AN ECOLOGY OF TRADE: TROPICAL ASIAN CULTIVARS
IN THE ANCIENT MIDDLE EAST
AND THE EASTERN MEDITERRANEAN

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DECLARATION

I, Sureshkumar Muthukumaran, confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis.
ABSTRACT

This thesis offers an ecological reading of long distance trade in the ancient world by investigating the anthropogenic movement of tropical Asian crops from South Asia to the Middle East and the Mediterranean. The crops under consideration include rice, cotton, citrus species, cucumbers, luffas, melons, lotus, taro and sissoo. The ‘tropicalisation’ of Middle Eastern and Mediterranean agriculture was a sluggish process but one that had a significant impact on the agricultural landscapes, production patterns, dietary habits and cultural identities of peoples across the Middle East and the Mediterranean by the end of the 1st millennium BCE. This process substantially predates the so-called tropical crop-driven ‘Agricultural Revolution’ of the early Islamic period posited by the historian Andrew Watson (1974-1983). The existing literature has, in fact, largely failed to appreciate the lengthy time-scale of this phenomenon whose origins lie in the Late Bronze Age. In order to contextualise the spread of tropical Asian crops to the Middle East and beyond, the history of crop movements is prefaced by a survey of long distance connectivity across maritime (Indian Ocean) and overland (Iranian plateau) routes from its prehistoric beginnings to the end of the 1st millennium BCE. This historical survey will highlight the variables (e.g. political processes, technological and social change) which made possible the ecological interface between South Asia, the Middle East and the Mediterranean.
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I. Introduction: A Genealogy of Old World Crop Exchanges

Before 1492 there were no tomatoes in Italy, no cattle in Texas, no oranges in Florida, no chilies in India, no coffee in Columbia, no tobacco in France and no chocolate in Switzerland. There was no danger of syphilis to the lustful of the Old World while those of the New World were kept at bay from smallpox, the dreaded pustular rash of the Old World. The European discovery and colonisation of the Americas brought little short of a revolution in the ecologies, agricultural regimes and dietary habits of both the Old and New Worlds. Crossing the Atlantic Ocean from the New World were maize, pumpkins, squashes, peanuts, pineapples, guavas, cacao, chile pepper, tomatoes, cashews, papayas, cassavas, sunflower and potatoes amongst a host of other crops while wheat, rice, barley, oats, sugarcane, coffee, bananas, citruses and a range of other cultivars travelled from the Old World to the New and became part of a labour-intensive, often slave-run, cash-cropping system.  

1492 inaugurated a world without biological borders and inadvertently one of the worst ecological-demographic disasters in human history, as it did not simply mark an exodus of people, ideas, technologies, livestock, and food crops, but also of weeds, pests and a host of diseases whose impact on the native populations of America was more severe than salutary. The environmental historian Alfred Crosby coined the phrase ‘the Columbian Exchange’ to describe this pivotal biological diffusion in his eponymous 1972 publication, now held as one of the foundational texts of the American school of environmental history.

But the Columbian Exchange is only the most recent and best recognised in a series of inter-continental biological dialogues. Archaeologists and economic historians have identified major thresholds in agricultural history, marked by the introduction of new crops and modifications in labour and capital inputs and have spoken of it either in terms of a revolution or an exchange. The most fundamental ‘revolution’ was, of course, the ‘Neolithic Revolution’, which saw the domestication of plants

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1 Heywood 2012: 72-73; McNeil 2014: 444-451; For a fuller list of crops see Hawkes 1998.
2 New World populations were not immune to a host of Old World diseases including smallpox, measles, mumps, whooping cough, influenza, yellow fever and malaria (McNeill 2014: 442); A recent genetic study by Llamas et al 2016, based on mitochondrial DNA from the osteological remains of ninety-two pre-Columbian South American individuals, indicates mass mortality and extinction of lineages during the early phase of European colonisation.
3 Childe 1936; Bellwood 2004; Barker 2006.
and animals and the attendant evolution of hunter-gatherers into sedentary farmers some 12,000 years ago in multiple regions of the Old World. The other notable prehistoric ‘revolution’ was the ‘Secondary Products Revolution’, which entailed changes in the management of domestic animals to obtain secondary products like milk, wool and traction. More recent agrarian ‘revolutions’ familiar to students of modern history include the 18th century ‘British Agricultural Revolution’, a prelude to the Industrial Revolution, and the ‘Green Revolution’ of the 1940s-1960s, both leading to increased crop yields and considerable demographic growth. The term ‘revolution’ is, however, a misnomer in all cases since these watersheds in agricultural history were culminating points of a process long in the making or more precisely a ‘time period when changes reached critical mass’.

The post-Neolithic agricultural regime of the Old World was fluid, absorbing new cultivars from different biogeographic zones and adapting them to local social and cultural complexes. The new cultivars included calorific staples like grains, pulses and tubers, cash crops like fibre and oil plants, aromatics, ornamental plants and non-staple food crops like fruits, vegetables and spices which the archaeologist Andrew Sherratt terms ‘variety crops’. East Asian grains like foxtail millet (Setaria italica) and broomcorn millet (Panicum miliaceum) reached Europe by the late 2nd millennium BCE through the mediation of Central Asian nomadic communities. While Europe has a species of wild apple (Malus sylvestris), a

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4 On the issue of multiple centres and protracted processes of crop domestication see Meyer, Duval and Jensen 2012 and Fuller, Wilcox and Allaby 2011; A forthcoming DNA study of forty-four Middle Eastern individuals dating between 12,000 and 1400 BCE demonstrates that the lineages of the earliest farming communities of the southern Levant and the Zagros were distinct, suggesting that the transition from hunter-gatherer to farmer was an independent development in both regions (Lazaridis et al 2016).
6 Toynbee 1884; Chambers and Mingay 1966; Overton 1996.
7 Gaud 1968; The ‘Green Revolution’, a term coined by officials at the United States Agency for International Development, was marked by the introduction of high-yielding disease-resistant genetically modified crops to populous developing countries.
8 The most conspicuous feature of more recent agrarian advances is mechanisation of farming which led to the shift away from peasant agriculture to the agrarian capitalism of present-day. Mechanisation freed labour for non-agricultural pursuits, which for the first time in human history became more significant than subsistence production in the local and global economy.
11 Sherratt 1999: 27.
species native to Central Asia (*Malus sieversii*) is the main contributor to the domesticated apple’s (*Malus domestica*) gene pool.\(^{13}\) Other Central and East Asian contributions to the Iron Age European agricultural landscape include apricots (*Prunus armeniaca*), peaches (*Prunus persica*), hemp (*Cannabis sativa*), pistachio (*Pistacia vera*) and carrots (*Daucus carota* subsp. *sativus*).\(^{14}\)

Sub-Saharan African crops like sorghum (*Sorghum bicolor*), finger millet (*Eleusine coracana*), pearl millet (*Pennisetum glaucum*), hyacinth bean (*Lablab purpureus*), cowpea (*Vigna unguiculata*) and castor (*Ricinus communis*) were transplanted to Peninsular India via maritime routes in a piecemeal process by the early 2\(^{nd}\) millennium BCE.\(^{15}\) The archaeobotanist Dorian Fuller and his colleagues dub this process the ‘Bronze Age inter-savannah translocations’.\(^{16}\) Somewhat later in the 1\(^{st}\) millennium BCE, bananas (*Musa x paradisiaca*), taro (*Colocasia esculenta*) and yams (*Dioscorea alata*) were transmitted in the reverse direction from tropical Asia to sub-Saharan Africa where they remain important calorific sources.\(^{17}\) These examples should suffice to underscore the scale and multi-directionality of crop movements across the Old World.

This thesis examines one such trajectory within the multi-directional Old World exchange of crops and fauna. The Indian subcontinent encompasses a great variety of ecological zones and is, agriculturally-speaking, extraordinarily diverse, with native crops being supplemented by cultivars from Africa, the Middle East, Central, East and Southeast Asia. It is specifically the transmission of crops and fauna of tropical and subtropical Asian origin from the Indian subcontinent to the Middle East and the Mediterranean which has been described as the ‘most important movement of crops before the Columbian exchange’.\(^{18}\) The botanist Michael Zohary notes that tropical South and Southeast Asian crops constituted the ‘largest group of

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\(^{13}\) Cornille et al 2012; Zohary, Hopf and Weiss 2012: 136.
\(^{16}\) Fuller, Boivin, Hoogervorst and Allaby 2011.
\(^{18}\) Sherratt 1999: 28.
introduced aliens’ in the Middle East and the Mediterranean.\textsuperscript{19} Alan Mikhail, a historian of the early modern Middle East, describes this tropical-temperate biological diffusion as responsible for the creation of a ‘unified ecological contact zone’ of overlapping sets of cultivars and livestock across the Eurasian landmass.\textsuperscript{20}

While not denying the importance of this phenomenon, the exceptionality of this exchange is exaggerated in historical narratives. The “Indian” tropical-temperate bioexchange stands out from other early crop movements not only on account of its wide geographical scope and diverse repertoire of crops but also because the cultures which were directly involved have left written records, lending greater visibility to agrarian changes here compared to other similar processes elsewhere in the Eurasian landmass. The stories of the latter have to be chronicled by archaeologists rather than historians. The only other ancient transcontinental Eurasian bioexchange with a comparable impression on documentary sources is perhaps the exchange of crops along the maritime and terrestrial ‘Silk Roads’ between China, Iran, India and Southeast Asia between the Han and Tang dynasties (2\textsuperscript{nd} century BCE – 9\textsuperscript{th} century CE).\textsuperscript{21}

The tropical-temperate exchange of crops between India, the Middle East and the Mediterranean has been variously described in scholarly literature depending on the agency, routes and chronology scholars have chosen to privilege. The historian Andrew Watson\textsuperscript{22} speaks of this exchange as an ‘Arab Agricultural Revolution’ or the ‘Medieval Green Revolution’ (700 -1100 CE). Sherratt opts for a more neutral ‘Trans-Eurasian exchange’\textsuperscript{23} but elsewhere has described the same process as part of the ‘Orientalisation’ of the Mediterranean.\textsuperscript{24} John McNeill, a global historian, privileges the maritime routes across the Indian Ocean and dubs it the ‘Monsoon Exchange’.\textsuperscript{25} Lynda Shaffer, another global historian, situates the crop exchange within a broader exchange of ideas and technology and describes the phenomenon

\begin{footnotes}
\textsuperscript{19} Zohary 1998: 127.  
\textsuperscript{20} Mikhail 2011: 952.  
\textsuperscript{23} Sherratt 2006.  
\textsuperscript{24} Sherratt 1999: 27.  
\textsuperscript{25} McNeill 2001.  
\end{footnotes}
as the ‘Southernisation’\textsuperscript{26} of the Northern Hemisphere. In terms of chronology, scholars have mostly failed to appreciate the lengthy process of crop transfers and have unhelpfully attributed agency to one or more political actors including the Romans, the Sasanian Persians and the medieval Arabs.\textsuperscript{27} The findings of this thesis, however, make it apparent that South Asian crop movements to the Middle East and beyond extend back to the Late Bronze Age horizon and no single political actor can be credited with initiating and sustaining this process.

The crop exchange under consideration here first entered scholarly purview with the historian Andrew Watson’s groundbreaking 1974 publication entitled, ‘The Arab Agricultural Revolution and Its Diffusion’. This was followed by another article, ‘A Medieval Green Revolution’ (1981), and finally a monograph, ‘Agricultural Innovation in the Early Islamic World: The Diffusion of Crops and Farming Techniques’ (1983). In these works, Watson argued for an agricultural revolution in the early Islamic Middle East and the Mediterranean (c. 700 – 1100 CE) fostered by the diffusion of new Indian crops and improved farming techniques. The tropical South Asian ‘summer crop’ package discussed by Watson included rice, sorghum, durum wheat, sugarcane, cotton, sour oranges, lemons, lime, pomelo, banana, coconut, watermelon, spinach, artichoke, taro, aubergine and mango. Watson argued that the cosmopolitan, Islamicised populations of the Middle East were the principal agency in this biodiffusion. He held, in Boserupian fashion, that the privatised labour-intensive farming of the Islamic lands, which involved equitable distribution of water, enriched irrigation methods (e.g. extensive use of water-lifting machines, underground canals, dams), crop rotation and greater application of fertiliser, allowed for higher crop yields, population expansion and urban development.

But Watson’s work is plagued by what one reviewer calls a ‘profound lack of interest in the pre-Islamic landscape and a host of flawed assumptions’.\textsuperscript{28} Most of the crops cited by Watson were already introduced well before the Islamic period and certainly did not arrive in a package.\textsuperscript{29} Nor was there anything novel about the

\textsuperscript{26} Shaffer 1994.
\textsuperscript{27} King 2015.
\textsuperscript{28} Decker 2009: 191.
\textsuperscript{29} While Watson’s case for the introduction of new tropical crops in the Middle East and the Mediterranean during the early centuries of Islam has been shown to be invalid causal association
hydraulic engineering of the early Islamic world which only represents an expansion of pre-existing hydraulic technologies.\textsuperscript{30} The dispersal histories of individual crops are varied and complex. The notion that tropical South Asian crops were an ‘exogenous deus ex machina to kick-start change’\textsuperscript{31} in hitherto static Middle Eastern and Mediterranean economies is thoroughly misleading. The diffusion of South Asian flora and fauna to the Middle East and beyond was not a linear uninterrupted event but rather an episodic process with its roots in the interconnected world of Late Bronze Age. While Watson’s work provides the stimulus for thinking about biological diffusions in the Old World, the so-called ‘agricultural revolution’ is far older than supposed and a much more gradualised process which needs to be contextualised with reference to long-term economic and social developments.

(Decker 2009; Ruas et al 2015; King 2015), there are many scholars who continue to cite his conclusions (e.g. Zohary 1998; Mears 2011: 153; McNeill 2014: 439). See Squatriti 2014 for a discussion of the lasting influence of the ‘Watson thesis’ on historical studies and other academic disciplines. There have, however, been strong critics of the ‘Watson thesis’ from its inception. See Johns 1984 for an early critique of Watson’s work which argues that it is shoddy in the details.\textsuperscript{30} Decker 2009: 190.\textsuperscript{31} Squatriti 2014: 1212.
II. Objectives, Scope and Limits

This thesis in essence offers an ecological reading of long distance trade networks in the ancient world by investigating the botanical transfers through maritime and overland routes from South Asia to the Middle East and the Mediterranean between the Late Bronze Age and the Iron Age (c. 1200 – 100 BCE), with the aim of assessing the motivations behind and impact of this phenomenon on ancient Middle Eastern and the Mediterranean societies. The discussion of individual crops will be prefaced by a detailed sketch of Indo-Middle Eastern relations from prehistory to the end of the Hellenistic period (c. 1st century BCE). This *longue durée* narrative of connectivity between the Middle East, the Mediterranean and South Asia, whose full contours have yet to be appreciated by ancient historians, forms an essential backdrop to both early and later crop movements.

The textual and archaeological materials collected here have yielded evidence for the introduction and naturalisation of several South Asian cultivars in the Middle East and the Mediterranean between the Late Bronze and Early Iron Ages. These cultivars most prominently include rice (*Oryza sativa*), cotton (*Gossypium arboreum*), citron (*Citrus medica*), lemons (*Citrus limon*), cucumbers (*Cucumis sativus*), luffas (*Luffa cylindrica*), lotus (*Nelumbo nucifera*), taro (*Colocasia esculenta*) and sissoo (*Dalbergia sissoo*). Sesame (*Sesamum indicum*) and Asian melons (*Cucumis melo*) travelled to the Middle East much earlier (Early Bronze Age) than other South Asian crops considered here and will accordingly be treated with brevity.

Mediterranean and Middle Eastern cultivars were also transmitted to South Asia between the Late Bronze Age and the Iron Age (c. 1200 – 100 BCE). A number of commonly used spice and aromatic plants in South Asia including coriander, cumin, black cumin, ajwain, fenugreek, saffron, marjoram and liquorice originate in temperate zones west of the Indian subcontinent.\(^{32}\) Although coriander (*Coriandrum sativum*), a native of the Middle East,\(^{33}\) was already identified as seeds at a late 3rd

\(^{32}\) See Dalby 2003 for further literature on individual cultivars.

\(^{33}\) Zohary, Hopf and Weiss 2012: 163.
millennium BCE context in Miri Qalat in Pakistani Baluchistan, its widespread use in South Asia probably owes to culinary exchanges with the Achaemenid Empire in the 1st millennium BCE. This is suggested by the use of an Akkadian or, more likely, Aramaic-derived loanword for the plant in Sanskrit: *kastumburu* (<Akk. *kusibirru*; Aram. *kusbara*). Similarly almonds, walnuts, pomegranates and apples are not native to the Indian subcontinent and derive from Central Asia and the Middle East. The movement of cultivars from the Mediterranean and the Middle East to South Asia is, on the whole, poorly documented. While these crop movements in the reverse direction shared the same routes and mechanisms with the tropical Asian crops moving to temperate zones, the Middle Eastern and Mediterranean contribution to South Asian agriculture, diet and culture is beyond the scope of the present study.

Like the Columbian Exchange, the tropical-temperate “Indian” exchange also entailed the transfer of human populations, animals, commensals, pests and diseases which left an irrevocable ecological imprint on host landscapes in the Middle East and the Mediterranean. The animals transmitted to the Middle East and the Mediterranean from South Asia included both domesticates and exotica ranging from chickens, peafowl, parakeets, Asian elephants, tigers, mongooses, water buffaloes and even cat and dog breeds. The movement of fauna had a significant impact on agricultural practice, communications, warfare and leisurely pursuits. The westward dispersal of chickens, for instance, ensured that egg consumption could become regular rather than seasonal as was the case with eggs produced by geese and ducks. But calorific needs were not the only motivation for the chicken’s

34 Tengberg 1999: 6, 10.
35 References to coriander in the early Sanskrit medical corpus have been collected in Singh 1999: 113.
36 Archaeobotanical evidence indicates familiarity with almonds and walnuts in northwest India by late Harappan period (c. 1800 BCE) (Fuller and Madella 2001: 340).
37 Bodson 1999: 75-78; Secord 2016.
38 The wild red junglefowl (*Gallus gallus*) is the main contributor to the domesticated chicken’s gene pool. The native habitat of this species stretches from northeastern India to southern China and Southeast Asia. Introggression with another species of wild fowl in South Asia, the grey junglefowl (*Gallus sonneratii*), was responsible for the yellow-legged feature of many varieties of modern chicken. See Peters 1913; Carter 1923; Colthered 1966; Borowski 1998: 156-8; Ehrenberg 2002; Fuller et al 2011: 551 and Perry-Gal et al 2015 for the zooarchaeological, iconographic and literary materials available for the dispersal of chickens from tropical Asia to the Middle East and Europe. Chickens were already known in the Middle East from around the mid-late 2nd millennium BCE onwards but only become common in the 1st millennium BCE. See also Boivin et al 2013: 252 – 4; Boivin et al 2014: 553, 556 for the dispersal of chickens into Africa.
westward movement. In classical Greece, cockerels appear as important courtship gifts in pederastic relationships, undoubtedly connected to one of the most common modes of gambling across the Old World: cockfighting.\textsuperscript{39}

Figure 1: Zeus with Ganymede holding a cockerel as a courtship gift, Attic red-figure kylix by the Penthesilea Painter, mid-5\textsuperscript{th} century BCE (Museo archeologico nazionale di Ferrara 9351) (Source: McClure 2002: 18).

Pests and commensals trailing humans, animals and plants along Indian Ocean routes included the black rat (\textit{Rattus rattus}), house mouse (\textit{Mus musculus}), Asian house shrew (\textit{Suncus murinus}) house crow (\textit{Corvus splendens}), geckos (\textit{Hemidactylus} spp.) and a great variety of insects including agricultural pests.\textsuperscript{40} A number of weed species like horse purslane (\textit{Trianthema} spp.) and buttonweed (\textit{Spermacoce} spp.) accompanied the trans-Indian Ocean shipment of grain.\textsuperscript{41} It is likely that trade in grain and farinaceous products across overland Eurasian routes also led to the spread of weeds and crop pests. The other significant unintentional

\textsuperscript{39} Dalby 2003: 83; On the importance of social and cultural factors (with an emphasis on cockfighting) in the westward spread of the chicken see Sykes 2012.

\textsuperscript{40} Fuller and Boivin 2009: 29-31; Boivin et al 2013: 246 – 249, 264.

\textsuperscript{41} Fuller and Boivin 2009: 27-28; Boivin et al 2013: 215-216.
dispersal was that of microbial pathogenic organisms (Protozoa, bacteria, viruses), whose role in the formation of familiar Old World diseases (e.g. smallpox, measles, influenza) and epidemics was central. The sheer complexity of this ecological change cannot be pursued in any great depth here and we will restrict our present analysis to the movement of crops from South Asia to the Middle East and the Mediterranean and, where relevant, agricultural pests.

A. Sources and Limitations
Owing to the wide spatial and temporal scope of this project, the sources consulted here avail themselves in a range of genres and in several ancient languages including Sumerian, Akkadian, Hebrew, Aramaic, Greek, Latin, Sanskrit and the Prakrits. The textual sources in Sumerian and Akkadian have rarely been privileged in discussions of ancient crop translocations despite the wealth of references to cultivated plants in both languages. This hesitation is a result of the imprecise identification of ancient plant names in both languages with modern botanical equivalents, especially in cases where there are no clear lexical cognates in other languages.\(^42\)

The archaeobotanical evidence is therefore of great importance in validating or invalidating interpretations of plant names in textual sources. As new crops fall outside the traditional tithing regime, their frequency in administrative documents is also expected to be low or non-existent. In such instances the archaeobotanical evidence, which typically avails itself as seeds, charcoal, plant impressions, pollen, phytoliths or even whole desiccated fruits, proves indispensable in the understanding of the spatial and chronological distribution of new cultivars.\(^43\) But the archaeobotanical record is far from exhaustive and some countries like Egypt, Israel and Greece have benefitted from more thorough sampling of archaeological plant remains than other nation-states in the modern Middle East and Mediterranean. Botanical remains are, of course, subject to the fortuitous coincidence of deposition and preservation. Archaeobotanical assemblages are differentially affected by

\(^42\) On the difficulties of identifying botanical species in the cuneiform record see Postgate 1984: 5-7.
\(^43\) See Fuller 2002: 248 – 249 and Zohary, Hopf and Weiss 2012: 9-13 for an overview of archaeobotanical datasets. Residue analysis of ceramics for distinctive plant chemical signatures is also a significant source of information on ancient cultivars and trade commodities.
climate, soil types, deposition conditions and other taphonomic processes (e.g. charring), resulting in the uneven sampling of cultivars.

While Greco-Roman records offer more extensive descriptions of plants, it must be borne in mind that not all authors saw the plant being described and some authors plagiarised and garbled older accounts, with the result that little useful information on the contemporary cultivation status of the plant can be extracted. Pliny, the author of the Natural History which holds a large influence over discussions of botany in antiquity, is notorious for plagiarism by modern standards. He claims, for instance, that the citron refused to grow anywhere but in Persia and Media, a statement which is a misreading of Theophrastus whom he copies and completely at odds with the relatively rich archaeological data for citrus fruits in Roman Italy (see Chapter VI). The agricultural historian Andrews’s appraisal of Solinus (3rd century CE), who in turn plagiarised Pliny in his description of citrons (46.6), is perhaps an apt description for Pliny in this instance as well: ‘Solinus, however, was such an unobservant individual that he was capable of being oblivious to a citron tree growing in his neighbour’s backyard.’ Lexical discrepancies are not unknown in ancient Greco-Roman sources either. A strict and systematic botanical taxonomy of the modern Linnaean type was unknown in the ancient world, resulting in substantial semantic fluidity among some botanical terms. Textual sources must therefore be applied cautiously in conjunction with archaeological sources and, wherever relevant, synthesised with data from disciplines like art history, agronomy, botany, genetics and linguistics for an accurate understanding of the history and dispersal of cultivated crops.

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44 For a discussion of “plagiarism” in Latin literature, including Pliny, see McGill 2012.
45 Pliny HN XII.16: sed nisi apud Medos et in Perside nasci noluit.
46 Andrews 1961: 41; cf. Purcell 2012 on Pliny: ‘he not infrequently garbles his information through haste or insufficient thought.’
III. The Historical and Geographical Context: South Asia, the Middle East and the Mediterranean c. 3500 – 100 BCE

‘Virtually everywhere one looks, the processes of human movement and encounter are long-established and complex. Cultural centres, discrete regions and territories, do not exist prior to contacts, but are sustained through them, appropriating and disciplining the restless movements of people and things.’

- James Clifford, Routes: Travel and Translation, 1997: 3

The ‘restless movements’ of people, commodities and ideas underpin all anthropogenic biological diffusions. The ease with which tropical crops are transmitted to the Middle East and the Mediterranean from the late Bronze Age onwards underscores a longstanding connectivity between South Asia, the Middle East and the Mediterranean. The diversity of terrestrial and maritime routes, middlemen and centres of exchange between South Asia, the Middle East and the Mediterranean matches the complex peregrinations of individual crops. The arrival of a new crop was, in most cases, preceded by trade in related botanical produce. Increasing demand eventually made it profitable to replace imports with local cultivation. Other cases of crop introductions may be altogether inadvertent: a case of piggybacking as part of a merchant’s subsistence needs before being bartered for local foods at the end destination. In order to understand how the human ecologies of the Middle East and the Mediterranean were transformed by trade networks, it is necessary to sketch a longue durée history of “Middle Asian” mobility across land and sea from its prehistoric beginnings to the age of the Hellenistic kingdoms (3rd – 1st centuries BCE).

47 Sherratt 1999: 19.
A. Origins, Routes and Modes of Transport

The origins of east-west connectivity in the Eurasian landmass lie in the distant prehistoric horizon. The earliest trade networks between South Asia and the Middle East, archaeologically discernible at least by the 4th millennium BCE, were little more than unorganised ‘down-the-line’ transmissions of small portable goods and perishables like precious and semi-precious stones, shells, stone and wood artefacts, resins, reeds, hides, finished crafts like baskets and cured foods.\(^{48}\) These local and regional circulations of goods involved both mobile pastoralists and settled communities.\(^{49}\)

Local deficiencies in vital raw materials probably played a key role in stimulating trade in bulky commodities over longer distances. An economy of scarcity in materials like metal, timber and stone which characterised southern Mesopotamia made connectivity across the Persian Gulf and the Iranian plateau a recurring structural feature of the region’s historical development.\(^{50}\) In the earliest phases no single agency shaped the contours of this trade since there were no professional merchants replying to distant demand with premeditated commercial strategies.

While the earliest trading landscapes did not consist of paved roads and imperial highways, natural impediments to communications in the form of mountains and deserts funnelled the long-distance trickling overland trade into several distinct routes which remained in constant use ever since: the northerly overland route or the Great Khurāsān road led from the Western Himalayas, stretched over the length of the Iranian plateau bypassing the arid interior (Dašt-e Kavīr; Dašt-e Lūt), skirted the southern sub-tropical shores of the Caspian Sea before descending onto the Mesopotamian lowlands through the Baghdad-Kermanshah-Hamadan corridor. This route was later to become an arm of the renowned ‘Silk Road’ that connected the Middle East to Central and East Asia.

The southerly overland route leading from the lower Indus valley through the modern Iranian provinces of Baluchistan, Sistan and Kerman, was less favourable to

\(^{48}\) Reade 2008: 12-13.
\(^{49}\) As Bovin and her colleagues note, the role of non-agrarian societies in crop transfers has frequently been downplayed: Boivin, Fuller and Crowther 2012: 464; Boivin, Fuller and Crowther 2015: 350-1.
\(^{50}\) van de Mieroop 1999: 30-31; Ratnagar 2004: 22-23.
latter-day trade caravans owing to drier and harsher climatic conditions encountered along the route. In the late 4th century BCE, Alexander’s ill-fated return to Babylon from India across the Gedrosian desert exposes the perils of travel for large-scale convoys along this route.\textsuperscript{51} It is salient to note, however, that the southerly overland route intersected at various points with the maritime coasting route from northwest India to the Persian Gulf. It was, after all, a Gedrosian pilot Hydrakes who guided Alexander’s fleet to Karmania (modern Kerman).\textsuperscript{52} An unpublished Persepolis Fortification Tablet\textsuperscript{53} (500 BCE) attesting to the travel of a relatively large party of fifty (Indian?) nobles (\textit{ruh šalup}) from Susa to India through Karmania (\textit{Šušanhumar Karman sapa}) also raises the possibility that maritime and overland routes coincided in southern Iran wherever terrestrial travel became too hostile for pack animals and pedestrians alike.\textsuperscript{54} 

Both overland routes are not, however, to be mistaken for single thoroughfares since they mask the presence of lesser riverine routes, side roads and pastoral tracks which remain, for the most part, imperceptible to the modern observer as pre-modern roads emerged from the determinism of local perceptions of the environment and not of physical features alone.\textsuperscript{55} Pack animals like zebu cattle, horses, donkeys and the Bactrian camel were the primary movers of long-distance trade across the Iranian plateau. Before the widespread use of the horse\textsuperscript{56} and the camel, zebu cattle, a domesticate of northwest South Asia,\textsuperscript{57} probably functioned as the chief pack animal between South Asia and eastern Iran. A pair of zebu cattle could pull loads of up to 900 kg over rough terrain and traverse 40 km in about 10 hours.\textsuperscript{58} Depictions of zebu cattle occur in Mesopotamian and west Iranian contexts by the late 4th millennium and osteological remains of zebu cattle are attested as far west as Shahr-i Sokhta in Sistan by the early 3rd millennium BCE.\textsuperscript{59} 

\begin{footnotes}
\item[51] Arr. \textit{Anab.} VI.21.1 - 26.5.
\item[52] Arr. \textit{Ind.} 27.1.
\item[53] PFNN 615.
\item[55] Horden and Purcell 2000: 128.
\item[56] In both South Asia and the Middle East domesticated horses only become important carriers from the 2nd millennium BCE onwards: Thapar 2002: 85; Fuller and Madella 2001: 368.
\item[57] Chen et al 2010.
\item[58] Matthews 2002: 440.
\item[59] Matthews 2002: 443.
\end{footnotes}
By the 2nd millennium BCE, if not slightly earlier, the Bactrian camel (*Camelus bactrianus*) was to become the single most important mover of trade along the plateau routes, especially across terrain that was difficult for wheeled transport. The 13th century Persian poet Sa’di recalls the hardiness of the camel over that of the horse: ‘to walk and then sit is better than to run and then collapse (…) an Arabian steed gallops in haste but a camel proceeds slowly night and day’. ⁶⁰ The Late Antique Greek author Didymus (4th/5th centuries CE) even remarks that he saw Bactrian camels ‘competing alongside horses and winning (in races)’. ⁶¹ The presence of camel bones, dung and hair at Shahr-i Sokhta and camel figurines attached to clay carts from Turkmenistan suggests the domestication of the Bactrian camel in Central Asia by the 3rd millennium BCE. ⁶² Mesopotamian references to the Bactrian camel as the ‘camel of the road’ (Sumerian *amsiharran*), suggesting some role in terrestrial transportation, are already to be found as early as the mid-3rd millennium BCE. ⁶³ Additionally, Steinkeller has convincingly interpreted the references to the *gugur*, a large ungulate from the central Iranian plateau (*Šimaški*), in Ur III texts as another word, possibly foreign, for Bactrian camels, thus confirming their role in long-distance transactions in late 3rd millennium BCE Mesopotamia. ⁶⁴ The Bactrian camel may have reached as far as the Mediterranean by the early 2nd millennium since a hematite seal from Northern Syria dating between 1800-1650 BCE depicts a divine couple sitting on a Bactrian camel. ⁶⁵

The persistent importance of camels as agents of transport east of the Zagros is also suggested by the Assyrian king Aššur-bēl-kala’s (1074—1057 BCE) efforts to breed them in 11th century BCE Assyria: ‘he sent out merchants and they brought back *burḫiš* oxen, female Bactrian camels and *tešēnu*-animals, he collected the female Bactrian camels, bred (them), and displayed herds of them to the people of his

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⁶³ Horowitz 2008: 601, 603-5; The earliest mention of the Bactrian camel is to be found in an Early Dynastic list of animals from Šuruppak. While the Sumerian term *amsi* normally denotes an elephant, bilingual Sumerian-Akkadian lexical texts equate the compound form of the Sumerian word *amsi* (e.g. *amsikarra*, *amsiharran*) with the Akkadian for camel (*ibīlu*). See Potts 2004a, Horowitz 2008 and Steinkeller 2009.
⁶⁴ Steinkeller 2009; On the region of *Šimaški*, stretching from the Isfahan region to the south Caspian, see Steinkeller 2014: 697-698.
⁶⁵ Heide 2010: 345; Walters Art Museum, Baltimore Inventory No. 42.804.
Aššur-bēl-kala may not have been the first Assyrian king to import and breed camels since the bones of nine Bactrian camels dating to the 13th and 12th centuries BCE were found at Middle Assyrian Dūr-Katlimmu/Tell Sheikh Hamad in western Syria. An Aramaic administrative document from the archives of the satrap of Achaemenid Bactria (mid-4th century BCE) indicates continued royal interest in the breeding of camels in later periods as well as attesting to tax exemptions granted to Bactrian camel-keepers (OP uštrapāna). The breeding of Bactrian camels is, of course, not an end in itself but a vital infrastructural investment in long-distance trade along the plateau routes. The high estimation of camels in eastern Iranian cultures is also suggested by the appearance of camelophoric (-uštra) names in the Avesta (c. 1100 – 500 BCE), the oldest extant Iranian textual corpus and the sacred scripture of the Zoroastrian faith, most notably that of the prophet Zarathuštra himself (probably a ‘driver of camels’ or less plausibly ‘possessor of mature camels’).

Figure 2: Attic lekythos found in South Italy (c. 410 - 400 BCE) bearing an image of a Persian, interpreted with Bacchic inflections, riding a Bactrian camel, British Museum

(Source: http://www.britishmuseum.org/research/collection_online/collection_object_details/collection_image_gallery.aspx?assetId=114605001&objectId=461605&partId=1)

66 Grayson RIMA II A.0.89.7 iv 26-28: burḫiš udrâte tešēnī tamkārī išpur ilqiūni udrāte ikṣur ušālid sugullātešunu nišī mātišu ušebri.
69 Schmitt 2002; On the Avesta see Skjaervo 2011 and for camels in the Avesta see Schwartz 1985: 660.
The relative quiet of the Atlantic and the Pacific in early human history presents a dramatic contrast to the constancy, volume and vibrancy of human activity in the Indian Ocean.\textsuperscript{70} The historian Felipe Fernández-Armesto remarks that the ‘precocity of the Indian Ocean as a zone of long-distance navigation and cultural exchange is one of the glaring facts of history: enormously important and puzzling, when you come to think about it, yet hardly remarked, much less explained, in the existing literature.\textsuperscript{71} Trans-oceanic navigation and networking was to a great degree born and perfected in the Indian Ocean theatre. The volume and distances travelled by peoples, commodities and ideas over this stretch of water in the prehistoric and early historic periods dwarfed those of other water-bodies whose edges were colonized by human settlers. In this regard, Plato perhaps fittingly appraised the Greeks in the Mediterranean to be nothing more than ‘ants or frogs about a pond’.\textsuperscript{72}

Monsoonal winds, seasonally reversing airstreams generated by the differential heating of land and sea during summer and winter, were the single most important movers of long-distance trade in the Indian Ocean and defined the contours of interactive spaces. Northeasterly winds prevailing in winter above the equator facilitated east to west movements while journeys in the reverse direction were hastened by summer southwesterlies.\textsuperscript{73} The knowledge of harnessing monsoon winds for open sea sailing, goaded by the experience of deep-sea fishing, was known to the inhabitants of the Harappan civilisation in northwest India by the late 3\textsuperscript{rd} millennium BCE when they took to sailing directly to Mesopotamia.\textsuperscript{74} The regularity of long-distance movements along monsoonal routes is, however, a relatively late development (mid-1\textsuperscript{st} millennium BCE onwards) in the Indian Ocean.\textsuperscript{75} While the Persian Gulf and the South Arabian coast were familiar territory for Indian sailors from the late 3\textsuperscript{rd} millennium onwards, longer direct open sea

\textsuperscript{70} Vink 2007: 54; Rangan, Carney and Denham 2012: 319.
\textsuperscript{71} Fernández-Armesto 2001: 382.
\textsuperscript{72} Plato Phaedo 109b: δὲ ἀνέστη ἐπὶ τέλη μὴρήμας ἢ βατράχους.
\textsuperscript{74} Boivin and Fuller 2009: 166.
\textsuperscript{75} Boivin et al 2014: 555.
voyages to the Red Sea and Africa are not attested with any frequency until the late 1st millennium BCE.  

Small-scale interconnecting coasting routes represent the typical and the earliest mode of connectivity along the Indian Ocean littoral. The earliest carriers were little more than seaworthy reed boats caulked with bitumen and dugout canoes. This was supplemented in the late 3rd millennium by more efficient long-distance seafaring craft: stitched wooden boats which became a distinctive and ubiquitous feature of Indian Ocean seascapes. The standard Babylonian version of the epic of Gilgameş redacted by Sîn-lēqi-unninni clearly refers to the sewn boat tradition in the description of the plugging in of the stitching holes in Utanapištim’s boat (XI. 64: sikkât mē ina qablīša lū amhaṣ). Stitched wooden boats have survived in parts of the Indian Ocean until recent times, providing substantial ethnographic data to understand pre-modern seafaring craft. Mediterranean seafarers unacquainted with this technique of boat construction were struck with surprise, fear or even disdain for this tradition. Ḥalfon ha-Levi, a 12th century CE Jewish merchant crossing the Indian Ocean from Egypt exclaims: ‘We set sail in a ship with not a single nail of iron, but held together by ropes; may God protect with his shield!’

B. The 4th - early 3rd millennium: Peoples and commodities across the ‘Lapis lazuli Road’

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76 The role of East Africa in the Bronze Age Indian Ocean interactive sphere is still unclear although the spread of tropical African crops to India between the late 3rd and early 2nd millennium BCE argues for trans-oceanic contacts (See footnote 15 on relevant literature). Whether this contact was direct or mediated by communities along the South and East Arabian littoral is still a moot point as African crops transmitted to India have not been recovered in early Arabian archaeological sites (Boivin, Blench and Fuller 2009: 266; Boivin and Fuller 2009: 114, 165-166). Copal, a hardened tree resin from East Africa (Zanzibar, Mozambique, Madagascar,) was found in a pendant in a mid-3rd millennium context at Eshnunna (Tell Asmar) in Mesopotamia (Meyer et al 1991). African copal may have reached Mesopotamia via Arabian intermediaries, lending support to the hypothesis that Peninsular Arabia mediated Mesopotamian and Indian interactions with East Africa.


83 Goitein and Friedman 2008: 11 n. 27.
The routes between the Indo-Iranian borderlands and the Middle East might as well be dubbed the ‘Lapis lazuli Road’\(^{84}\) as the azure stone exclusively derived from eastern sources remains the single most diagnostic feature of the east-west trade in archaeological assemblages in both early and later phases. Owing to the specific geological conditions under which lapis lazuli can be formed, the natural geographical distribution of lapis lazuli is extremely narrow. Geological surveys have established four sources for lapis lazuli in the Old World, all of which lie east of Iran: Badakhšan in eastern Afghanistan, Iškašim in the Pamir Mountains of Tajikistan, the Lake Baikal region in Siberia and the Mogok region of Upper Myanmar (Burma).\(^{85}\) While Iškašim in the Pamirs is only about 130 km northeast of Badakhšan, the lapis lazuli deposits are located on a precipitous cliff face 4600 metres in elevation, making it unlikely that this site was exploited in antiquity.\(^ {86}\) The lapis lazuli deposits in Siberia, bordering a glacier at 5029 metres in altitude, are equally remote.\(^ {87}\) The famed Mogok Stone Tract in Upper Myanmar, rich in jade, gold, placer diamonds, sapphires and above all rubies, is also known to produce lapis lazuli\(^ {88}\) but it is unclear if the lapis lazuli from Mogok was mined and traded westwards in antiquity.\(^ {89}\)

This makes the lapis lazuli deposits in the mountains of Badakhšan, along the upper reaches of the Kokcha in eastern Afghanistan, the most feasible source for the stone in antiquity and certainly the main source for regions immediately to the west of Afghanistan. The Badakhšan deposits are themselves of difficult access with the four known mines (Sar-i Sang, Chilmak, Stromby, Robat-i Paskaran) ranging in altitude between 1800 and 5000 metres.\(^ {90}\) Sar-i Sang, the most important and still-active mine, is located on a steep mountainside, with the approach to the mine having to be renegotiated every spring following the ruin of old pathways by snowfall and fierce winter storms.\(^ {91}\)

\(^{84}\) Sarianidi 1971.  
\(^{86}\) Law 2014: 426.  
\(^{87}\) Herrmann 1968: 28.  
\(^{88}\) Waltham 1999.  
\(^{89}\) Law 2014: 424.  
\(^{90}\) Herrmann 1968: 22, 24.  
\(^{91}\) Herrmann 1968: 24.
Figure 3: The valley of Sar-i Sang, northeast Afghanistan (Source: http://www.minimaetmoralia.it/wp/il-teso-ro-afghano-di-sar-e-sang/).
The earliest evidence for trade in and the use of lapis lazuli derives from the site of Mehrgarh in Pakistani Baluchistan where small beads of the stone were recovered from 7th millennium BCE graves. In the west, lapis lazuli (Sumerian zāgin; Akkadian uqnû) is first attested in Northern Mesopotamian sites like Tepe Gawra, Nineveh and Arpachiyah by the early 4th millennium BCE and in the south and as far as Egypt from the mid-4th millennium onwards. The magnitude and immense geographical reach of the early trade in lapis lazuli is best reflected in the discovery of over 22 kilogrammes of unworked lapis lazuli at the artisanal quarter of a late 3rd millennium palace in Ebla, Syria. Sumerian textual sources of the late 3rd and early 2nd millennium are replete with references to lapis lazuli. The stone, which was considered auspicious, found extensive use in the sacred and palatial sphere as material for cultic objects, cylinder seals, amulets and ornaments, as inlays in a variety of objects including gaming boards, weapons, musical instruments, statuary or was simply hoarded as treasure in its raw form.

Figure 4: Unworked lapis lazuli fragments from Royal Palace G, Ebla, Syria c. 2400 – 2300 BCE (Source: Pinnock 1995: 150).

92 Law 2014: 419.
94 Pinnock 1995:150-2; Casanova 2001: 158.
95 Winter 2010.
96 Ibid.
Figure 5: Detail from the “Standard of Ur”, perhaps a part of a musical instrument, lapis lazuli, shell and red limestone inlay, Royal Tombs of Ur, c. 2550 - 2400 BCE (Source: Aruz and Wallenfels 2003).

Lapis lazuli certainly did not travel alone but was accompanied by a host of other perishables and non-perishable commodities, the former having left scarce archaeological traces. Among the raw materials coming from the east, tin, the most common alloying agent in bronze, was undoubtedly a vital import. The most important sources of tin for the Middle East and the Eastern Mediterranean are located beyond the Iranian plateau, in southern Central Asia (Eastern Kazakhstan, Uzbekistan, Tajikistan and Afghanistan) and northwest India (Aravalli mountains).  

Minor tin deposits are also found closer to Mesopotamia in the central Zagros (Deh Hossein, Sanandaj-Sirjan-zone). Tin-bronzes are first attested in small quantities in Mesopotamia (Tepe Gawra, Kish, Ur, Tell Judeidah) and Iran (Susa, Kalleh Nissar) in the late 4th and early 3rd millennium and become more frequent from the late 3rd

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98 Nezafati, Momenzadeh and Pernicka 2008: 9-11; Helwing 2009 disputes the importance of the Zagrosian tin deposits in antiquity.
millennium onwards.\textsuperscript{99} The mastery over large-scale tin-bronze casting by the end of the 3\textsuperscript{rd} millennium is suggested by the boast of Rimuš (2278 – 2270 BCE), the second king of Akkadian Empire, that he erected a statue of himself in tin (probably tin-bronze) at the sanctuary of the god Enlil in Nippur.\textsuperscript{100}

The constancy of demand, which dawned upon the local suppliers of materials like lapis lazuli and tin, probably encouraged the development of professional trade networks by the end of the 4\textsuperscript{th} millennium. The end of the 4\textsuperscript{th} millennium also marks the eastward expansion of a southwest Iranian material culture termed Proto-Elamite (c. 3100 – 2900 BCE). This cultural phenomenon, perhaps linked to the spread of an ethno-linguistic group, is marked by the adoption of distinctive ceramic forms (bevel-rim bowls, nose-lugged bichrome jars), the use of seals and inscribed tablets in the Proto-Elamite script.\textsuperscript{101} Proto-Elamite tablets have been found in Kerman (Tepe Yahya), several sites on the central Iranian Plateau (Qazvin, Kashan, Tehran plains) and as far east as Sistan (Shahr-i Sokhta) while the pottery types (especially bevel-rim bowls) extend further east into Pakistani Baluchistan.\textsuperscript{102}

While the exact impetus behind the expansion of Proto-Elamite culture across the Iranian plateau remains unclear,\textsuperscript{103} genetic and linguistic studies which provide evidence for wide-ranging east-west population movements in prehistoric and historic periods, suggest that a similar population-language-culture dispersal may be at work here. In this regard, one recent study of DNA sequences from ancient osteological remains in the Middle Euphrates valley has yielded solid evidence of a genetic link between Bronze Age populations of the Middle East and those of modern South Asia. The molecular biologist Henryk Witas and his colleagues\textsuperscript{104} examined mitochondrial DNA sequences extracted from the dental remains of four individuals, two from Early (c. 2650-2450 BCE) and Middle (2200-1900 BCE) Bronze Age Terqa in Syria and two from Roman (200-300 CE) and Late Antique (500-700 CE) Tell Masaikh, Syria. All four individuals carried mitochondrial DNA

\textsuperscript{99} Nezafati, Momenzadeh and Pernicka 2008: 9-11; Radivojević et al 2013: 1031.
\textsuperscript{100} Foster 2016: 8, 324.
\textsuperscript{101} Petrie 2013: 15; On the undeciphered Proto-Elamite script and tablet finds see Desset 2012 and Dahl, Petrie and Potts 2013.
\textsuperscript{102} Petrie 2013: 15; Lamberg-Karlovsky 2013: 564.
\textsuperscript{103} Lamberg-Karlovsky 2013: 566.
\textsuperscript{104} Witas et al 2013.
haplotypes belonging to the M4b1, M49 and/or M61 haplogroups which are absent in modern Syria but are to be found in Trans-Himalayan and South Asian populations. Haplogroup M lineages are believed to have diversified in the Indian subcontinent between 5800 and 2500 years ago.\(^{105}\)

The presence of a distinctive South Asian genetic signature in the Middle Euphrates valley indicates an early (pre-2500 BCE) population movement from the east. The alternative suggestion of Witas and his colleagues that this might represent itinerant merchants is untenable since direct Indo-Mesopotamian trade relations are only a feature of the late 3rd millennium BCE and even then it is extremely unlikely that South Asian merchants ventured as far inland as the Middle Euphrates valley. The genetic evidence for an early migration from the east inevitably implicates itself with the much-disputed origins of the Sumerian-speaking peoples of southern Mesopotamia.\(^{106}\) Odontometric analyses of individuals from Chalcolithic (Eridu; Ubaid) and Bronze Age (Ur) sites in southern Mesopotamia have previously been used to suggest Sumerian affinities with Indian populations.\(^{107}\)

On the linguistic front, Braun has argued, perhaps overly optimistically, for morphological and lexical correspondences between Sumerian and the Tibeto-Burman language family.\(^{108}\) Other scholars have more reasonably proposed that Sumerian is a coastal creole, including among other contributors the languages spoken by the peoples of coastal Iran and the Indus.\(^{109}\) Although there is no consensus on Sumerian origins or the affiliations of the language, the bioarchaeologist Arkadiusz Soltysiak notes that the South Asian origin theory for Sumerian-speakers is ‘relatively better grounded, although no author tested it in proper way and it still remains only a speculation.’\(^{110}\) Julian Reade, remarking on the unfamiliarity of India to scholars of the ancient Middle East, pithily notes that the ‘Indian precedence over Early Dynastic Mesopotamia introduced a new and disturbing element into ancient history’.\(^{111}\) The Biblical baggage aside, there

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\(^{105}\) Witas et al 2013.
\(^{106}\) Witas et al 2013; Reade 1997.
\(^{107}\) Soltysiak 2006.
\(^{110}\) Soltysiak 2006: 151.
\(^{111}\) Reade 2001: 28.
remains a strong historiographical bias in approaching the history of the ancient Middle East from the point of view of the modern ‘West’, both conceptually and geographically. This has even extended to the appropriation of the pre-Islamic Middle East as the ‘cradle of ‘Western civilization’. The future work of scholars familiar with the archaeological, historical and linguistic setting of regions to the east and north of the Middle East will hopefully promote more holistic readings of the ancient Middle East, as well as elucidate contentious issues like the Sumerian question and its alleged eastern associations.

Whatever the origins of the Sumerian peoples, the archaeological and genetic data unmistakably indicates strong links between Mesopotamia and populations in the east. The earliest Sumerian polities, in particular the city of Uruk, may have even sponsored long distance trading and diplomatic ventures in the early 3rd millennium BCE if later-day literary materials are to be believed. Sumerian literary texts of the late 3rd and early 2nd millennium preserve the memory of Uruk’s interactions with a distant and wealthy eastern polity named Aratta, whose El Doradoesque portrayal and no-show in prosaic economic and administrative texts has led scholars to posit that Aratta belongs to the realm of fabulous travel fiction rather than reality. Aratta may not, however, be entirely mythical since an Indus valley locality named Aratā is attested in Sanskrit sources of the 1st millennium BCE (e.g. Baudhāyanaśrautasūtram 18.13, 18.44). Although the Sumerian and Sanskrit references to Aratta are separated by over a millennium, the conservatism of toponyms and the easterly location of Aratta relative to Mesopotamia means that the homonymity is too much of coincidence to be ignored. With regards to the mythicisation of Aratta in Sumerian texts, one might perhaps draw a parallel with the later-day Arabic cycle of stories relating to Sindbad the sailor (literally ‘a man of Sind i.e lower Indus’) where the portrait of the Indian Ocean is generic and mythical but ultimately rooted in a tangible topography.

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112 Pollock 2005.
113 On Uruk in the early 3rd millennium BCE see the essays and bibliography in Crüsemann et al 2013.
114 See Vanstiphout 2003 and Mittermayer 2009 for the Sumerian literary texts relating to Aratta.
117 Pinault 1998
C. Late 3rd – Early 2nd Millennium: The Middle Asian Interactive Sphere

While the expansion of Proto-Elamite culture, east-west population movements, the widespread use of lapis along the Nile-Indus corridor and the Sumerian legends about the eastern country of Aratta already suggest substantial connectivity across the Iranian plateau in the late 4th and early 3rd millennium, the earliest historically verifiable organised trade between India and the Middle East belongs to the late 3rd millennium BCE. The Harappan civilisation of northwest India, stretching from the Makran coast in the west to the upper Ganga-Yamuna Doab in the East and southwards into Gujarat, the Sumerian and Akkadian-speaking populations of southern Mesopotamia and polities in Oman (Magan), Eastern Arabia (Dilmun) and Iran (especially Elam in Khuzestan, Marhaši in Kerman and Šimaški in the central Iranian plateau) were the key players in the creation of an intensively interactive zone between the late 3rd and early 2nd millennium BCE. In Mesopotamian chronology this extends from the Early Dynastic III to the Old Babylonian periods.

The Harappan archaeologist Gregory Possehl has fruitfully described this interactive zone as the ‘Middle Asian Interaction Sphere’ whose frontiers extended from southern Central Asia in the north to the Arabian Peninsula in the south and from the Mediterranean in the west to the Indian subcontinent in the east.

Harappan artefacts in Mesopotamia, Iran and the Persian Gulf are the main witnesses for the vibrant trade links between India and the Middle East in this period. Textual references to Meluḫḫa, the Sumerian-Akkadian designation for the Harappan civilisation and its peoples in northwest India, represent the other key source for understanding early trade and political links. The relative absence of Mesopotamian artefacts in India and the extensive distribution of Indus artefacts in the Persian Gulf indicate that Mesopotamian traders were largely uninvolved with

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118 Note also other eastern Iranian and South-Central Asian polities mentioned in Mesopotamian sources: Tukriš which is probably to be identified with the archaeological culture termed the Bactria-Margiana Archaeological Complex (BMAC), covering the territories of modern-day northern Afghanistan, southern Uzbekistan and eastern Turkmenistan, and Kupin which was probably located somewhere in Baluchistan (Steinkeller 2014: 693, 701-704).
sailing to India.\textsuperscript{122} The newfound maritime confidence of the Harappans from c. 2500 BCE onwards, expressed itself in the foundation of trading colonies on the southern Iranian coast (Sutkagen-dor, Sotka-koh), in Oman (Ra’s al-Junayz, Ra’s al-Hadd, Hili, Maysar), in Bahrain and eastern Arabia (Saar, Ras al-Qala) and eventually in southern Mesopotamia itself.\textsuperscript{123} The presence of distinctive Indus cooking and serving vessels alongside personal adornments like shell bangles and toys at these ‘colony’ sites suggests that Harappan merchants were accompanied by their womenfolk and children, a rare phenomenon in ancient trade.\textsuperscript{124}

\begin{figure}[h]
\centering
\includegraphics[width=0.5\textwidth]{figure6.png}
\caption{Terracotta bird whistle-toy, Harappa (Source: https://www.harappa.com/figurines/62.html)}
\end{figure}

\textsuperscript{122} Vidale 2004: 261-2; Boivin and Fuller 2009: 164.
\textsuperscript{123} Cleuziou 1992; Wright 2010: 225-228; Parpola 2015: 210-212; Frenez et al 2016.
\textsuperscript{124} Cleuziou 1992; Blackman and Méry 1999; Cleuziou and Méry 2002: 296 - 298; Kenoyer 2008: 24-25; Thornton 2013: 609; Frenez et al 2016: Compare, for instance, the Old Assyrian trade network in Anatolia in which Assyrian merchants left their wives in Aššur to manage their households and on occasion maintained secondary local wives in Anatolia. A few Assyrian women did, however, accompany their husbands on the trip to Anatolia (Michel 2010, 2014).
Harappan trade commodities included raw and finished beads of semi-precious stones (lapis lazuli, carnelian, chalcedony, heliotrope), shell artefacts (Turbinella pyrum etc), ivory, animal figurines, gold and a variety of timbers (sissoo, ebony, teak).\textsuperscript{125} Textiles almost certainly formed an important element of exchange\textsuperscript{126} although they are largely invisible in the textual and archaeological records as are agricultural products like dates, ghee, reeds and cured foods. The late 3\textsuperscript{rd} millennium

\textsuperscript{125} Potts 1993; Ratnagar 2004; Reade 2001: 26-28; Morello 2014: 541 – 543.
\textsuperscript{126} Smith 2013.
horizon also saw the introduction of at least one South Asian cultivar and a few animals to the Middle East along east-west trading routes. Sesame (*Sesamum indicum*), a major oil-producing crop of Indian origin, was cultivated in the Middle East by the late 3rd millennium BCE. The earliest archaeological evidence for sesame in the Middle East presently derives from the site of Abu Salabikh c. 2300 BCE. One of the Akkadian terms for sesame, *ellu*, undoubtedly derives from the Dravidian *eḷḷu* (sesame), whose variants are still commonly used in modern South Dravidian languages. This borrowing incidentally reveals the presence of Dravidian-speaking elements in the Bronze Age Indus valley. A few Indian animals including water buffaloes, zebu cattle, peacocks and monkeys were also introduced into Mesopotamia. ‘The Curse of Agade’, a Sumerian composition of the Ur III or early Old Babylonian period (late 3rd - early 2nd millennium BCE) describes the former capital Agade as a place where the ‘monkey, monstrous elephant, buffalo (and) beasts of exotic climes rub shoulders in the broad streets’.

The water buffalo (Sumerian *abzaza*) is well attested in seals of the Sargonic period including those of royalty like Tar’am-Agade, the daughter of king Naram-Sin, and of high administrative officials like the scribes of Enheduanna, high priestess of the moon-god Nanna at Ur, and the king Šarkališarri. The buffalo’s disappearance in later periods suggests that there were never many buffaloes imported from India to begin with. It is not clear if the buffalo was bred for ornamental and ritual purposes or if it had an economic role in Sargonic Mesopotamia much as it does in the marshlands of modern Iraq and Khuzestan in Iran (Figure 9).

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128 Fuller 2003c: 132.
129 On Akkadian terms for sesame see Stol 1985.
130 Southworth 2005: 204, 224, 332.
132 On the domestication of water buffaloes (*Bubalus bubalis*) in India see Nagarajan, Nimisha and Kumar 2015.
Figure 9: Domesticated water buffalo (*Bubalus bubalis*) and children at Khorramshahr at the confluence of the Shatt al-Arab and Karun rivers, Khuzestan, southwestern Iran, Mohammadreza Soltani Tehrani, 2013 (Source: http://silkroadartgallery.com/?mohammadreza-soltani)

Figure 10: Water buffaloes on the seal of Ibni-šarrum, the scribe of king Šarkališarrî, Louvre AO 22303 (modern impression from ancient seal; Source: Aruz and Wallenfels 2003: 209)
South Asian zebu cattle (*Bos indicus*), on the other hand, undoubtedly functioned as important sources of milk, meat, leather, dung for fuel and fertilizer, and traction. While zebu cattle were already familiar in Mesopotamia and western Iran from eastern Iranian and Indian sources from as early as the late 4th millennium BCE, additional waves of zebu from the east and localized breeding increased zebu stocks in the Middle East from the late 3rd millennium BCE onwards. Although locally domesticated cattle (*Bos taurus*) were available in the Middle East, zebu cattle proved attractive as they are heat tolerant, highly resistant to livestock diseases and have lower water requirements. Genetic (mitochondrial; autosomal; Y-chromosomal) data pertaining to modern Middle Eastern cattle populations indicates considerable introgression between *Bos taurus* and *Bos indicus* especially in Iraq. The crossbreeding of zebu and local taurine stocks to produce hardier drought and disease-resistant cattle, is probably phenomenon dating back to the Sargonic period.

Figure 11: Zebu bulls (Kangayam breed) in Samathur, Tamil Nadu, India (Source: http://www.thehindu.com/news/national/tamil-nadu/kangayam-bulls-line-up-at-kaalnadai-thiruvizha/article6867280.ece)

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134 Matthews 2002; Boivin and Fuller 2009: 159.
The peacock onomatopoeically named the ېaya-bird\textsuperscript{137} in Sumerian was probably introduced in Mesopotamia in Sargonic times but like the buffalo disappears after the Old Babylonian period and is only attested in the 1\textsuperscript{st} millennium BCE as a result of re-introductions from India.\textsuperscript{138} Monkeys frequently attested as figurines from the Early Dynastic to Old Babylonian periods represent Indian and African imports as there are no primates native to Mesopotamia and Iran.\textsuperscript{139} As the monkey figurines are stylized it is not possible to identify the species with precision. Some figurines, like a red calcite monkey from late 3\textsuperscript{rd} millennium BCE Susa found alongside other Indus-related objects (Figure 12), bear generic similarities to the Rhesus macaque (\textit{Macaca mulatta}),\textsuperscript{140} which is found abundantly from Afghanistan to mainland Southeast Asia. A few other exotic animals may have arrived on occasion by way of tribute and diplomatic embassies. A (wild?) cat (\textit{gullum}) of Meluḫḫa is mentioned in an Old Babylonian Sumerian-Akkadian collection of proverbs and elsewhere Ur III economic texts refer to models of an unidentified Meluḫḫan bird.\textsuperscript{141}

\begin{figure}[h]
\centering
\includegraphics[width=0.5\textwidth]{squatting_monkey.jpg}
\caption{Squatting monkey (Rhesus macaque?), Red calcite, Susa, Late 3\textsuperscript{rd} millennium BCE, Louvre Sb 5884 (Source: author’s photograph)}
\end{figure}

\textsuperscript{137} Nanše and the birds A.50; Enki and the World Order 229 (Black et al 1998-2006).
\textsuperscript{138} Meissner 1913; Bodson 1998: 166-77; Bodson 1999: 75-81.
\textsuperscript{139} Dunham 1985; Ratnagar 2004: 203-7; Note the Proto-Elamite gypsum statuette of a monkey dated c. 3000 BCE and another grey marble statuette of two monkeys of slightly later date in the collection of the Fogg Museum, Harvard University (Nos. 1986.601; 1983.174) which appear to be among the earliest depictions of primates in the region.
\textsuperscript{140} Possehl 1996: 261; Araz 1992: 97-98.
\textsuperscript{141} Possehl 1996: 141-3; Steinkeller suggests that this might be a reference to chickens (Steinkeller 2013: 426).
The Harappans were not only involved in the trade of goods from the Indian subcontinent but also profited from the shipping of Persian Gulf resources like copper, timber and hard stones. While the Harappans dominated the sea-lanes along with shippers and traders from coastal Oman (ancient Magan) and Dilmun (Bahrain), the kingdom of Marhaši (or Parašum in Akkadian sources) in modern-day Kerman acted as a middleman for South and Central Asian goods (e.g. tin, gold and lapis lazuli) transmitted westwards through the southern overland routes. These commodities were exported to Mesopotamia together with local luxury chlorite stoneware in the so-called ‘Intercultural style’ which drew inspiration from both western and eastern iconography. Apart from Marhaši whose eastern boundaries extended to the Bampur valley in Iranian Baluchistan, late 3rd and early 2nd millennium polities like Šimaški in the Central Iranian plateau and Tukriš in Bactria-Margiana, located along the northerly land route or the Great Khurāsān road, were also responsible for the movement of South Asian commodities to Mesopotamia and beyond. The peoples of Mesopotamia were not passive recipients of foreign trade but were themselves actively involved in regional trading networks. Most of the large seafaring ‘Magan-boats’ attested in Sumerian texts of the Ur III period were not actually from Magan (Oman) but were seacraft made and serviced by Mesopotamian shippers and traders under the aegis of the Ur III state. These state barges carried vast quantities of Mesopotamian produce like textiles, barley, aromatic oils and leather for consumers across the Persian Gulf.

In Mesopotamia the earliest distinctively Indian artefacts are attested at Early Dynastic IIIa levels (mid-3rd millennium BCE) in the form of long carnelian and etched carnelian beads in the Royal Tombs of Ur. The forms of ornamentation found in the Royal Tombs of Ur, particularly those associated with queen Puabi of the Meskalamdug dynasty and her retainers, bear strong associations with the Indus

142 Thornton 2013: 601.
143 The polity of Marhaši is also known in archaeological literature as the Jiroft civilisation after the modern region, which has yielded the most diagnostic sites for this civilisation, or the Halil Rud civilisation after the main fluvial body in the area.
144 Steinkeller 1982: 250-2; Steinkeller 2013; Steinkeller 2014: 693.
145 Perrot and Madjidzadeh 2003; Steinkeller 2013; Vidale and Frenez 2014.
146 Steinkeller 2013: 414.
147 Presumably named after a type of seafaring vessel used by coastal Omani traders or alternatively the ships were named after the end-destination.
148 Steinkeller 2013: 418-422.
region. Both the queen and her retainers are equipped with distinctive gold and silver floral headdresses, which are otherwise only attested in the iconography of the Harappan civilisation. Puabi and another occupant of a tomb at Ur were also dressed with girdles strung with lapis lazuli and carnelian beads of South Asian origin. The wearing of jewelled girdles by women, incidentally still a distinctive feature of Indian costume is perhaps an Indian contribution to Mesopotamian ornamentation. Either the court of Ur was smitten with Indus fashions as Aruz suggests or the retainers and perhaps Puabi herself may have come from further east. DNA and isotopic analyses hold great potential in unravelling ancient population movements, including perhaps the identity of the occupants of the Royal Tombs of Ur. Kenoyer, Price and Burton’s (2013) strontium isotopic analysis of human dental remains from cemeteries in Harappa and Ur has so far been inconclusive since the access to Mesopotamian samples was limited to two human teeth from Ur. The strontium analysis data for Harappa has, however, suggested population movements from other areas in the Indus and beyond.

Contacts between the Indus and Mesopotamia are much more pronounced in the subsequent Sargonic (or Old Akkadian) and Ur III periods. A coincidence of Harappan mercantile entrepreneurism and the rise of an expansionist imperial polity in Mesopotamia kindled intensive trade and political contact between both regions. Sargon (2334 – 2279 BCE), the eponymous founder of the first historically verifiable Mesopotamian empire, famously claims to have ‘moored the boats of Meluhha (Harappan India), Magan (Oman) and Dilmun (Bahrain) at the quay of Akkad’, his capital somewhere near present-day Baghdad. The presence of Harappans in Sargonic Mesopotamia is vividly confirmed by the seal inscription of one Šu-ilišu, described as the interpreter of the Harappan language (emebal Meluḫḫa). The Ur III king Šulgi also claimed that he could speak the language of

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150 Apart from its functional role in holding garments in place, the pleasant jingling sound of jewelled waist girdles (like those of anklets and bangles) held an erotic allure. The Sanskrit poet Māgha, for instance, refers to the loins of a woman as the ‘abode of the girdle’ (kāñcidhāman) (Sīṣupālavadha X.83).
153 Kenoyer, Price and Burton 2013.
154 Steinkeller 2013: 415.
155 Frayne RIME II E2.1.1.11; E2.1.1.12; Foster 2016: 322; This inscription of Sargon is preserved in Sumerian and Akkadian versions from Old Babylonian Nippur.
The presence of Harappan settlers, including merchants, craftsmen and perhaps other kinds of specialists like puppeteers (see below), is also indicated by discoveries of Indus seals and seal impressions at Mesopotamian and Western Iranian sites including Ur, Girsu, Umma, Nippur, Kish, Eshnunna and Susa. Some Sargonic administrative texts note the issue of food rations for Harappans and even a Maršaššian for a journey back to Meluḫḫa. The descendants of Harappan traders who settled in southern Mesopotamia in the Sargonic period continue to be attested in the subsequent Ur III period where administrative documents attest to the presence of a Meluḫḫa village in the Guabba province south of Lagaš, home to the largest port in southern Mesopotamia.

Figure 13: Seal and seal impression of Šu-ilišu, the interpreter of the Harappan language, southern Mesopotamia, c. 2220 – 2159 BCE, Louvre (Source: Aruz and Wallenfels 2003: 413)

The first kings of Akkad maintained an aggressive military presence in the Gulf and Iran aimed at securing direct control over the region’s natural resources (e.g. hard stones, copper) and the trade routes leading to the Indus. Mesopotamian expansionism, however, soured political relations with polities in the east. Despite close commercial links, Mesopotamian sources indicate that the Harappan polity
(Meluhha) was allied to the chief enemies of the Sargonic dynasty in the east: the powerful kings of Marhaši in modern-day Kerman. The Harappans came to the aid of Abalgamaš, king of Marhaši, and his general Sidgau in a battle in Western Iran against Rimuš (2278 – 2270 BCE), the second king of the Sargonic dynasty. The Harappans, led by one king (x)-ibra, again implicated themselves in a revolt against Naram-Sin of Akkad alongside Marhaši. A copy of a Sargonic inscription also suggests that the Harappans opposed king Maniştūšu (2269 – 2253 BCE) in a battle fought in Oman. This is not at all unlikely given the archaeological evidence for a strong Harappan settler presence along the Omani coast.

The political relations of the later kings of Akkad and their Ur III successors with Marhaši and her staunch ally Meluhha become more amicable. Texts from Nippur attest to a marriage between a prince of Akkad, perhaps the future king Šarkališarrī of Akkad (2217 – 2193 BCE) or his brother Ubil-Istar, and a Marhašian princess. The king Ŝulgi of Ur gave his daughter Liwwir-miṣṭašu in marriage to a king of Marhaši. The envoys of the Marhašian kings were regular features at the court of the Ur III kings. It is quite probable that Marhaši entertained close matrimonial and diplomatic links with Harappan royalty well before the détente with the kings of Akkad and later Ur. The close relationship between Marhaši and Meluhha is, however, impossible to reconstruct in detail owing to the absence of “insider” documents. Consequently early Irano-Indian ties remain visible only in broad outline through outlier Mesopotamian perspectives. That Marhaši held close relations with the Harappans even in later times is suggested by Marhaši’s gift of a ‘speckled dog/feline (ur) of Meluhha’, perhaps an Indian cheetah or leopard, to Ibbi-Sin, the last king of the Ur III dynasty of southern Mesopotamia.

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160 Frayne RIME II E2.1.2.8; Steinkeller 1982: 256; Steinkeller 2014: 693; Parpola 2015: 215; Foster 2016: 324.
161 Parpola 2015: 216.
164 Potts 2002: 345; Potts 2004b: 8; Steinkeller 2014: 692, 697.
166 Steinkeller 1982: 260-1 n. 95.
167 Cheetahs are presently extinct in South Asia.
168 Frayne RIME III/2.1.5.4; Potts 2002: 347 – 351; Parpola 2015: 216.
The involvement of the Harappans in the political affairs of Mesopotamia, although mediated by Marhaši, is a strong testament to a well-connected information network, resembling in some ways the better-known Late Bronze Age ‘international’ system represented by the 14th century BCE Amarna correspondence between the Egyptian Pharaoh and his Middle Eastern counterparts.169

The Bronze Age interactive sphere between Mesopotamia and the Indus was not limited to political and trade contacts but also extended to inter-cultural exchanges. The case of Harappan ornamentation on the elite of Early Dynastic Ur has already been considered. A form of puppetry may have been another Indus contribution to the Middle East. Three ithyphallic terracotta puppets excavated at Nippur, dating between 2100 and 2000 BCE, have strong parallels with terracotta puppets found in Harappan sites like Lohumjo-daro, Chanhu-daro, Mohenjo-daro and Lothal.170 Stone versions of similar animal and human puppets, with Indus precedents, are also reported at the Marhašian site of Konar Sandal South in Iran.171

Cubical and spherical weights of the Indus type appearing at various Middle Eastern sites (e.g. Tell Abraq, Konar Sandal South, Shimal, Susa, Ur) vouch for the influence of Harappan metrology.172 This system of weights, despite being of Indian origin, was known in Mesopotamian texts as the ‘standard of Dilmun’,173 as it was widely adopted across the Persian Gulf. The finds of Harappan dice and gaming pieces at sites like Ur, Lagash and Barbar, probably associated with a precursor of the chaupar-pachisi-type of board game,174 indicate either the popularity of an Indian game in the Middle East among local populations (like chess in later times) or alternatively represent the games brought by Harappan merchants and colonists.175

Cultural influences percolated in the opposite direction as well. The famous Near Eastern “contest scene” between man and beast has its equivalents in the

171 Pittman 2013: 65.
174 This game has been simplified into ludo in the modern West.
The iconography of the Indus although the lion or bull is usually substituted with the local tiger. Asko Parpola discusses the case of the distinctive Mesopotamian royal and heroic coiffure in the form of a plaited double-bun which has Indus and Vedic parallels as well. The examination of cultural affinities and exchanges between Mesopotamia, Iran and India is still in its infancy. The chronology and direction of influences, if not independent developments, is unclear for many common cultural features like deities with horned headdresses, the decoration of eyes with kohl, the profession of snake charmers or the use of shells as libation devices. Culture, as the art historian James Cuno aptly states ‘has never known political boundaries and has always been mongrel and hybrid, (providing) evidence of contact between peoples and their intertwined history’. 

Map 1: Major late 3rd millennium BCE sites across “Middle Asia” (Source: Vidale and Frenez 2015: 145)

178 The profession of the snake charmer (Sumerian mušlah; Akk. mušlahhu) is already attested in Mesopotamia in the mid-3rd millennium BCE. The earliest named snake charmer by the name of Balul was in the service of the king Ur-Nammu of Lagaš who ruled sometime between 2550 – 2400 BCE: Frayne RIME I E1.9.1.2; E1.9.1.4. The ancient Indian snake charmer (Skt. sarpavid) and his Mesopotamian counterpart were not frivolous entertainers familiar to modern audiences but professionals skilled in the lore of snakes (Skt. sarpavidya) including the interpretation of snake omens, poison extraction and the propitiation of snake deities. See Macdonell and Keith 1912: 438 for Vedic references to the ‘science of snakes’ and snake charmers. Note also Potts 2007b on a parallel if not related ritual involving serpent sacrifice in the Persian Gulf and India for which there is archaeological evidence from mid-1st millennium BCE Bahrain.
179 Cuno 2008: 172.
D. The 2nd – Early 1st Millennium: Decline and Revival

With the end of the mature Harappan polity c. 1900 BCE and the political crisis engendered by the collapse of the centralised state in Mesopotamia and the attendant rise of multiple centres of power controlled by Amorite princelings, the vibrant maritime trade of the Persian Gulf suffered a dent and entered a long phase of gradual decline. The end of the mature Harappan polity, perhaps a centralised state, did not entail civilisational collapse and outposts of Harappan culture survived especially in Gujarat and even further south in the Tapti valley and the upper reaches of the Godavari in Maharashtra (Daimabad).\(^{180}\) The early 2nd millennium marked the heyday of the late Harappan port of Kuśasthali or Dvārakā, successively ruled by the Raivata, Pûnyajana and the Yādava dynasties.\(^{181}\) The outlier survivals of the Harappan civilisation continued to maintain maritime contacts with the Persian Gulf. Harappan seals are attested in Nippur in Mesopotamia and the northern Persian Gulf (Failaka) as late as the Kassite period c. 1400 BCE.\(^{182}\)

Direct political and trading relations between South Asia and Mesopotamia, however, effectively came to an end. Polities in the Iranian plateau and the Persian Gulf mediated the “Indian trade”, in a manner reminiscent of trading relations prior to the late 3rd millennium BCE. Romila Thapar, a historian of ancient India, in this regard fittingly remarks that “the more spectacular maritime trade was occasional but in its interstices there was a steady small-scale contact, often coastal, which involved transporting essential supplies quite apart from luxury items”.\(^{183}\) The durability of long distance trade networks was not premised on the existence of large-scale polities since the regular pattern of exchange in the Persian Gulf was one that was sustained by small-scale agro-pastoral and fishing communities along the littoral zones.\(^{184}\)

Early Old Babylonian documents between c. 1900 – 1750 BCE indicate that the region of Dilmun (Bahrain and eastern Arabia) ranked foremost among the

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\(^{181}\) Thapar 1978: 222-3; Shastri 2000: 3-4.

\(^{182}\) Possehl 1996: 150; Chakrabarti 1999: 199.

\(^{183}\) Thapar 1997: 12.

middlemen for Indian commodities including precious and semi-precious stones like lapis lazuli and carnelian, ivory and timber.\textsuperscript{185} Dilmunite merchants travelled inland as far north as Mari and Šubat-Enlil, the short-lived capital of a Northern Mesopotamian empire created by Šamši-Adad I (c. 1808 – 1776 BCE).\textsuperscript{186} Archaeological discoveries of Late Harappan ceramics at Dilmun sites like Qala’at al-Bahrain and Saar on Bahrain (c. 2000 – 1850 BCE) indicate that the peoples of the Indus and Gujarat only sailed as far as eastern Arabia and Bahrain in this period.\textsuperscript{187}

On the Mesopotamian side, much of the Gulf trade was initially managed through the Ningal temple at Ur which levied a tithe on all incoming trade commodities.\textsuperscript{188} One trader Milku-dannum dedicated, for instance, a šuba-stone (agate?) from Meluhha to the temple as tithe in the reign of Sumu-ilum of Larsa (1894-1866 BCE).\textsuperscript{189} The prerogative of taxing Persian Gulf trade commodities was later transferred to the Larsait royal court in the reign of Warad-Sin (1854-1825 BCE).\textsuperscript{190} The involvement of palace and temple in this period was limited, however, to taxing trade. Long-distance trade enterprises were otherwise coordinated and sustained by private entrepreneurs pooling their resources together.\textsuperscript{191} This early form of profit-oriented joint-stock venture is more clearly outlined by the voluminous Kültepe archives of Assyrian merchants in Anatolia (19\textsuperscript{th} – 18\textsuperscript{th} centuries BCE).\textsuperscript{192}

Overland trickle trade routes through the Iranian plateau may have been less affected although the pace of communications here was invariably slower compared to the maritime routes. A round trip by camel caravan between Afghanistan and
Mesopotamia could take up to six months.\textsuperscript{193} In contrast, vessels plying the routes between the Indus and the Straits of Hormuz could cover the journey in a minimum of twenty days.\textsuperscript{194} The lapis lazuli frequently attested in the Kültepe archives of the Assyrian traders in Anatolia probably derived from overland routes passing through Northern Mesopotamia rather than the maritime routes.\textsuperscript{195}

Indus products were still imported on a substantial scale, enough in one case to make a throne of Indian (\textit{Meluḫḫan}) wood, perhaps teak, and a votive lapis lazuli axe and sedan chair for the god Tishpak at his temple in Eshnunna in the Diyala valley of central Mesopotamia.\textsuperscript{196} Texts from Mari in the Middle Euphrates region also attest to furniture made of woods from Meluḫḫa including a kind of table (Akk. \textit{kanniškaraku}).\textsuperscript{197} Despite the termination of direct contacts, the Indus lands remained familiar in the Old Babylonian literary imagination, appearing, for instance, in contemporary literary compositions like ‘Enki and the World Order’ or ‘Enki and Ninhursag’, lexical texts, incantations and ritual texts (e.g. Lipšur litanies) and in the inscriptions of the kings of Akkad which were copied as part of Babylonian scribal activity.\textsuperscript{198}

The mid-late Old Babylonian period (c. 1750 – 1500 BCE) marked a nadir in Indo-Middle Eastern trading relations. Textual sources for the Gulf trade also become woefully thin in this period. The exhaustion of surface copper deposits in Oman gradually reoriented the focus of Mesopotamian trade away from the Gulf towards the west, where it now received copper from Cyprus through Syria.\textsuperscript{199} Sometime in the same period, the Sumerian-Akkadian toponym Meluḫḫa, formerly denoting the Indus region, came to be applied on the regions of Egypt and Nubia. This toponymic shift, the result of lost of contact and the similarity of some African trade products to Indian ones (e.g. exotic woods, ivory and wild animals like leopards and elephants), emerges most clearly in the Amarna letters, the mid-14\textsuperscript{th} century

\begin{thebibliography}{9}
\bibitem{193} Herrmann 1968: 36 n. 75.
\bibitem{194} Carter 2013: 590.
\bibitem{195} Veenhof and Eidem 2008: 82-84; Larsen 2015: 200.
\bibitem{196} Frankfort et al 1940:194.
\bibitem{197} Durand 1983: ARM 21 no. 298.3 (370-1); ARM 21 no. 289.10 (326-7); Kupper 1992: 166.
\bibitem{198} Possehl 1996: 142-144.
\bibitem{199} Crawford 1996:15-17, 20; Heimpel 2003: 38.
\end{thebibliography}
correspondence of contemporary Middle Eastern kings found at Amarna, the short-lived Egyptian capital. 200

But revival was not far in sight and it is likely that while the trade was reduced to a trickle, it never completely disappeared. The long-lasting Kassite dynasty of Babylon (c. 1475 – 1155 BCE) played a crucial role in the revitalization of the Gulf trade in the late 2nd millennium BCE. The correspondence between the Egyptian pharaoh and the Kassite kings of Babylonia preserved in the Amarna corpus (mid-14th century BCE), as well as Hittite royal correspondence, indicates that large amounts of lapis lazuli were sent to the Levant, Egypt and Anatolia from Kassite Babylonia. 201 The meagre amounts of lapis lazuli sent by Mitannian (Syrian) and Assyrian kings to the Egyptian Pharaoh suggest that the Kassites probably received their supplies through maritime or the southerly land routes via Elam rather than the overland trading routes. 202 The maritime hypothesis seems likely in light of Kassite domination over parts of the western Persian Gulf including the island of Bahrain (Dilmun) where a governor was installed c. 1450 BCE. 203 Materials of Indian origin like agate, carnelian and ivory have been excavated at the Kassite (City III) levels of Qala’at al-Bahrain (mid-15th – late 13th century), the most important settlement and seat of the Kassite governor in Bahrain. 204 The increased use of chalcedony types (agate, onyx, sardonyx) for seals, amulets and jewellery including the distinctive chalcedony ‘eyestones’ in Kassite Babylonia was probably the result of vibrant trading activity with India which was a major source of chalcedony. 205 The appearance of late Indus seals in Kassite contexts at Nippur and Failaka has already been noted. 206 The similarity of 13th and 12th century ceramics at Shimal, Oman and Tell Abraq in the U.A.E with those found in contemporary Pirak in Pakistan might also suggest commercial links between both regions. 207

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201 Olijdam 1997.
202 Olijdam 1997; Moorey 1999: 90.
203 Hoyland 2001:16; Potts 2006.
204 Olijdam 1997.
207 Olijdam 1997.
The transition from the Bronze Age to the Iron Age in the Middle East and the Mediterranean, associated with migratory movements like those of the “Sea Peoples” and Aramaeans, has usually been seen as disruptive to long distance trade connections. Recent residue analysis of Phoenician flasks from early Iron Age sites in Israel has not only refuted this view but has lent spectacular confirmation to the early origins of the Indian spice trade. Ten Phoenician flasks dating between the 11th and late 10th centuries BCE from Tel Dor, Tell Qasile and Kinneret have yielded traces of cinnamaldehyde, a distinctive chemical signature of Cinnamomum species which are native to India and Southeast Asia. The flasks contained the essential oil of cinnamon (Cinnamomum verum) or cassia (Cinnamomum cassia), the two most commercially significant Cinnamomum species. South India and Sri Lanka were the closest sources of cinnamon while cassia is a native of Indochina.

The finds of Cinnamomum essential oils in early Iron Age Phoenician flasks are not completely anomalous since cassia blossoms, used to extract aromatic oils, were previously known from the 7th century BCE botanical remains at the Heraion of Samos. The finds of Phoenician flasks at both cultic and ordinary domestic sites indicate that cinnamon oil was not only considered a luxury. The aromatic oil was probably used in rituals, perfumery, wine flavouring and medicine. In the Book of Exodus (30:23-4), the Israelite god instructs Moses to gather fragrant cinnamon (Heb. kinnemōn bešem) and cassia (kiddāh) among other aromatics to make the holy oil used to anoint the Tabernacle and the Aaronite priests. While this tradition may belong to an earlier Iron Age phase, the passage in Genesis as it appears today is the redaction belonging to the so-called Priestly Source (P) dated between the 6th and 5th centuries BCE.

The importance of cinnamon as a Levantine export is also recalled by Herodotus who remarks that the Greeks learnt ‘from the Phoenicians to call it cinnamon’ (Hdt.
The outlandish story of cinnamon collected from the broken nests of giant Arabian birds recounted by Herodotus was probably a Phoenician fabrication to enhance the product’s status and keep other Mediterranean traders, especially those of Greek origin, in the dark about the origins of cinnamon. This sort of fanciful advertising has more recent ethnographic parallels. The inhabitants of the Siassi islands in New Guinea, for instance, sell ceramics to non-pottery producing tribes as the shells of deep-sea molluscs harvested with much difficulty. Given the early archaeological and textual attestations of cinnamon and cassia in the eastern Mediterranean, an earlier acquaintance with these spices in Mesopotamia is certain. The earliest extant textual references to both spices in Mesopotamia only date, however, to the 6th century BCE. The Akkadian šalīḥātu for cinnamon is probably a borrowing from the Sabaic slḥt (modern Arabic salīḥatun). Pliny preserves this Semitic name for cinnamon as serichatum.

Myristate-related compounds found in some Phoenician flasks from the same early Iron Age sites in Israel have also suggested the presence of nutmeg from Southeast Asia but this is presently not conclusive. The cinnamon finds, however, put into perspective the previously isolated discovery of Indian peppercorns in the abdomen and nostrils of the mummy of the Egyptian pharaoh Ramesses II (1279 – 1213 BCE). The Late Bronze Age also sees the earliest appearance of rice, citrons and possibly an Indian cucurbit in Mediterranean-Middle Eastern textual and archaeological records (see Chapters V-VII). Taken cumulatively, this evidence suggests more intensive connections with South Asia in the Late Bronze Age and Early Iron Age horizons than was previously assumed. The arrival of these new spices and cultivars should perhaps be associated with the expansion of Kassite trading networks in the Persian Gulf, although the archaeological and textual evidence in support of this view is still scant.

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214 Hdt. III.111.
217 Pliny HN XII.99.
218 Gilboa and Namdar, personal communication; Gilboa and Namdar 2015: 269 note 10.
E. The First Millennium: The Age of Empires

Political and economic conditions in the Middle East from the 9th century BCE onwards were increasingly ripe for long-distance contact and exchange of ideas and commodities. The rise of large stable imperial polities in the Middle East throughout the 1st millennium BCE (Assyrian, Neo-Babylonian, Achaemenid Persian and Seleucid Empires) assured the security of long-distance movement. A secure agrarian base encouraged urban and demographic growth and sustained demand for long-distance produce. Similar socio-economic developments, especially the rise of an urban leisured class with interests in long distance trading, can be discerned in contemporary northern India.

The late Assyrian and Neo-Babylonian horizon (8th – 6th centuries BCE) sees the appearance of previously unattested Indian commodities in textual and archaeological sources including cotton, ginger, bdellium and an unidentified ‘Indian’ wood, perhaps teak or sandalwood. The Nimrud and Tell Tayinat manuscripts of the Assyrian king Esarhaddon’s (680 – 669 BCE) ‘Succession Treaty’ imposed on his officials and vassals cites ginger (Akk. zinzaru ‘u), a rhizome native to tropical Asia, as a medicament in a curse clause. The earliest references to ginger in Greek sources (ζιγγυρίβερτ) are also in medical contexts. The paucity of references to ginger and the exclusive use in medicine suggest that these early references are to imported dried rhizomes rather than fresh locally grown ginger.

Andreas of Carystus, the physician of Ptolemy IV (late 3rd century BCE), and Menestheus of Stratonicia (2nd century BCE), the earliest extant Greek authorities

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220 On the “second urbanisation” phase of northern Indian history (i.e. post-Harappan) see Erdosy 1988 and Allichin et al 1995.

221 See Jursa 2009 on new eastern spices and aromatics in 1st millennium BCE Mesopotamia.

222 SAA 2 6: 643; Lauinger 2012: 111 for the Tell Tayinat manuscript; Zinzaru ‘u, a hapax legomenon in Akkadian, is identified as ginger on the basis of lexical cognates in Semitic and Indo-European languages, all of which are direct or indirect borrowings from the Indo-Aryan singivera or a Dravidian source (Tamil inji-vēr). The medical applications of zinzaru ‘u in Esarhaddon’s succession treaty also support the identification with ginger (Watanabe 1987: 208).

on ginger, acknowledged its Indian origin\textsuperscript{225} since it was toponymously dubbed the \textit{ivōıkōv}.\textsuperscript{226} Neither the Assyrian nor the Neo-Babylonian state, however, sustained direct links with South Asia unlike their Persian or Hellenistic successor-states. It is nonetheless likely that Middle Eastern traders, scholars and elites in the early 1\textsuperscript{st} millennium BCE had some vague hearsay knowledge of the region. The Assyrian king Sennacherib’s (704 – 681 BCE) mention of the eponymous \textit{sindû} wood, perhaps teak, is the first unambiguous reference to the Indus region in Middle Eastern records of the 1\textsuperscript{st} millennium BCE,\textsuperscript{227} although it is unclear if the Assyrians knew ‘\textit{sindû}’ (‘Indus’ from the Sanskrit \textit{sindhu}) to be a country and not simply the name of an exotic wood.

The Assyrian Empire, the largest and most significant polity in the Middle East in the early first millennium, had access to South Asian commodities through both maritime and overland routes. The introduction of cotton and sissoo cultivation in Assyria was probably mediated by southern Mesopotamia (see Chapters IV and X). Ivory, elephant hides and timber from species like ebony and \textit{ellūtu}, which the Assyrians received as tribute from southern Babylonian potentates,\textsuperscript{228} undoubtedly came from South Asia, Oman and the eastern Iranian coast. A few other South Asian commodities in Assyria were probably acquired through the transit trade of the Iranian plateau routes. The inscriptions of Tiglath-pileser III (744 – 727 BCE) refer to a trans-Zagrosian locality as \textit{MƗt-tarlugallē} or ‘Land of the Roosters’,\textsuperscript{229} suggesting the transmission of the domesticated chicken (\textit{Gallus domesticus}) from South Asia along these routes.

Lapis lazuli is predictably a prominent commodity along the plateau routes and is well attested in both textual and archaeological sources of the early 1\textsuperscript{st} millennium. The Assyrian king Esarhaddon (680-669 BCE) describes the tribute of ‘blocks of lapis lazuli’ provided by ‘distant-dwelling Medes’ (\textit{madāya ša ašaršunu ruqu}) in

\textsuperscript{225} The earliest archaeological finds of ginger are presently in the form of starch grains recovered from charred residues on cooking vessels in late 3\textsuperscript{rd} millennium BCE Harappan Farmana (Kashyap and Weber 2013).

\textsuperscript{226} ap. Galen \textit{Gloss.} s.v. \textit{ivōıkōv} 19.105K.

\textsuperscript{227} Parpola 1975; RINAP 3 17.vi.14b; 17.vi.23; 17.vii.31; 44.41b; 44.63b; 46.123b; 46.148b; 49.20b.

\textsuperscript{228} e.g. Shalmaneser III (858-824 BCE): RIMA III A.0.102.5 vi 7; A.0.102.5 vii 7; A.0.102.5 vi 8-27; A.0.102.5 vii 28-29; A.0.102.5 ii 51-4; Šamši-Adad V (823 – 811 BCE): RIMA III A.0.103.2 iv 11-29; Tiglath-Pileser III (744-727 BCE): RINAP 1 III.47, 26, r. 23; III 51.18.

\textsuperscript{229} RINAP 1: 17.1; 41.4b; 47.29; 47.37b.
whose territory Bikni, the mountain of lapis lazuli, was to be found. The latter is probably to be identified with Mt Damāvand south of the Caspian Sea. The Assyrian blanket term ‘Medes’ (Madāya) for Iranian-speaking ethnic groups beyond the Zagros could have included merchants coming from as far east as Bactria. The Greek physician Ctesias, who worked at the court of the Persian king Artaxerxes II in the early 4th century BCE, refers to a Bactrian merchant dealing in Indian gemstones, suggesting an important albeit unstressed intermediary role assumed by Bactrians along the plateau routes. A banded-agate eyestone inscribed with the Assyrian king Esarhaddon’s dedication to the Babylonian deity Marduk was acquired in Kabul in Afghanistan sometime in the late 1970s but it is not clear if this was the result of some ancient transaction or more recent loot.

Apart from lapis lazuli, a number of other precious stones filtered into Mesopotamia from South Asia either through the overland or maritime routes. Sax’s mineralogical analysis of 361 Assyrian and Babylonian cylinder seals in the British Museum’s holdings yielded evidence for the use of green microcrystalline grossular garnet and brown-and-white agate of Indian origin. Mineralogical analysis of seals and jewellery promises to be of further use in uncovering Assyrian trade links with the east. Brown-and-white agate, for instance, finds extensive use in diadems, necklaces and other ornaments found in the 8th century tombs of the Assyrian queens in Kalḫu (Nimrud) and garnet in jewellery from Neo-Babylonian Uruk.

The Achaemenid Persian period (late 6th – 4th centuries BCE) saw the introduction of further varieties of Indian gemstones including rubies and beryls which came from South India, Sri Lanka and Myanmar. Phylarchus, a Greek historian of the 3rd century BCE, notes that the ‘gold plane-trees and the gold grapevine beneath which the Persian kings commonly sat to conduct their business’ was wrought with ‘grapes made of emeralds as well as of Indian rubies and extremely expensive jewels’.

230 RINAP 4: 1.iv.32; 1.iv.46; 2.iii.53; 2.iv.1 etc.  
231 Radner 2003: 59.  
232 Ctesias *Indica* F45.6.  
233 Leichty 2011: 283; cf. an inscribed agate eyestone of an earlier Assyrian king Adad-nārārī I (1307 – 1275 BCE) found in a tomb at Khodjali in Azerbaijan: RIMA I A.0.76.46.  
236 Moorey 1999: 83.  
237 Ath. XII.539d.
Posidippus of Pella, a 3rd century BCE poet celebrating Achaemenid heirlooms acquired by the Ptolemies in Alexandria also attests to rubies, beryls and other Indian stones. Apart from precious stones, finely crafted metalware also ranked among the costlier Indian exports in this period as suggested by one Pseudo-Aristotelian treatise on mirabilia (4th – 3rd centuries BCE):

‘They also say that among the Indians the copper is so bright, pure and free from rust that it cannot be distinguished in colour from gold; moreover that among the cups of Darius there are certain goblets and these not inconsiderable in number, as to which, except by their smell, one could not otherwise decide whether they are of copper or gold.’


The Pseudo-Aristotelian author almost certainly refers to brass (Skt. *pītala*), an alloy of copper and zinc, which is gold-like in appearance when polished, and produces a distinctive metallic smell like copper and iron when it comes into contact with sweaty hands. The gold-like character of brass is also borne out by the Sanskrit synonyms *dīptaloha* or ‘shining metal’ and *pītala* or *pītaka*, ‘the yellow metal’.

The Achaemenid period in fact marks the high watermark of political and trading relations between South Asia and the Middle East in the first millennium. Cyrus the Great’s eastern territorial conquests in the late 6th century BCE included the Indian polities of Thataguš (Sattagydia), located in the Bannu region of the Middle Indus, and Gandāra (Akk. *kurPariparasma*), occupying the Kabul valley. Darius I (r. 522 – 486 BCE) would later extend Persian rule into the lower Indus (OP *Hinduš*; Akk. *kur Indi*). The political integration of the lands lying between

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238 Austin and Bastianini 2002: Nos. 1-3; 6; 8; Kuttner 2005: 151-156.  
239 This phenomenon is caused by the production of carbonyl compounds when skin comes into contact with some types of metals (Glindemann et al 2006).  
240 On the history of brass production in India see Biswas 1993.  
242 Kent DB 16-17; Xen. Cyr. I.1.4; Arr. *Ind.* I.3; Pliny *HN* VI.92.  
243 Kent DPe 17-18, DPh 7, DSf 44, DSe 24, DNa 25; DSm 10; On the archaeology of Achaemenid India see Fleming 1993 and Magee and Petrie 2010; For a discussion of Achaemenid and
southern Bulgaria and the lower Indus under the banner of the Achaemenid Persian kings is perhaps the most spectacular testament to trans-continental Eurasian connectivity. The solider and diplomat now treaded on paths hewn by the merchant. Regularised diplomatic intercourse between the Persian court and Indian polities is indicated by the frequent travel of officials and diplomats between Susa and India in the Persepolis Fortification tablets dating to the reign of Darius I (522 – 486 BCE). Ctesias (early 4th century BCE) also refers to Indian envoys who regularly brought gifts to the Persian king. While redacted at a later age, the Matsya-Purāṇa (early centuries CE), an encyclopedic Sanskrit text with a genealogical, cosmological and mythological focus, preserves the memory of Indian diplomatic missions to the Achaemenid court in Susa. Here the Persian capital Susa acquires mythical dimensions and is described as the beautiful city of wise Varuṇa, the god of the ocean (124.22: suṣā nāma purī ramyā varaṇasyāpi dhīmataḥ).

Map 2: The Achaemenid Persian Empire (Source: http://www.livius.org/pictures/a/maps/the-persian-empire-persian-names/)

244 Hallock 1969: PF 785; 1317; 1318; 1358; 1383; 1397; 1410; 1425; 1437; 1440; 1511; 1524; 1525; 1529; 1548; 1550; 1552; 1556; 1558; 1572; 1601; 2057.
245 Ctesias Indica F45.19, 39; F45m; F45dβ; F45py.
246 On the dating, concerns and the use of the Purāṇas as historical documents see Rocher 1986.
It is possible that Indian embassies came not only from the petty princelings of the northwest who acknowledged Achaemenid suzerainty but also from the powerful neighbouring kingdom of Magadha in the eastern Gangetic plain which by the mid-4th century BCE under the bellicose Nanda dynasty had expanded to meet the Achaemenid frontier in the northwest. The founder of this dynasty, Mahāpadma Nanda, is flamboyantly described in the Viṣṇu-Purāṇa among other Indian texts as an exterminator of kings, sole sovereign and one whose commands were not transgressed. While Achaemenid-Magadhan interactions are poorly documented, the Nanda dynasty of Magadha figures as a significant element in narratives concerning Alexander’s incursion into India. The reports concerning the military might of the Nandas, in Greco-Roman sources the kingdom of the Gandaridae (or Gangaridae), allegedly incited the mutiny of Alexander’s army on the banks of the Vipāsā river much to the Macedonian king’s chagrin.

247 Kulke and Rothermund 2004: 57-60.
248 The Viṣṇu-Purāṇa (early centuries CE) belongs to the same class of texts as the Matsya-Purāṇa whose encyclopaedic concerns range from royal genealogies, cosmologies, legal codes, ritual, pilgrimage and above all stories concerning the gods (Rocher 1986).
249 Viṣṇu-Purāṇa IV.24.3-4: mahāpadmo nandah paraśurāma ivāparo 'khilakṣatrāntakārī bhavitā ... sa ca ikacchatrām anullanghitaśasano mahāpadmah prthivim bhokṣyati.
250 Fauconnier 2015.
251 Diod. Sic. XVII.93-94; Plut. Alex. 62; Curtius IX.2.3; ME 68; Arr. Anab. V.25.1-2. The wealth and resources commanded by the Nandas became proverbial in Indian tradition. Māmulaṅkār, a Tamil poet from the far south of India speaks of the ‘treasure amassed in great Pāṭalī by the Nandas of victorious battle and much fame’ (Akanaṅgū 265; dated between the late centuries BCE – early centuries CE). A statement in Somadeva’s Kathāsārītāgara (11th century CE) claims that the treasury of the Nandas amounted to 990 million gold ingots. (I.4.94-95).
Indians of various vocations figure in sources of the Achaemenid period. The Babylonian Murašû archive (late 5th century BCE) attests to the billeting of numerous foreign military colonists including Indians (*Indumāja*) in the rural...
hinterland of Babylonian cities like Nippur in exchange for their military service. The Achaemenid rulers made extensive use of the Indian contingents in their campaigns and by the 4th century BCE had incorporated a small number of Indian war elephants, which were to become a major feature of early Hellenistic armies.

A Gandharan female slave (Gandaruitu) bearing the name Nanā-silim, perhaps obtained as a war captive during Cyrus’ campaign in Gandāra, is attested in the Egibi archive from Babylon during the reign of Darius I (508/7 BCE).

Ctesias (early 4th century BCE) saw an Indian mahout in Babylon while Chares of Mytilene (late 4th century BCE) observed Indian magicians in the spectacles organised for the mass wedding celebrations of Alexander’s officers at Susa, suggesting the presence of Indian entertainers at the Persian court. Since Ctesias remarks that he tasted Indian cheese (τυρός) at the Persian court, it seems likely that Indian or at the very least Indian-influenced cooks were present in the Persian king’s kitchens since Indian cheese (Sanskrit kilāṭa; Hindi pānīr), unlike its western counterparts, is produced fresh by the acidification of heated milk and cannot be stored for export over long distances. Finally, the appearance of personal names (e.g. Indukka; Hindukka) etymologically linked to the toponym India (Hinduś) in Babylonian and Elamite texts may represent hypocorisms and thus offer further evidence for the settlement of Indians in the central provinces of the Empire.

The mid-first millennium BCE also witnesses an intensification of direct long distance profit-oriented maritime trade across the Indian Ocean, with Indians and Arabs being the chief carriers of this trade. This phenomenon is perhaps unrelated to the development of empires in the Middle East and is more a testament to the

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252 Zadok 1977: 125; Dandamaev 1992: 54, 59, 63, 144, 165; Kessler 2002 suggests that the toponym Sittacene, for Sattagī in Babylonian texts, in the east Tigridian region derives its name from the settlement of colonists from Sattagydia, one of the Indian countries conquered by Cyrus.
253 Hdt. VII.65-66, 86, VIII.113; IX.31; Strabo XIV.22.2, XVII.59.4; Arr. Anab. III.11.5, III.8.3-6; Ctesias Indica F45.7; On the Asian elephant in the late Persian and Greco-Roman periods see Scullard 1974; Scarborough 1985; Charles 2008, 2010.
254 Pliny HN VI.92.
255 Dar. 379:44.
257 Ctesias Indica F45ba.
258 Ath. XII. 538e; Aelian VH VIII.7.
259 Ctesias Indica 48.

Kāludāyin, an early Buddhist monk and contemporary of the Buddha, offers the guileless motivation of merchants who crossed the ocean: the desire for wealth (āsāya vānijā yanti samuddam dhanahārakā) (Theragāthā 530).

Open-sea sailing with the aid of monsoonal winds became more common in this period. Boivin, Blench and Fuller 2009: 265. In one of his discourses, the Buddha casually refers to seafaring merchants on the open seas who took along a land-sighting bird. The Saṅkha-Jātaka, a story from a didactic compendium in the Pali Buddhist canon (mid-1st millennium BCE), explicitly refers to ships powered by the monsoonal winds. Colwell 1895-1907: No. 463.

The various different seas (Khuramāḷa, Aggimāḷa, Dadhimāḷa, Nilavaṇṇakusamāḷa, Nalamāḷa) distinguished by colour and attribute in the Suppāraka-Jātaka, another didactic Buddhist tale, probably represent actual places traversed by merchants across the Indian Ocean. The identity of these places is, however, uncertain. The Khuramāḷa sea is said to be distinguished by the presence of deep-sea billfish (marlin, sailfish, swordfish) described as ‘men-like fish with razor-sharp noses’ (manussā khuranāsikā) which might suggest the East African coast, where these fish are more commonly sighted, rather than the Persian Gulf. In this regard, the Nāyādhammakahāṇo, a cycle of Jain didactic stories dating between the late centuries BCE and the early centuries CE, refers to a distant land called Kāliyadīva where Indian seafaring merchants observed and even captured ‘astonishing’ wild horses in ‘brownish, gray and black hues’ (Nāyā. 17.9-24). As horses, donkeys and wild onagers were well known in South Asia, Jain has suggested that the ‘astonishing’ (accherā) wild horses of the story in the Nāyādhammakahāṇo may be a secondary description of an encounter with zebras in an East African locality like Zanzibar.

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262 Boivin, Blench and Fuller 2009: 265.
263 Boivin, Blench and Fuller 2009: 265.
264 Dīghanikāya XI.85: sāmuddikā vānijā tīradassim sakunām gahetvā nāvāya samuddam ajjhogāhānti.
265 Colwell 1895-1907: No. 442: nāvā phalakuppantā anavassatā erakavātayuttā.
266 Colwell 1895-1907: No. 463.
268 Nāyā. 17.9: bahave tattha āse pāsantī. kim te? hari-renu-sonisuttogā āinānā.
269 Jain 1980: 73; Nalini Balbir who has helped in my reading of the Prakrit text notes that the hypothesis of zebras is not unfounded.
Within the Persian Gulf, Indian merchants appear to have deposited their wares in Eastern Arabia and left the local dispersal of Indian commodities to Arab merchants. This accounts for the persistent attribution of Indian aromatics like cinnamon, cassia and nard to Arabia in early Greek sources.\textsuperscript{270} Theophrastus, a contemporary of Alexander, however, accurately remarks that these aromatics derive ‘from India, whence they are sent over sea’.\textsuperscript{271} Nearchus in the late 4\textsuperscript{th} century BCE states that ‘the Assyrians (i.e. Mesopotamians) imported cinnamon and other spices’ from Maceta, the promontory of Oman (Ras Musandam), indicating that Indian ships typically sailed up to this point.\textsuperscript{272} Some Indian merchants may have on occasion ventured further into the Gulf. The Bāveru-Jātaka,\textsuperscript{273} an edifying canonical Buddhist story contemporary with the Achaemenid period, narrates the passage of Indian merchants to Babylon (Bāveru from Old Persian Bābiru) where they peddle a crow and a dancing peacock to the astonished Babylonian citizens.

More typically, it was Arab merchants who undertook the shipment of Indian commodities to Mesopotamia. The Neo-Babylonian king Nebuchadnezzar (r. 605-562 BCE) is said in Greek sources\textsuperscript{274} to have (re)founded the trading emporium of Teredon/Diridotis at the head of the Gulf, perhaps Eridu although cuneiform texts do not offer confirmation.\textsuperscript{275} Nearchus notes that merchants (ἐμποροὶ) brought to Teredon or Diridotis ‘frankincense from the land of Gerrha (Eastern Arabia) and all the other sweet-smelling spices Arabia produces’.\textsuperscript{276} Arab merchants appear to have gone beyond Teredon since Aristobulus observes in the 4\textsuperscript{th} century BCE that the Gerrhaeans in northeastern Arabia ‘import most of their cargoes on rafts to Babylonia, and thence sail up the Euphrates with them, and then convey them by land to all parts of the country’.\textsuperscript{277} This situation undoubtedly applied to the 6\textsuperscript{th} century BCE as well when the riverine distribution of Indian commodities is attested in Neo-Babylonian archival texts. Cinnamon and cassia appear, for instance, among

\textsuperscript{270} Hdt. III.107, 111; Diod. Sic.II.49.3; Strabo XV.1.22, XVI.4.19; Arr. Anab. VII.20.2.
\textsuperscript{271} Theophr. Hist. pl. IX.7.2; cf. Aristobulus ap. Strabo XV.1.22.
\textsuperscript{272} Arr. Ind. 32.7.
\textsuperscript{273} Colwell 1895-1907: No. 339.
\textsuperscript{274} Potts 1990: 85 (e.g. Berossus ap. Eusebius Praeparatio Evangelica XLI).
\textsuperscript{275} Jursa 2010: 110.
\textsuperscript{276} Arr. Ind. 41.6-7; cf. Strabo XV.3.5; XVI.3.2; Pliny HN VI.32; Amm. Marc. XXIII.6.11.
\textsuperscript{277} Aristobulus ap. Strabo XVI.3.3.
the merchandise procured by one Nabû-dûr-paniya for the Ebabbar temple in Sippar. Nabû-dûr-paniya did not venture far to purchase these exotic commodities since he is elsewhere said to have sold oil to the temple from the local riverine port (muhhi kāri).

The last quarter of the first millennium saw a reduplication of trends already observed in the Achaemenid period although the spatial extent of Indian diplomatic contacts now encompassed the Mediterranean as well. Trade commodities in this period included previously unattested South and Southeast Asian spices and aromatics like turmeric, amomum, cardamom, costus, Indian bay leaf or malabathron, cloves, spikenard and camphor.

The far-flung diplomatic dealings of the Mauryan Empire of India are perhaps most famously represented in the 2nd and 13th Rock Edicts of the Mauryan king Aśoka (3rd century BCE) which invoke the kingdoms of Antiochus II, Ptolemy Philadelphus, Magas of Cyrene, Antigonus Gonatas of Macedonia and Alexander of Epirus. Envoys of the Seleucid (Megasthenes; Deimachus) and Ptolemaic (Dionysius) kings resided at the Mauryan capital of Pātaliputra for extended periods. The Greek and more broadly the Mediterranean world also learnt in this period of the existence of lands beyond India through the mediation of Indian informants. Megasthenes, the Seleucid envoy to the Mauryan court, is the earliest extant Greek author to describe Southeast Asia as the land of gold (ξλυίς κόρα), a literal rendering of Suvarṇadvīpa or Suvarṇabhūmi, the Sanskrit term for Southeast Asia, presumably referring to the auriferous regions of Sumatra, Western Borneo and Malaya.

The diplomatic missions of Aśoka to the west probably included Buddhist proselytisers as well. Jain tradition recalls the dispatch of proselytiser-diplomats

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278 MacGinnis 1996: No.16 (BM 67001).
279 Jursa 2009: 168 n. 103 (Nbn. 821).
280 On Hellenistic contacts with India see Raschke 1975; Salles 1996; Karttunen 1997; Muthukumaran 2012.
284 Megasthenes ap. Solinus 52. 6-17; Pliny HN VI.80; Pomponius Mela I.70; Wheatley 1961: 177-184; Seldeslachts 1998: 282-3.
by Aśoka’s grandson Samprati to barbarian countries, presumably including the regions his grandfather had been in contact with. The memory of Aśokan diplomatic contacts with Egypt may be preserved in an Egyptian Demotic narrative of the Roman period entitled ‘The Swallow and the sea’ where Aśoka is corrupted as 3wšky (Aouesky), the ‘prince of Arabia’ who writes to Pharaoh. The Indian Ocean connections of the Demotic text are also suggested by the unmistakable parallel with the Indian story of the sandpipers and the ocean (tiṭṭibhadampatikathā) preserved in the Sanskrit Pañcatantra, a compendium of didactic stories which worked its way in later times to La Fontaine’s Fables via the Arabo-Persian Kalīla wa-Dinna.

The multicultural and cosmopolitan nature of “Middle Asian” societies at the nexus of trade and communications routes is perhaps best reflected in the case of Hellenistic Bactria and northwest India. The transmutability and flexibility of ethnic identities in these liminal zones is especially suggested by the case of Sophytos, a well-travelled Indian merchant from Alexandria-in-Arachosia (Kandahar) of the 2nd century BCE, whose loquacious autobiographical inscription in Greek (an acrostic no less) is replete with Homeric diction and fabulously rare words conjuring the rarefied intellectual climate of Callimachian Alexandria. The roughly contemporary Heliodorus, an ambassador of the Indo-Greek king Antialkidas to the Indian Śuṅga king Bhāgabhadra, left an inscription in Prakrit on a freestanding temple pillar in Vidiśā (Besnagar) which describes him as a Bhāgavata i.e. a worshipper of the Indian deity Vāsudeva-Kṛṣṇa. While the Indian Sophytos parades his Homeric erudition, the Greek Heliodorus’s inscription quotes didactic precepts, which have echoes of a passage in the Mahābhārata (MBh 11.7.19: damas tyāgo ’pramādaś ca te trayo brahmaṇo hayāḥ).

Elsewhere at the Greek city of Miletus on the Anatolian coast, a Greek astrometeorological inscription dating to the late 2nd century BCE cites the ‘Indian Kallaneus’ (kατὰ Ἴνδοῖν Καλλανέα) as an

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286 Hemacandra, Sthavirāvalīcarita XI.89-90.
287 Betro 1999.
288 While the Pañcatantra was committed to writing c. 200 – 400 CE, the stories are much older. On the sources of the Pañcatantra see Falk 1978.
291 For a detailed study of both personalities see Mairs 2014: 102-145.
authority on stellar movements and meteorological phenomena. 292 David Pingree, the eminent historian of the exact sciences, suggests that Kallaneus (probably from the Sanskrit Kalyāṇa) was using a Greek rather than Indian method of prediction since lunar conjunctions with fixed stars were used as indicators of meteorological phenomena in India rather than the heliacal movements cited in the Milesian parapegmata. 293 The mingling of Mediterraneo-Middle Eastern and South Asian cultures is further suggested by the case of Dhammarakkhita, an Indo-Greek (Yona) monk who preached Buddhism in western India in the 3rd century BCE. 294

On the maritime front, Indians and Arabs continued to dominate Indian Ocean trading networks in the Hellenistic period. The frequency of direct Indian voyages to the African coast increases in the Hellenistic period. Agatharchides of Cnidus (2nd century BCE) remarks that merchant vessels from Patala on the lower Indus frequently visited the island of Sūqūtrā, 295 which lay 125 miles east of Cape Guardafui on the Horn of Africa. This now-remote island was in antiquity a major trading site attracting Indian, Arab and Greek settlers. 296 A shipwrecked Indian rescued by the Ptolemaic coastguard off the Red Sea later acted as guide for Eudoxus of Cyzicus’s voyage to India (late 2nd century BCE) on behalf of his Ptolemaic patrons, 297 providing evidence for Indian vessels plying the seas up to Egypt. A passage in the Mahāniddesa, a canonical Buddhist exegetical text in Pali dating to the reign of Aśoka if not earlier, 298 confirms the expansive trading world of Indian merchants which stretched from Southeast Asia to ‘the country of the Greeks, the country of the distant Greeks (and) Alexandria (in Egypt).’ 299 This no doubt refers to the neighbouring Seleucid Empire and Ptolemaic Egypt whose capital Alexandria (Allasanda) is explicitly named.
Like Eudoxus, a few other Greek-speaking merchant-mariners from Seleucid Asia and Ptolemaic Egypt ventured out to India but in far fewer numbers than the Indians and Arabs who travelled westwards. Among those who have left traces in documentary sources, are Iambulus whose visit to the Mauryan capital Pāṭaliputra is reproduced in garbled form by Diodorus Siculus and Sosandros who authored a now-lost Indian periplus.

There is little need to relate the beginnings of Roman trade with India, which was little more than an inheritance and intensification of pre-existing Hellenistic contacts with India. The Romans, whose contact with India is the best known long distance trading relationship of antiquity today, were late-comers to an interconnected world that was over three millennia in the making. The entry of Rome in the Indian Ocean at the end of the 1st millennium BCE also coincided with the emergence of new pan-Oceanic carriers of trade, most notably the Tamils of the far south of India and northern Sri Lanka whose dispatch of embassies to Rome in the age of Augustus suggest an earlier involvement in the western Indian Ocean world. Archaeological and epigraphic data in Tamil-Brahmi from the early centuries CE indicate that Tamil mercantile communities operated from the Straits of Malacca in Southeast Asia to the Red Sea frontier of Egypt, a trading world spread over 7000 km, a scale hitherto unknown in the ancient world. Like other mobile communities, Tamil traders and settlers moved botanical produce as trade commodities and for their own consumption. The macro-remains of coconut, rice, pepper and mung bean at Roman Berenike and Myos Hormos on the Red Sea coast (1st century CE) and the mung bean and horsegram at Khao Sam Kaeo in southern Thailand (c. 300 BCE) have been interpreted as foodstuffs moved by Tamil

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300 Diod. Sic. II.55.2; II.60.1-3.  
301 BNJ 714: τοῦ κατὰ τὴν Ἱβρικὴν.  
303 Two contemporary Tamil dynasties (Pāṇṭiya; Cēra) are explicitly named in the Indian embassies to Augustus (Strabo XV.1.4; Suet. Aug. 21.3; Florus II.34.62; Orosius VI.21.19). The Pāṇṭiyas ruled in the basin of the Vaikai and the Porunai (Tāmiraparani) with a capital at Maturai and a major port and pearl fishery at Koṅkai while the Cēras, a trans-Western Ghats power were centred on the inland capital of Kāṭūr (Vaṭṭi) with ports at Muṭūr and Toṇṭi on the west coast (Subbarayalu 2014).  
304 Note especially Tamil-Brahmi epigraphs at Phu Kao Thong (2nd century CE) and Khuan Luk Pat (3rd century CE) in southern Thailand, at Khor Rori in Oman (1st century CE) and Berenike and Quseir al-Qadim on the Egyptian Red Sea coast (1st century CE) and South Indian pottery types found from the Red Sea region to Indonesia from the late centuries BCE to the early centuries CE (Mahadevan 2003: 49; Chaisuwan 2011; Rajan 2011; Subramanian 2012; Belina et al 2014).
seafarers and traders for their own consumption. While the impetus for this massive spatial stride is poorly investigated in the scholarly literature, it was certainly no overnight development but one that came on the heels of long-established small-scale regional networks combined with maritime daring in the fashion of the early Phoenician and Greek traders in the Mediterranean.

F. Summary

Our examination of the communications and commerce between South Asia and the Middle East from the 4th millennium BCE onwards highlights the difficulties of speaking of crop introductions as singular events or ‘packages’ since competing networks and agencies, and multiple routes often operated simultaneously. The importance and intensity of a specific trade network was predicated on variables like political stability, material prosperity, social complexity, infrastructural investments, technological innovations, risk management, economic opportunism and, above all, demand. Some chronological horizons, namely the late 3rd millennium BCE and the late 1st millennium BCE, are characterised by direct, intensive and regularised contact but otherwise transit trade managed by intermediaries in the Persian Gulf, Southern Arabia and Eastern Iran appears to have been the default mode of contact between South Asia and the Middle East.

We will now turn to the individual histories of South Asian crops and their peregrinations through these diverse networks. The cultivated Asian melon and sesame were already transmitted westwards by the 3rd millennium BCE but the story of the majority of South Asian crop transmissions to the Middle East and the Mediterranean belongs to the Late Bronze and Iron Ages.

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IV. Tree Cotton
*Gossypium arboreum*

A. Introduction
Cotton fibre is the white unicellular epidermal seed trichome or root hair derived from four domesticated malvaceous species of the genus *Gossypium*, namely *G. hirsutum* (upland cotton), *G. barbadense* (sea island cotton), *G. herbaceum* (Levant cotton) and *G. arboreum* (tree cotton). The trichomes on domesticated cottons are of two types: The long seed trichomes (2.2 – 6 cm), also known as lint, number between 13,000 and 21,000 on the ovule epidermis depending on the type of cotton. These long trichomes, which are a distinctive feature of domesticated cottons, are not only a major source of yarn for textile manufacture but are also used in the production of a variety of fibrous equipment like lamp wicks, ropes and fishing nets. The shorter trichomes known as fuzz or linters (2 – 6 mm) are morphologically similar to the hairs produced by wild cotton species and remain stuck to the seed after ginning. The fuzz, which only starts to develop five to seven days after the growth of lint fibres, is primarily harvested for its cellulose content which is used in the manufacture of a variety of commodities including plastics, paper and even explosives.

In addition to fibres, cotton seeds are a major source of comestible oil which is also used as lamp fuel, soap, lubricant and emollient. The latter functions are, however, less common owing to the rapid rancidification of cotton oil. Following oil extraction, the residual protein-rich cottonseed cake is used as livestock fodder while the plant stalks function as efficient fuel sources especially in tree-deficient ecologies like Egypt. The seeds, flowers, leaves and the root of the cotton plant have also been ascribed healing properties in South Asian and Middle Eastern medical traditions. The pharmaceutical potential of cotton continues to elicit interest in modern medicine. A lugubrious epidemic of infertility across Chinese villages consuming cold-pressed cottonseed oil at the height of the Cultural Revolution (1966-76) revealed that gossypol, a polyphenolic yellow compound in cottonseeds,

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307 The Buddha, for instance, prescribes the use of cotton leaves (*kappāsika*) for imparting an appetizing flavor to the food of the sick (Mahāvagga VI.5.5). For medical uses in the medieval Islamic Middle East see Watson 1983: 31, 163.
functioned as a non-hormonal male contraceptive.\textsuperscript{308} Cotton is presently not only the pre-eminent fibre crop but also ranks alongside tobacco (\textit{Nicotiana tabacum}) as the most widely grown non-subsistence crop worldwide.\textsuperscript{309}

Of these economically valuable taxa, \textit{G. hirsutum} and \textit{G. barbadense}, New World tetraploid (\(n = 26\)) species which were unknown in the Old World until post-Columbian times, account for the bulk of global cotton fibre production today. The remaining two diploid (\(n = 13\))\textsuperscript{310} species of Afro-Asiatic origin, \textit{G. herbaceum} and \textit{G. arboreum}, produce a relatively smaller quantity of the fibrous seed coat lint. They are presently of negligible value in industrial production and only survive as relic crops. Nonetheless the receptivity of the early modern textile industry to New World cottons owes entirely to the long-standing familiarity with Old World cotton species whose anthropogenic diffusion to West Asia and the Mediterranean from tropical and subtropical Asia in antiquity we shall investigate in this chapter.

![Figure 14: Tree Cotton (Gossypium arboreum)](http://khartasiacrcc.mnhn.fr/en/content_en/gossypium-arboreum-l)

(Source: http://khartasiacrcc.mnhn.fr/en/content_en/gossypium-arboreum-l)

\textsuperscript{308} Segal 2003: 116-121.
\textsuperscript{309} Brite and Marston 2013: 41.
\textsuperscript{310} Diploid plants only have two sets of chromosomes per cell whereas tetraploids have four. This feature accounts for greater productivity in tetraploid species.
B. Sub-Saharan cotton: *Gossypium herbaceum* L.

Before engaging in a discussion on the spread of cotton cultivation to the Middle East and the Mediterranean it is necessary to identify the primary centre of cotton domestication and dispersal particularly since Old World cottons feature two genetically-related species, *G. herbaceum* and *G. arboreum*. *G. herbaceum* is a native of sub-Saharan Africa and well-documented wild populations (*G. herbaceum* L. subsp. *africanum*) still exist in the far south of the continent.\(^\text{311}\) Despite the presence of a native cotton species, the earliest secure archaeological and textual evidence for the exploitation of a locally cultivated cotton species for textile production in Africa appears to be rather late and coincides with Roman rule in North Africa in the 1st century BCE.\(^\text{312}\)

The earliest cultivated cottons in North Africa are archaeologically attested in the form of bolls and seeds at Qasr Ibrim (Lower Nubia) in the 1st century CE.\(^\text{313}\) Qasr Ibrim has also yielded a sizeable quantity of cotton textile fragments, presumably of local manufacture, which constitute 80% of all textile finds dating to the first four centuries CE.\(^\text{314}\) Cotton textile fragments have also been recovered from several contemporary and later Nubian sites including Karanog and Meroe.\(^\text{315}\) Virgil’s casual reference to Nubian cotton (lit. ‘wool’) groves (*nemora*) in a passage of the Georgics (II.120) celebrating the characteristic botanical produce of various exotic

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\(^{311}\) Fuller 2008: 3; Zohary, Hopf and Weiss 2012: 108.

\(^{312}\) The reports concerning the finds of cotton from late 4th millennium Nubian sites by Indian archaeologists (Chowdhury and Buth 1971, 2005) are unacceptable on methodological grounds and undoubtedly represent intrusive material from late Meroitic/post-Meroitic (formerly X-group) periods (see Zohary, Hopf and Weiss 2012: 108-109 and Fuller 2002). The first reference to cotton in an Egyptian context concerns the Saite pharaoh Amasis’s gift of an embroidered cotton corselet to the Spartans (Hdt. III.47; see below). The claims for the presence of cotton in Egypt before the 1st millennium BCE are not convincing. Palynological analysis conducted by French scholars who examined the mummy of Ramses II in 1976 found traces of cotton pollen in the cavity of the king’s mummy (Leroi-Gourhan 1985). The results of the study were rather controversial as traces of tobacco, a New World species, were also identified in the mummy. The presence of cotton pollen in the king’s mummy, like that of tobacco, must be the result of post-excavation contamination (Buckland and Panagiotakopulu 2001). Cotton fibres interpreted as ‘pillow stuffing’ have also been recovered from Tell el-Amarna but these are not contemporary with its 18th Dynasty founder Akhenaten (c. 1353-1335 BCE) and are thought to be either remains from a Roman or Coptic settlement or perhaps more recent material used by gerbils as nesting material (Thomas 1987).


\(^{315}\) Wild 1997: 289.
lands suggests that the cultivation of cotton was already commonplace in Nubia by the late first century BCE.  

Evidence for cotton cultivation in Egypt proper emerges most distinctively from Greek papyri, ostraca and wooden boards dating between the 2nd and 4th centuries CE from sites in the Dakhla (Kellis) and Kharga (Kysis/Dush) oases in the Western Desert. The same oasis sites in the Western Desert have also yielded cotton in the form of seeds, bolls and textile fragments confirming the testimony provided by contemporary written documents. Additionally, at least one site in the Eastern desert, the Roman garrison of Maximianon (Al-Zarqâ), has yielded cotton seeds dating between the 1st and 3rd centuries CE. The Elder Pliny was also aware of cotton cultivation in Upper Egypt and Nubia and even notes that the priests of Egypt favoured cotton garments. The scale of cotton cultivation outside Nubia and the Egyptian oasis settlements remains uncertain. A private letter of the second century CE, probably belonging to the Oxyrhynchite or Arsinoite nome, appears to suggest that cotton was common in parts of the Nile valley by the 2nd century CE:

Arethousa to Herakles: By all means send me through this shipment twenty drachmai’s worth of good cotton thread. See that you do not neglect it, since your brothers have no outer garments, now that their cotton ones are worn out, and they need them, as you know, inasmuch as they spend all their time in the field.

- SB 6.9026 (P.Mich.1648)
Cotton cultivation was also introduced further west into Libya where cotton seeds have been found in Garamantine oasis settlements of the Fazzān region of southwest Libya dating to the 3rd century CE.\textsuperscript{321} It seems most likely that the exploitation of the native Sub-Saharan species \textit{G. herbaceum} only took place under the influence of imported cottons from the East.\textsuperscript{322} Fuller even raises the possibility that the Kushite and Upper Egyptian cotton industry could have been exploiting the imported Indian variety of cotton, \textit{G. arboreum} rather than the local \textit{G. herbaceum}.\textsuperscript{323} The seeds and textile products of \textit{G. herbaceum} and \textit{G. arboreum} are virtually indistinguishable in archaeological contexts\textsuperscript{324} so the question of the origin of the cultivated cotton in northeast Africa presently remains unsettled.

In any case, the earliest Greek sources on cotton dating to the 5th – 4th centuries BCE consistently associate the textile and plant with India and/or the Persian Gulf. Moreover, the loanwords for cotton in several Mediterranean and Middle Eastern languages (e.g. \textit{παηίαειμ}, \textit{εΪλπαικμ}, \textit{סַפְרַכ}) point towards an easterly mode of transmission. Even in the medieval period when cotton was well-known in the Mediterranean region it remained at the ideological level an ‘eastern’ textile par excellence as the remark of the 11\textsuperscript{th} century author al-Tha'labī demonstrates: ‘people know that cotton belongs to Khurāsān (northeast Persia up to the Oxus) and linen to Egypt’.\textsuperscript{325} We can thus confidently discount the likelihood that \textit{G. herbaceum} and production centres in northwestern Africa had any role whatsoever.

\textsuperscript{321} Pelling 2005: 402-6, Pelling 2008: 50, 56, 58-59: AMS dating on one seed recovered from Jarma yielded a date of 1770 ± 40 BP or c. 130 – 300 CE (Pelling 2013).
\textsuperscript{322} While the textual sources for cotton imports in Egypt provide a relatively early date (6\textsuperscript{th} century BCE), the earliest archaeologically verifiable cotton textile imports found at the Red Sea ports of Berenike and Quseir el-Kadim only date to the Roman period. The 1060 fragments of cotton textiles found at Roman Berenike emanate from two distinct chronological horizons: a small sampling dates to the pre or early Flavian phase (1\textsuperscript{st} century CE) while the bulk of the finds date to the late 4\textsuperscript{th}-5\textsuperscript{th} centuries CE. The Indian provenance of these textiles is suggested by the Z-spun threads, patterning and dyeing methods (e.g. blue check and dot rosette motifs on resist-dyed textiles) as well as the presence of Z-spun cotton threads on other South Asian imports like Sri Lankan and South Indian beads strung on a Z-spun cotton string. Both sites have also yielded evidence for Z-spun Indian cotton sails (1\textsuperscript{st} – early 2\textsuperscript{nd} centuries CE) which were found in association with reinforcement bands and brailing rings. Additionally, six cotton mat fragments (1\textsuperscript{st} century CE) with Ghiordes knots found at Berenike probably represent remnants of sleeping-mats used by Indian sailors. See Wild 1997; Wild and Wild 2001; Wild and Wild 2008; Wild and Wild 2014a: 211-227; Wild and Wild 2014b: 100-104.
\textsuperscript{323} Fuller 2008: 19.
\textsuperscript{324} Fuller 2008: 3.
\textsuperscript{325} Lamm 1937: 198.
in the dissemination of cotton cultivation to the Middle East and the Mediterranean prior to the 1st century BCE.

C. Cotton in South Asia

(kārpāsa; tūla; tuṇḍikerī; samudrāntā; badarā)

_Gossypium arboreum _called tree-cotton in common parlance, the other Old World species in question, is native to South Asia and wild forms have been observed in the lower Indus (southern Sindh) and hilly tracts of the central Deccan.

The original range of _G. arboreum _is harder to determine since feral varieties appear to have spread across the Indian subcontinent together with the domesticated crop. Fuller suggests that the distribution of wild cotton during the wet phase of the early to mid-Holocene might have even stretched across the Persian Gulf into the peninsular littoral of Arabia which would have acted as a natural bridge for the wild progenitors of _G. herbaceum _and _G. arboreum_. This might explain the early and rather perplexing presence of cotton fibres and the impression of a Z-spun fabric in plaster at Dhuweila in eastern Jordan c. 4400 BCE. The presence of cotton fibres at Dhuweila is not completely isolated since cultivated cotton is already attested further east in Mehrgarh in the Pakistani province of Baluchistan c. 5000 BCE. The Dhuweila find may therefore offer a tantalising glimpse into the prehistoric long-distance transactions of the Neolithic.

The earliest archaeobotanical evidence for the use of cotton in South Asia is available in the form of mineralised thread in copper beads and uncharred seeds from Late (Ceramic) Neolithic/Early Chalcolithic Mehrgarh (c. 6000-4500 BCE) in

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326 Hutchinson and Ghose 1937; Santhanam and Hutchinson 1974; Fuller 2008: 3.
328 Fuller 2008: 3-4.
330 A cotton-like fibre is also reported from the fourth millennium burials (c. 3700-3200 BCE) of the Majkop culture at Novosvobodnaya in the North Caucasus region (Shishlina et al 2003:).
331 Microscopic and histochemical analysis has demonstrated that three textile fragments from the Novosvobodnaya burials, now preserved in the State Hermitage Museum, to have a ‘ribbon-like cellulosic structure’, which is compatible with cotton. While it is clear that the Novosvobodnaya textile fragments derive from a plant fibre the textile specialists admit that further investigation is needed to confirm its precise identity (Shishlina et al 2003: 339).
332 Boivin and Fuller 2009: 128.
Baluchistan, Pakistan. Textile impressions of an unidentified fibre, perhaps cotton, have also been reported from contemporary levels at Mehrgarh. Additionally, a grave dated to the 4th millennium BCE at the site of Shahi Tump in southern Baluchistan has yielded a cotton string preserved in a carnelian bead. The early finds in Baluchistan (Mehrgarh; Shahi Tump) provide compelling evidence for the domestication of cotton already in the pre-Harappan period. Cotton is subsequently amply attested at various Mature to Late Harappan sites (2600 – 1700 BCE): as pseudomorphs or mineralised fibres at Mohenjo Daro, as pollen at Balakot (Sindh) and as seeds at Hulas, Harappa, Kunal, Banawali, Sanghol (Punjab) and Kanmer (Kutch). From the early second millennium onwards cotton begins to appear at sites outside the Indus alluvial plains particularly in Saurashtra, Rajasthan and the Upper Ganges valley.

Although the archaeological evidence suggests the widespread use of cotton across northwestern India by the early second millennium BCE, cotton remarkably goes unnoticed in the early Vedic textual corpus. It seems that the Brāhmaṇa priestly elite of the Indo-Aryans did not take an immediate interest in the use of cotton in ritual contexts. The material is strikingly absent from the earliest Vedic texts and only appears in the Kalpasūtras, late Vedic prose manuals on ritual practice. The earliest attestation for cotton in Indian literature, (Sanskrit karpasa; Prakrit kappâsa) appears to be in the Āśvalāyanaśrautasūtram (IX.4.17), the Lātiyāyanaśrautasūtram (II. 6.1; IX. 2.14) and the Gobhilagṛhyasūtram (II.10.10) of the early first millennium BCE. The kar-prefix of the Sanskrit word karpasa probably points to the Austro-Asiatic origin of the word. The synonymous term tūla, another ubiquitous word for cotton in classical Sanskrit, is probably of Dravidian origin and derives from a word which originally described feathers (Proto-South Dravidian *tuu- cf. Ta. tūval ‘feather’; tuy ‘cotton’). Both terms thus suggest that the pre-Indo-Aryan-speaking inhabitants of the Indian subcontinent were familiar with...
cotton, a fact confirmed by the archaeobotanical findings. Later Sanskrit lexicographers offer further terms for cotton. The most prominent of these are tuṇḍikerī (‘possessing a beaked fruit’), samudrāntā (‘reaching to the sea’), badarā and bhāradvājī (‘relating to the clan of Bharadvāja’), the latter only denoting wild cotton shrubs (Amarasimha, Nāmaliṅgānuśāsanam II.7.6).

D. Cotton in the heartland of the Assyrian Empire (iṣṣū nāḷ śīpāti)

Any account of the spread of cotton cultivation from South Asia to the Middle East must begin with the well-known inscribed records of the Assyrian king Sennacherib (704-681 BCE) whose efforts to enrich the gardens of his dazzling ‘Palace Without a Rival’ (Egalzagdinutukua) at Nineveh with exotic flora provides us with the earliest unambiguous textual evidence for the cultivation of cotton in Mesopotamia:

I planted alongside it (the palace) a botanical garden, a replica of Mount Amanus, which has all kinds of aromatic plants (and) fruit trees, trees that are the mainstay of the mountains and Chaldea (i.e. swamps of Southern Iraq), together with cotton trees (lit. “trees bearing wool”), collected inside it.

- RINAP 3/1 16 vii.17
(parallel: RINAP 3/1 17 vii.53)

I created a marsh to moderate the flow of those waters and planted a canebrake in it. I let loose in it herons, wild boars (and) roe deer. By divine will, vines, all kinds of fruit trees, olive trees, (and) aromatic trees flourished greatly in (those) gardens (planted) on newly tilled soil. Cypress trees, sissoo trees, (and) all kinds of trees grew tall and sent out shoots. The marshes thrived greatly. Birds of the heavens, heron(s) whose home(s) are far away, made nest(s) and wild boars (and) roe deer gave birth in

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341 The term is also used for other plants like a species of yam. The meaning is unclear but is perhaps related to ‘bāḍara’ ‘coarse’.
342 Literally the ‘bull of the forest’. It could be a water buffalo or some other swamp-dwelling cervid species.
abundance. I cut down sissoo trees (and) cypress trees grown in the orchards (and) marsh reeds from the swamps and I used (them) in the work required (to build) my lordly palatial halls. They picked cotton (lit. “trees bearing wool”) (and) wove (it) into clothing.

- RINAP 3/1 17 viii.46 - 64
(parallel: RINAP 3/1 16 viii.50)

In spite of the rather laconic references to cotton in Sennacherib’s inscriptions, several points can be adduced as regards to the origins, status and the extent of cultivation of cotton in Assyria. Like the later Herodotean ‘wool from the tree’ (ἐῖβα ἀπὸ ξόλου) (III.47) cotton is named periphrastically in Assyrian records as ἠς ὄν ‘wool-bearing trees’. This highlights the most notable feature of this cultivar but offers little information with regards to the routes (or peoples) through which cotton reached Assyria. The reference to cotton in tandem with the ‘trees that are the mainstay of the mountains and Chaldea’ (ἰσχε τυκλατ ἱδί ὑ ὁ Καλδ) does, however, point to the likely geographic origin of the cotton shrubs in the Ninevite ‘botanical garden’ (κηρήμαχη). Since cotton could not be procured from the mountainous zones of the Assyrian Empire, this seems to imply that Chaldea, the Babylonian swamp region in the extreme south of modern Iraq, also called the Sealand (ματ ταμτι), was its source.343 The second reference to cotton occurs in tandem with Sennacherib’s attempts to recreate southern Babylonian marshscapes (agammu) in Nineveh, reinforcing the connection of the cotton trees with this region.

Elsewhere in his royal inscriptions Sennacherib claims that he ‘planted in great number all (types) of mountain vine, every type of fruit tree from all over the world, (including) spice and olive trees’ (καλισγιμίρ ἐφ ὁ άδνητε ρίγε ὑ ὁ ἱαντ ἐκ αλλι αζκ) (RINAP 3/1 17 viii.20-21; cf. RINAP 3/2 223 18b-21).344 Since the Assyrian ‘world’ (άδνητι) at that time included several other territories to the east and southwest which were known to grow cotton well before the Hellenistic period, we cannot entirely discount the Iranian territories, particularly Elam, and Peninsular

343 Zawadzki 2006: 27.
Arabia as potential sources for the cotton plant. The case for a Babylonian intermediary seems, however, to be more convincing when we examine the cuneiform sources and archaeological findings from Babylonia and the Persian Gulf region which seem to suggest a long tradition of local cotton cultivation beginning sometime in the early first millennium BCE (see below).

It appears that cotton-growing in the Assyrian heartland was limited to the palace since we do not hear of cotton cultivation outside of the royal ‘botanical garden’ (*kirimahhu*). Sennacherib’s inscriptions written in 696 and 694 BCE (RINAP 3/1 16 & 17) contain the most detailed accounts of Nineveh’s reconstruction and both make mention of the king’s attempts at cultivating cotton. This suggests that cotton was introduced into Nineveh sometime early in the reign of Sennacherib, perhaps after his first campaign to southern Babylonia (703) against Marduk-apla-iddina, a Chaldaean contender for the throne of Babylon. There is, however, archaeological evidence for cotton in Assyria well before the reign of Sennacherib. The royal burials at Northwest Palace of Kalhu associated with Yabâ, the wife of Tiglath-pileser III (744-727) and Atalia, the wife of Sargon II (721-705) have yielded a single fragment of a cotton textile.345 The discovery of a cotton textile among the funerary paraphernalia is not, however, tantamount to cotton cultivation as it could be an import. The presence of foreign prestige goods in royal Assyrian burials is also vividly confirmed by a fragmentary 7th century text from Nineveh describing a royal funeral, perhaps that of Esarhaddon, equipped with exotic grave goods like a Babylonian black-fringed carpet (*dappastu*) and a gold Elamite headdress.346

There remains, however, a faint possibility that the cotton cultivated in Sennacherib’s palace in Nineveh simply represents a continuation of a palace cotton industry that already existed in Kalhu, the erstwhile imperial capital. In this respect Albenda, whose work is beset with doubtful attempts to identify the cotton plant in Assyrian wall-reliefs,347 has reasonably suggested in one instance that the floral garland framing a row of winged genii in the 8th or early 7th century paintings recovered from the Assyrian residence at Til Barsip (room 25) may represent a side

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347 Winter aptly notes that some of Albenda’s interpretations represent ‘overdetermination based on single or limited samples’ (Winter 2007: 378).
profile of a split cotton pod (Figure 15).\textsuperscript{348} It may also be salient to note that Sennacherib does not claim to be the first king to procure cotton while elsewhere in his inscriptions he readily acclaims and takes credit for his innovations.\textsuperscript{349}

Figure 15: Floral garland framing a winged female genii, Room 25, Assyrian palace at Til Barsip (Tell Ahmar) (Drawing by Cavro, Louvre AO 25067 K)

The longevity of the Assyrian palace cotton industry is unclear since the extant Assyrian textual sources outside of Sennacherib’s inscriptions do not refer to cotton. The Ninevite cottons have consequently been perceived, following an argumentum ex silentio, as a short-lived experiment.\textsuperscript{350} Frahm suggests that Sennacherib’s cultivation of cotton was abortive since a slightly later inscription composed in the 14\textsuperscript{th} regnal year of Sennacherib (691 BCE) appears to substitute grain (\textit{ašnan}) for cotton in the same passage (RINAP 3/1 18 viii 23).\textsuperscript{351} This section of the inscription is, however, highly fragmentary and the building reports concerning Nineveh, in any case, become increasingly terse in Sennacherib’s extant inscriptions after 694 BCE, as other subject matters are added to the royal annals. It appears unlikely that cotton cultivation would have been abandoned since a complex network of irrigation canals

\textsuperscript{348} Albenda 2005: 58-59.
\textsuperscript{349} e.g. RINAP 3/1 17 vi 89: (But) as for me, Sennacherib, the foremost of all rulers, expert in every type of work, regarding large columns of copper (and) striding lion colossi, which none of the kings of the past (who came) before me had cast; with the ingenious mind that the prince, the god Ninšiku, had granted to me (and) taking counsel with myself, I intensively pondered how to perform this work. Then, with my (own) ideas and knowledge, I created a cast work of copper and expertly carried out its artful execution.
\textsuperscript{350} Watson 1983: 38; Brite and Marston 2013: 43.
\textsuperscript{351} Frahm 1997: 277-278.
and aqueducts engineered by the king for his new capital enabled a constant and ready supply of water even for the thirstiest of crops:

‘Sennacherib, king of the world, king of Assyria: Over a long distance, I had the water of the two Ḫusur rivers (Ḥazur), the water of the Pulpulliya river, the water of the city Ḫanusa, the water of the city Gammagara, (and) water from mountain springs on the right and left sides of it added to it (and thereby) I had a canal dug to the plain of Nineveh. I had an aqueduct constructed (by packing down) white limestone over deep wadis (and thereby) enabled those waters to flow over it.’

- RINAP 3/2 226 1-9 (Jerwan inscription B)

This was also true of the older capital Kalḥu and the Assyrian heartland as a whole which benefited from intensive state-sponsored irrigation projects. Sennacherib boasts that he was able to grow ‘every type of fruit’ in Nineveh ‘thanks to the waters of the canals that I caused to be dug’ (RINAP 3/2 223 18b-21 ‘Bavian inscription’). It may be significant to note that the cotton plants in Nineveh are described as ‘trees’ (iṣṣū) readily bearing fruit, presupposing a few years of good growth. The perennial *G. arboreum* rapidly grows to the height of a small tree so the description of cotton as a tree in the Ninevite gardens is not perplexing, even if it were only introduced less than a decade ago. Abū Ḥanīfa al-Dinawarī, a Persian writer in Arabic of the 9th century CE, remarking on cotton in Arabia noted that ‘the cotton trees [in the lands of the Kalb tribe] grow high until they look like apricot trees, and last twenty years’. Overall, there seems to be no good reason to assume that cotton production in central Assyria was abandoned after the reign of Sennacherib. Large-scale cultivation outside of the palatial quarters, however, may not have been feasible owing to the wet and cold winters of northern Mesopotamia.

Cotton was certainly deemed eminently suitable for Assyrian royal textiles already in the 8th century BCE as evidenced by the presence of cotton among the funerary

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354 Brite and Marston 2013: 43.
garments of the Assyrian queens buried at Kalḫu. The unspecified workers in Sennacherib’s Ninevite inscriptions who are said to have sheared and woven cotton into textiles (ibqumū iṃḥaṣū ṣubātīš) are almost certainly the female weavers attached to the royal household (ušpāṭi ša šarrī) who appear to have exercised stringent quality control in the procurement of textile raw materials (RINAP 3/1 17 viii.46 - 64). A letter sent by Sennacherib during his tenure as crown-prince to his father Sargon II concerning the reception of tribute from Kummuḫ (Commagene) makes apparent the role of the palace weavers in the selection of raw materials:

They (the Commageneans) also brought red wool. The merchants told me that they have selected seven talents (c. 210 kg) from it but that the Commageneans did not agree but said: “Who do you think you are? You are not to make the selection. Let them take it over and let the king’s weavers make a selection over there.”

- SAA 1. 33: 19-r.1

In order to understand the prestige that cotton accrued in the Assyrian heartland, it is now necessary to examine the textual sources from Southern Mesopotamia for the arrival and use of cotton.

**E. Cotton in Babylonia** (*kiṭinnû/kidinnû; karpassu*)

**i. The identification of *kiṭinnû/kidinnû* with cotton**

While the identification of cotton in Sennacherib’s inscriptions is unambiguous, the interpretation of the evidence in Babylonian textual sources is less straightforward. The term *kiṭinnû* (or *kidinnû*) has only recently been convincingly identified with cotton. Despite unresolved problems in the etymology of *kiṭinnû*, there is now general agreement among Neo-Babylonian specialists that this term represents cotton. The efforts to identify the term for cotton in the Babylonian tongue have a

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358 Graslin-Thomé 2009: 208-210; Kleber 2011; Payne 2011; Near Eastern and Mediterranean archaeologists have also been receptive to the identification. See Volling 2008: 66-67; Sauvage 2014: 218; Joannès has ignored Zawadzki’s identification and reverts back to the identification of *kiṭinnû*
longer history in Assyriological scholarship and A. L. Oppenheim, despite his abortive attempts to identify cotton with the term ṭīmu, should be credited with formulating the research question in his pioneering ‘Essay on Overland Trade in the First Millennium B.C.’. In addition to kiṭinnû, an inventory of textiles from the Hellenistic Bit Rēš temple in Uruk (253/2 BCE) uniquely attests to the use of the Sanskrit loanword karpasu (Skt. kārpāsa), parallel to the Hebrew שַׁפְרַּכ in the Biblical Book of Esther (I.6).

Before engaging in a thorough discussion of cotton cultivation in Babylonia and the potential trade pathways through which cotton was introduced there, it is necessary to summarise and supplement the arguments adduced for the identification of kiṭinnû with cotton, as older scholarship has regularly confused this term with kitû, a word for linen or finished linen products. While linen is of great antiquity in the Middle East, having been used there from at least the 7th millennium BCE, kiṭinnû is only attested in textual sources of the 1st millennium BCE. It appears primarily as fabric for the garment of cultic statues in Babylonian temples and is a relatively valuable and rare commodity at least until the middle of the 6th century BCE when its use becomes more widespread during the Neo-Babylonian period. Most importantly, there are several texts which unmistakably discriminate between kiṭinnû and kitû, the term for linen, suggesting that the former was some other kind of material. The text on the clay case covering the so-called Sun Tablet of 9th century BCE Babylonian king Nabû-apla-iddina, which survives in a 6th century BCE copy and possibly amendment of the original envelope, enumerates several garment offerings used in the clothing ceremony (lubuštu) for the sun-god Šamaš in Sippar. Among the textiles, the šibtu garment of Šamaš is followed by the word

given in the CAD i.e. as a derivative of linen. Somewhat confusingly, he then proposes that it is in fact a woollen garment owing to the use of the determinative SIG (wool). This identification is, however, untenable as one text (CT 55, 834) unambiguously indicates that kiṭinnû was used a wool-substitute and therefore cannot itself be wool. See Joannès 2014: 460.

References:

360 NCBT 1244: 8, 11, 23.
362 Löw 1924: 241; Thompson 1949: 113; Oppenheim 1967: 251; CAD s.v. kiṭinnû.
363 Linen textile fragments dating to the 7th millennium BCE have been recovered from Nahal Hemar and Jarmo in Israel. Çatal Hüyük and Çayönü in Anatolia have yielded evidence for the use of linen textiles from a 6th millennium context. See McCroriston 1997: 519; Potts 1997: 66-67; 117-119; Völling 2008: 66; Gleba 2008: 65.
365 BBS 36 = Zawadzki 2013a no. 175; Woods 2004.
kiṭinnû (ki-tin-nu), in a position where we expect an indication of the material. Other varieties of textiles like the šalḫu, ḫullānu and mēzeḫu are either preceded or followed by the determinative GADA (Akkadian kitû) which unmistakably indicate that they were linen products.\textsuperscript{366}

Two archival texts from the Ebabbar temple of Šamaš in Sippar, dating to 560 BCE and 502 BCE\textsuperscript{367} and a Hellenistic marriage agreement from Babylon dating to 281 BCE,\textsuperscript{368} provide further attestations of kitinnû prefixed with the determinative SÍG (šīpûtu) for wool. It is clear, however, that this is a case of association by resemblance much like Sennacherib’s description of cotton plants as ‘trees bearing wool’ (iṣṣū nāš šīpāti).\textsuperscript{369} CT 55, 834\textsuperscript{370} explicitly states that kitinnû recycled from the lubûru-garment of Šamaš (šig kitinnû ultu lubari) was provided to a weaver named Sūqaya for the manufacture of the šibtu garment for the bed of Šamaš instead of wool (ku-mu SÍG.ḪL.A). Both the use of the determinative SÍG and the substitution of kitinnû for wool indicates that the quality of the textile crafted from kitinnû was held to be similar to wool rather than linen. The similarity to wool is also borne out in other tablets from Sippar where kitinnû is issued alongside red wool (tabarru) for the weaving of šibtu garments for the goddess Anunîtu.\textsuperscript{371} Texts from both the Ebabbar temple of Sippar and the Eanna temple of Uruk indicate, in fact, that the heavy šibtu garments, which were used to dress the deities and occasionally used as a bedspread for the ritual bed, were only ever made from kitinnû or wool.\textsuperscript{372} Kitinnû is also traded in bulk as is typical of raw cotton or wool whereas unprocessed linen fibres (kitû) are unsurprisingly described to be packaged and sold in bundles or hanks (qûtu lit. ‘a hand of’).\textsuperscript{373}

\textsuperscript{366} Zawadzki 2006: 25.
\textsuperscript{367} CT 55, 834 (Zawadzki 2013a no. 582); CT 55, 753.
\textsuperscript{368} CT 49, 165: 8.
\textsuperscript{369} The comparison of cotton with wool is perfectly logical. The fibres of cotton resemble tufts of wool. The cotton textiles of antiquity had a coarser texture than those of today and even occasionally looked hairy like wool (Stauffer 2000: 249; Schmidt-Colinet et al 2000: 8). In this regard, a brocaded cotton weave from Palmyra was initially mistaken to be a woollen garment by textile experts (Stauffer 2000: 249 n. 5; Schmidt-Colinet et al 2000: 8 n. 36).
\textsuperscript{370} Zawadzki 2013a no. 582.
\textsuperscript{371} CT 56, 5; Nbn 879.
\textsuperscript{372} Zawadzki 2006: 26; BM 64060; BM 49188; IBK 165.
\textsuperscript{373} e.g. BE 9 65: 20; PBS 2/1 150: 20; Zawadzki 2006: 108-109; Quillien 2014: 277; CAD sv kitû; One text also describes raw linen as thick (ka-b[a-ri]); see Zawadzki 2013a no. 367.
It is also salient to note that although the cuneiform references to kitinnû increase in the period between the 6th and 5th centuries BCE, when compared to the frequent attestations for wool and linen in hundreds of documents, kitinnû represents a small fraction of textile production in southern Mesopotamia. This is strongly suggestive of its relative rarity and novelty.\textsuperscript{374} A few documents provide prices for kitinnû and the extant evidence suggests that it more or less corresponds with the price of wool (average of 4 minas per shekel of silver),\textsuperscript{375} although it also can be more expensive (e.g. BM 79603: 2 minas per shekel of silver; Cam 250: 3 minas per shekel of silver).\textsuperscript{376}

\textbf{ii. The etymology of kitinnû}

Payne rightly notes that ‘etymology is not central’ to the identification of kitinnû with cotton\textsuperscript{377} but it is certainly worthwhile to explore the possible connections this word may have with the better-known Arabic quṭn or quṭwn (vulg. qoṭon) from which most European terms for cotton are derived. The spelling of kitinnû with the sign TIN (and not TI) indicates a second radical ŧ, just like the Arabic quṭn.\textsuperscript{378} The Arabic word quṭn is quite distinct, but not altogether unrelated, from the Arabic term for flax/linen (kattān) which has cognates in Biblical Hebrew ketonêt/ kuttōnet (linen tunic), Ugaritic ktn, Aramaic kettƗn/kittƗn and the Akkadian kitû. The West Semitic forms of this word were in turn borrowed into Mycenaean Greek as kito (classical Greek χίττων).

Pelliot notes that both flax and cotton lack proper Semitic etymologies and the terms relating to both categories have been regularly confused.\textsuperscript{379} Following Nöldeke, he suggests that both words might derive from the same unidentified foreign base but were adopted into Arabic from different sources at varying dates.\textsuperscript{380} It is not difficult

\textsuperscript{374} There are over 45 references to kitinnû in published texts, the majority of which derive from the archives of the Ebabbar temple in Sippar (6\textsuperscript{th} – 4\textsuperscript{th} centuries BCE) while the rest are from the contemporaneous archives of the Eanna temple in Uruk (see Appendix C). It is likely that a few more references will be found as the study of the voluminous corpus of Neo-Babylonian archival texts, numbering in the tens of thousands, progresses.

\textsuperscript{375} The price of wool fluctuates throughout the Neo-Babylonian period but not too drastically; See Kleber 2010.

\textsuperscript{376} Kleber 2011: 88; Payne 2011.

\textsuperscript{377} Payne 2011: 250 n. 2.

\textsuperscript{378} Kleber 2011: 90.

\textsuperscript{379} Pelliot 1959: 426.

\textsuperscript{380} Pelliot 1959: 426; Löw 1924: 242.
therefore to envision the Babylonian *kiṭinnû* as the product of a similar process. While Semiticists generally agree that the Arabic *quṭn* and *kiṭinnû* are of foreign origin, it has proven difficult to find lexical cognates resembling *quṭn* or *kiṭinnû* in any of the ancient recorded languages. Pelliot and Vollers have suggested that the Arabic *quṭn* is either of Egyptian or Indian origin.\(^{381}\) Fraenkel associated *quṭn* with the Coptic *kontion*.\(^{382}\) Although South Asian vocabulary has few if any lexical items resembling *quṭn* or *kiṭinnû*, several terms in South Dravidian denoting a kind of coarse cotton cloth might provide a lead (*Ta. kiṇṭan* Ka. *giṇṭa* Te. *giṇṭemu*).\(^{383}\)

As well as the Sanskrit loanword *kirbās* (*Skt kārpaṇa*), several other words are used by medieval Arab authors for cotton including ‘*uṭub*, *kursuf* and *ṭūṭ*. The forms ‘*oṭb* and *ajās* are also known from the Yemenite dialect. The diverse names for the cotton plant and its fibre in Arabic do not straightforwardly correlate with any known Indian lexical items. This has led Watson to postulate that cotton must have been familiar in the Arabian Peninsula from a very early date.\(^{384}\)

To conclude, the identification of the Babylonian *kiṭinnû* with cotton can be proposed on the basis of the analysis of the relevant textual evidence whose chronological distribution matches the archaeological attestations of the material in the wider Middle East (see below). The identification does not rely on the equation with Arabic *quṭn*, although it is entirely possible that both terms derive from the same non-Semitic word, perhaps of South Dravidian origin.

### iii. Origins and the scale of cultivation in Babylonia

Since cotton is rarely attested in a fiscal or agricultural context in Babylonian texts, it may be doubted as to whether the fabrics and raw fibres mentioned in the cuneiform texts are the result of local cultivation. In this respect, a list of tithe revenues (*šibšu*) from Sippar (501 BCE) which names cotton after barley and emmer (5 gur 4½ *ki-ṭin-nu-ū ši-ib-šu*)\(^{385}\) provides a sure sign that cotton was grown in the region. It also follows that cotton must have been growing in Babylonia well before Sennacherib introduces the plant in his palace gardens in Nineveh. The

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\(^{381}\) Pelliot 1959: 426; Löw 1924: 241.

\(^{382}\) Fraenkel 1886: 42.

\(^{383}\) DEDR 1540.

\(^{384}\) Watson 1983: 162 n. 3.

\(^{385}\) Dar 533: 34.
earliest mention of kiṭinnû, as had already been noted, is in the 9th century cultic regulations of the Babylonian king Nabû-apla-iddina inscribed on the clay cover of the so-called Sun Tablet which survives in a Neo-Babylonian copy. Given the antiquarian fervour of the Neo-Babylonian kings and the conservative nature of temple ritual in this period it is highly unlikely that Nabû-apla-iddina’s regulations were tampered with. Cotton must therefore have been known as a cultivar in Babylonia as early as the 9th century BCE if not earlier. The specifics of cotton’s introduction in Babylonia are unfortunately invisible in the textual record. Polities in the Persian Gulf must have mediated cotton’s arrival in Babylonia from South Asia and there is ample reason to suspect that the island of Bahrain (see below) was involved in this transmission.

The Assyrian kings of the 9th and 8th centuries who visited Babylonian temples in the course of their military campaigns first encountered cotton textiles draped on cultic statues in Babylonian temples. The usage of a strikingly new material, one that was whiter than wool or linen in colouration, is unlikely to have escaped Assyrian attention. The Assyrian interest in the textiles of divinities outside of Assyria bears out in at least one, albeit hostile, context. The booty enumerated in Sargon II’s plunder of the immensely wealthy temple of Haldi, the tutelary deity of Urartu, in Muṣašir included nine lubûru-garments of the god which were richly decorated with golden discs (nipû) and rosettes (aiarû). As Babylonia formed part of the same religio-cultural continuum as Assyria, the cult of its deities was meticulously tended for by visiting Assyrian kings. Tiglath-pileser III, for instance, declares that he reverently sacrificed at the chief cultic centres of Babylonia:

In Sippar, Nippur, Babylon, Borsippa, Cutha, Kish, Dilbat, and Uruk, cult centers without rival, I offered pure sacrifices to the deities Bêl (Marduk), Zarpânu, Nabû, 

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386 BBS 36 = Zawadzki 2013a no. 175.
388 Relations between the royal houses of Babylon and Assyria were particularly close in the 9th century beginning with the reign of Shalmaneser III (858-824 BCE) who visited and made offerings in Babylon, Borsippa and Kutha (Grayson RIMA III A.0.102.5 v 3b – vi 5; A.0.102.6 ii 45-54; A.0.102.8 24’ – 29’a; A.0.102.14 77-84; A.0.102.16 50b – 65’s; A.0.102.58 etc); cf. Adad-nârârî (810 – 783 BCE); RIMA III A.0.104.8).
The close interactions of Assyrian kings of the 9th and 8th centuries BCE with Babylonian temples where cotton was already used in sacred garments reinforces the suggestion made earlier that Sennacherib’s cotton plants in Nineveh, which bear a distinct association with southern Babylonia in his inscriptions, were not an innovation of the 7th century but probably already featured in the palace gardens of earlier Assyrian rulers. The references to cotton in Mesopotamian records before the 6th century are, unfortunately, meagre. Apart from the texts of Nabû-apla-iddina and Sennacherib, cotton is not attested in the extant corpus of Mesopotamian texts until late in the 7th century when an archival text from Sippar dating to the accession year of the Assyrian king Sîn-šar-iškun (c. 627 BCE) attests to the use of cotton for the šibtu-garments of the goddess Anu_WRAP_Latin:ûtu. The dearth of early references to cotton in Babylonia owes entirely to lacunose archival documentation of the early 1st millennium BCE. The rich archival documentation, especially those associated with the temples in Sippar and Uruk, only starts in the late 7th century on the eve of the Assyrian empire’s demise.

Beginning with the Neo-Babylonian period (626-539 BCE), cotton, which was previously only attested in the cultic and royal domain, appears to be readily available to a wider section of Mesopotamian society. A few texts from the early 6th century mention cotton but the archival documentation for cotton only becomes substantial from the reign of Nabonidus (555-539) onwards. The archival texts, chiefly hailing from the Ebbabar temple in Sippar and the Eanna temple in Uruk, attest to the issue of cotton as income to various temple functionaries including officials in charge of the rations of the king (ša kurummati šarrī), brewers (sirāšū), an alphabet scribe (sēpiru), a measurer of staples (mandīdu) and the overseer of the bakers (šāpir nuḫatimmē). Even a boatman (malāhu) who coordinated the visit of the cultic statue of the god Šamaš to Babylon in 521 BCE was paid with cotton for his services:

390 Zawadzki 2013a no. 556.
391 See Appendix C.
21 minas of cotton was given to Kinaya, the boatman of the barge, who came with god Šamaš from Babylon. Month of Šaβatu, the 20th day, the accession year of Darius, king of Babylon, king of Lands. (BM 64557; Zawadzki 2005)

As private production of garments in households is not documented by cuneiform texts in this period, the extent of cotton’s use outside of the temple domain is unclear. A dowry of a woman named Amat-Nanâ from Babylon dating to 281 BCE contained a cotton textile (var. kitinnītu) among other valuables including furniture and silver\(^{392}\) (CT 49, 165:8). It is described as ‘desirable’ (ḥišihtu) and was assessed to be worth 25 shekels of silver alongside another garment.\(^{393}\) The high valuation of the cotton textile might suggest that it was still a luxury well into the Hellenistic period. Unfortunately it is not clear what kind of textiles the inventory documents. Roth notes that not all the references to textiles in dowry lists denote clothes for the use of the betrothed but probably represent other kinds of textile goods like cushions, blankets and curtains.\(^{394}\) The valuation of textiles could also be affected by the workmanship and quality of the textile. The cotton textile from Amat-Nanâ’s dowry is therefore a poor yardstick for measuring the use of cotton in private households.

The presence of cotton textile fragments in a Neo-Babylonian (6\(^{th}\) century BCE) jar burial from Uruk could suggest that it was no longer a luxury material.\(^{395}\) This would accord well with the moderate prices listed for cotton in Neo-Babylonian texts (see above). The number of comparable burials with textile remains is, however, relatively low so the finds are not a good indication of how widespread cotton was.\(^{396}\) Additionally, ordinary denizens may have been buried with goods considered to be valuable.

\(^{392}\) CT 49, 165:8.
\(^{395}\) Van Ess and Pedde 1992: 257.
\(^{396}\) The cotton from Neo-Babylonian Uruk is the earliest extant archaeological attestation of the material in southern Mesopotamia. Otherwise cotton is not encountered in the archaeological record until the Parthian period (2\(^{nd}\) century BCE). A large cache of fragmentary cotton textiles have been retrieved from the Partho-Sasanian burials dating from the 2\(^{nd}\) century BCE through to the 5\(^{th}\) century.
Although the mechanics of cotton production in Babylonia are invisible in the textual record, we may safely assume, owing to the high capital investments, that cotton cultivation was not the prerogative of the average householder but belonged to the institutional economy managed by large landholders like temples and the ruling elites. Cotton was probably grown in tandem with fruit trees and date palms in irrigated groves just as it was in parts of the Persian Gulf until recent times. Ethnographic data from Oman, for instance, indicates that cotton was grown in open fields at the periphery of irrigated date palm gardens. Even in India, cotton was either grown in fields or alongside date palm gardens. Theophrastus notes that the Indians ‘plant them (cotton) in the plains in rows, wherefore, when seen from a distance, they look like vines. Some parts also have many date-palms.’

iv. Foreign sources for the Babylonian market?
The surge in references to cotton in Neo-Babylonian temple archives from Sippar and Uruk from the reign of Nabonidus onwards may not entirely owe to the vagaries of source survival. The extension of Babylonian political control to the Persian Gulf and Nabonidus’ conquest of the north Arabian kingdom of Tayma could have availed to Babylonian merchants greater access to cotton suppliers from neighbouring regions. An administrative document from the archives of the Ebabbar temple in Sippar dating to 547 BCE uniquely attests to two merchants, Nāṣir and Šulā, paying for the rent of property owned by the temple in cotton instead of silver. The extremely low rate of exchange, over 9 minas of cotton for 1 shekel of silver, suggests that the merchants were short on silver credit but had a large supply of cotton to pay in lieu. While the merchants could have traded in locally produced cotton, it is probable that they also had access to supplies from foreign sources, notably localities in and around the Persian Gulf like Elam and Dilmun and perhaps as far as the Indus region. Even in the case of linen, local supplies were augmented


Richardson and Dorr 2003.

Theophr. Hist. pl. IV.4.8: φυτεύοντο δὲ ἐν τοῖς πεδίοις αὐτῷ κατ’ ὀρχοῦς, δ’ ὁ καὶ πάρρηθεν ἀφοράθη ἀμπελοὶ φαίνονται. ἔχει δὲ καὶ φοῖνικες ἕνα μὲρῃ πουλλοὺς; Fuller suggests that the earliest cotton in the pre-Harappan Indus was cultivated alongside perennial fruit crops like vines and dates (Fuller 2008: 4; Fuller and Madella 2001).

See Appendix C.

For the identification as merchants see Bongenaar 1997: 285; Graslin-Thomé 2009: 393-4.

BM 75584; Zawadzki 2013a no. 570.
by foreign imports. One text from Sippar dating to 503 BCE refers, for instance, to linen from Egypt (kitu ša ānu Miṣir)402 while another undated text of the Achaemenid period from Uruk refers to a linen textile from the Indian satrapy of Gandhāra (GADA gandarasanu).403 The use of both Egyptian and Indian linen (hinduyin) in the same context is incidentally recounted later in the Mishna’s provisions for the High Priest’s garments on Yom Kippur:

In the morning he (the High Priest) was clothed in Pelusium linen worth twelve minas, and in the afternoon in Indian linen worth eight hundred zuz.

(Mishna, Yoma 3.7; Danby 1933: 165)

F. Cotton in Western Iran

i. Cotton in pre-Achaemenid Iran

The history of cotton in western Iran prior to the Achaemenid period has to be reconstructed entirely on the basis of archaeological finds since the textile terminology of the native Elamite language of southwestern Iran is poorly understood and no lexical item corresponding to cotton has been identified in this language.

Twelve fragments of cotton textiles along with an undetermined amount of carbonized fragments were recovered from a royal burial at Arğān dated to the late 7th or early 6th century BCE.404 The site of Arğān lies close to the border of modern Khūzestān and Fārs along an important ancient communications and trade artery.405 Inscriptions on the grave goods identify the owner of the tomb as one Kidin-Hutran son of Kuruš (DISki-din hu-ut-ra-an DUMU kur-lu-iš-na). Kidin-Hutran probably belonged to a family of local dynasts ruling in the Behbahān area of eastern Khūzestān, centred at either Hidali or Huhnur,406 in the aftermath of the Assyrian

402 CT 2, 2: 8; Joannès 1992: 182-3; see Quillien 2014: 275-276 on linen imports.
403 GCCI 2, 361: 8, 20; Presumably a type of linen which natives of Gandhāra like the great grammarian Pāṇini refer to as umā (IV.3.192).
405 Gaube 1986.
406 Mesopotamian and Elamite sources indicate that these were the most important cities in the area. The modern location of either is unclear and Arğān has been proposed as a candidate for both cities; see Henkelman 2003: 185.
sack of Susa in 646 BCE. The cotton textile fragments from the Arğân tomb, which have been assessed to constitute at least three individual items of clothing, presently represent the best-preserved and most significant corpus of early cotton textiles west of India. In addition to the three individual items of clothing which were folded and placed inside the coffin, the deceased was dressed in a robe ornamented with 98 gold bracteates which has decomposed in its entirety. This was presumably made of the same material.

An undetermined number of cotton textiles with gold appliqués have also been reported from the rich neo-Elamite burials found at the village of Gubagi near Rāmhormoz, Khuzestan province. The tombs belonged to Aninuma and Lārna, Elamite royal women related to the king Šutur-Nahhunte son of Indada who is dated to the early 6th century BCE. The latter king was previously only known from the inscriptions of his subordinate Hanni, the governor (kutur) of Ayapir, at Kul-e Farah and Shikaft-e Salman on the Īzech plain. An unprovenanced seal belonging to one Huban-kitin son of king Šutur-Nahhunte probably belonged to the son of this king as well. The textiles from Gubagi once again represent a sizeable early corpus of cotton textiles but detailed information concerning the textiles and other paraphernalia from the tomb are presently only available in Persian publications.

The find of cotton textiles in Elamite royal burials is, however, not tantamount to local production of cotton since both the textile and the fibre could have been imported. It is difficult to distinguish trade cottons and locally spun textiles in the archaeological record. However, textile dyes, patterning and the direction of

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407 A cylinder seal excavated at Susa belonging to one ‘Parsirra son of Kuruš’ quite possibly belongs to a brother of this local dynast. Alvarez-Mon tentatively identifies, following Vallat (1984: 6), Kuruš, the father of Kidin-Hutran, with a namesake appearing in the Susa Acropole texts dating to the early 6th century BCE. (Scheil 1907: 16,4; 50,5; 127,6). This identification is unlikely since the Kuruš of the Susa texts appears to be a merchant or emissary associated with the enigmatic Unsak (an ethnonym or perhaps collective noun for a group of officials) who supplied the court at Susa with wool and kuktum garments (Alvarez-Mon 2010:10, 38-39, 2015: 49). The son of a mid-ranking official could not be accorded a burial as rich as that found at Arğân. Nonetheless the name Kuruš is rare in Elamite texts and may be of non-Elamite origin.


410 On dating see Alvarez-Mon 2010: 49-50.


413 The most important book-length treatment of the Gubagi finds is Shishegar 2015 (not seen by the author).
spinning yarn can provide clues to the origins of cotton textiles in Elam. Spun cotton threads typically fall into two distinct traditions of spinning, i.e. the process by which fibres are twisted into a sturdy continuous thread: 1) Z-spun (right or clockwise spin) which is associated with India and later the Persian Gulf region and 2) the S-spun (left or anticlockwise spin) tradition which is chiefly associated with Egypt and the Levant where the spinning direction of cotton fibres mimics the spinning of flax which has a natural S-twist. The cotton textiles from the Arğan tomb were all found to be S-spun fabrics.

Figure 16: Yarn twist traditions (Source: Schmidt-Colinet et al 2000: 14)

The S-spun fabrics of the Arğan tomb would therefore seem to rule out the Indian subcontinent as the source of the finished textiles. Additionally, the design of the textiles recovered from Gubagi and Arğan resembles textiles attested in contemporary Mesopotamian and Elamite textual and iconographic sources, as well as later Persian ones. The abundant use of metal appliqués in the Arğan and Gubagi cotton textiles as well as the presence of a fringed garment with embroidered rosettes in the Arğan tomb strongly suggests that the textiles were produced locally or else in a neighbouring region sharing a similar textile aesthetic. Different types of Persian fabrics sewn with gold appliqués are well

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Alvarez-Mon 2010: 30-32.  
On the ancient tradition of using of gold appliqués on sacred and royal dress in the Middle East see Gaspa 2014.
attested in classical Greek sources (σάραπις, καλάσιρις, ἀκταία). The textiles recovered from the Elamite burials could easily correspond with Democritus of Ephesus’s (c. 3rd – 2nd centuries BCE) description of a fine, lightweight gold-strewn Persian textile called ἀκταία:

‘You could also see, he says, ‘what are referred to as aktaiai; this is the most expensive type of Persian garment. It is woven compactly to make it strong and light, and is covered with gold beads; the beads are all attached to the inside by means of a purple thread that runs through their middle.’


Even if the textiles from Arğān were produced locally, there remains the possibility that the cotton fibres were imported from abroad. But since we have already established that cotton grew in Babylonia it is not at all unlikely that it also grew in the lowlands of Khuzestan, a well-irrigated region which is ecologically similar to the neighbouring lower Mesopotamian plain.

The archaeological evidence for the early use of cotton in western Iran beyond Elam is meagre. The paucity of evidence stems in part from the fact that textiles from Iranian archaeological sites, with a few exceptions, are poorly studied. Hasanlu (Gilzanu) near Lake Urmia has yielded charred textiles dating between 1100 – 800 BCE which are predominantly of wool. Some textiles, however, consist of unidentified bast and vegetal fibres which could well include cotton. Five cotton textile fragments of uncertain dating were reportedly found in a bronze bathtub coffin, presumably of the Amlash culture (early – mid 1st millennium BCE), in Gilān province in northwestern Iran. This isolated find should be interpreted as trade textiles emanating from production centres situated along the Persian Gulf.

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419 Ath. XII.525d: ίδοι δ’ ἐν τις φησιν ἴνα τᾶς καλλομένας ἀκταίας, ὅπερ ἐστὶ καὶ πολυπλέκτατον ἐν τῷς Περσικῶς περιβλήμασιν. ἔστιν δὲ τοῦτο σαμπίνιν ἵσχυσι καὶ κουφώσις χάριν· καταπέπασται δὲ χρυσώς κέρχρους οἳ δὲ κέρχροι νῆματι πορφυρῷ πάντες εἰς τὴν ἑσθα μοῦραν ἄμματ’ ἐξοικον ἀνά μέσον.
421 Álvarez-Mon 2010: 33 n. 58.
since there is no evidence to suggest cotton cultivation or related textile production in the south Caspian region in the first millennium BCE.\footnote{Cotton textiles are not archaeologically attested in the south Caspian zone until the Parthian period. A fragment of a child’s woollen garment lined with cotton was recovered from Hecatompylos (Shahr-i Qumis) and dated to the early half of the first century BCE by a coin found with it (Kawami 1992: 14; Met Museum 69.24.30).}

Map 4: Ancient Iranian sites with textile finds (Source: Vogelsang-Eastwood 2006: 225)

**ii. Cotton in Achaemenid Iran**

While there is relatively abundant documentation for cotton in texts from neighbouring Babylonia for the Achamenid period (see above), the same is not true of the Persian heartland where contemporary textual sources in Elamite or Old Persian for textiles are almost non-existent. Much of the rich material culture of the Persian elite consequently has to be reconstructed from archaeological and external textual sources, chiefly those in Greek and to a lesser extent in Hebrew. Old Persian
appears to have more than one term to designate cotton. The late Hellenistic Greek loanword παμβακίς (see below) indicates the use of *pampaka/i/u in Old Persian for cotton which eventually gave rise to the Middle Persian pambag and New Persian pambah (cf. Khotan Saka. mamma). The Hebrew סַפְרַכ, on the other hand, reveals that Old Persian was also using Indic-derived terms for cotton (Skt. kārpāsa).

The use of cotton to manufacture soft furnishings like hangings, carpets, cushions and mattresses appears to have begun in the Achaemenid period. Greek moralisers commenting on the wanton luxury (τροφή) of the Persian elite lifestyle frequently credit the Persians with novel pleasurable inventions, perhaps not entirely unfounded, which included all kinds of textiles. The Book of Esther, perhaps best described as a historical novella about the Jewish experience in the Persian Empire composed in the late Hellenistic period, describes the Persian king’s palace-garden in Susa festooned with hangings of white (linen), cotton and blue-coloured textiles (רּפָסְרָכִּים) (Esther 1.6). Charred textiles have indeed been recovered from the Achaemenid palaces in Persepolis and Susa but the materials have yet to be analysed.

Nearchus’s casual report in the 4th century BCE that the Macedonians used cotton for ‘mattresses and the stuffing of saddles’ is undoubtedly a case of Macedonians adopting Persian customs. It is unclear, however, if he refers to a post-conquest custom or if cotton was already in used in Macedonia before the reign of Alexander the Great. Since cotton has been identified as a constituent of a funerary pyre textile from the tomb of Philip II of Macedon (Tomb II) in Vergina, the latter interpretation seems likely. The Persian influences on Macedonian material culture, including a taste for cotton, probably date back to the early 5th century BCE when the royal

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424 e.g. Aristo?enax, Life of Archytas: πολλά δὲ ιματίων καὶ στρατιώτων (ap. Ath. XII. 545e).
426 Vogelsang-Eastwood 2006: 226-8; On the subject of curtains, it should be noted that a kind of temple drapery or curtain made of cotton is also attested in an inventory of textiles owned by Bit Rēš temple in Hellenistic Uruk (NCBT 1244: 23; 253/2 BCE); See Beaulieu 1989: 69-72.
427 Nearchus ap. Strabo XV.1.20: ἐκ δὲ τῆς αὐτῆς αἰτίας ἐνιός καὶ ἐπαναθέν ἠριον. ἐκ τούτου δὲ Νέαρχος φησὶ τίς εὐπρεπῶς ὑφαίνοντα σινδόνας, τοὺς δὲ Μακεδόνας ἀντὶ κναφάλλων αὐτοῖς χρησίας καὶ τοῖς σάγμασι σάγης.
house of Macedon accepted Persian suzerainty and contracted matrimonial ties with Persian nobility.429

The Persian palaces stored immense quantities of luxury textiles which were extracted as tribute and hence formed part of the state revenues.430 Plutarch, for instance, reports that the treasury at Susa at Alexander’s conquest contained 5000 talents (150,000 kg) of purple dyed cloth from the Peloponnesian port of Hermione, which had been stored there for 190 years.431 Cotton textiles, both imported and locally produced, almost certainly formed a part of the immense textile cache of Persian treasuries. Ctesias, the 4th century Cnidian physician at the Persian court, describes brilliant lac-dyed, perhaps cotton, textiles presented to the Persian king by the Indians:

‘In India there is a large creature something like a scarab and red in colour. At first sight it looks like a moth. It has huge feet and is soft to the touch. It is born on the amber-bearing trees and lives off its fruit. The Indians hunt this animal, crush it and extract from it a dye for purple textiles, their clothes and anything they want to dye or colour in this way. They bring this dyed material to the Persian king. And the Persians find its appearance absolutely marvellous. Compared with the material produced locally in Persia, it is much better. According to Ctesias, it is so impressive because it is even brighter and more brilliant than the famous coloured clothes of Sardis.’


Ctesias is incidentally the first author outside India to describe the red lac dye extracted from the resinous secretions of the parasitic lac insect (*Kerria lacca*) which is distributed from India through Southeast Asia. Lac (Skt. *lākṣā*, *jatu*, *alakta*, *raktā*) has been used in India from antiquity to present as a cosmetic, dye and a

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429 Gygaea, the daughter of the Macedonian king Amyntas I, was given in marriage to Bubares, a Persian nobleman (Hdt. V.21; VIII 136.1; Justin VII, 4.1-2); See Paspalas 2006 for Persian influences on Macedonian material culture.
430 Curtius V.6.3: *vestis ingens modus*.
constituent of medicaments.\textsuperscript{433} It is not clear what material the lac-dyed textiles which Ctesias refers to were made of but dyed cotton textiles were undoubtedly present in Achaemenid Iran. The widespread of appeal of red-dyed cottons in antiquity is borne out in an archival text from Sippar dating to 531 BCE which attests to the dyeing of a cotton garment for the goddess Anunītu with madder (Akk. ḫūratu).\textsuperscript{434} No examples of such textiles have survived within the Persian heartland but a remarkably well-preserved red-dyed cotton chemise from the Scythian burials of the 4\textsuperscript{th} – 3\textsuperscript{rd} centuries BCE at Pazyryk in the Altai region of Southern Russia could reflect the kinds of cotton commodities in circulation throughout and beyond the Persian Empire.\textsuperscript{435} Incidentally madder and lac-dyed cotton textiles have also been recovered from the remote cave burials in the Muktinath valley of the Himalayas (Western Nepal) dating between 400 BCE – 50 CE.\textsuperscript{436} The appearance of cotton textiles in this mountainous region bordering the Tibetan plateau corroborates Ctesias’s remark that the Indians were also trading cotton with the cynocephalic peoples living to the north.\textsuperscript{437} Note should also be made of the finely-preserved red woollen sleeve with white cotton bands recovered from a burial at the site of Djoumboulak Koum, a fortified settlement in the Keriya valley of the southern Tarim basin (Xinjiang) dating between the 5\textsuperscript{th} and 3\textsuperscript{rd} centuries BCE.\textsuperscript{438} In all three cases, dry and cold climatic conditions have aided the preservation of the textiles in more generous measures than southerly climes would allow.\textsuperscript{439}

\textsuperscript{433} See Lienhard 2007 for the use of lac in ancient India.
\textsuperscript{434} Madder was imported to Mesopotamia from the north Syrian and/or Anatolian region. A religious text from Aššur, for instance, refers to madder from Hatti (ḫūratu śā bar Hatti) (KAR 60, r. 9 cf. RAcc p. 4 : 24); See Zawadzki 2006: 41–44 for dyes in Babylonian texts and Gaspa 2013: 226 on dyes in Assyrian texts.
\textsuperscript{435} Barkova and Polosmak 2005: 44; Good 2011: 147.
\textsuperscript{436} Alt et al 2003: 1531.
\textsuperscript{437} Ctesias \textit{Indica} 41; On the so-called dog-headed peoples of India reported in Greek ethnographic discourse see White 1991.
\textsuperscript{438} Desrosiers 2000: 146.
\textsuperscript{439} Archaeological textiles like all organic ephemeral matter are subject to aggressive processes of deterioration. The spatial range of archaeological textiles is uneven with a bias towards desert or alpine climatic zones. In other geographical zones, textiles that are carbonised, waterlogged or mineralised through contact with metals like copper have the best chance of survival (Strand et al 2010: 151-2). If differential survival were not enough, the identification of excavated textiles remains problematic and a great number of textile finds from the ancient Near East and the Mediterranean zone remain unidentified (Margariti et al 2010: 522; Strand et al 2010: 152).
G. Cotton in Arabia

i. Bahrain and Muharraq

While the archaeological finds of cotton in the Persian Gulf postdate the literary references to cotton in Babylonia, the linguistic and contextual evidence logically leads to the conclusion that cotton must have reached the latter region through the Persian Gulf. Cotton certainly reached the Middle East through maritime routes since the beginnings of cotton cultivation in Central Asia appear to be rather late. The earliest archaeologically attested cotton seeds in Central Asia only date to the Hellenistic period. Soviet archaeological expeditions in Central Asia, which are still not satisfactorily published, reported the presence of cotton seeds dating to the early Hellenistic period (3rd – 2nd centuries BCE) in the valleys of the Amu Darya, Syr Darya, Murgab and Zeravshan rivers (ancient Bactria-Sogdiana).

The reconnaissance expedition along the Arabian side of the Persian Gulf commissioned by Alexander the Great in the winter of 325/4 or 324/3 BCE brought back reports of extensive cotton cultivation on the islands of Bahrain (Gk. Τύλος) and Muharraq and in eastern Arabia. Androthenes of Thasos who led the expedition committed his observations into a now-lost treatise entitled ‘Voyage along the Indian coast’ (τῆς Ἰνδικῆς Παράπλωθ Ath. III.93b) which was consulted and quoted by Theophrastus when describing local cotton production:

‘They say that the island (of Tylos) also produces the ‘wool-bearing’ tree in abundance. This has a leaf like that of the vine, but small, and bears no fruit; but the vessel in which the ‘wool’ is contained is as large as a spring apple, and closed, but when it is ripe, it unfolds and puts forth the ‘wool,’ of which they weave their fabrics, some of which are cheap and some very expensive. This tree is also found, as we said, in India as well as in Arabia.’

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440 Brite and Marston 2013: 44.
441 Theophr. Hist. pl. IV.7.7-8: φέρειν δὲ τὴν νῆσον καὶ τὰ δέντρα τὰ ἐρυμφόρα πολλά. ταῦτα δὲ φύλλα μὲν ἔχειν παρόμοιαν τῇ ἁμέλειᾳ πλὴν μικρόν, καρπὸν δὲ σιδήραν φέρειν· ἐν ὧ δὲ τὸ ἔρυμν ἡλίκον μὴλὸν εὐρύνον συμμεμοικόν· ὅταν δὲ ἐρυμφὸν ἦ, ἐκπεισάνουσα καὶ ἐξείρειν τὸ ἔρυμν, ἕξο οὗ τὰς συνόδας θυάνουσα, τὰς μὲν υπελεῖς τὰς δὲ πολυτελεστάτας. Γίνεται δὲ τοῦτο καὶ ἐν Ἰνδίς, ὅσπερ ἐλέχθη, καὶ ἐν Ἀραβίᾳ.
Pliny gives a similar account of the cotton-trees of Bahrain (Tylos) which clearly owes much to Theophrastus but is supplemented by a later account on Arabia by Juba of Mauretania (48 BCE – 23 CE):

‘On a more elevated plateau of the same island, we find trees that bear wool, but of a different nature from those of the Seres; as in these trees the leaves produce nothing at all, and, indeed, might very readily be taken for those of the vine, were it not that they are of smaller size. They bear a kind of gourd, about the size of a quince; which, when arrived at maturity, bursts asunder and discloses a ball of down, from which a costly kind of linen cloth is made. This tree is known by the name of *gossypinus*: the smaller island of Tylos (Muharraq), which is ten miles distant from the larger one, produces it in even greater abundance. Juba states, that about a certain shrub there grows a woolly down, from which a fabric is manufactured, preferable even to those of India. He adds, too, that certain trees of Arabia, from which vestments are made, are called cynæ, and that they have a leaf similar to that of the palm. Thus do their very trees afford clothing for the people of India.’

Androstenes of Thasos crucially notes that cotton was used to manufacture both expensive high-quality fabrics and cheaper varieties on Bahrain (τὰς μὲν ἐντελεῖς τὰς δὲ πολυτελεστάτας ap. Thphr. *Hist. pl.* IV.7.7), suggesting that it was easily accessible to a wide spectrum of the local population. Juba’s account in Pliny which draws on mercantile sources hints that local merchants even thought the cotton of Arabia to be superior to that of India.

It is not surprising that the island of Bahrain (Akk. *Dilmun* Gk. Τόλος) and the neighbouring island of Muharraq were major cotton production centres. Bahrain functioned for millennia as the natural point of exchange between Mesopotamia,

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443 Roller 2008.
Oman and the Indus owing to the abundant supply of freshwater and favourable port facilities. Close links with the Iranian coast in the first millennium BCE are also suggested by Dilmunite royal names (Upēri; Hundaru) appearing in Assyrian royal inscriptions of the late 8th and 7th centuries whose onomastic analysis indicates that the local rulers were of Elamite affiliation.\textsuperscript{444}

Cotton must have been introduced into the groundwater-irrigated oasis settlements of Bahrain and perhaps eastern Arabia from the Indus region well before the 9th century BCE when cotton first surfaces in Babylonian records. The earliest archaeological traces of cotton cultivation only date, however, to the period of Achaemenid rule between the 6th – 4th centuries BCE. Seven carbonised seeds of cotton were recovered from a domestic dump of the Achaemenid period at the important Iron-Age site of Qal’at al-Bahrain.\textsuperscript{445} Additionally, cotton textile fragments were found in a contemporary ‘Bathtub’ coffin from the same site.\textsuperscript{446} The presence of small spindles at the Hellenistic levels of Qal’at al-Bahrain also suggest the spinning of delicate fibres like cotton.\textsuperscript{447}

\textbf{ii. The Arabian Peninsula}

The discussion of cotton cultivation in the Persian Gulf region has largely followed the contours of the extant textual and archaeological evidence. There may well have been other production centres in the wider region. Androthenes of Thasos noted in the 4th century BCE that cotton was to be found growing in the Arabian mainland as well but no details have been availed in our extant sources.\textsuperscript{448}

The lexical diversity of terms relating to cotton in Arabic would suggest a long-standing familiarity with cotton but the archaeological evidence for cotton cultivation in the groundwater-irrigated oasis settlements of Arabia is rather late. The earliest definite evidence for cotton cultivation in Arabia comes not from eastern Arabia but from the Nabataean site of Hegra (Mada’in Sâlih) in northwestern Saudi Arabia, which lies on the overland ‘incense’ trade route

\textsuperscript{444} Potts 1990: 337, 2006.
\textsuperscript{445} Bouchaud et al 2011: 410.
\textsuperscript{447} Lombard 1999: 178-179.
\textsuperscript{448} Theophr. \textit{Hist. pl.} IV.7.7; cf. Pliny \textit{HN} XIII.28.
connecting South Arabia with Jordan. 204 charred cotton seeds dating to the 1st century CE, presumably by-products of ginning, were recovered from domestic contexts and at least 9 cotton textile fragments of Z-spun threads of varying quality were found in Hegra’s monumental tombs dating between the 1st and 3rd centuries CE. Given the earlier textual and archaeological records for cotton in eastern Arabia and Bahrain, it seems most probable that cotton reached northwestern Arabia from the east.

**H. Cotton in the Mediterranean**

**i. Cotton in Egypt and the Levant**

The earliest reference to cotton in an Egyptian context derives from Herodotus rather than native Egyptian sources. Herodotus reports that the Saite pharaoh Amasis (570 – 526 BCE) gave a linen corselet (θώραξ) with gold and cotton figural embroidery to the Spartans and dedicated another identical corselet at the sanctuary of Athena in the Rhodian city of Lindos (Hdt. III.47). According to Pliny the corselet of Amasis survived for over five hundred years in the sanctuary of Athena at Lindos and its intricate cotton and gold thread embroidery appears to have attracted a fair few visitors much to the detriment of the object:

‘Those, no doubt, will be astonished at this, who are not aware that there is preserved in the Temple of Minerva, at Lindus, in the Isle of Rhodes, the cuirass of a former king of Egypt, Amasis by name, each thread employed in the texture of which is composed of three hundred and sixty-five other threads. Mucianus, who was three times consul, informs us that he saw this curiosity very recently, though there was but little then remaining of it, in consequence of the injury it had experienced at the hands of various persons who had tried to verify the fact.’

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450 Hdt. III.47: ἐν τοῖς μὲν λίνοις καὶ ζύοις ἐκοινωσμένοις σχημα, κεκοινωσμένοι δὲ χρυσῷ καὶ εἰρίσθαι ἀπὸ ζύλους; Quilted armour corselets made of cotton (Skt. sūtrakaṅkaṭa) were known in India but in Amasis’s corselet, cotton is only used on the embroidery. For Indian parallels see Kauṭūliya Arthaśāstra II.18.16; II.23.10.
451 Pliny HN XIX.12: mirentur hoc ignorantia in aegypti quondam regis, quem amasim vocant, thorace in rhodiorum insula lindi in templo minervae ccccxv filis singula fila constare, quod se
The use of cotton in a diplomatic gift perhaps suggests that it was a rare and costly material. Indeed, there is no indication that cotton was growing in Egypt in the 6th century BCE and the Egyptians must have procured the fibres from either Babylonia or eastern Arabia which were the closest sources for cotton. Cotton is absent from the Egyptian archaeological record until the Greco-Roman period. The earliest archaeologically attested cotton fibres were found on the linen wrappings of a Ptolemaic mummy (PUM II) of the 2nd century BCE but these are thought to be intrusive. Otherwise cotton only appears in the Egyptian archaeological record from the 2nd century CE onwards by which time it was already a well-established cultivar further south in Nubia and in the oases of the Eastern and Western desert (see above on Sub-Saharan cotton).

The evidence for cotton cultivation in the Levant is limited. The meaning of נפרכס for cotton, a hapax legomenon in the Biblical Book of Esther (VI.1) was forgotten by rabbinical times (3rd – 5th centuries CE) since it is glossed as a kind of cushion or mattress in the commentaries. In rabbinical texts, cotton, which was grown in the land of Israel, is referred to as ‘vine wool’ (semer geper) since its palmate leaves were thought to resemble those of the grape vine. As the earliest reference to cotton cultivation in the southern Levant is in the Mishnah (Kil. 7.2), there is no evidence from textual sources that the plant grew there earlier than the 3rd century CE. The earliest archaeologically attested cotton textiles in Israel and the Transjordan, found at Masada, Jerusalem (Jason’s Tomb), Qumran and Khirbet Qazone, only date to the 1st century CE and are thought to represent imported materials. Further east in the zone of the Syrian desert, cotton is amply

expertum nuperrime prodidit mucianus ter cos. parvasque iam reliquias eius superesse hac experientium iniuria.
452 Cockburn 1986.
453 TB Megillah 12a.
454 Mishna Kil. 7.2; TJ, Ket. 2:4, 27d; Tosefta Sabb. IX 121.
455 A ‘reel of cotton’, stratigraphically dated to between the 12th – 10th centuries BCE, was reported from the site of Tell es-Saidiyeh in the central Jordan valley (Tubbs 1988: 41; Shamir 2001: 126). The string was recovered during the re-exavation of the site in the late 1980s under the sponsorship of the British Museum. The find is unlikely to be intrusive since it derives from a layer (Level XII) that was destroyed by fire and found in conjunction with charred debris (Tubbs 1988: 41). However, there is no information whatsoever in the archaeological report as to how this string was identified as cotton or whether it was subject to scientific analysis at all. For the cotton fragment from Masada see Sheffer and Granger-Taylor 1994; On the cotton hairnet from Jason’s Tomb in Jerusalem see Rahmani 1967: 93-4; The Nabataean cemetery at Khirbet Qazone has yielded a child’s tunic in
represented in the rich tombs of Palmyra dating to the 1\textsuperscript{st} and 2\textsuperscript{nd} centuries CE.\textsuperscript{456} Modest evidence for cotton dating to the early centuries CE was also found in Dura-Europos.\textsuperscript{457} It is often readily assumed that these finds are imports from India since the Palmyrenes played a major role as middlemen in the trade with India.\textsuperscript{458} It is equally likely that the cotton textiles of Palmyra and Dura-Europos, and indeed those from Levantine sites, were sourced from nearby production centres in Mesopotamia and eastern Arabia.

\textbf{ii. Cotton in the Greek world}

The earliest appearance of cotton on the Greek mainland is contemporary with the Achaemenid Empire. This is not surprising as the material culture of the Persians was widely imitated by Greek elite consumers.\textsuperscript{459} Cotton fibres have been identified in two of the four textile fragments recovered from an Alcmaeonid family tomb (35 HTR73) in the Kerameikos cemetery in Athens dating to the last third of the 5\textsuperscript{th} century BCE.\textsuperscript{460} Not far from Athens, the village of Trakhones at the foot of the Hymettus range in Attica has also yielded a cotton textile fragment from a grave dating to the 5\textsuperscript{th} century BCE.\textsuperscript{461} We have already noted the carbonised cotton textile recovered from the tomb of Philip II of Macedon (Tomb II) in Vergina.\textsuperscript{462} The association of cotton textiles with elites like the eminent Alcmaeonid family of Athens and the Macedonian royal house indicates that they were luxury commodities, presumably acquired through long-distance exchange. There is no evidence to suggest that cotton cultivation was attempted in the Eastern Mediterranean in the mid-1\textsuperscript{st} millennium BCE.

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cotton and a baby’s linen tunic with cotton sewing-thread (Granger-Taylor 2000: 150, 155); The Qumran caves have yielded cotton textile fragments which, if not intrusive, are thought to date between the 1\textsuperscript{st} century BCE – 68 CE (Muller et al 2004); For later 3\textsuperscript{rd} century cotton finds from Nessana and En-Boqeq see Bellinger and Pfister 1962 and Sheffer and Tidhar 1991.\textsuperscript{456} 42 fragments of cotton textiles were found in the tombs of Kitot (40 CE), Iamblik (83 CE), Elahbel (103 CE) and Grave 69. See Stauffer 2000: 249; Schmidt-Colinet et al 2000: 8-9, 12; Wild et al 2008: 145.\textsuperscript{457} Pfister and Bellinger 1945.\textsuperscript{458} Seland 2014.\textsuperscript{459} Miller 2004.\textsuperscript{460} Environmental Scanning Electron Microscopy (ESEM) established that both textiles (Y1, Y2) have flat and convoluted cellulose microfibrils, a morphological trait which could only be consistent with cotton; See Margariti et al 2010: 525.\textsuperscript{461} Zisis 1955.\textsuperscript{462} Moraitou 2007.
The rarity of cotton in the Mediterranean is best exemplified by the lack of a consistent term to describe cotton in classical Greek sources. Although Herodotus conceives of cotton periphrastically as ‘tree-wool’ (much like the Assyrian ḫṣšū ṇāš šīpāṭī), he uses various terms to express this concept: ‘wool from trees’ (III.47: ‘ἐῖρῃ ἀπὸ ξύλων’), ‘fruit which bears wool’ (III. 106: κάρπος εἰρῳ προφέροντα) and ‘garments made from trees’ (VII.65: εἴματα ἀπὸ ξύλων πεποιημένα). Nonetheless, Herodotus’s comment that cotton was ‘exceeding in beauty and goodness than that of sheep wool’ (III.106), seems to suggest first-hand knowledge of the fibres and textile.\footnote{Herodotus, Hist. III. 106: τὰ δὲ δένδρα τὰ ἄγρα αὐτόθι φέρει καρπον εἴρῃ καλλονῇ τε προφέροντα καὶ ἀρετῇ τῶν ἀπὸ τῶν ὄψων καὶ ἀσθήτη ἵνετῳ ἀπὸ τοῦτων τῶν δενδρῶν χρέωνται.}

Theophrastus, or rather his source, Androsthenes of Thasos, remarks on cotton in India, Arabia and Bahrain in the Herodotean vein as ‘wool-bearing trees’ (τὰ δένδρα τὰ ἑρϊφόρα).\footnote{Theophr. Hist. pl. IV.7.7.} Theophrastus compares the leaves of the cotton-tree with the grape vine (ἄμπελος) and the mulberry tree (συκάμνος), the cotton fruit with the spring apple (μῆλον ἐαρινόν) and the whole cotton plant with the dog-rose (κοινόρόδον).\footnote{Theophr. Hist. pl. IV.4.8, 7.7.} The description is on the whole accurate but the eclectic comparanda invoked by Theophrastus makes it clear that the cotton tree was a strange sight to the Mediterranean observer of the 4th century BCE.

By the Hellenistic period eastern loanwords are applied on cotton. κάρπασος, a loanword from the Sanskrit kārpāsa, is known in Greek from the 3rd century BCE onwards. Brust suggests that the word may have been adopted for cotton when the Greeks came into direct contact with Indians during Alexander’s campaign.\footnote{Brust 2005: 313.} The terms κάρπασος and its Latin equivalent carbasus were not, however, consistently used to designate cotton. They were regularly conflated with linen cloth. Even the Periplus Maris Erythraei, a 1st century CE merchant-mariner’s guide to western Indian Ocean trade, for lack of words, describes κάρπασος (cotton) as the material out of which Indian ‘linen-cloth’ (ὀδόντον) is made.\footnote{PME 41: Πολυφόρος δὲ ἡ χώρα σίτου καὶ ὀργῆς καὶ ἐλαίου σημαίνου καὶ βουτάρου καὶ καρπάσου καὶ τῶν ἀπὸ αὐτῆς Ἰνδικῶν ὀδόντων τῶν γοδαίων; While ὀδόντον usually denotes a linen-cloth, the Periplus consistently uses it to describe an ordinary-grade cotton textile while higher-grade cotton textiles were referred to as σινδών (Wild and Wild 2014a: 214-215; Wild and Wild 2014b:}
referring to raw cotton as κάρπασος, in most other cases, κάρπασος and the Latin carbasus were simply used as a generic term for a ‘fine textile’.\textsuperscript{468} In spite of the presence of eastern loanwords, Hellenistic scholars like Aristobulus (4\textsuperscript{th} century BCE) and Eratosthenes (3\textsuperscript{rd} century BCE) continued to describe cotton as wool from trees.\textsuperscript{469}

Another loanword for cotton attested in Hellenistic sources is the term πάμβαξ or παμβάκι, a borrowing from the *Old Persian pampaka/i/u (Middle Persian pambag; New Persian pambah).\textsuperscript{470} The word is rarely used in Greek and its earliest extant appearance is in the work of the late Hellenistic epigrammatist Myrinus (2\textsuperscript{nd} - 1\textsuperscript{st} centuries BCE).\textsuperscript{471} The Suda, a 10\textsuperscript{th} century Byzantine lexicon-encyclopaedia, holds an entry for this word. The Suda’s sources on πάμβαξ include Eudemus of Argos, a poorly known Greek lexicographer of the 2\textsuperscript{nd} century CE\textsuperscript{472} and Myrinus himself since it quotes his epigram.\textsuperscript{473} The context in which παμβάκι appears in Myrinus’s work evokes the rarefied world of a rich courtesan (ἐταῖρα) as well as his elite patrons. It would therefore appear that cotton was still a fibre of prestige in the Mediterranean during the late Hellenistic period:

‘When Time was about to drag down to Hades pathetic Statyllius, the effeminate old stump of Aphrodite, he dedicated in the porch of Priapus his light summer dresses dyed in scarlet and crimson, his false hair greasy with spikenard, his white shoes that shone on his shapely ankles, the chest in which reposed his cotton frippery, and his flute that breathed sweet music in

\section*{References}

\textsuperscript{468} Wagler 1897; Brust 2005: 312-3.
\textsuperscript{469} Aristobulus and Eratosthenes ap. Strabo XV.1.20-21.
\textsuperscript{470} Hemmerdinger 1970: 64; Brust 2005: 155.
\textsuperscript{471} Little is known of Myrinus but he certainly postdates Leonidas of Tarentum whose influence is to be found in his extant works (Albiani 2006). Myrinus appears to be either a contemporary of the epigrammatist Statilius Flaccus (1\textsuperscript{st} century BCE-1\textsuperscript{st} century CE), whose namesake is mockingly invoked as a hermaphrodite in one poem (Herrmann 1958: 97) or he could be identified with Myrinus of Amisus, a student of the poet Dioscorides of Tarsus, who is known from a decree of the late 2\textsuperscript{nd} century BCE set by the Knossians at Delos (ID 1512 = SIG\textsuperscript{3} II 721; Powell 1929: 39-40). If the latter hypothesis is correct, Myrinus’s origins in the Pontic region of Anatolia, which had a strong Iranian presence from the Achaemenid period onwards (Boyce and Grenet 1991: 281-304), could explain the use of an Iranian loanword for cotton.
\textsuperscript{472} For fragments of Eudemus’s Περί λέξεων ῥητορικῶν (On rhetorical language) see Niese 1922.
\textsuperscript{473} Suda s.v. Βάμβαξ, ἤ παμβάξ, Βάμβαξ, ἤ παμβάξ καὶ παμβάκις: τὸ παρὰ πολλοῖς λεγόμενον βαμβάκιον. ἐν Ἐπιγράμμασι: καὶ τὴν τροτοδόκην κοιτίδα παμβακίδον.
βαμβακοειδής (‘like cotton’), an adjectival form deriving from πάμβαξ is also used in the context of Dioscorides’s description of the ἄκάνθον, which either describes the cotton thistle (Onopordum acanthium) and/or the Illyrian thistle (Onopordum illyricum), both of whose leaves are covered by a white cottony down:

Cotton thistle: it has leaves similar to those of the fish thistle and prickly excrescences on top that are covered by cobweb-like down. They say that after harvesting this down they make from it a cotton-like thread. 475 (Mat. Med. III.16 trans. Beck 2011)

For this analogy to be made, it follows that cotton plant was not a complete rarity in the Eastern Mediterranean of the 1st century CE. It is also likely that the Greek word βαμβάκος attested in the Antatticista, a 2nd century CE Greek lexicon, as the name of a drug among the Cilicians is another variation on πάμβαξ, referring not to the fibres but to another part of the cotton plant used in medicine. 476

Even though cotton was cultivated in the Middle East, the textile is strongly associated with India in the Greek ethnographic discourse. Herodotus is the first to remark that the Indians wove garments from cotton. 477 The fine white cottons (muslins) of Indian manufacture must have been distinctive enough for the Greeks to recognise that the Indian soldiers in the army of Xerxes led by Pharnazathres were dressed in cotton. 478 Early Hellenistic authors, some of whom had first-hand

474 Greek Anthology VI. 254: τὴν μελακήν Παρίης Στατύλλον ἀνδρόγυνον ὄρθω ξεκείν εἰς Ἀἰδήν ἦν· ἐμέλλε χρόνος, τάκ κόκκον βαφθέντα καὶ ὀστίνθοι θέρετρα, καὶ τοὺς ναρδούλεας ἄλλοτρίως πλοκάμον, σφαιράδα τ’ ἐστερφθοιν ἐπ’ ἀστραγάλοις γελόσαν, καὶ τὴν γρυποδοκιν κοτίδα, σαμβακίδαν, αὐλοῖς ὁ ἔντεκαν ἔσπερεις ἐν κόμως, δώρᾳ Πρυτανείων ἄριον ἐπ’ προθόροιν. 475 Dioscorides Mat. Med. III.16 ἄκάνθον· ἐμφαρή τ’ θμίλλα ἔχει τ’ λεκη ἄκανθη· ἐπ’ ᾅκρος δὲ ἔχει ἀκανθόδεας ἐξιζαῖς, καθ’ ἀρχεοειδῆς ἄπτοε γνοὺς, οὗ συλλεγομένον ὑφήν τινα βαμβακοειδῆ γίνεσθαί φασί; Dioscorides’s observation is repeated by Oribasius in Collectiones medicæ 11.21; The same thistle whose cotton-like thread was harvested is probably referred to in Serv. Aen. I. 649: item Epicadus in Sicilia, quarum floribus quom dempti sint nuclei ex his implicitis multieres multiplicem conficere vestem. hinc vestimenta acanthina appellata. 476 Antatticista ed. Bekker 1814: 85: Βαμβάκοις τοὺς ψαφμακοὺς Κύλικες καλοῦσιν. 477 Hdt. III.106. 478 Hdt. VII.65: Ἰνδοὶ δὲ εἴματα μὲν ἐνδεδυκτές ἀπὸ ξίλων πεποιημένα, τόσα δὲ καλάμια εἶχον καὶ ὀστοὺς καλλιμίνους· ἐπὶ δὲ σίδηρος ἦν.
experiences in India during Alexander’s campaign (e.g. Nearchus), continued to report of Indians wearing white cotton garments.479

Apart from the loanwords κάρπασος and παμβίκις, koine Greek also used the terms βοσάς, οἴθόνων and perhaps τόλη for cotton.480 Like κάρπασος, the semantic range of these terms extended well beyond cotton to include linen and other textiles. The Semitic loanword βοσάς (Akk. būṣu, Heb. būṣ, Aram-Syr. būṣā), for instance, originally referred to very fine linen textiles481 but in Greek it was applied to cotton and other fine-textured textiles like those manufactured from fibres of the Pinna nobilis mollusk.482 Pollux, referring to cotton cultivation in Egypt in the late 2nd century CE, refers to cotton as βοσάς483 as does his contemporary Philostratus.484 Given the extended semantic field of these terms it would be rash to make any conclusions on the availability of cotton in the ancient Mediterranean based on later Greco-Roman references. Pausanias’s references to βοσάς growing in Elis485 are ambiguous and probably do not refer to cotton. It is only in the local documents (papyri, ostraca, wooden boards) from the cotton producing centres of Roman Egypt that the compound ἔριξζυλόν or ἔρεξζυλόν (lit. ‘tree wool’) is consistently used to designate cotton (see above).

### iii. Cotton in the Western Mediterranean?

Leaving aside the early problematic references to carbasus in early Latin authors (e.g. Caecilius Statius in Pausimachus c. 190 BCE),486 Pliny is the first Latin author to offer substantial comments on cotton. Pliny applied the terms xylon (≪ Gr. ξύλον ‘wood’) and gossypinus or gossypium, a word of unknown etymology,487 to describe

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479 Strabo XV.1.20, XV.1.71; Arr. Ind. XVI.1; Curtius VIII.9.15, 21, 24.
480 Brust 2005: 313.
481 Oppenheim 1967.
482 Wild et al 2008: 143; Burke 2012.
483 Pollux Onomasticon 7.75-76: καὶ μήν καὶ τὰ βόσσινα, καὶ ἡ βόσσια λίνος τι εἴδος παρ’ Ἰνδοῖς. ἢδη δὲ καὶ παρ’ Αἰγυπτίων ὅπο ξύλου τι ἔριαν γίνεται, εἰς οὗ τὴν οἰκήτην λίνη μάλλον ἀν τὶς φαϊνευκέναι, πλὴν τὸ πάχος ἑστὶ γὰρ παραντέρα. τὸ δὲ δένδρῳ καρπὸς ἐφικτότατος καρπόν μάλιστα προσευκώς ερυθρὸν τὴν διάφρασιν, ἣς διαστάσεις ἐκείναν αὐστίνη τὸ ὅσπερ κάρυον, ἐνδόθεν ἔξαψεταί τὸ ὅσπερ ἔριαν, ἵπτ’ αὐτὸ κρόκοκη γίνεται.’
484 Philostr. Vit. Apoll. II.20.
485 Pausanias V.5.2; VI.26.6; VII.21.14.
487 Semitic philologists have suggested a link between gossypium and the Arabic kursif, one of the synonyms for cotton. Both may derive from an eastern loanword via a Greek intermediary (hypothetical form: *κορσίπον). See Löw 1924: 236; Fraenkel 1886: 145.
the cotton-tree. He also uses the term *xylinum* for the fabric. Otherwise he is content to describe it as wool (*lana*) from plants. Pliny never saw the cotton-tree and his descriptions of the plant and the fabric are hopelessly confused. At one point he even claims that the Nubians and Indians made thread out of apples (*HN* XIX.15: *facit lina … Aethiopes Indique e malis*) and elsewhere thought that the ‘wool’ was derived from the leaves. Pliny’s descriptions of what appears to be cotton in Central Asia are conflated with silk. He is not alone in this regard since Strabo also claims that σηρικά or silken cloth was made from the bark of some plants while Virgil speaks of the Seres combing silken fleece from leaves. Pliny realizes, however, that he is discussing the same plant which grew in Egypt, Nubia, Arabia and India.

Cotton textile finds in the western provinces of the Roman Empire mostly date to the 3rd and 4th centuries CE, suggesting that it was a rare textile in earlier periods. There can be no doubt that in antiquity cotton was not cultivated in the western Mediterranean since Latin authors remark of the plant in unfamiliar terms and the imported textile was regularly confused with silk and other finely woven wares. Hence, Posidonius’s remark that the (New) Carthaginians wove beautiful garments from the bark of the thorns of a tree must refer to some kind of barkcloth rather than cotton.

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488 Pliny *HN* XIX.14; XII.38-39.
489 Pliny *HN* XIX.14.
490 Pliny’s contemporary the Latin geographer Pomponius Mela also describes cotton in India as wool from trees (*lanas silvae ferant* III.62). The oldest extant Latin authority to cite cotton as ‘wool-bearing’ trees is Varro (1st century BCE) who cites Onesicritus, a companion of Alexander, as authority: Varro ita refert: Onesicritos ait, in India esse arbores, quae lanam ferant (ap. Serv. Aen. 1.649). His younger contemporary Virgil also refers to cotton as ‘wool’ in a Nubian context: quid nemora Aethiopum molli canentia lana (*G*. I.120).
491 Perhaps a confusion arising from Theophrastus’s description of the cotton fruit as being similar to the spring apple (*μῆλον ζαρπόν*) (*Hist. pl.* IV.4.8, 7.7).
492 Pliny *HN* XVI.88.
493 Pliny *HN* VI.54-55.
494 Strabo XV.1.20: τοιαύτα δὲ καὶ τὰ Σηρικὰ ἐκ τῶν φλοιῶν ξαινομένης βόσσου.
495 Virgil *G*. II.121: *velleraque ut foliis depectant tenuia Seres?*
497 The earliest cotton textile remains in the western Mediterranean are the fragments recovered from Pompeii (1st century BCE – 79 CE) (Borgongino 2006: 72-3). Otherwise cotton textile fragments have typically been reported from late Roman contexts in sites like Munigua, Aquincum (Budapest), Rome, Pisa, Chew Stoke and Damblain. See Wild et al 2008: 145 and Raschke 1978: 651; 907-909.
498 Posidonius ap. Strabo III.5.10: περὶ δὲ νέαν Καρχηδόνα δένδρον ἐξ ἀκάνθης φλοιῶν ἀφιέναι ἐξ αὐτοῦ ὑφάσματα γίνεται κάλλιστα.
I. Conclusion: The Appeal and Limits of Cotton Cultivation in the Ancient Middle East and the Mediterranean

It is not surprising that cotton appealed to the Middle Eastern and Mediterranean textile aesthetic which valued multi-coloured (Akk. *birmu*) fabrics since cotton absorbs dyes better than bast fibres like linen.\(^{499}\) Additionally, white undyed cottons were purer and more luminous than wool or linen in coloration, which may have made them more attractive in ritual and funerary contexts.\(^{500}\) Herodotus avows that cotton was superior to wool in beauty (καλλονή) and goodness (ἀρετή)\(^{501}\) while Nearchus also claims that it appeared brighter (λαμπρότερος) than any other textile.\(^{502}\) The early use of cotton for the manufacture of sacred and royal garments in Mesopotamia was perhaps seen to enhance the divine radiance (*melammu*) and terrifying splendour (*namurratu*) of both god and king.\(^{503}\) The Assyrian king Aššurbanipal’s hymn to the goddess Ištar of Nineveh hints, for example, at the dazzling effect of viewing the ornamented cultic statue in the temple, which was clearly dressed in luminous garments ornamented with gold appliqués, not unlike the cotton garments found in the aristocratic Elamite grave at Arğān:

Like Aššur, she wears a beard and is clothed with brilliance [...]. The crown on her head gleams like the stars; the luminescent discs on her breasts shine like the sun! (SAA 3.7)

The recreation of the divine within the liminal space of the ancient Mesopotamian temple was realised in part through the offering of the finest and rarest material goods to the deity. It is in the context of the temple in which cotton finds its earliest and most enduring use in the Middle East. The ancient Mesopotamian aesthetic preference for white and luminous cotton garments in ritual contexts was inherited by the Islamic world.\(^{504}\) According to the *Muwatta* of Mālik ibn Anas, the earliest

\(^{499}\) Barber 1991: 33; McCorriston 1997: 523; Wool, however, absorbs dyes better than cotton: Dalley 1991: 120.

\(^{500}\) Zawadzki 2006: 28.

\(^{501}\) Hdt. III.106.

\(^{502}\) Nearchus ap. Arr. *Ind.* XVI.1; Nearchus or perhaps Arrian in this instance also suggests that cotton may appear brighter to the observer since it is worn by dark-skinned Indians: τὸ δὲ λίνον τὸ οὖσιν ἢ λαμπρότερον ἢ γλυκόν ἢ λαμπρότερον τὸ ἴσον ἢ λαμπρότερον τὸ λίνον φαίνεται τούτῳ παντὸς.

\(^{503}\) On Mesopotamian ‘aesthetics of luminosity’ discussed with Indian parallels see Winter 1994.

\(^{504}\) Halevi 2007: 87, 95.
collection of hadith, the Prophet himself was buried with three white cotton cloaks from Saḥūl (saḥūliyya), a town in Yemen renowned for these textiles. Cotton was held in equally high regard in Zoroastrian tradition, even over silk, which was tainted by its association with the obnoxious worm. The latter in Zoroastrian thought belonged to the xrafaštārān, a class of impure creatures created by the Evil Spirit (Angra Mainyu). The Dādestān ī Mēnōg ī xrad (Judgements of the Spirit of Wisdom), a didactic (andarz) Zoroastrian text transmitted orally for centuries and then written in Middle Persian sometime in the late Sasanian period, avows for the ritual purity of cotton over that of silk:

‘Of the garments that people wear, polychrome silk is good for the body and cotton for the soul, because polychrome silk arises from a noxious creature, and the nourishment of cotton is from water and its growth from earth.’


Laundering cotton is also much easier than wool, particularly as the latter displays a marked tendency to shrink. Cotton clothing also easily adapts itself to a variety of climes unlike wool.

Despite the promising qualities of the new fibre, cotton remained a marginal element in the fibre output of the ancient Middle East. Sheep’s wool (Akk. šipātu) and to a lesser extent goat’s wool (Akk. šipāt enzi; šārtu) remained the most important materials for textile manufacture. Even linen (Akk. kitū), despite having been known for millennia, was far less common a material than wool. Waetzoldt estimates that linen only accounted for around 10% of the textile production in the voluminous corpus of economic texts from the Ur III period (2112 – 2004 BCE). The status of linen in the Middle East of the early first millennium

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505 Halevi 2007: 85.
506 Andrés-Toledo 2013: 28.
507 Tafazzoli 1993.
508 Dādestān ī Mēnōg ī xrad 16.64-66: az paymōzan ī mardomān dāreedī pad tan parnagān ud pad rowān pambag weh ēd rāy ē parnagān az xrafašt bawēd ud pambag parwarīšn az āb ud rōyišn az zamīg (Andrés Toledo 2013: 28).
509 On the use of wool in the ancient Middle East and the Eastern Mediterranean see Breniquet and Michel 2014.
510 On the history of linen cultivation in the Middle East and Europe see Zohary, Hopf and Weiss 2012: 101-106.
BCE was not any more different. Quillien’s study of first millennium Babylonian textual sources concerning linen suggests that it remained of secondary importance at least until the Achaemenid period when private entrepreneurs actively promoted flax cultivation.\textsuperscript{512}

The chief risk incurred in cultivating fibre crops like cotton or flax is the reduction of arable land and the diversion of labour and water resources available for subsistence crops. Fibre crops demand a higher labour investment than is required for the rearing of caprids for wool production.\textsuperscript{513} Additionally, the rearing of caprids typically exploits agriculturally marginal lands like the steppe zones, desert pastures, hilly flanks and highland pastures in summer. The herd’s consumption of post-harvest stubble and provision of manure also make them a welcome seasonal presence in the cultivated zones. The caprids also doubled as a source of meat, fat, tallow, horn and hides. Consequently, the cost and labour-effective pastoralist strategy prevailed over the fibre crops in the Middle East of the first millennium BCE. Nonetheless, cotton was easily incorporated into the agricultural regime as the capital inputs (irrigation, labour) required for cotton cultivation were already in place. Flax already provided a model for the cultivation of cotton. Mesopotamia and adjacent regions, which had a long and illustrious history of textile production, applied the prevailing knowledge of fibre processing, textile production and ornamentation on the new fibre.

The agricultural practice associated with cotton was, however, not identical to flax. Cotton has a long growing season of about 200 days and is a water intensive crop in the early growing phase, requiring at least 500 mm of water.\textsuperscript{514} In India this is availed by the seasonal monsoon but in Mesopotamia cotton cultivation would be entirely dependent on irrigation in the summer months. During the last two months, the plant needs drier conditions to allow the fibrous fruit to grow free of decay.\textsuperscript{515} The medieval Iberian agronomist Ibn Bassal of Toledo (d. 1105) describes, for instance, the meticulous attention lavished on cotton in its growing stages in his Diwān al-fīlāḥa:

\textsuperscript{512} Quillien 2014: 273, 292.
\textsuperscript{513} McCorriston 1997: 523-524.
\textsuperscript{514} Wild and Clapham 2007: 16; Fuller 2008: 4,6; Wild et al 2008: 144; van der Veen 2011: 89.
\textsuperscript{515} Robbins 1931: 497; Langer and Hill 1982: 262; Burkill 1997.
‘… watering should be stopped until it grows to the length of a finger or about a handsbreadth. Then it should be tended, pruned, straightened, and moved again and again, then watered, then singled and weeded, then watered, continuing this practice until the beginning of August. It should be watered every fifteen days. At the beginning of August watering should stop, for fear lest the plant go soft … giving no produce.’

The dense irrigation networks made Mesopotamia an ideal environment for the growth of cotton since the water supply could be easily regulated. Cotton is a relatively versatile crop in spite of the demands it places on water and labour resources. Tree cotton tolerates saline soils, periodic droughts and even slight temperature fluctuations, requiring a minimum of 15 degrees Celsius. It is thus known to grow in marginal environments like arid plains of Khorasan and Gulestan in southeast Iran or the saline littoral zone of Gujarat and Baluchistan. It is perhaps for the latter reason that cotton is also called samudranta (‘reaching to the sea’) in Sanskrit.

It is the processing and not the growing stage of cotton which is far more painstaking since it involves several time-consuming processes beginning with picking, dehusking, ginning (removal of seeds), carding or bowing to align the fibres, spinning and finally weaving. Fibre crops are by nature cash crops as they yield more produce than is necessary for the consumption of individual households. The complicated processing of the fibres also means that cotton cultivation must involve a large organised community of cultivators and weavers. Cotton was part of an institutional textile industry supported by the palace in the case of Assyria and the temple in the case of Babylonia. It simply could not be a regular feature of household production since the average household in Mesopotamia could not muster the labour and capital resources needed for large-scale cotton cultivation, processing and textile production.

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517 Bouchaud et al 2011: 414; Brite and Marston 2013: 41.
518 Brite and Marston 2013: 41.
There are also significant biological limitations to the spread of Old World cotton. The annualized photoperiod-neutral forms of cotton, which are able to withstand cold winters in temperate climatic zones, are a late development in the history of cotton cultivation. The overlapping ranges of the early annualized herbaceous varieties *G. herbaceum* L. races *persicum* and *kuljianum* in Iran, Central Asia and Chinese Turkestan (Xinjiang) suggest these regions were the first to develop hardier cotton cultivars sometime between the early and mid centuries CE. Even in India, the annual form of *G. arboreum* (‘race bengalense’) only appears to have evolved in the medieval period. Nonetheless, Sennacherib’s description of the cotton plants in Nineveh suggest a hardier strain of the perennial tree cotton which had adapted to northerly climes since the plants were able to produce enough cotton to be woven into textiles.

The fledgling local production of cotton in the ancient Middle East was ultimately never large or prestigious enough to compete with the cotton textiles of India which were highly valued in the trading system of the ancient Indian Ocean world. The *Periplus Maris Erythraei* of the 1st century CE bears testimony to the continued import of Indian cotton textiles. It may be the case that the quality of Middle Eastern cottons fared poorly against their Indian counterparts in antiquity. In India, the creation of extraordinarily fine cotton fabrics began with a painstaking mode of spinning the thread. Using a very light spindle under humid conditions, ‘the hand-spinners of India were able to stretch a single pound of cotton into well over 200 miles of thread, a feat not possible on the best of modern machinery’.

Wild and Wild who examined Indian cotton textiles at the Egyptian Red Sea site of Berenike note that ‘some pieces were exceptionally fine, and, after two thousand years in the ground, have the texture and appearance of old hand-made paper.’ The 10th century CE Arab traveller Sulaiman reported that the muslins of eastern India were so fine and delicate that a dress made of it could pass through a signet ring. One

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519 Primitive cottons are photoperiod sensitive i.e. flowering is triggered by seasonal changes in day length. Cotton requires short and mild winter days to trigger flowering (Brite and Marston 2013: 41).
520 Watson 1983: 162 n. 2; Brite and Marston 2013: 41-42, 44.
521 Souza 2009: 351.
522 e.g. PME 6, 14, 31-2, 41, 48, 51, 61.
523 Barber 1991: 43.
525 Elliot 1867: 5.
variety of diaphanous cotton produced in Bengal was named ‘evening dew’ (ṣabnam) as it was reputed to become invisible when laid over dewed grass.\(^{526}\) Such diaphanous cottons were also known in antiquity. The Āyāraṅga-sutta, a Jain canonical text (4\(^{th}\) – 3\(^{rd}\) century BCE), refers, for instance, to a ‘pair of robes so light that the smallest breath would carry them away’.\(^{527}\) It was perhaps the ethereal quality of the finest Indian cottons that captivated the earliest Middle Eastern and Mediterranean consumers of this new fibre and prompted them to attempt its cultivation in spite of environmental and economic impediments.

In an age where cotton is ubiquitous, it is difficult to recognise the novelty or uniqueness of this fibre. The 9\(^{th}\) century CE Arabic poet Al-Buḥṭūrī’s ruminations on the unfading radiance of the ruined Sasanian palace at Madā’in (Ctesiphon) invokes among other things luminous white billowing robes of cotton, an image perhaps familiar to the earliest connoisseurs of cotton textiles in the Middle East:

> It was not disgraced by the robbery of carpets
> Of silk brocade, or plunder of curtains of raw silk;
> Lofty its battlements soar,
> Raised on the summits of Radwa and Quds;
> Clothed in white, so that
> You see of them but cotton robes.\(^ {528}\)

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\(^{526}\) Chakraborti and Bari 1991: 57.
\(^{527}\) Jacobi 1884: 196.
\(^{528}\) Serrano 1997: 83.
V. Asiatic Rice *Oryza sativa* L.

A. Introduction

Asiatic Rice *Oryza sativa* L. (Poaceae) is a domesticated grain crop native to the tropical and subtropical regions of Asia, which presently ranks among the most important grains in global diet.\(^{529}\) *Oryza sativa* is composed of two distinct phylogenetic subspecies, namely *japonica* and *indica*, for which genetic evidence indicates at least two centres of domestication: the broad thick-grained *japonica* appearing in southern China (c. 4000 BCE) and the thin elongated *indica* variety emanating from the Gangetic basin (c. 2500 BCE).\(^{530}\) Recent genetic and archaeological evidence indicates that the *indica* subspecies of rice was not an independent domesticate but arose as a result of hybridisation between domesticated *japonica* rice from East Asia and the wild predecessor of *indica* rice in the Gangetic valley.\(^{531}\) Modern genetics of landraces from northeast India may also indicate a third distinct origin for the so-called *aus* rice varieties.\(^{532}\) The genetic history of the crop is further complicated by post-domestication hybridisation between domesticates and the wild ancestors as well as the presence of rarer forms which may be of independent origin (e.g. aromatic rice varieties: *basmati* in South Asia and *sadri* from Iran).\(^{533}\)

In South Asia domesticated rice is attested at various archaeological sites in the Ganges basin from the mid-3\(^{rd}\) millennium BCE onwards and subsequently appears at mature and late Harappan levels in north-western India (c. 2200 BCE) before materialising at the edge of the eastern Iranian plateau at Pirak on the north Kachi plain in the early 2\(^{nd}\) millennium BCE.\(^{534}\) The arrival of rice at Pirak heralds its slow

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\(^{529}\) According to the data collected by Prescott-Allen and Prescott-Allen 1990: 368, rice ranks second only to wheat in the global production and consumption of cereal crops.


\(^{531}\) Kingwell-Banham, Petrie and Fuller 2015: 274; Note also the proponents of a monophyletic model wherein *indica* is considered to be an offshoot of *japonica* rice: Molina et al 2011: 8351–8356; For a critique of Molina et al see Fuller 2011: 82-83.


\(^{533}\) Nesbitt, Simpson and Svanberg 2010: 324-5; Note also the *ashina* and *rayada* rice varieties.

\(^{534}\) The rice finds at Pirak have been suggested to be of the *japonica* variety. See Costantini 1981; Nesbitt, Simpson and Svanberg 2010: 325; Fuller 2006a: 36; Fuller and Madella 2001: 336-337, 354-5; Sato 2005. The earliest evidence for rice (c. 6400 BCE) in the Indian subcontinent comes from the site of Lahuradewa in the Gangetic valley (Uttar Pradesh) but this probably represents a cultivated wild strain of rice. See Kingwell-Banham, Petrie and Fuller 2015: 273-274.
westward movement along the Iranian plateau through overland and perhaps even coastal routes into western Iran and Mesopotamia.

In Late Antiquity and the early Islamic period, rice already figures as an important crop in the Middle East and the Eastern Mediterranean, growing especially in Mesopotamia, Susiana, the lowlands south of the Caspian sea (Gīlān, Daylam, Tabaristān), in Jordan and Palestine notably around the well-watered districts of Bet She’an and Banias in the Golan, in the Nile Delta and in oases like the Fayyūm and in the low-lying plains of Anatolia like those of the Seyhan river delta in Cilicia. The 4th century CE editor of the Babylonian Talmud, Rav Ashi notes, for instance, that rice was a staple crop in Susiana (Hozae) and Yāqūt al-Hamawi, reporting of the same region (Khūzistān) in the 13th century alleged that the 50,000 ovens baking rice bread led to an overall rise in temperature of the entire country. The 10th century author Ibn Ḥawqal even avows, no doubt with hyperbole, that some people especially in the riparian regions south of the Caspian sea were so used to eating rice bread that they suffered terrible colics and even died from consuming wheat.

The culinary history of the Middle East also abounds with recipes involving rice ranging from the elaborate rice-jelly and Greek (rūmī) rice pudding served at the court of Balās (484-88) to the Sasanian spiced rice dish served with poultry and lamb about which the Abbasid poet Abu al-‘Abbās al-Adīb waxes lyrical: ‘Sasan in his days invented it/ And Kisra Anu Shirwan loved it’. The culinary arts reached a new peak amongst the urban leisured class in the Abbasid period (750–1258 CE) as evinced by the flowering of gastronomic poetry and cookbooks, some ascribed to no less than the Caliphs themselves. The 10th century poet al-Ḥāfīz al-Dimashqī’s

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536 TB Pes. 50b–51a
537 al-Hamawi Mu'jam al-buldān I, 413.
538 Ibn Ḥawqal Širāt al-'Arḍ: 272 (381). On rice consumption in the riparian region south of the Caspian sea see also Ḥudūd al-‘alam 134, 137; ʿIṣṭakhri 212; Muqaddasi 354.
539 al-Tha'labīi Ta'rīkh ghorar al-siyar, 585.
540 Abu al-'Abbās al-Adīb ap. Ibn Sāyūr al-Warrāq, Kitāb al-Ṭabīkh trans. Nasrallah 2007: 259-260; Sāsān is the eponymous ancestor of the Sasanian kings, usually considered to be the grandfather of Ardašīr I (r. 224-242), the founder of the Sasanian dynasty. Kiswa Anu Shirwan is none other than the celebrated Kosrow I Anūsirvān (r. 531-79) whose patronage of learning, Gibbon thought even deceived exiled Greek philosophers from Athens that a ‘disciple of Plato was seated on the Persian throne’ (Gibbon 1788: 238).
eulogy on aruzziyya, an Iranian inspired rice-porridge simmered in milk with cassia, galangal, sugar and clarified butter, suggests that rice preparation evolved into a complex art form, much as it remains in present-day Iranian cuisine:

How excellent the rice a cook brought, like the beauty of the full moon in the middle of the sky --
Purer than doubled snow, its weaving of the colour of breezes and dews.
It was like a cut page, as white as white pearls.
It dazzled the eyes of the beholders with its light,
and the light of the full moon trembled before morning.
It was as if the sugar on its sides was light materialised over them, white.

al-Ḥāfiz ap. Ibn Sayyār al-Warrāq, Kitāb al-Ṭabīkh 51

Rice today is a common article of food across the Middle East, especially in southern Iraq, Iran, the Arab states of the Persian Gulf and in deltaic Egypt. The fragrant rice of southern Iraq (timman anbar) served with meat or fish stew (timman wa marga) is a hallmark of contemporary Iraqi cuisine as are the elaborate polows and chelows of Iran, rice and meat dishes delicately flavoured and coloured with aromatics, dried fruits and nuts. Before the 20th century, however, in the regions of the Middle East where rice was not a staple it was typically considered a prestige food reserved for the affluent. The lower classes consumed rice irregularly, customarily on festive occasions. In 18th century Aleppo, for instance, the price of rice was double that of wheat. The status of rice as an enviable luxury is also echoed in an old Arab folk saying: ‘What do the people of paradise eat? – rice in butter.’

Despite the prominence of this crop in later times, the earliest history of rice in the Middle East and the Mediterranean has elicited scant scholarly attention and its appearance in antiquity has been largely discussed with the aid of Greco-Roman or

543 On polows see especially the chapters on rice in the MādDAT al-Ḥayāt, a Safavid cookbook authored by Nūr-Allāh, the chef of Shah ‘Abbās I (r. 1588-1629) in Fragner 1984: 342-360.
545 Zubaida 1994: 93.
Hebrew texts.⁵⁴⁶ The materials for the study of rice cultivation in the ancient Middle East are, however, already to be found in Akkadian and Elamite, the languages of Mesopotamia and southwestern Iran. A collation of these texts, ranging in genre from the lexicological to the epistolary, has hitherto been unrealised, not least on account of philological impediments. The archaeobotanical finds for rice, albeit meagre for much of the 1st millennium BCE, should also be interpreted alongside textual sources to understand the spatial and chronological distribution of rice cultivation as well as to assess the economic, ecological and social impact of the spread of rice in the Middle East and the Eastern Mediterranean.

Apart from collating the textual and archaeological sources and untangling the complex vocabularies relating to rice, this chapter will also seek to understand the trade pathways through which rice was introduced into the Middle East and the Eastern Mediterranean and how this crop was integrated into local ecologies and the agricultural cycle. We will also comment on the potential appeal rice had for producers and the factors which limited its production in the Middle East and the Eastern Mediterranean. Finally note will also be made of the food processing technologies associated with rice as well as its role in local medical and magical traditions.

B. Rice between Assyria and the Aegean

In the spring of 318/7 BCE, amidst the clamour of the Second War of the Diadochi, the troops of Eumenes of Cardia fleeing from the armies of Seleucus and Pithon, the satraps of Babylonia and Media, crossed the Tigris into Susiana where they found themselves ‘completely without grain’ (κατὰ μέρος σίτου μὲν παντελῶς ἐσπάνιζεν) and subsisted instead on rice, sesame and dates which were said to grow aplenty in Susiana (δασύλλως ἐχούσης τῆς χώρας τούς τοιούτους καρποὺς).⁵⁴⁷ Not much later in the 2nd century BCE, Zhang Qian the Han ambassador to Central Asia notes that rice grew in Parthia (Anxi) and Mesopotamia (Tiaozhi).⁵⁴⁸ Strabo, probably citing Aristobulus, notes that rice grew in Bactria, Babylonia, Susiana and Lower Syria.⁵⁴⁹

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⁵⁴⁶ The most comprehensive treatment of which is still Hehn 1887: 368-376; See also Feliks 1963a; Konen 1999.
⁵⁴⁸ Shiji Dayuan 123; Watson 1993: 235.
⁵⁴⁹ Strabo XV.1.18.
Rice, in fact, may have been familiar in the Greek world by the 5th century BCE since a fragment of Sophocles’ Triptolemus appears to remark of bread made of rice (ὅπις ὄρτον).\textsuperscript{550}

The casual references of Greek and Chinese commentators on the cultivation of rice in Mesopotamia and Susiana in the last centuries of the 1st millennium BCE strongly argue for a longer history of wet-rice cultivation in the Middle East. However, any attempt to trace rice in the textual records of the ancient Middle East and the Eastern Mediterranean prior to the earliest secure attestation in Greek authors of the 4th century BCE (Theophrastus; Hieronymus of Cardia) is pitted with philological problems. It is imperative therefore to deal at length in the following sections with the complex vocabularies relating to rice in the written records of the first millennium BCE as well discussing the archaeological finds of rice in conjunction with the textual sources.

i. Rice vocabularies in Mesopotamia and Elam

The Akkadian and to a lesser extent Elamite cuneiform records of the Iron Age are rich in references to wild and cultivated flora but the modern botanical identity of a great many species remains elusive. The majority of Akkadian plant names only merit generic descriptors like ‘a medicinal plant’, ‘a briar’ et cetera in the modern lexicology of that language and only around sixty florae can be matched with modern botanical equivalents with any degree of certainty.\textsuperscript{551} However, the case for rice in Iron Age cuneiform records, although largely constructed on etymological and contextual analysis, is not so dismal. R.C. Thompson (1876 -1941), a pioneer in the study of Mesopotamian natural sciences, was the first to convincingly identify in Neo-Assyrian lexical texts, on the basis of Iranian cognates, the cereal kurângu (var. mA kuriangu; nA kurâggu (ia > ã; ng > gg); nB kuriaggu (ng > gg)) with rice.\textsuperscript{552} Thompson was only aware of the appearance of the grain crop in the Neo-Assyrian lexical series URU.AN.NA = maštakal,\textsuperscript{553} a work largely of pharmaceutical

\textsuperscript{550} Ath. III. 110e.
\textsuperscript{551} Bleibtreu 1980: 16; Bück 2011: 696.
\textsuperscript{552} Thompson, 1939; Note also ŠE ia-an-gu in the lexical series MUR.GUD known from a Hellenistic copy from Uruk (Recension B) (SpTU III 116 iv 23).
\textsuperscript{553} BM 108860 = CT 37, 32; VAT 9000 = Köcher, KADP II III 65.
interest, but there since have been other cuneiform sources for *kurângu* including an earlier late Middle Assyrian record (c. 1100 BCE) for the crop. The term *kurângu* is presently known from eight Akkadian texts which are listed in Table 1 and will hereafter be quoted with reference to the respective appendix numbers:

<table>
<thead>
<tr>
<th>Text</th>
<th>Genre</th>
<th>Date of Compilation</th>
<th>Date of Manuscript(s)</th>
<th>Provenance</th>
<th>Museum/ Publication No.</th>
<th>Appendix No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Letter of Erib-il to Kalhu</td>
<td>Administrative letter</td>
<td>n/a</td>
<td>Late Middle Assyrian (c. 1100 BC)</td>
<td>Kaššat (Tell Barri)</td>
<td>K9.1.1 (Salvini 1988)</td>
<td>A.1</td>
</tr>
<tr>
<td>Letter to the governor of Kalḫu (Bel-dan or Šarru-duri)</td>
<td>Correspondence of the governor of Kalḫu</td>
<td>n/a</td>
<td>Neo-Assyrian (744-728 BC); reign of Tigrath-pilesar III</td>
<td>Governor’s Palace, Kalḫu (Nimrud)</td>
<td>ND 425 (Postgate, 1973: No. 207)</td>
<td>A.2</td>
</tr>
<tr>
<td>Letter to the Assyrian king Tigrath-Pilesar III</td>
<td>Royal correspondence</td>
<td>n/a</td>
<td>Neo-Assyrian (744-727 BC); reign of Tigrath-pilesar III</td>
<td>Kalḫu</td>
<td>ND 2675 (Luukko 2012/ SAA 19: 20)</td>
<td>A.3</td>
</tr>
<tr>
<td>URU.AN.A = mašakal II 485</td>
<td>Lexical text</td>
<td>Neo-Assyrian</td>
<td>Idem</td>
<td>Aššur, Nineveh, Kalḫu, Huzirina (Sultaniepe)</td>
<td>BM 108860 – CT 37, 32; VAT 9000 – Kößer, KADP II 65; CTN 4 192, 193; STT 2 391</td>
<td>A.4</td>
</tr>
<tr>
<td>Practical Vocabulary of Aššur 23-4</td>
<td>Lexical text</td>
<td>Neo-Assyrian</td>
<td>Idem</td>
<td>Aššur, Huzirina</td>
<td>VAT 14264; VAT 14260; Aššur 13556 (Istanbul) (Landsberger and Gurney 1957), SU 51/131</td>
<td>A.5</td>
</tr>
<tr>
<td>IIAR.GUD Recension B 116 iv 23</td>
<td>Lexical commentary text</td>
<td>Neo-Assyrian</td>
<td>Hellenistic</td>
<td>Uruk</td>
<td>SPTU III 116 iv 23</td>
<td>A.6</td>
</tr>
<tr>
<td>List of stones and materia medica</td>
<td>Magico-medical text</td>
<td>n/a</td>
<td>Neo-Babylonian (ca. 626-539 BC)</td>
<td>Sippar</td>
<td>BM 93084 = CT 14 16</td>
<td>A.7</td>
</tr>
<tr>
<td>Dedication of Ishûya, the tile collector</td>
<td>Administrative text from temple archives</td>
<td>n/a</td>
<td>575 BC; 30th year of Nebuchadnezzar II</td>
<td>Ebbabur Temple, Sippar</td>
<td>BM 63797</td>
<td>A.8</td>
</tr>
</tbody>
</table>

Table 1: Akkadian texts with references to *kurângu*

The Akkadian term *kurângu* appears to have no extant cognates in West Semitic languages whose forms for rice appear only in the Greco-Roman period and are related to the Greek ὑποὖρα (e.g. Heb. ‘ōrez). Turning to the Iranian languages, Thompson observed the striking congruence of *kurângu* with *guranj/gurinj*, the

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New Persian word for rice, first attested in Ferdowsi’s Šāh-nāma.\footnote{Thompson, 1939: 180; Thompson 1949: 106, the Šāh-nāma was composed between 975 and 1010 CE.} The logographic reading ŠE.LI.A, rendered as a synonym to kurângu in the lexical series URU.AN.NA = maštakal (A.4: II 485), written with ŠE (grain) and L.I.A meaning grass (Akk. dišu),\footnote{UR₅.RA = ūbulla 17, 3 ú-li-a = dišu; Thompson 1949: 106.} offers little by way of a crop-specific description.

As the inflorescence of rice, like sorghum and oats, is panicked (i.e. loosely branched)\footnote{Thompson 1939: 181.} while that of wheat and barley is spiked and compressed along a central rachis (stem), contemporaries could not have missed the striking visual difference between matured rice crops and the traditional cereal crops. This morphological variation may have led to the ambiguous taxonomic status of rice in the view of Mesopotamian scholars. A ritual text from Neo-Babylonian Sippar (ca. 626-539 BCE) (A.7) prefixes the determinative Ú, referring generically to plants, rather than ŠE (grain) to rice. The Mesopotamian cognitive approach to plant classification was, in any case, governed by exigencies other than morphological resemblances since even leguminous crops like chickpeas (ḥalluru) and peas (kakkû) were occasionally categorised with cereals (ŠE-group) in lexical texts like URU.AN.NA = maštakal.\footnote{Thompson 1949: 95.}

It is salient to note that neither kurângu nor its related forms are attested in the cereal section of UR₅.RA = ūbulla (Tablet XXIV), a comprehensive bilingual lexical series (Sumerian; Akkadian) of Old Babylonian date, or for that matter in any of the copious archives of the late 3\textsuperscript{rd} and early 2\textsuperscript{nd} millennium BCE, indicating, without doubt, its status as a new grain crop in the late 2\textsuperscript{nd} millennium BCE. It is only in MUR.GUD, a lexical commentary (ṣâtu u šūt pi) that was compiled in the early first millennium BCE to update the older UR₅.RA = ūbulla that we encounter kurângu.\footnote{SpTU III 116 iv 23 (Recension B): še.ba.ri.gim = MIN par-sik-ti = kur’(text: ŠE)-ia-an-gu; Most copies of MUR.GUD derive from the 7\textsuperscript{th} century Assyrian royal library in Nineveh but the passage referring to rice is currently attested only in a Hellenistic copy from Uruk in Babylonia; For the dating of MUR.GUD see Vedeler 2002.}
Thompson thought the philological connection between kurângu and the Iranian cognate to be ‘obvious’ and the identification with rice has met with general acquiescence on the part of most Semitic philologists but the discipline standard Chicago Assyrian Dictionary, among other doubting voices, cautiously identifies it only as ‘a cereal’ (CAD s.v. kurângu).

Further support for the identification of kurângu with rice can be found in the lexical forms related to NPers guranǰ – gurinǰ in the various Turkic languages of Central Asia which were not noticed by Thompson. The Turkic lexical cognates (Uigur kürüč, kurüč, krünč, krüč; Kirghiz küriş, Karakalpak gurinǰ Tobol Tatar kürüč etc) appear to make a far more convincing case for Akkadian kurângu/kuriaggu denoting rice. Additionally a restored Middle Persian *gwyync form is also known from a fragmentary Middle-Persian-Sogdian glossary.

While the later cognates in Iranian and Central Asian Turkic languages are able to independently establish the meaning of kurângu as ‘rice’, the connection between kurângu and the rice vocabularies of South Asia remains problematic. If the etymon of kurângu derives from the Sanskrit vrīhi (Pali vīhi), as is usually supposed, the phonetic changes would suggest a convoluted borrowing via a western Indo-Iranian dialect which reproduces the Indo-Aryan v- with an initial velar consonant. This phenomenon is, however, only a feature of Middle and New Persian (e.g. OP VištƗspa > NPers Gustasp). In any case the phonetic changes in the Neo-Elamite form for rice (miriziš) would suggest that the Old Persian, from which it borrows from, had not evolved the initial gu-/ku- (*vrīziš) (see below). It appears highly unlikely therefore that kurângu is of Indo-Iranian affiliation.

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560 Thompson 1949: 106.
561 e.g. Rabin 1966; Borger 1971: 310.
562 The arguments against the identification with rice, voiced notably by Salvini and Jursa, have largely been constructed on the basis that the 11th century BCE is too early a date for an Indo-Iranian word to be attested in Mesopotamia (Salvini 1998: 188; Jursa 1999/2000: 294). However, we shall shortly observe that kurângu does not appear to be of Indo-Iranian derivation and even should it prove so, it would not appear anachronistic since at least one other Indo-Iranian loanword is already unequivocally attested in Akkadian for this period (see section III).
563 Rachmati 1932 (s.v kurinǰ); Bailey 1976: 306 (s.v. rrīysū); Nazarova 2005: 82; Hauenschild 2006: 42 (s.v. kurinǰ); Nesbitt, Simpson and Svanberg 2010: 334; cf. Japanese urushine, urachi.
564 Henning 1977: 45 (Fragment M. 2a).
565 The term vrīhi proper occurs first in Atharvaveda Saṃhitā (e.g. X.9.26; XI.1.18) and the Taittirīya Saṃhitā of the Black Yajurveda (I.8.9.3) although it may have already known to Indo-Aryan speakers of the period of the Rgveda which refers to purodāsa ‘rice cake’ and odana ‘rice gruel’.
566 On the development of Mid. Pers. vi-/vi- into gu see Hübischmann 1895: 154-56; Mayrhofer 1975.
If a non-Indo-Iranian lineage is sought, especially since rice is already present on mature Harappan sites, Dravidian, a major South Asian linguistic phylum centred primarily in Peninsular India but historically distributed at least as far west as Sindh (lower Indus basin),\(^{567}\) could offer clues to the origin of \textit{kurângu}. The conjectural early Dravidian forms for paddy and the unhusked grain of rice, \(^{(v)}\)ari, \(^{(v)}\)ariki, \(^{(v)}\)ari-(\(n\))ci\(^{568}\) or perhaps even \(^{*}\)urigi\(^{569}\), based on two related Peninsular Dravidian forms\(^{570}\) would seem an appealing precursor to the form BA.RÍ.GA\(^{571}\) which appears as a synonym to \textit{kurângu} in the Practical Vocabulary of Aššur (line 24) and the MUR.GUD, both lexical series of the early first millennium BCE (A.5; A.6).\(^{572}\)

Incidentally Southworth, a proponent of the Elamo-Dravidian (Zagrosian) hypothesis, suggests that the early Dravidian forms \(^{(v)}\)ari, \(^{(v)}\)ariki, \(^{(v)}\)ari-(\(n\))ci, which initially denoted ‘seed’ or ‘grain’, may be related to the Elamite word ‘\textit{bar}’ (seed).\(^{573}\) The presence of later cognates elsewhere in the Indian Ocean world like Ngaju-Dayak \textit{bari}, Malagasy \textit{wari} and related words for rice among the Somali (\textit{baris}) and Bantu (\textit{wari}) may suggest an early maritime dispersal (1\textsuperscript{st} millennium BCE or earlier) of rice through seafaring contacts made by Dravidian-speaking populations in India.\(^{574}\)

\(^{567}\) Toponyms (primarily suffixes denoting villages/hamlets), reconstructed plant names in Proto-Dravidian (e.g. date palms, \textit{Ziziphus}) and distinct cultural practices like cross-cousin marriages reveal the presence of Dravidian speakers in prehistoric Sindh and Gujarat. See Southworth 1988, 1992, 2005: 288-321; Trautman 1979, 1981.

\(^{568}\) Southworth 2011: 145.


\(^{570}\) DEDR 215: Tam \textit{arisi}; Kan \textit{akki Kui irgi Be argi}; DEDR 5265 Tam, Te \textit{vari}.

\(^{571}\) Rabin suggests that the logographic reading BA.RÍ.GA is related to other New Persian and Persian-derived forms for rice e.g. \textit{berenj}, \textit{barinj}, \textit{birinj}, Armenian and Ossetic \textit{brinj}; Syriac \textit{biring}; Rabin 1966: 4; Southworth and Witzel similarly suggest that the Proto-Dravidian form \(^{*}\)varinci, a form with infixed -\(n\)- was responsible for the M.Pers. \textit{brinj}, N.Pers. \textit{birinj}; Witzel 1999b: 27, 31; Southworth 2011: 145.

\(^{572}\) In the Hellenistic recension of the MUR.GUD however the term for the cereal crop named BA.RÍ.GA appears to be confused with the homophonous Sumerian noun \textit{bariga} referring to a unit of capacity or a measuring container since the second Akkadian equivalent is given as \textit{parsiktu}, also denoting a unit of capacity.

\(^{573}\) Southworth, 2011: 145.

\(^{574}\) Southworth, 1979: 206; Fuller, however, suggests on the basis of archaeobotanical data that the adoption of rice among Dravidian populations in Peninsular India was rather late. The prehistoric agricultural regime of Peninsular India appears to be focused on native millets (e.g. \textit{Brachiaria ramosa}; \textit{Setaria verticillata}) and pulses (\textit{Vigna radiata}; \textit{Macrotyloma uniflorum}): Fuller 2011: 88; Fuller 2003b: 193, 204; Fuller 2006b: 184, 186; Fuller 2007: 411, 425. He thus proposes that terms relating to rice may represent a semantic shift from millets to rice, not least on account of superficial morphological similarities between some millet species and rice: Fuller 2003b: 204; Fuller 2006b: 191-193; Fuller 2007: 411, 425; It is nevertheless highly probable that rice was known among Dravidian populations, even if sparsely used, since a Dravidian presence is already attested in prehistoric Sindh and Gujarat: See note 566 as well as Southworth 1992: 82; Southworth 1995: 271.
Returning to kurângu it should also be noted that the formative suffixes –gu/-ṅgu/-kku are strongly redolent of a South Asian, especially Dravidian, context\(^{575}\) although none of the extant homophonous nouns in early South Asian literary languages are semantically related to grain crops (Ta kuraṅku Ka. koraṅgi Tu. kuraṅga (monkey); Skt MBh kuraṅga (antelope); Skt kuruṅga (name of a chieftain in Ṛgveda)). However it may be significant to note the presence of several terms for millet species in South-Central Dravidian languages constructed with the root ‘ragu’ (proto-Dravidian *iraki) which may at the outset have functioned as a generic term for millet-grass or grain species (e.g. Ka. katu baragu (B. ramosa); Ka. ṛaka, Te. āruka, āruga (P. scrobiculatum); Ka. Te. Tu. rāgi, Ta. irāki (E. coracana); Ta. varaku (P. scrobiculatum); Ta. kēlvaraku (E. coracana) etc).\(^{576}\) A similar and perhaps related series of words with an infixed –ṅ- in the suffix is also used to describe millet species in Dravidian and Indo-Aryan languages (e.g. Ta. īruṅku (S. vulgare); Ka. kaṅku (ear of corn); Skt priyaṅgu (S. italica); Skt kaṅgu (S. italica) etc). Witzel speculates that these lexical forms could ultimately have precursors in the extinct languages of the Indus civilisation.\(^{577}\)

It seems most probable therefore that kurângu and its related forms are not of direct Indo-Aryan or Dravidian extract but owe to another South Asian language formerly spoken over a wider geographical zone. This might perhaps include the unknown upper Gangetic substrate in Indo-Aryan languages (Masica’s Language X)\(^{578}\) or the extinct Indus language(s), which Witzel argues, on the basis of Ṛgvedic loanwords, to be divided into two main branches, a northern branch (Harappan/Kubha-Vipaṅga) centred in Greater Panjab which displays Austroasiatic affinities and a southern branch (Meluhhan) centred in Sindh.\(^{579}\) In any case, the presence of South Asian linguistic isolates like Nahali and Kusunda in Nepal, Vedda in Sri Lanka, Shom Pen in the Nicobar islands and Burushaski in Gilgit-Hunza (Northern Pakistan)\(^{580}\)

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\(^{575}\) Caldwell 1856: 153.
\(^{576}\) Fuller 2003b: 201-202; Fuller 2006b: 193; DEDR 379; 812; 5260; cf. Ka. āku referring to young rice not yet transplanted, young sprouts of corn and Te. āku referring to seedlings of paddy for transplantation (DEDR 335).
\(^{577}\) Witzel 1999b: 35-36.
\(^{578}\) Masica 1979.
\(^{579}\) Witzel 1999b.
\(^{580}\) On the linguistic isolates and unclassified languages of South Asia see Blench 2008.
caution against tracing any straightforward links between kurângu and the ancient literary languages of South Asia especially since it is clear that too many etymological bridges have been burned between kurângu and its donor language.

On the other hand, the Neo-Elamite form *miriziš for rice (PF 544:1), incontrovertibly derives from the eastern Indo-Iranian form *vrīziš (*vrīzi-š), surviving in Pašto vrīži,\(^{581}\) with a minor phonetic change attested elsewhere in Iranian loans into Elamite (e.g. OP Vištāspa > El. Mišdašba). The form *rumiziš attested in another Persepolis Fortification Tablet (PFNN 587: 1) no doubt represents a metathesis of *miriziš.\(^{582}\) Henkelman has additionally proposed that the form GIŠ ru MEŠ may stand as an abbreviation for GIŠ ru-mi-zi-š.\(^{583}\) Although the Elamite evidence referring to rice is scanty, it clearly attests to the cultivation of the crop in the 5th century BCE at important localities like Liduma (PF 544) and Kurra (PFNN 587) on the royal route between Persepolis and Susa.\(^{584}\)

### ii. Early Mediterranean literary records for Rice

Despite the early appearance of rice in Akkadian and Elamite texts which demonstrates its cultivation in both Northern and Southern Mesopotamia as well as Susiana, rice (Heb. 'ōrez; Aram. 'urzā, 'arūzā) does not appear in Levantine records until the Greco-Roman period. Rabbinic texts indicate that rice was widely cultivated and consumed as a staple in Roman Palestine especially after the lifetime of Hillel the Elder, a contemporary of Augustus (Mishna Tebul Yom. I:1).\(^{585}\) The Jerusalem Talmud, remarking on the quality of locally grown rice, even states that there was ‘none like it outside Israel’ (TJ Dem. 2:1,22b). More than one variety of rice was known in Roman Syria-Palestine since the Rabbinic sources observe that red rice (Skt. raktaśali) grew in the plain of Antioch on the Orontes.\(^{586}\) The history of rice cultivation in Syria-Palestine is evidently older since Strabo already refers to

\(^{581}\) cf. Nūrīstānī wrīc, Kānvirī wrrîjī Khotanese rēruz, Sogdian rēza.


\(^{583}\) Attested in an unpublished Persepolis Fortification tablet in Tehran (Fort. 7253); See Henkelman 2008: 526, 2010: 56.

\(^{584}\) Kurra (Kōppa in Ptol. Geog. VI.4.6) and Liduma have been localised in the Fahlīyān region of western Fars. Additionally Liduma has been identified with the site of Jenjān (Arfa’ī 1999: 43; Potts 2008: 284, 295).

\(^{585}\) e.g. Mishna Demai 2:1; Mishna Shebiith 2:7, 10; Mishna Hallah I:1; 3:7; 4:3; TJ, Ter. 1:4, 40d; Feliks 1963: 151, 165; Safrai 1994: 117–118.; Konen 1999: 29-32.

\(^{586}\) e.g. Tosefta Dem. 2.1.
the cultivation of rice in Lower Syria and a benediction for rice dishes attributed to Simeon he-Hasid, either the first or the second high priest of Jerusalem to bear that name in early Hellenistic times, would suggest that rice was an important crop in Syria-Palestine by the 3rd and 2nd centuries BCE.

As for Greek records, while the question of whether ὀρυζ carbohydr (rice) is of Indo-Iranian or Dravidian etymology remains unsettled, the term itself presents no semantic conundrums and is undoubtedly related and perhaps even derived from West Semitic forms for rice like Hebrew ʿōrez; Aramaic ʿurzā, ʿarūzā, Syriac rūzā, ʿūrūzā Arabic ʿaruzz, ruzz, ʿuruz, ʿurz and Amharic rūz.

Much controversy, however, engulfs ὀρυζής, the earliest extant Greek reference to rice. The term ὀρυζής appropriately occurs in a lost Sophoclean oeuvre, composed in 468 BCE, on the mythical Eleusinian prince Triptolemus who was instructed by the goddess Demeter in the arts of agriculture. The botanical identity of ὀρυζής already appears to be much disputed in ancient texts. Three Greek texts of the Antonine period (c. 138–193 CE), namely the gastronomic encyclopaedia of Athenaeus and the lexica of Athenaeus’ contemporaries, Pollux and Phrynichus, have left their impressions of the Sophoclean ὀρυζής. Phrynichus, following common opinion, thought ὀρυζής to be rice, but Athenaeus is more ambiguous and suggests that it was either bread made of rice or an Ethiopian grain resembling sesame. Pollux, the Naucratian grammarian, on the other hand does not identify it

587 Strabo XV.1.18.
588 TJ Ber. 6:1, 10b; Rabin has suggested, based on tradition of the Peshitta, that the reference to minnîth, which occurs in Ezekiel’s inventory of goods imported into Tyre, is a reference to rice (Ezekiel xxvii.17). While it is not impossible that rice was known in Judaea of Ezekiel’s age, Rabin’s case for minnîth as a loanword putatively from Tamil uthi (food i.e. rice) via a hypothetical Akkadian *minî- form, which supposedly survives in a metathesis of later Mesopotamian Arabic tenn, (temen, temman, timmƗn), is far from convincing. The text, in any case, appears to be corrupt and if valid it may simply refer to the name of the town from which wheat was exported ( Judges XI.33). See Rabin 1966 esp. 3, 6-7; also Nesbitt, Simpson and Svanberg 2010: 326; The strong association of rice cultivation with Judaea is also borne in the apocryphal story related by al-Tabarî that the Caliph Abû Bakr died on account of being fed poisoned rice by Jews (Târîkh al-Rusul wa al-Mullîk I.2127-8: anna I-Yahid sammat-hu fi aruzza).
590 Dalby, for instance, does not accept this identification (Dalby 1996: 251-2, 2003: 60).
591 Pliny HN XVIII.65.
592 Phrynichus Præp. soph. 93 B: οἱ πολλοὶ ὀρυζὰν καλὸναν.
593 Ath III.110e : ὀρυζάν δ’ ἄρτον μὲνητήν Σοφοκλῆς ἐν Τριπτολέμῳ ἤτοι τοῦ ἐξ ὀρυζῆς γυνηχινοῦ ἢ ἀπὸ τοῦ ἐν Αἰθιοπίᾳ γυνηχινοῦ σκέφτετο, δ’ ἐστὶν ὄμοιον σηράμφω.
with rice but only notes that it was an Ethiopian bread made from grain resembling sesame.\textsuperscript{594} The 5th century CE Alexandrian lexicographer Hesychius remains undecided and glosses it as bread amongst the Ethiopians and a grain resembling sesame or according to others rice.\textsuperscript{595}

The source of the conflicting statements about the identity of ὅρινός may be connected to the recognition in classical ethnography of a branch of ‘Eastern Ethiopians’ localised in or near South Asia\textsuperscript{596} and the regular confusion between Ethiopia and India.\textsuperscript{597} Herodotus himself alleges that both Ethiopians and an Indian tribe named the Kallantiae used the same grain (Hdt. III.97.2).\textsuperscript{598}

The muddled identity of ὅρινός could also stem from the superficial morphological similarities between rice and some millet species.\textsuperscript{599} Rabbinical literature, for instance, even classifies rice (ʿōrez) as a variety of millet.\textsuperscript{600} The native Setaria millet of Nubia \textit{(Setaria sphaceleata)} and a small grained variety of sorghum, both archaeologically attested in the Napatan and Meroitic periods (c. 750 BCE - 350 CE), fit well, in size and colour, with the Greek descriptions of an Ethiopian grain resembling sesame\textsuperscript{601} and could be confused with rice by unfamiliar observers. Bloch suggests that the term ὅρινός has been extended to denote rice by Roman lexicographers on account of phonetic similarities with ὁρυζα but at the outset probably denoted a different grain.\textsuperscript{602}

\textsuperscript{594} Pollux \textit{Onomasticon} VI.73: ὃς ὅρινός τινά ἄρτον Ἀἰθιοπαῖς τὸν ἔς ὅρινόδου γινόμενον, ὅ ἐστι σπέρμα ἐπιχώριον, ὅμοιον σπέρματι.
\textsuperscript{595} Hesychius s.v. ὅρινός ἄρτον παρὰ Αἰθιοπι. και σπέρμα παραπλῆσιον σπέρματι, ὅπερ ἐγκνώς σπειρώνται. τινάς δὲ ὁρυζαν.
\textsuperscript{596} e.g. Hdt. III.94; VII.70; Probably an attempt to reconcile the Homeric dictum ‘Ἀἰθιοπαῖς, τοι δὲ δῆθα διδαχθέντα’ (Hom. Od. 1.23).
\textsuperscript{597} e.g. Aeschylius Supp. 284–286; For the regular confusion between Ethiopia and India in classical sources see Pisanī 1940 and Karttunen 1989: 86 n.159.
\textsuperscript{598} Hdt. III.97.2: οὕτωι οἱ Ἀἰθιοπαῖς καὶ οἱ πλησίωροι τούτοις σπάροντες μὲν ἥρωνται τὸ ἀυτὸ τὸ καὶ οἱ Καλλαντίαι ἤντον; This could refer to some kind of grain used in both Africa and India like pearl millet (\textit{Pennisetum glaucum}), sorghum (\textit{Sorghum bicolor}) or finger millet (\textit{Eleusine coracana}). See Fuller 2006b: 190 on African sorghum and millets in South Asia.
\textsuperscript{599} Fuller 2006b: 191 (in some cases leading to semantic shifts in terms for millets into rice).
\textsuperscript{600} Rashi tosafot Ber. 37a; Note also in the Neo-Assyrian lexical commentary series \textit{MUR.GUD}, known from a Hellenistic copy, \textit{karāngu} (var. ŠE ia-an-gu) occurs immediately after millet (\textit{duhnu}) (Recension B) (\textit{SpTU} III 116 iv 23).
\textsuperscript{601} On sorghum and millets in Napatan and Meroitic Nubia see Fuller 2004: 72-3; Fuller 2013: 165-9.
\textsuperscript{602} Bloch 1925: 45.
However, it is salient to note that ὀρύζησις is said to refer to bread made of rice and not the grain itself hence some divergence from ὀρυζα is not anomalous. Phonetically ὀρύζησις suggests an Iranian root rather than a northeast African origin and this supports identification with rice rather than an Ethiopian (i.e. Nubian) millet species.603 More than a century ago Hehn already drew attention to the fact that the nasalised ὀρύζησις agrees well with the Armenian brinz and Persian birinj (Simnānī varinj) forms for rice, also borrowed into Mesopotamian Arabic as pirinj.604 In any case, it is clear that ὀρύζησις was not in regular use in Koiné Greek. Chrysippus of Tyana (2nd - 1st centuries BCE), for instance, makes reference to a flat rice bread as ὀρυζιτης πλακοδις (ap. Ath. XIV.647d) rather than using the Sophoclean ὀρύζησις, a hapax legomenon, which could simply be a poetic neologism.605

Herodotus, a contemporary of Sophocles, may have known of the consumption of wild rice (Skt. nivāra) in South Asia from hearsay reports. He refers to itinerant Indian tribes consuming a grain the size of a millet (ὅσον κέγγρος τὸ μέγαθος) which they gathered with the husk before boiling (τὸ συλλέγοντες αὐτῇ τῇ κάλυκι ἔφουσί τε καὶ στέονται) but otherwise he appears to be altogether unfamiliar with the domesticated rice crop.606 The earliest unambiguous reference to ὀρυζα proper occurs in Theophrastus and the early Hellenistic authors who accurately describe its cultivation and knew it to be a staple in India.607 Aelian drawing on an unknown Hellenistic source, perhaps Megasthenes, remarks of war elephants fed on rice wine (οἴνος ἑξ ὀρυζης).608 Its cultivation in the Mediterranean is also affirmed by references in Chrysippus of Tyana’s lost treatise on breadmaking, Ἀρτοποικῆ, (2nd-1st centuries BCE) to a flat bread or cake prepared from rice (ὀρυζητης πλακοδις).609 Not much later, Horace refers to rice-gruel as food for the invalid (tisanarium

603 Schmitt 2002; Tucker 2007: 778. 604 Hehn 1887: 370. 605 On neologisms in classical dramatists see Smereka 1936; Stevens 1976; Collard 2005: 355-60. 606 Hdt. III.100; This description could well refer to one of the native Indian millets (e.g. Panicum sumatrense; Brachiaria ramosa; Setaria verticillata) especially since the modes of processing millets are similar to rice. On South Asian millets see especially Fuller 2006b. 607 Theophr. Hist. pl. IV.4.10; Aristobulus and Megillus ap. Strabo XV.1.18; Eratosthenes ap. Strabo XV.1.13; Megasthenes ap. Ath. 153e, Strabo XV.1.53, 60; Diod. Sic. II.36.3. 608 Aelian NA XIII.8. 609 Chrysippus of Tyana ap. Ath. XIV.647d.
oryzae) while Dioscorides notes that it grew in marshes and wetlands and was considered moderately nutritious as well as useful for gastrointestinal ailments.

Although rice never became a common article of consumption everywhere in the Roman Mediterranean, a sizeable corpus of texts exist to attest to its use in food and medicine. While it was certainly known as an imported grain, rice was probably not grown in the western Mediterranean before the 1st century CE since Turranius Gracilis who wrote one or more geographical and agricultural works on Spain and Africa in the 1st century BCE claimed that olyra, a variety of emmer wheat, and rice were the same species and even the well-versed Pliny offers a confused description of the plant.

Whether rice was known in Hellenistic Egypt, where it was eminently suited to grow in the Delta and Fayyum oasis, remains a moot point. A long account of payments from Heracleopolis of the 2nd century BCE may refer to a rice-seller (ὅρυζτοπόλης) by name of Ἴρων but the papyrus is too fragmentary at this point for a decisive reading. Pliny quoting an Egyptian medical recipe notes that a certain medicament was devised from crocodile innards mixed with the droppings of starlings fed only on rice, suggesting the presence of the crop in the Nile delta sometime earlier than the 1st century CE.

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610 Horace Sat. II.3.155.
611 MM II.95.
612 e.g. Apicius II.2.8; II 2.9; Vinidarius Exc. 7.9; HA Elagabalus 21.3; Edict. Diocl. I 23; André 1981: 54; Konen 1999: 37-41.
613 e.g. Galen Aliment. fac. 6.525 (K), 6.687, Simpl. med. 12.92; Cels. de med. II 18.10, 22.11; Aretaeus De curat. acut. morb. I 10.6.5; II 2.17.7; Archigenes of Apamea Fragm. 23.5; 23.12; Aet. Amid. Med. I 305.1; II 97.9.
614 Pliny HN XVIII.75; cf. XVIII.82.
615 The beginning of rice cultivation in Egypt was already a point of contention in European scholarly circles in the late 18th century. The French naturalist C.S. Sonnini, for instance, notes: 'La question de savoir si les anciens Egyptiens ont cultivé le riz a ete agitée, et, comme il arrive presque toujours en pareil cas, la discussion laisse encore dans l'esprit quelqu'incertitude.' (Sonnini 1799: 251).
616 P. Tebt. III.2.890: 2.35: ἱέρωνι ὅρυζ(ζοπόλης?) ἐς ἄν(ἡλιομ). 617 Pliny HN XXVIII.110: Rice never seems to have become an important crop in Egypt in pre-Islamic times since it is rarely attested within the fairly voluminous papyrological documentation of the Greco-Roman period e.g. P.Hawara 245 = SB I 5224, Z. 36. 41 (1st-2nd centuries CE); P. Tebt. II 612 (d) (1st century CE); P. Freib. IV 67 (2nd/3rd centuries CE). There also appears to be no native Egyptian term surviving for rice since the later Coptic word for rice (pi-arros) derives from West Semitic forms. It may, however, be salient to note that the Nile Delta where rice was better suited to grow has not produced much papyri; See Konen 1999: 34-35.
iii. Archaeobotanical imprints of riziculture in the Middle East and the Mediterranean

While the textual sources suggest an early introductory date for rice cultivation in the Middle East, the archaeobotanical data for rice in Western Asia and the Eastern Mediterranean of the 1st millennium BCE is meagre and much scope remains for the systematic sampling of ancient plant remains, particularly in Middle Eastern archaeological sites. A single charred grain of rice was reported from the site of Hasanlu (Gilzanu) in a pit dated by the excavators to 750-590 B.C.\(^{618}\) van der Veek, however, suggests that the single grain of rice from Hasanlu may be a misidentification of einkorn (\textit{Triticum monococcum}) especially since subsequent archaeobotanical work at the site yielded no trace of rice at the 1st millennium levels.\(^{619}\) More convincing albeit badly preserved is the single grain of rice from Mycenaean Tiryns dating to the 12th century BCE, which complements the late Middle Assyrian reference to \textit{kuriangu}.\(^{620}\) Sallares suggests it was an exotic import rather than a locally cultivated species\(^{621}\) and Tiryns, the port of Mycenae, may have received the grain from a nearby source like Mesopotamia rather than distant India in this period.\(^{622}\)

Following a long drought in data, the 1st century CE is exceptionally well endowed with rice finds from various sites including Egyptian Red Sea ports of Myos Hormos (Quseir al-Qadim) and Berenike (Medinat el-Haras),\(^{623}\) Parthian Susa\(^{624}\) and even sites as far afield as Roman Novaesium (Neuss am Rhein)\(^{625}\) and

\(^{618}\) Tosi 1975.
\(^{619}\) van der Veen 2011: 77 no. 6; On a related note, einkorn grains recovered by Japanese researchers at Sang-i Chakmak, a Neolithic site in Northern Iran, in the early 1970s were also misidentified at the outset as rice owing to superficial morphological similarities between einkorn and rice (Fuller, personal communication).
\(^{620}\) Kroll 1982: 469.
\(^{621}\) Sallares 1991: 23.
\(^{622}\) Note should also be made of an 18th century claim for the presence of rice in ancient Egypt. The renowned French antiquarian, Anne Claude de Caylus (1692-1765), and one M. de Bose, his colleague in the Académie des Inscriptions et Belles-Lettres, independently reported of pieces of rice straw used as a binder on the gilded plaster covering of an undated statue of Osiris (de Caylus 1752: 14; Somnini 1799: 253). Täckholm and Täckholm believe the identification to be improbable (Täckholm and Täckholm 1941: 412) but at least two contemporary scholarly works (Daressy 1922; Darby et al 1977: 493) appear favourable to the testimony of the French scholars despite the fact that the whereabouts of the statue are presently unknown.
\(^{624}\) Miller 1981.
Mogontiacum (Mainz) in Germany and Tenedo (Zurzach) in Switzerland. The sudden flourish in archaeobotanical finds in the 1st century CE is also paralleled by the sizeable literary references to rice in the Julio-Claudian and Flavian periods, most notably in the works of Horace, Pliny the Elder, Celsus, Dioscorides, Archigenes of Apamea and Aretaeus of Cappadocia. The Roman military encampment in Novaesium (Neuss) alone produced 196 charred grains of rice dating to the first quarter of the 1st century CE. Rice-hull impressions identified on bricks from several sites in the South Dez plain of Susiana, dating between 25 BCE and 250 CE, also indicate localised cultivation of rice. Additionally Susa, the capital of the province, yielded 373 carbonised grains of rice dating to the 1st century CE.

The immense spatial range covered by the later finds argues for prolonged exposure to the crop and a gradual diffusion of rice cultivation certainly appears more historically cogent than an instantaneous adoption. The conservative character of dietary habits is in any case affirmed elsewhere by Plutarch who reporting on other Indian cultivars in the Mediterranean states ‘we know that many older people still cannot eat ripe cucumber, citron or pepper’.

C. Rice and the Eastern Iranian Trade Networks

Salvini and Jursa claim that the early appearance of kurângu (MA var. kuriangu) in a 11th century BCE epistolary context nullifies the supposed Iranian etymology and its identification as rice. Firstly we already have observed that kurângu is unlikely to be of Indo-Iranian derivation and even should it prove so, neither an Iranian etymology nor the presence of a South Asian cultivar in Mesopotamia of the late 2nd millennium would appear to be anachronistic.

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626 Zach 2002: 104-5.
628 Note also the amphora inscribed with ‘orissa’ (variant of Latin oryza) from Herculaneum dated to 79 CE (Corpus Inscriptionum Latinarum IV 10756).
629 Horace Sat. II 3.155; Celsus II 18.10, 20, 23, 24; II 22.11, 24; II 7.2; II 23; III 7.2; IV.14.3; Dioscorides Mat. Med. II 80.6.6; 96.1.2; II 75; II 95; Aretaeus De curat. acut. morb. I 10.6 = 25 A.234 (K); II 17.7 = 24 A.255 (K); Archigenes of Apamea Fragm. 23.5; 23.12; Fragm. Inedita 69.16 (ed. Calabró 1961).
630 Nesbitt, Simpson and Svanberg 2010: 326, 329.
631 The rice grains from Susa were recovered alongside remnants of storage jars (Miller 1981).
632 Plutarch Quaest. Conv. VIII.9 1-5 (731-734).
The easterly connections of Assyria at this date are incidentally affirmed in a fragmentary clay tablet from Aššur containing the annals of the Assyrian king, Aššur-bêl-kala (1074—1057 BCE) which states that he ‘sent out merchants and they brought back burḫišt oxen, female Bactrian camels and tešēnu animals’ and that ‘he collected the female Bactrian camels, bred (them), and displayed herds of them to the people of his land’ (burḫiš udrāte tešēnu tamkārī išpur ilqiūni udrāte īkṣur ušālid sugullātešunu nīšī mātišu ušebri).634 Aššur-bêl-kala’s inscription furnishes the earliest extant use of an Indo-Iranian loan-word for the two-humped Bactrian camel in Mesopotamia (ānšे udru cf. Skt. úśṭra), vital, as we have discussed, to commerce and communications along the terrae steriles of the Iranian plateau.635 It is also significant that the earliest reference to kuriangu derives from Kaḥat, a site east of the Jaghjagh tributary in the Ḥābūr triangle, which maintained a strong Assyrian trait in material culture throughout the so-called dark age of Aramaean migrations,636 and would thus have profited from the easterly links sustained by the Assyrian kingdom.

Moreover, both archaeological and literary sources from the Middle East of the late 2nd millennium BCE, as we observed in chapter III, reveal an insatiable demand for lapis lazuli (Akk. uqnû), imported from the mountains of Badakhshan in the easternmost reaches of modern Afghanistan.637 Even more importantly the largest sources for tin (Akk. annaku), an essential component in bronze production, are to be found in regions east of Mesopotamia, most notably in the region between Kandahar and Badakhshan and in the Zaravšān valley of Uzbekistan and Kazakhstan.638 Smaller deposits of tin also occur closer to Mesopotamia in the region of Deh Hossein in the Iranian Central Zagros and in Chah Kalapi, Shahkuh and Chah Ruh in the Helmand basin of Seistan (Drangiana).639 The remarkable discovery of gold and silver vessels displaying strong affinities with Middle

634 RIMA II A.0.89.7 iv 26-28.
635 The Bactrian camel (Sumerian amsikarr̂al amsīharr̂an; Akk. ibīlu) is of course no stranger in Mesopotamia since literary and iconographic evidence suggest its use in Mesopotamia from the middle of the 3rd millennium BCE. See Potts 2004a, Horowitz 2008 and Steinkeller 2009.
637 Olijdam 1997.
638 Helwing 2009.
639 Ibid.
Assyrian iconography near Fullol in Badakhshan (northeast Afghanistan), close to the lapis lazuli and tin mines, would also suggest lively trade interactions along the Great Khurāsān road.\textsuperscript{640}

It may well be the case that rice was initially brought into Mesopotamia by traders along Eastern Iranian routes for their own consumption of which surplus was bartered rather than appearing as a commodity on its own right. This mode of transmission finds parallel much later in the early 1\textsuperscript{st} century CE when the monsoon trade brought Indian rice to Egypt. The archaeobotanical finds of rice at Roman Myos Hormos (Quseir al-Qadim), which include husk fragments recovered alongside items of Indian provenance like Indian pottery and Tamil Brahmi ostraca (Trenches 8 and 8A), would suggest that rice was consumed on-site by Indian traders.\textsuperscript{641} Similarly the small quantities of rice recovered alongside Indian pulses like mungbean (\textit{Vigna radiata}) from a 1\textsuperscript{st} century CE dump in Berenike (Medinat el-Haras), another Red Sea port, suggest that the consumers were members of a South Asian trading diaspora rather than local inhabitants.\textsuperscript{642} This mode of crop transmission also finds support in a tale relating to seafaring merchants (\textit{saṃjattā-nāvā-vāniyagā}) in the Nāyādhammakahāo, an early Jain didactic text,\textsuperscript{643} which notes that merchants from Campā departing on a long-distance sea-voyage took with them essentials like rice, flour, oil, ghee, curd, fresh water, utensils, medicines, hay, wood, weapons, clothes among other items (Naya. Mallī VIII.49).

It remains unclear, however, as to when rice cultivation might have taken root in Mesopotamia since the earliest extant reference from Middle Assyrian Kaḥat (A.1) is already casual and does not suggest that the crop was unfamiliar. Crop introductions need not of course be protracted processes since Pliny could report in the 1\textsuperscript{st} century CE that a kind of high-yield millet had ‘been introduced from India into Italy within the last ten years’.\textsuperscript{644}

\textsuperscript{640} Olijdam 2000.
\textsuperscript{641} van der Veen 2011: 46-47.
\textsuperscript{642} Wendrich et al 2003: 64; Cappers 2006: 191; For a mid-1\textsuperscript{st} millennium BCE reference to a South Asian recipe involving rice cooked in milk with mungbeans and sesame (\textit{kuryāttilamudgamiśram sthālipākam}) see the Jaiminīyagrhyasūtram I.7 (Caland 1922: 12).
\textsuperscript{643} Winternitz 1983: 418 and Upadhye 1983: 14 suggest that the parts of the Jain canon could well date back to the period between Mahāvira and the Council of Pāṭaliputra (5\textsuperscript{th} - 3\textsuperscript{rd} centuries BCE).
\textsuperscript{644} Pliny \textit{HN} XVIII.55.
D. The role of rice in the ancient Middle East and Mediterranean

i. The allure and adoption of rice

The non-lexical references to rice (kurângu) from 11\textsuperscript{th} century Kâhat (A.1) and 8\textsuperscript{th} century Kalâhu (A.2; A.3) occur in agricultural contexts and clearly indicate that it was a subsistence crop and not simply an exotic cultigen or import for elite consumption and medical requirements. The dedication of rice to the Ebbabar temple along with sesame by Iqîšâya, a tithe collector is also a sure sign that it was grown in the region around Sippar by the 6\textsuperscript{th} century BCE (A.8).\footnote{Jursa 1999/2000: 294 note 25.} Nevertheless the scarce references to rice in the textual sources must be symptomatic of its relatively marginal role in Mesopotamian agriculture and diet of the 1\textsuperscript{st} millennium BCE. The grain par excellence in Mesopotamia was barley (Akk. uttetu, uttatu; Hordeum vulgare, especially the six-rowed variety) and following on its heels were an assortment of wheats (emmer, einkorn, timopheevoid wheat), millets (broomcorn, foxtail), sesame, dates, flax, chickpeas, onions, garlic and cress.\footnote{Thompson 1949: 99-100; van Zeist 2008; Jursa 2010: 362; Fales 2010: 76-78.}

The producer’s incentives to embrace a new grain crop could range from agricultural diversification and risk mitigation to adoption for social and prestige reasons, especially if the crop was held in esteem on account of taste, nutrition and potential medical value. The Assyrian king Sennacherib’s (704-681 BCE) statement that he divided the irrigated meadowland around Nineveh into plots and gave them to the citizens to grow their own orchards\footnote{RINAP 3/1 15 viii.8-19; 16 viii 12-23.} would suggest that the individual producers in antiquity had greater leverage in crop choices than is usually supposed.

Two Neo-Assyrian letters of the second half of the 8\textsuperscript{th} century, both excavated at the imperial capital of Kalâhu, are able to throw some light on the desirability of rice as a subsistence crop to the individual producers and the state in the early first millennium BCE. The first letter is addressed to the governor of Kalâhu, either Bēl-dān (active 744-734) or Šarru-dûrî (active probably 734-728),\footnote{On dating of the text see Postgate 1973: 10-11.} by a subordinate
official and refers to citizens fleeing from a settlement named Sidqī\(^{649}\) where they are reported to have ‘abandoned the rice (kurāngu) they were sowing’ (A.2). As the letter is in a highly fragmentary state, the factors impelling the runaway harvesters of Sidqī are thoroughly unclear. It may perhaps be a case of uncontrollable locust plague, an agricultural woe well attested in other Mesopotamian epistolary and omen texts.\(^{650}\) It is also not entirely certain if rice was a crop of the cultivator’s own choice or if its cultivation here was encouraged by the official writing the letter.

The second Neo-Assyrian letter, also dating to the reign of Tiglath-pileser III (r. 744-727), suggests more clearly that the state was indeed keen on incorporating rice into its agricultural repertoire and system of rations (A.3). In this letter a royal official writes to the king noting that all the barley and rice (written with the logogram ŠE.LIL.MEŠ; cf. Practical Vocabulary of Aššur [A.5] for the equation with kurāngu) had been harvested on land ostensibly belonging to the state. The grain was most probably used to provision the building construction activity referred to in subsequent fragments of the same text. It is likely that the 11\(^{th}\) century letter found at the Assyrian provincial centre of Kaḥat in the Ḫābūr triangle, in which a certain official Erīb-īlī writes to his subordinate in Kaḥat asking if there was enough rice (kurıangu ibušši laššu) and for someone to irrigate (lišqi) the fields, also represents a state-sponsored enterprise (A.1). The incorporation of rice in the state system of rations for provisioning the bureaucracy and labour force and their dependents is also evidenced in the Persepolis Fortification Archives of the Achaemenid period (e.g. PF 544; PFNN 587).

The rarity of rice in official documentation indicates, however, that rice was a crop with little or no traditions of taxation across much of the Middle East, hence leaving a light paper trail. A comparable situation may be observed in late medieval Spain and Italy (c. 13\(^{th}\) century CE) where rice was cultivated, primarily by the poor, in low-lying marshes too wet for wheat and at the outset bore little or no traditions of taxation.\(^{651}\)

\(^{649}\) The location of Sidqī is not known but it must be in the province of Kalḫu since it appears in the archives of that governor.
\(^{650}\) Radner 2004.
\(^{651}\) For rice in medieval Spain see Levi-Provencal 1932: 165-66; Lagardère 1996: 71-87; Montanari 1994: 101–2, 131; For Italy see Motta 1905; Messedaglia 1938: 2-15; 50-64; Lecce 1958; cf. rice-
ii. The limits of rice production

Despite the apparent adoption of rice cultivation by the Assyrian state as early as the 11th century BCE, rice never became a rival to the traditional grain plants of Western Asia and the Mediterranean in antiquity. This was certainly due in part to environmental constraints. Although rice is cultivated at wide latitudes, it is best grown in areas of low-lying fertile soils like naturally or artificially inundated river valleys, marshlands and desert oases with recommended growing temperatures of 20-38 ºC. Ancient and contemporary sources indicate that rice is typically a summer crop in the Middle East and the Mediterranean, planted in spring and harvested between August and November, although Ibn al-‘Awwām, writing in 12th century Spain, suggests that rice may be sown twice a year. He nevertheless admits that winter sowing yields far less compared to that of summer (Kitāb al-Falāḥa II.1 p. 59 Clément-Mullet).

Like wheat, rice is high in yield, disease-resistant and of high calorific value, making it an attractive cultivar for producers, but the intensive labour and water requirements of rice meant that its potential ecological niche in the ancient Middle East was limited to regions of higher temperatures and better irrigation like the marshlands of southern Mesopotamia, Susiana and the Ḥābūr triangle. Beyond the naturally inundated marshlands in the extreme south of Mesopotamia, where the waterways and canals of Euphrates and Tigris form a delta that leads into the Persian Gulf, rice cultivation in the flat semi-arid alluvial plain of southern Mesopotamia would have entirely been dependent on irrigation. The searing summers and consequent high evapotranspiration rates in southern Mesopotamia (up to 3426 mm/annum in the Baghdad region) are unfavourable to large-scale rice production, especially since the crop is typically grown in submerged soils. Talmudic and early Islamic sources indicate that rice was predominantly grown in bread (khubz al-aruzz) as poor man’s food in medieval Basra and Wāsīt (Ibn Qutayba ‘Uyūn al-akhbār I, 221 (Cairo edition); Ibn Baṭṭūṭā II.5; Al-Jāḥiz, Kitāb al-Bukhālā’ p. 100, 108 (Cairo edition) (ed. Van Vloten: 129, 140).  

van der Veen 2011: 77.  

The Mishna, for instance, notes that rice is a summer crop (Shebi II.7) and a passage in the Jerusalem Talmud notes that rice was grown in water in the three summer months before the Jewish New Year (TJ, Dem. II: 2, 33d (Rome Ms.)). Strabo also notes that rice was harvested at the setting of the setting of the Pleiades (October/November) (XV.1.18).  

Kitāb al-Falāḥa II.1 p. 59 ed. Clément-Mullet.  

Sanlaville 2002: 95.
the regions of lower Mesopotamia with easy access to abundant water supplies like the Kaskar region where the Shaṭṭ al-Ḥayy, a major canal, links the Tigris and Euphrates and Maysan (Greek Mesene) located in the eastern part of the Great Swamp (Arab. al-Baijiha) along the lower reaches of the Tigris.656

Even in the rain-fed moist steppe zone of Northern Mesopotamia, where dry farming of cereal crops was practiced, summer cultivation of rice would have required much more water than was availed by winter and spring precipitation. The estimated water requirement of paddy in modern Iran is 9000 m3 per hectare657 whereas the water needs of barley, the staple crop of the ancient Middle East, only ranges between 4000 and 7500 m3 per hectare.658 Irrigation, of course, was also adopted in northern Mesopotamia to circumvent water shortages and to bring more land into cultivation. The Assyrian king, Aššurnasirpal II (883-859 BCE), for instance, vaunts in his famed ‘Banquet Stele’ of the elaborate irrigation scheme devised for his new capital Kalḫu which diverted the waters of the Greater Zab into fields lying contiguous to the city:

I dug out a canal from the Upper Zab, cutting through a mountain at its peak, (and) called it Patti-hegalli (‘canal of plenty’). I irrigated the meadows of the Tigris (and) planted orchards with all kinds of fruit trees in its environs. I pressed wine (and) offered first fruit offerings to Aššur, my lord and the temples of my land.659

It is not surprising therefore to find textual references to rice cultivation in the central Assyrian provinces in the 8th century or at 11th century Kaḥat in the Assyrian-held eastern Ḫabûr region, where the adoption of rice was probably stimulated by a combination of higher precipitation rates and large-scale state-sponsored irrigation schemes. The epistolary text from 11th century Kaḥat, in any case, explicitly refers to artificial irrigation (A.1).

657 Nesbitt, Simpson and Svanberg 2010: 313.
659 Grayson RIMA II A.0.101.30: 36b-40a; On Aššurnasirpal’s canal in Kalḫu see Oates 1968: 46-48.
iii. The consumption and social functions of rice

While we have established that rice was cultivated in the Middle East and the Eastern Mediterranean much earlier than generally acknowledged, we now need to discuss its consumption, uses and cultural associations in antiquity. In the ancient Middle East, apart from bread (and beer in the case of barley), the cereal crops were used to concoct a variety of foods for daily consumption and ritual offering, ranging from cereal porridges/mash (Akk. *ašūdu; pappāsu*)\(^{660}\) to garish confectionaries like the *siqqurratu*, a tiered cake resembling a Mesopotamian temple tower (ziqqurrat).\(^{661}\)

It appears that South Asian food processing modes and culinary traditions did not migrate along the trade routes which brought rice to the Middle East and the Mediterranean since the Greek and Hebrew sources indicate that rice was primarily consumed in the form of bread, porridge and cake\(^{662}\) much like barley or wheat varieties or even supplemented to older recipes. A scholium to Aristophanes’ Equites, for instance, notes that rice was employed to make θριήν, a traditional dish of food wrapped in fig leaves, variously filled with eggs, milk, lard, flour, honey, cheese, etc.\(^{663}\) Ancient opinions as regards to the nutritious value of rice appear to be ambivalent. Rabbinical sources, for instance, claim that rice was twice as nutritious as wheat\(^{664}\) while the eminent physician Galen (c. 129 - c. 216/17 CE) was less enthusiastic about the subsistence value of rice:

‘Everyone uses this grain for restraining the stomach, producing a boiled version like groats. But it is less digestible and less nourishing than groats, as it is also inferior to groats in its pleasantness as food.’

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\(^{660}\) e.g. ND 5461:2; SAA 12, 68:30.

\(^{661}\) e.g. TFS 87 r.2; See Gaspa 2012: 45-91, 295-6.


\(^{663}\) Schol. Ar. Eq. 954b.1: θριήν: χόνδρος ὢ δρυζα ἔχεται ἢ σεμιδάλες ἀρκόνυτας. εἶτα ἐπιχείται τὸ ὄδορ καὶ φυρὰ καὶ τὸ ἰημενόν μετὰ ἀπαλού τυρόν καὶ ών ὄλγων. εἶτα περιλαμβάνεται φύλλος σκύνιος ὄλον καὶ περιμελείται καννάβῳ ἢ πατύρῳ ἢ λίνῳ καὶ καθίσται εἰς ζωμόν κρίδου ἰημενόν ἀρτί τοῦ λαβεὶν ἰκανὴν ἐγηνίν.

\(^{664}\) TJ *Pea* VIII 5.20d; Mishna *Pea* VIII.5.
But quite apart from subsistence, rice was also endowed with magico-medical properties although only a single Neo-Babylonian ritual text from Neo-Babylonian Sippar (ca. 626-539 BCE) avows for this role in the 1st millennium BCE. Other ingredients in the prophylactic formulation include breccia or mottled stone (turminû), the ruddy sabu-stone, brownish limestone (elallû), the pappardîlû-stone (agate?), the pilaqqu-stone (belemnite?), the muššaru-stone (serpentine?), the ‘iron stone’ (parzîllu), alum (gabû), a variety of barley (šeguššu), white cedar wood (tîalu), an aromatic terebinth-like plant named butnâmû, a wooden magical wand (ēru), the head of a crow (qaqqad aribî) and other rare plants (labubittu; ūabarînu), hitherto only attested magico-medical texts of the 1st millennium BCE and whose botanical identity remains elusive.

The appearance of rice alongside such constituents in an apotropaic prescription is far from anomalous since grains and lentils like arsuppu, šeguššu (a variety of barley), emmer, bread wheat and chickpeas, which were processed into flour, were often used in anti-witchcraft and other magico-medical rituals. The association of rice with magical ritual appears, in fact, to have persisted into Late Antique Mesopotamia. Glimpses of late pagan agricultural life in the rural areas of Northern Mesopotamia are preserved in Ibn Waṣhiyā’s Al-fîlâḥah al-nabâṭîyâh, or the Book of ‘Nabataean Agriculture’ (10th century CE), an Arabic translation of a Syriac original (as-Suryānî al-qadîm) compiled circa 600 CE by one Qūthāmâ who,

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665 cf. Ibn al-‘Awwâm, Kitâb al-Falâha II.1 p. 62 ed. Clément-Mullet; Yanbûšād, a Kasdānî (Chaldean?) author of late antique Iraq (dates unknown; possibly c. 300-600 CE) who attributes to rice the humoral quality of ‘dryness’, even alleges that the consumption of rice interfered with one’s cognitive faculties (ap. Ibn Waṣhiyâ’s al-fîlâḥah al-nabâṭîyâh p. 482; El Faïz 1995: 155.).

666 BM 93084: obv.3 = CT 14 16.


668 It may be significant that rice is extensively quoted by late Roman medical authors hailing from Eastern provinces (e.g. Aetius of Amida, Paulus of Aegina, Oribasius of Pergamon) suggesting greater familiarity with the crop in the Roman East. For references see Konen 1999: 40.
according to the text, relied on earlier Mesopotamian authors. In this text rice bears an interesting association with tricksters (mushaʿbidh) and ‘people of illusions and conjurers’ (ašḥāb al-khiyālāt wa-sihr al-aʿyun):

‘It (rice) is also used by tricksters who take a handful (of rice) and throw it in a bowl where there are snakes. The snakes will then rise up on their tails and dance in the bowl. This is done by magicians and the people of illusions and conjurers’ (Ibn Waṣḥīyah, al-Filāḥah al-nabaṭīyah 487).

Anûkh (dates unknown; c. 300-600 CE), one of the Mesopotamian authors cited by Qūthāmā, places rice under influence of Mars and Saturn (NA: 482), planetary bodies which were long believed in Mesopotamia to exercise a nefarious influence. The supernatural astral affiliation of the crop, albeit known from a later text, also bodes well with its use in magical traditions. The peculiar cultural associations gained by rice in the Middle East ultimately indicate that the crop successfully adapted itself to the local cultural complexes.

E. Conclusion

Rice-gruel which Prajāpati, the firstborn of Order, dressed with fervour for the Brāhman, which guards the worlds from breaking at the centre —I with this rice-gruel will conquer Mrityu (Death)

- Atharveda Samhitā IV.35

Should I sing of his fragrant rice, with ghee and the fat of a small rabbit poured upon it?

-Māṅkuṭi Kīlār sings Vāṭṭārṛēṇiyāṭaṇ (Puranānūru 396)

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670 Hämeen-Anttila 2006: 3-52.
672 El Faïz 1995: 154-155; Note, for instance, the astrological report of Balasi from 7th century Nineveh (SAA 8 82) in which he suggests that the conjunction of Mars and Saturn portended evil and necessitated an apotropaic namburbū ritual.
While in South Asia, rice became the object of lyrical musing and religious ceremonial in the first millennium BCE and beyond, it does not appear to have had any such great sway on the cultures of the Middle East and the Mediterranean before the Islamic period. It is nevertheless now certain that rice has a longer history in the Middle East than previously assumed and was a notable constituent of an increasingly diversified agricultural regime. The neglect of rice as a component of ancient Middle Eastern and Mediterranean agriculture partly stems from the uncertain terminology relating to rice in local languages, an uncertainty that has been clarified in this chapter. The divergent names for rice in Middle Eastern and Mediterranean languages hint at varied and complex dispersal histories following either maritime or overland routes from the Indus valley and further east. The lack of a straightforward Indic loanword for rice in the earliest texts from the Middle East reveals a highly stochastic pattern of circulation and suggests a slow westward transmission of rice via intermediaries in Eastern Iran rather than an uncomplicated direct transmission from India.

Despite localised cultivation in the Middle East and parts of the Eastern Mediterranean in the 1st millennium BCE, the commodity potential of rice from India was not dampened since the Periplus Maris Erythraei still cites it as an article of trade in India in the 1st century CE. The selective export of Indian rice only to ports at the entrance of the Red Sea (northern Somalia; Socotra) could suggest that local rice production may have been sufficient elsewhere in contiguous regions, thus making the Indian exports redundant. Alternatively rice was simply not known to many peoples of the ancient Middle East and the Mediterranean. The novelty of rice even as late as the 7th century CE is especially revealed by Ibn al-Faqīh al-Hamadhānī’s anecdotal account of Utbah ibn Ghazwan’s troops mistaking a basket of non-hulled rice (biqishrih) for a poisonous substance left by the enemy, suggesting that rice remained unfamiliar to Peninsular Arabs even on the eve of the Islamic conquest of Mesopotamia.

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673 PME 14, 41, 31; production of rice in Gedrosia: PME 37.
674 PME 14, 31.
675 al-Hamadānī, Mukhtaṣar Kitāb al-buldān s.v. al-Baṣra trans. Massé 1973: 227; A late 14th century Yemeni agricultural treatise by al-Malik al-Afdal al-‘Abbas suggests, however, that rice was known in pre-Islamic Arabia; See Meyerhof 1943-4: 53.
VI. Citrus species: Citrons and Lemons

*Citrus medica & Citrus x limon*

One should prepare delightful confectionaries and beverages from hog-plums, mangoes, pomegranates and citrons. 676

-Suśruta-Saṁhitā, Uttaratantra 25.2
(1st – 4th centuries CE)

A. Introduction to the genus *Citrus*

The globally familiar citrus family includes many commercially important comestible species like the mandarin (*C. reticulata*), sweet orange (*C. sinensis*), Seville or bitter orange (*C. aurantium*), pomelo or shaddock (*C. maxima*), satsuma (*C. unshiu*), citron (*C. medica*), lime (*C. aurantiifolia*), lemon (*C. limon*), grapefruit (*C. paradisi*) and makrut or kaffir lime (*C. hystrix*). All citrus varieties are of tropical and sub-tropical Asian origin whose natural range extends from northeast India through to southwestern China and mainland Southeast Asia. 677

Citrus taxonomy is convoluted owing to interspecies hybridization and high mutation frequency. As citrus species are able to reproduce apomictically (i.e. asexually) or through vegetative propagation, the interspecific hybrids are able to maintain their distinct characteristics. 678 Most commercially significant citrus species do not occur in the wild and are anthropogenic hybrids or selections from wild species. 679 Recent phylogenetic evidence as well as earlier studies of citrus morphology and biochemical features indicate that all commercially important citruses can be traced back to a handful of wild amphimictic or inter-fertile progenitor species including citrons (*C. medica*), mandarins (*C. reticulata*), pomelos

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676 Sus. 25.2: ṛṝṛaṭaṅraṇraphaladādimaṭalauṅgaś kuryācchabhānavi ca ṣāḍavapānaṅkāṇi.
(C. maxima), papedas (C. micrantha) and potentially extinct varieties of wild citrus.680

Only two varieties of citruses were known in the Middle East and the Eastern Mediterranean in antiquity: citrons and lemons, the latter being a late arrival in the last quarter of the 1st millennium BCE. Other citrus species like bitter or Seville oranges (Citrus aurantium) and lime (Citrus aurantifolia) only dispersed westwards in the early medieval period with the Arab expansion, while sweet oranges (Citrus sinensis) were only familiar in the Mediterranean from the Renaissance onwards.681

![Citron (Citrus medica)](http://www.edenproject.com/learn/for-everyone/plant-profiles/citron)

Although the citron (Citrus medica), one of the ‘true’ citrus species, was the first citrus species to arrive in the Middle East and the Mediterranean, it is perhaps the least familiar of citrus cultivars today as it has been displaced by other sour citrus types like lemon and lime. The citron is a thorny, short-lived (15-20 years) shrub or

small tree growing up to three metres in height. The fragrant yellow fruit of the citron is distinguished by minimal flesh, a thick aromatic rind and above all by its knobby skin. The natural habitat of the citron extends from the Eastern Himalayan foothills through to monsoon northeast India with a disjunctive population in the Western Ghats of South India. The lemon is of hybrid origin with up to three or four ancestral citrus taxa (C. aurantium; C. micrantha; C. reticulata) contributing to its genome with the citron being its direct male parent. This hybridization took place in South Asia although the chronology or specific circumstances leading to the creation of lemon cultivars are hazy.

B. Citruses in Early South Asia

Citrus cultivation has a long genealogy in South Asia. The citrus charcoal from the Harappan site of Banawali, dating to the last quarter of the 3rd millennium, is the earliest extant find of cultivated citrus in the Indian subcontinent. Citrus seeds were also recovered from an early 2nd millennium BCE context at the Harappan site of Sanghol in Punjab. Vats identified an elliptic-ovate leaf-shaped steatite pendant from late 3rd millennium BCE Harappa as representing the leaf of lemon, an identification that is not entirely unwarranted in light of the archaeobotanical evidence. A species-level identification has not been made in either case but the citron seems likely given that it was the earliest citrus species to disperse westwards. Slightly later finds of citrus in South Asia include citrus wood charcoal from Sanganakallu in South India (c. 1400 – 1300 BCE) and citrus peel from Gopalpur in Odisha, eastern India (c.1300-1100 BCE). The scanty but geographically dispersed finds of early citruses, probably citrons, indicate that the citriculture had a pan-Indian distribution by the middle of the 2nd millennium BCE.

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683 Asouti and Fuller 2008: 114.
686 Asouti and Fuller 2008: 126.
688 Vats 1940: 467.
689 Fuller et al 2011: 549.
The scent of the citron was so familiar to a South Asian audience that it could be cited as a benchmark for incense. In Kauṭilya's Arthaśāstra, a treatise on the political economy dating in part to the 3rd century BCE, incense from the region of Suvaṇṇakuḍḍya (present-day Assam) is likened to the odour of citrons (II.11.64: sauvanakudyaṇam raktapīṇaṁ mātulunagandhī). Citrons were even regarded as ideal greeting gifts in ancient South Asia much like the gifting of oranges during the Chinese New Year.691 In the Sanskrit playwright Kālidāsa’s Mālavikāgnimitram, a historical play set in the 2nd century BCE, a female attendant procures citrons (bījapūraka) from the royal garden as greeting gifts for queen Dhārini while in the Apadāna, a compendium of Buddhist biographies, a monk is even nicknamed a ‘giver of the citron’ (mātulunagaphaladāyaka).692 The importance of citrons in South Asian cultures is also suggested by the multitude of names applied on the species in both classical and vernacular languages. In Sanskrit, the citron’s many names include mātuluṅgā, bījapūra, cholaṅga, vetasa, suksesara, gila, jantumārin, jambīra, dvijaketu and rucaka. A few of these like bījapūra (‘seed-filled’) and jantumārin (‘worm-killer’) are descriptive labels while others like cholaṅga and mātuluṅgā are borrowings from Austro-Asiatic and Dravidian languages.693

C. The Archaeological Data for Citrons and Lemons

If the history of the citruses in the Middle East and the Mediterranean were reconstructed on the basis of the textual data alone, it would appear that citrus species were only familiar in either region from around the middle of the 1st millennium BCE and only one species, the citron, was known in antiquity. The archaeological data, while patchy for earlier periods and biased in favour of Mediterranean region, indicates that the citron was already present in the Middle East-Mediterranean region by the end of the 2nd millennium BCE and the lemon no later than the 1st century BCE. The earliest finds consist of a handful of charred citrus seeds, a few with remnants of fruit flesh, unearthed in a stratum dated to c. 1200 BCE at Hala Sultan Tekke, a city with pan-Mediterranean trading links on the southeast coast of Cyprus.694 While the remains have not been subject to direct

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692 Mālavikāgnimitram Act 3; Apadāna II.446; See Sharma 1979: 49-50 on other Sanskrit references to citrons.
dating, Gilboa and Namdar remark that the presence of several seeds in secure archaeological contexts leaves little room for doubt on the dating.\(^{695}\) Even if the early dating is accepted, the seed finds in Cyprus do not necessarily represent local cultivation but could be imports from regions further east, perhaps Mesopotamia or Iran.

Figure 18: Citrus seeds, a few with flesh remains, Hala Sultan Tekke, c. 1200 BCE (Source: Hjelmqvist 1979: 128)

The earliest and surest sign of citrus cultivation in the Mediterranean zone is provided by pollen samples from Iron Age sediment deposits in Kyme (Cumae), Carthage and Jerusalem. Citrus species are dependent on entomophilous pollination (i.e. pollination by insects) so airborne pollen is limited. Consequently, even minute traces of citrus pollen in the archaeological record are significant as they suggest the presence of a sizeable number of trees in the immediate vicinity in order for the pollen to be detectable in the sediment samples. The pollen data from an ancient lagoon at Kyme/Cumae on the bay of Naples provides evidence for citron cultivation from as early as the foundation of the site in the 7th century BCE.\(^{696}\) A total of 70 citrus pollen grains were observed regularly throughout the entire

\(^{695}\)Gilboa and Namdar 2015: 273.  
sediment sequence dated between the 7th century BCE and 15th century CE, attesting to the great antiquity and continuity of citrus cultivation in southern Italy.697

Elsewhere in the Mediterranean, citrus pollen dating to the mid-4th century BCE was found in a silted channel at the harbour of the renowned Phoenician city of Carthage on the North African coast.698 Monte Sirai, another Phoenician colony-site, located in southern Sardinia has also yielded evidence for citrons from a chronological context (6th century BCE) closer to the finds from Greek Cumae. Chemical analysis of organic residues from a wine jug found among funerary offerings at the necropolis of Monte Sirai (Grave 158) have yielded traces of polymethoxyflavones, a flavonoid or organic chemical compound found exclusively in the Citrus genus.699 Polymethoxyflavones are found especially in the essential oil of citrus peels, suggesting the use of citrus peels in the flavouring of wine in antiquity.700 Closer to the Phoenician homeland in the Levant, citron pollen grains dated archaeologically and by Optically Stimulated Luminescence (OSL) methods701 to the 5th – 4th centuries BCE were identified in the layers of plaster in a garden attached to the Persian satrapal residence in Ramat Rahel, Jerusalem.702 As the citron pollen appears in high frequencies at the site (up to 32% of the palynological assemblage of Layer II), there is no doubt that citron trees were located in the sampling location.703

Apart from micro-remains in the form of chemical compounds and pollen, a tomb in Tamassos in central Cyprus dating to the Archaic period (c. 750 – 480 BCE) has yielded an entire desiccated citron fruit as part of the unburnt funerary offering of fruits.704 The citron, presently in the collection of the Fitzwilliam Museum, Cambridge,705 was found during Ohneflasch-Richter’s 1889 excavations in

699 Pagnoux et al 2013: 425; On polymethoxyflavones see Li et al 2009.
700 Some ancient sources do note the use of citrons as an additive to wine albeit in the context of using it as a purgative for poisons: Theophrastus Hist. pl. IV.4.2; Virgil G. II. 126-135; Pliny HN XXIII.105; Oppius ap. Macrobius Saturnalia III.19.4
701 See Langgut et al 2013: 119 on this dating method.
702 Langgut et al 2013: 122-124; Langgut 2014: 5-6, 8-9; See Lipschits et al 2012 for an overview of the site of Ramat Rahel.
703 Langgut 2014: 5-6, 8-9.
705 Inv.-Nr. GR 275.1892.
Tamassos, As the exact tomb from which the fruit derives is presently unknown, no precise dating can be accorded to the find.706

Figure 19: Citron from a grave in archaic Tamassos (Source: Buchholz 1988: 123)

The westward spread of citrons has frequently been credited to Persian elites transplanting the trees to the eastern Mediterranean and this interpretation is reinforced by the earliest Greek terms for the citron: the Median or Persian apple.707 The evidence for citrons from Cumae, Monte Sirai and perhaps even Tamassos predates or is contemporary with the earliest phase of the Persian expansion into the Mediterranean, suggesting that the introduction of citrons into the Mediterranean region could not have been the handiwork of the Persians. It seems more probable that Assyrian imperial agents following on the heels of the Assyrian king Tiglath-pileser III’s (744-727 BCE) Mediterranean conquests should be credited with bringing this eastern cultivar westwards to the Levant. Once established on the Levantine coast, the citron spread across the Mediterranean through the colonial and trading networks of the Phoenicians and Greeks. This mode of dispersal is consistent with the presence of citrons at Cumae, Carthage and Monte Sirai, key colony sites of the Greeks and Phoenicians in the western Mediterranean.

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706 Although the fruit under discussion from Tamassos has been illustrated in Buchholz’s publication and certainly appears to correspond to the morphology of a citron, a new re-examination of the find appears in to be order given the early date of discovery. The discovery of a carbonised citrus-like fruit at 6th century BCE Ischia in the Gulf of Naples was later re-identified as the pome fruit of Sorbus domestica (true service tree), a native of southern Europe (Coubray, Zech-Matterne and Mazurier 2010).
Macro and micro-botanical finds of citrus become much more copious towards the end of the first millennium BCE and the early centuries CE. The lemon, previously thought to be a medieval Arab introduction to the Mediterranean, makes its earliest appearance in archaeological and iconographic records in the same period as well. The later finds of citrus are almost entirely concentrated in Campania (southern Italy) and Egypt, no doubt as a result of more intensive archaeological work in these regions and inherent preservational biases: the dry climatic conditions of desert regions in Egypt and the Vesuvian eruption (79 CE) which preserved an extraordinary quantity of organic matter at sites like Pompeii, Herculaneum and Oplontis.  

Egypt has yielded several complete and well-preserved desiccated citron fruits. Germer remarks of an entire citron fruit and fragments found in an undated and poorly documented context at Thebes. While Germer has arbitrarily dated the find to the Ptolemaic period (3rd – 2nd centuries BCE), an early dating is perhaps not implausible given the appearance of citrons elsewhere in the Mediterranean in earlier chronological contexts. Several complete citron fruits of Greco-Roman date, whose provenance is not reported, are also to be found in collection of the Dokki Agricultural Museum in Cairo. The only complete citron fruit with a well-documented archaeological context in Egypt appears to be the desiccated fruit recovered from the site of Mons Claudianus in the Eastern Desert (1st century CE). Citron seeds have also been identified at the Eastern Desert sites of Mons Claudianus (2nd century CE) and Mons Porphyrites (2nd century CE) as well as at the nearby Red Sea port of Myos Hormos (1st – 2nd century CE). Later finds of citron in Roman Egypt are represented by rind and seed fragments from Kellis in the Dakhla oasis (3rd – 4th centuries CE) and leaves from the funerary garlands of mummies in the necropolis of Antinoe (c. 3rd century CE). 

708 Borgongino 2006.  
709 Germer 1985: 106.  
713 van der Veen and Tabinor 2007: 94-95  
714 van der Veen 2011: 86.  
716 Germer 1985: 106.
In southern Italy, pollen samples recovered from sediments in Lake Avernus west of Naples indicate that citrus species were grown around the lake by the late centuries BCE.\footnote{Grüger and Thulin 1998: 38; Grüger et al 2002: 251.} Citrus pollen dated to the 1\textsuperscript{st} century CE was also recovered from the silted harbor of Naples (ancient Neapolis).\footnote{Ermolli et al 2014: 9, 12.} The city of Pompeii in the Vesuvian region has yielded a wealth of evidence for citrus species in the form of macro-remains, pollen and iconographic evidence dating from the 3\textsuperscript{rd} century BCE to the destruction of the site by Vesuvius in 79 CE. The earliest citrus finds at Pompeii, represented by six citron seeds found in a well under the Temple of Venus, date to the pre-Roman Samnite period of Pompeii’s history (3\textsuperscript{rd} - 2\textsuperscript{nd} centuries BCE).\footnote{Pagnoux et al 2013: 426, 434.} Citrus seeds dating to a 2\textsuperscript{nd} century BCE context were also found in the House of the Wedding of Hercules\footnote{Pagnoux et al 2013: 425.} and the House of the Vestals.\footnote{Lippi 2000; Pagnoux et al 2013: 425; Mai and Girard 2014: 174.} Palynological analysis at the House of the Wedding of Hercules indicates the local cultivation of citrus trees.\footnote{Mai and Girard 2014: 174.} Later finds in Pompeii include citrus pollen grains from a grave in Porta Nocera\footnote{Coubray, Zech-Matterne and Mazurier 2010: 278.} and seeds at the Temple of Fortuna Augusta (late 1\textsuperscript{st} century BCE).\footnote{Coubray, Zech-Matterne and Mazurier 2010: 278; Pagnoux et al 2013: 426; Mai and Girard 2014: 174.} Jashemski has additionally suggested that the trees planted in holed pots along garden walls in Pompeii (House of Polybius, Garden of Hercules, House of the ship Europa) may have been citruses on the basis of Theophrastus’s remark that citrons were sown in pots with holes (\textit{Hist pl. IV.4.3}).\footnote{Jashemski 1979: 79, 285, 240; The early 3\textsuperscript{rd} century Roman agricultural author Florentinus also notes that citrons were planted along the wall for ease of roofing them in winter (ap. \textit{Geoponica} X.7).}

Beyond Pompeii, two charred citrus fruits, not identified at the species-level, were found at Herculaneum (1\textsuperscript{st} century CE) during 18\textsuperscript{th} century excavations.\footnote{van der Veen 2011: 86; These fruits are now at the Archaeological Museum in Madrid.} Another unpublished citrus fruit (1\textsuperscript{st} century CE) found at a Roman villa (Villa Sora) in Torre del Greco on the bay of Naples during excavations in 1797 is now housed in the Archaeological Museum in Palermo.\footnote{Borgongino 2006: 154.} Further afield in Rome, thirteen waterlogged citrus seeds and a rind fragment, AMS-dated to the late 1\textsuperscript{st} century BCE...
BCE, have been recently identified in a votive deposit under a building located at the northern end of the Forum Romanum.\textsuperscript{728}

The archaeobotanical and iconographic evidence for citruses from southern Italy provides the first unambiguous evidence for the presence of lemons rather than citrons anywhere in the Mediterranean or the Middle East. The morphology of the exine or the outer layer of the citrus pollen grains recovered from the House of the Wedding of Hercules at Pompeii suggests an identification with lemons (\textit{Citrus limon}) rather than citrons (\textit{Citrus medica}).\textsuperscript{729} Similarly the citrus seeds from Augustan Rome, which were examined with a Scanning Electron Microscope (SEM), display an irregular rugose seed surface cell pattern characteristic of lemons.\textsuperscript{730} The citron seed surface, on the other hand, exhibits regular longitudinal striations.\textsuperscript{731} Additionally, wood recovered from an amphora in the sculpture garden at the Villa of Poppaea at Oplontis has been identified as belonging to lemon\textsuperscript{732} and the citrus pollen found in the garden here probably belongs to the same species as well.\textsuperscript{733}

The presence of lemons in southern Italy is also confirmed by contemporary iconographic sources which depict both lemons and citrons. The House of the Orchard in Pompeii contains two panels with paintings of fruiting lemon trees while another Pompeian panel, now preserved at the Naples Museum, depicts Eros bearing a floral and fruit garland containing lemons.\textsuperscript{734} A Roman mosaic housed at the Palazzo Massimo, Rome (Inv. No. 58596), probably originating from a 1\textsuperscript{st} century CE villa near Tusculum, contrasts the smooth lemon from the knobby citron, both nestled in a basket of fruits.\textsuperscript{735}

\textsuperscript{728} Pagnoux et al 2013: 426.
\textsuperscript{730} Pagnoux et al 2013: 434.
\textsuperscript{731} Pagnoux et al 2013: 431.
\textsuperscript{733} Ermolli and Messager 2013.
\textsuperscript{734} Jashemski et al 2002: 101; Pagnoux et al 2013: 425; See Andrews 1961: 41, 44 on other Roman depictions of citrus fruits.
Figure 20: Fruiting lemon tree, House of the Orchard, Pompeii (Source: Ciarallo 2000: 14)

Figure 21: 1st century CE mosaic from a villa near Tusculum depicting a lemon and citron (Source: Jashemski 2002: 101)
While the lemon is present by the last quarter of first millennium BCE, ancient texts do not distinguish between lemons and citrons. The lemon was probably perceived, in the earliest period of its introduction, as a variety of citron, hence leaving no lexical traces. Townsend notes that the terminology for citrons and lemons is confused even in modern Iraq. In Basra lemons are locally known in Arabic as *athrugh*, a term that is clearly related to the Hebrew and Aramaic terms for citron (*etrog*). In this respect, Brigand and Nahon have noted that medieval Arabic agricultural authors like Ibn al-Awwâm who described several types of citrons, probably included lemons with thick mesocarps as a variety of the latter.

References to an edible variety of citron in ancient Greek sources may refer to the lemon rather than the citron whose edible pulp is minimal. While Theophrastus described the citron to be inedible in the 4th century BCE, authors from the early Roman Imperial period describe an edible variety of citrons which could refer to lemons. There are, however, a few unambiguous references to the consumption of citrons in non-Greek sources which cautions against a facile interpretation of ‘edible citrons’ as lemons. The Mishna, for instance, remarks that children ate their citrons (Heb. *etrogim*) at the end of the Sukkot ceremony.

The earliest extant Middle Eastern-Mediterranean textual sources to explicitly distinguish between citrons and lemons (from Arabic *laymūn*) date no earlier than the 7th century CE. Ibn Wahshîyâh’s Book of ‘Nabataean Agriculture’ (10th century CE), an Arabic translation of a Syriac text by one Qâthâmâ (c. 600 CE), quotes Arabicised Syriac words for the lemon (*ḥasbanā; khashīḥā*), indicating that the distinction between lemons and citrons was made at some point in the pre-Islamic period.

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736 Andrews 1961: 44.
737 Townsend 1980: 467.
738 Townsend 1980: 469.
739 Brigand and Nahon 2016 (in press).
740 Pagnoux et al 2013: 436.
742 Plutarch *Quaest. Conv.* VIII.9; Athenaeus III.85c.
743 Mishna Sukkah 4.7.
D. The Citron and Lemon in the Mediterranean - Of Apples and Cedars: Citrus Terminology in Greek and Latin

The earliest Greek term for the citron emphasizes its eastern origin by describing them as Persian or Median apples.\textsuperscript{746} Theophrastus, who offers an accurate account of the citron tree’s morphology, is the earliest extant author to describe the plant as the Persian or Median apple.\textsuperscript{747} At least one other Hellenistic author recognized the Indian origins of the tree as the 5th century CE lexicographer Hesychius, who drew on now-lost Hellenistic sources, glosses the citron (κίτριον) as the Indian apple (τὸ Ἰνδικῶν μῆλον).\textsuperscript{748} While the archaeological findings suggest a long-standing familiarity with citrons and localized cultivation in the Mediterranean from the 7th century BCE at the latest, the traditions concerning the citron’s eastern origin remained strong in the Mediterranean zone down to the early centuries CE. Athenaeus, for instance, explicitly notes that the citron came to the Greeks from the upper country i.e. the interior of Asia (ἐκ τῆς ἄνω χώρας).\textsuperscript{749} It was perhaps encountered with greater frequency in regions east of the Mediterranean thus reinforcing its status as an eastern fruit par excellence.

A few Greco-Roman authors from around the 4th century BCE onwards also identified citrons with the mythical ‘golden apples’ (παγχρύσεα μῆλα) guarded by a fearsome serpent in the garden of the Hesperid nymphs.\textsuperscript{750} The retrieval of these apples was counted as either the penultimate or last of Herakles’s famous labours.\textsuperscript{751} In his discussion of citrons, the 2nd century CE gastronomic author Athenaeus quotes the 4th century BCE comic playwright Antiphanes as referring to citrons in his fragmentary play ‘The Boeotian’.\textsuperscript{752} This identity of the fruit in question is not made explicit in the passage of Antiphanes cited by Athenaeus but the reference to the “apple” seeds having come to Athens from the Persian king, supports the identification with the citron.\textsuperscript{753} Both Antiphanes and his contemporary imitator

\textsuperscript{746} Note Pliny’s variant malus Assyria or ‘Assyrian apple’ (HN XII.15).
\textsuperscript{747} Theophr. Hist. pl. IV.4.2: τὸ μῆλον τὸ Μηδικῶν ἢ τὸ Περσικῶν κυλούμενον, I.11.4; I.13.4.
\textsuperscript{748} Hesychius s.v. κίτριον.
\textsuperscript{749} Ath. III.84a.
\textsuperscript{750} Hesiod Theogony 216, 335; Andrews 1961: 38.
\textsuperscript{751} Pherecydes FGrH 3 F 17; Panyassis, Heraclea EpGF F 10 = PEG I F 11.
\textsuperscript{752} Ath. III.84a-b.
\textsuperscript{753} Ath. III.84b: νεωστὶ γὰρ τὸ σπέρμα τοῦτ’ ἀφηγμένον εἰς τὰς Ἀθήνας ἐστι παρὰ τοῦ βασιλέως.
Eriphus, who is also quoted by Athenaeus, liken the Persian-derived apples to the Hesperid ‘golden apples’ (χρυσᾶ μῆλα).\(^754\)

The scholar-king Juba II (c. 48 BCE – 23 CE) also believed citrons to be the golden apples of the Hesperides.\(^755\) The horticultural author Pamphilus of Alexandria (1st century CE) remarks of Hesperid apples as fragrant (εὔοσμος) and inedible (ἄβροτος), a description which is strongly suggestive of Theophrastus’s description of citrons.\(^756\) Pamphilus was not describing the mythical tree but actual fruits which the Spartans used as divine offerings. The early mythic associations gained by the citron are suggestive of the high value accorded to the tree whose cultivation in the Mediterranean was probably restricted to the estates of elites in the earliest periods.

The growing of citruses must, however, have become widespread by the 1st century CE since Dioscorides claims that everyone knows the citron (Mat. Med. I.115.5: πάσα γνώριμα). It is roughly in the same period when a more specific terminology for citruses evolves in both Greek and Latin, perhaps as a result of increased familiarity with citrons. From about the 1st century BCE onwards, terms relating to coniferous tree species were applied to the citron in both Greek and Latin. Diophanes of Nikaia (1st century BCE) and Dioscorides (1st century CE) speak of citron as the κεδρόμηλα or ‘cedar-apple’,\(^757\) probably on account of the superficial resemblance of the green unripe knobby citron fruits to unripe cedar cones.\(^758\) Isidore of Seville notes that the ‘Greeks call it κεδρόμηλαν, and Latin speakers citrea because its fruit and leaves bring to mind the smell of cedar (cedrus).\(^759\) The application of terms relating to coniferous trees on citrons was the source of great confusion for later commentators attempting to identify citrons in older texts which had only remarked of them as Persian, Median or golden apples.\(^760\) Athenaeus discusses the lexical confusion at length ending with a suggestion that the presence

\(^{754}\) Ath. III.84a-c.


\(^{756}\) Ath. III.82e: καὶ ἐν Δακιδίμων ὀὲ παρατίθεσθαι τοῖς θεοῖς φησὶ Πάμφυλος ταῦτα· εὔοσμα δὲ εἶναι καὶ ἄβροτα, καλεῖται δ’ ἐπιπρίδων μῆλα; Andrews 1961: 38.

\(^{757}\) Diophanes ap. Geoponica X.76; Dioscorides Mat. Med. I.115.5.

\(^{758}\) Grant 1997: 193.

\(^{759}\) Etymologies XVII.vii.8.

\(^{760}\) See for instance the discussion in Macrobius’s Saturnalia 3.19.3-5 where Homer is erroneously cited as providing evidence for citrons.
of spines around the leaves both juniper trees (κεδρίον), another coniferous species, and citrons (κίτριον) may have led to a shared terminology.\textsuperscript{761}

In Latin the citron fruit was described as the citrium or malum citrium (var. citreum; citrum) and the tree itself dubbed citrus, from which derives the modern botanical Latin name for the genus.\textsuperscript{762} In addition to the term κεδρόμηλα, later Greek authors extensively used the Late Latin forms κιτρέα, κίτρον and κίτριον to describe citrons.\textsuperscript{763} The Latin citrus for citrons appears to derive from citrum, the name of the coniferous sandarac tree native to the Mediterranean (\textit{Tetraclinis articulata}) which was highly valued for its fragrant wood and resin.\textsuperscript{764} The extension of terms relating to fragrant coniferous species to describe citrons in both Greek and Latin emphasizes the ornamental and odoriferous worth of citrons rather than its gustatory quality to Mediterranean cultivators.

\textbf{E. The Citron in Israel}

‘Just as the citron is fair and praised among the wild trees, and all the world acknowledges it, so the Lord of the World was fair and praised among the angels’

- Targum on the Song of Songs II.3 (compiled 7\textsuperscript{th} – 8\textsuperscript{th} centuries CE)\textsuperscript{765}

The citron (etrog) is one of the four species (\textit{arba'at ha-minim}) alongside myrtle twigs (hadassim), date palm fronds (lulavim) and willow twigs (aravot) associated with rituals performed during the Jewish Feast of the Tabernacles (Sukkot)\textsuperscript{766}, an autumnal harvest and thanksgiving festival which has as its mythological underpinning, the Israelites’ dwelling in tabernacles (tents) during the forty years of wandering in the wilderness. The Book of Leviticus, which enumerates the four species to be used to rejoice before the Israelite God, only speaks of the ‘fruit of the goodly tree’ (\textit{peri e'z hadar}) (Lev 23:40), which Rabbinic exegetes universally

\textsuperscript{761} Ath. III.83-84d.
\textsuperscript{762} Andrews 1961: 42-43.
\textsuperscript{763} Pagnoux et al 2013: 423.
\textsuperscript{764} The etymology of the Latin name for citrus will be treated by P. Nahon in a forthcoming article in the Revue des études latines (late 2016).
\textsuperscript{766} Rabinowitz 2007.
identify as the citron (*etrog*). The Book of Nehemiah’s discussion of Sukkot is altogether unaware of this tradition and notes instead that foliage from olives, date palms and thick trees was used to construct the ceremonial tabernacle (*sukkah*) (Nehemiah 8:15). Nehemiah also claims that the traditional rituals associated with Sukkot had been disrupted for a long time (8:17), undoubtedly as a result of the Jewish exile in Babylonia. The divergence between Leviticus and Nehemiah on Sukkot traditions and the vague reference to the ‘goodly fruit’ in Leviticus indicate that the use of the citron in Sukkot festivities was a post-exilic innovation.

Citrons were associated with Sukkot by the Hellenistic period at the latest since Josephus and rabbinical sources note that Alexander Yannai (Jannaeus), the Hasmonean ruler of Judaea and high priest of the Temple in Jerusalem (r. 103 – 76 BCE), was pelted with citrons by worshippers for disregarding the libation ritual. Josephus elsewhere explicitly notes that the citron was one of the four species used in Sukkot rituals as does the Targum Onkelos, the Aramaic translation and commentary of the Torah dating to the 2nd century CE. Rabbinical sources indicate that the citron was a common cultivar in Roman Palestine and the fruit was cheap except during Sukkot when fine specimens could fetch the prices worth three meals.

The archaeological and linguistic data suggest that citrons may have already assumed a ritual role in Sukkot festivities at an earlier date. The early archaeological finds of citrons from across the Mediterranean establish that the introduction of citrons in the Levant could not have been later than the 8th or early 7th centuries BCE (see above). Citrons appear, however, to have been confined to palatial pleasure gardens and perhaps sacred enclosures for much of its early history in the Mediterranean. The earliest finds of citrus pollen in the Levant are those belonging to a 5th century BCE Persian satrapal garden at Ramat Raḥel, Jerusalem where

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768 Late 5th century BCE; Marcus 2007.
769 Rokach and Shaked 2007; Feliks 2007; Ben-Sasson 2012: 16-17.
770 Josephus Ant. 13:372; TB Suk. 4.9; Tosefta Suk. 4.9; 3.16.
771 Josephus Ant. 3.10: φέροντας ἐν ταῖς χερσίν εἰρρημένην μωραίνης καὶ ἵππως σών κράδη φοίνικας πεποιμένην τοῦ μήλου τοῦ τῆς παρασίας προσόντος; Targum Onkelos Lev. 23:40; On the date of the Targum Onkelos see Sarna et al 2007: 590-1.
772 e.g. TJ Suk. 3:12, 54a; Feliks 2007.
citrons were grown alongside other exotic species like Lebanese cedar, birch and Persian walnut and familiar Mediterranean plants like olive, fig, grape, willow, poplar and myrtle. The use of a Sanskrit-derived Persian loanword (NPers. tōrang < Sanskrit mƗtuluńga) to describe the citron in Hebrew (etrog) strongly suggests Persian agency in the widespread dissemination of the citron beyond palatial gardens. The use of the citron in Sukkot festivities perhaps already came into vogue sometime in the late Achamenid Persian period (4th century BCE).

Apart from its role in Sukkot festivities, the citron became a prominent marker of religious affiliations in both Hebraic and Levantine Christian art from around the 1st century CE onwards, appearing in a variety of mediums including synagogue and church mosaic floors, tomb reliefs, coins and ritual objects. The appeal of the citron for use in religious ritual and imagery lies not only in its pleasant odour but also in its ability to flower and bear fruit throughout the year. This feature made the citron the ideal symbol of fertility and endless spring in both Hebraic and Christian traditions. Late Antique and medieval Jewish commentators even identified the forbidden fruit of the garden of Eden with the citron. The early 12th century Jewish scholar Rabbeinu Tam, for instance, possessed a text of the Targum (Aramaic translation and commentary) on the Song of Songs which names the forbidden fruit of Eden as the etrog (7.9: etroga de-gan 'eden). Medieval rabbinical tradition (Midrash) also claims that the citron was held sacred on account of the fruit’s morphological resemblance to the human heart. As a sacred tree in Middle Eastern traditions, the citron had to be protected from perceived ritual pollution, hence the Syriac author Qūthāmā (c. 600 CE), preserved in Ibn

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774 Daryaei 2006-7: 81; Ciancaglini 2008: 105; A’lam 2011a.
775 Daryaei 2006-7: 81.
776 variants: wƗdrang, wƗrang; bƗzrang; bƗdrang, bƗlang; cf. Arabic otranj; toranj.
778 Isaac 1959: 179; Ben-Sasson 2012: 16; This feature is prominently noted by ancient Greco-Roman authors as well: Theophrastus Hist. pl. IV.4.3 Caus. pl. I.11.1, I.18.5; Dioscorides, Mat. Med. 1.115.5; Pliny HN XII.15-16, XVI.107; Servius Commentary on Virgil’s Georgics II.127.
782 e.g. Lev. R. 30.12-14; Isaac 1959: 183; Rabinowitz 2007.
Waḥshīyah’s 10th century CE Arabic translation, notes that menstruating women were forbidden to touch the citron tree.\footnote{Nasrallah 2010: 641.}

**F. Citruses in Mesopotamia**

When pomegranates hovered around me,

Lemons came to my rescue,

O that sweet one, I do not want him anymore!

Take me back home.

- Iraqi (Arabic) folk song\footnote{Nasrallah 2013: 401.}

While the archaeological record along with the Greek and Hebraic sources leave no doubt as to the citron’s presence in the Middle East and the Eastern Mediterranean by the early first millennium BCE, the plant remains unaccounted for in the visual, textual and archaeological records of ancient Mesopotamia and Iran. The present invisibility of the citron is almost certainly a result of our patchy knowledge of plant terminology in cuneiform texts rather than the unimportance of the citron in that region. A large number of the exotic fruit trees listed in the ‘Banquet Stela’ of the Assyrian king Aššurnasirpal II (883-859 BCE) remain, for instance, unidentified and it is plausible that the citron lurks behind one of these terms.\footnote{Grayson RIMA II A.0.101.30 36b -52; For an identification of some of these fruits see Postgate 1987: 128-132.}

Thompson identified the plant named the *ildakku* or *adƗru* in Akkadian texts as the citron\footnote{Thompson 1949: 312-4.} but this is thoroughly unconvincing. Not only was the *ildakku/adƗru* tree growing in Mesopotamia by the early 2nd millennium BCE, its wood was employed for the manufacture of furniture.\footnote{CAD s.v. adƗruν ildakku.} The wood of the citron is hardly suitable for craft manufacture beyond a walking stick. The earliest Greek term for the citron, *ta melon medikon* (the Median apple), could, however, provide a possible lead for potential Akkadian terms for the citron. The translation of the Sumerian *ḥašhur* and the Akkadian *ḥašhuru*, as ‘apple’ in a species-specific sense is misleading. These terms, just like Greek *μῆλον*, Latin *malum*, Ugaritic *ṭpḥ*, Hebrew *tapp̄āḏh* and the
Egyptian *dph*\(^ {788} \), encompassed a wide range of rounded fleshy arboreal fruits including true apples\(^ {789} \), sorb apples, quinces, apricots, peaches, pomegranates and citrons.\(^ {790} \) The Targum on the Song of Songs, an Aramaic exegesis of the Hebrew scripture, explicitly cites the citron (*etroga*) as the equivalent of “apple” (*tappū‘āh*) (II.3).\(^ {791} \)

The use of the term “apple” for a variety of plump arboreal fruits in the Mesopotamian textual tradition is suggested in the bilingual (Sumero-Akkadian) UR\(_3\).RA = ḫubullu lexical series whose manuscript tradition goes back to the Old Babylonian period (c. 1800 BCE). The lexical series lists various kinds of “apples” whose accompanying epithets suggest different fruit species rather than variations within the same plant: white apple (*hašhur babbar*), mountain apple (*hašhur kurra*), conifer apple (*hašhur arganum*), *damšilum*\(^ {792} \)-apple (*hašhur damšilum*), *kurdilum*-cucumber apple (*hašhur kurdilum*) or armanu-plant apple (*hašhur armanu*).\(^ {793} \) A few of these “apples” have been tentatively identified on the basis of lexical cognates in other Semitic languages.\(^ {794} \) The mountain apple (*hašhur kurra*) equated with the term *šapargillu* (var. *supurgillu*) in the lexical series is identified, for

\(^ {788} \) cf. Latin *pomum* and its Romance derivatives e.g. French *pomme* (>English pome) for a spherical fruit.

\(^ {789} \) True apples (*Malus domestica*), one of whose wild progenitors was of Central Asian origin, (Cornille et al 2012) were known in the Middle East by the late 3\(^ {rd} \) millennium BCE. The earliest archaeobotanical sampling of apples in Mesopotamia consists of a garland of dried diced apples from a grave (PG1054) in Early Dynastic Ur (Ellison et al 1978). These are thought to be European wild apples or crab apples (*Malus sylvestris*) rather than domesticated apples (*Malus domestica*). Miller proposes that the three-leaved three-fruited pendant on the “diadem” of Puabi, also from the Royal Cemetery at Ur, represents apples rather than pomegranates as suggested by Woolley, the excavator of the royal tombs of Ur (Miller 2000: 154; Miller 2013). Pre-Sargonic texts from Tello attest to the use of “apple” wood in the construction of trunks and pegs and ribs for carts (Potts 1997: 108). This could well refer to the wood of a true apple species since an apple (or pear) wood shaft for a bronze macehead is reported from Iron Age Hasanlu (Level IVb; c. 800 BCE) (Dyson 1962: 646). Both wild and domesticated varieties of the apple were probably not a common sight in the warm Mesopotamian lowlands since the apple grows best in temperate climes or in higher altitudes (Zohary, Hopf and Weiss 2012: 137-138). While other fruits like pomegranates, grapes and figs can be identified with certainty in Egyptian and Mesopotamian iconographic sources, apples are conspicuous by their rarity if not absence, suggesting that most of the “apples” appearing in ancient Middle Eastern textual sources were not true apples (Darby et al 1977: 697-699; Bleibtreu 1980: 187). Tengberg et al even dispute the identification of apples on the Puabi diadem from Ur as they note that “several other sub-globular fruits with adhering floral pieces exist in the Middle East” (Tengberg et al 2008: 925-926).


\(^ {791} \) Alexander 2003: 42, 97-98.

\(^ {792} \) A kind of cucurbit.

\(^ {793} \) Landsberger et al 1957-1974; MSL XI., 110 (B); Thompson 1949: 302.

\(^ {794} \) Powell 1987: 146-7.
instance, with the quince (Aramaic səfargəlƗ; Arabic safarjal). The armanu-apple (hašhur armanu) is probably a pomegranate (Egyptian alḥammƗn). The precise botanical identity of most other “apples” is unclear. There is a remote possibility that the hašhur arganum or conifer apple cited in a Neo-Assyrian manuscript of the UR5,RA = :`~ubullu` may be the citron. The Greek κεδρόμηλον (cedar/conifer-apple), first attested in Diophanes of Nikaia (1st century BCE) for the citron, is perhaps a calque of a Semitic word.

As regards to Mesopotamian visual sources, Bonavia suggested that the knobby oblong cone-like fruits held in a mode of blessing by winged protective spirits (apkallu) found in Assyrian palace and temple reliefs (9th – 7th centuries BCE) might be citrons. The fruit in question has typically been interpreted in scholarly literature as a large conifer cone, the male flower of the date palm and less likely as an artichoke. The presence of a bucket (Akk. banduddƗ) in the other hand of the protective spirit, suggests that the Assyrian “cone” functioned as a sprinkler conveying blessings and good fortune much like the ubiquitous rosewater sprinklers used across the Indo-Islamic world. The “cone” has been identified with the Akkadian term mulilu or ‘purifier’, reinforcing the interpretation of its function as a sprinkler. The role of the “cone” as a sprinkler makes perhaps an identification with the citron less likely but not impossible.

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795 Thompson 1949: 307; Postgate 1987: 130-1; CAD s.v. supurgilla.
796 Thompson 1949 304-5 argues for an identification with the apricot; Hoch 1994: 25; CAD s.v. armanna.
797 Rm 0367: obverse 8.
798 Diophanes of Nikaia ap. Geoponica X.76.
Figure 22: Winged protective spirit with “cone” and bucket, Northwest Palace, Nimrud, 865-860 BCE, Yale University Art Gallery (Source: author’s photograph)
There is in fact a rather remarkable congruence between the Assyrian “cones” and depictions of citrons in medieval Indian art where they are frequently found as attributes of Brahmanical, Buddhist and Jain deities and semi-divine beings.\(^802\) The puckered surface of the Assyrian “cones” is not particularly reminiscent of pinecones but could be like the Indian depictions of citrons, an attempt to outline the small knobbles and ridges on citrons. Citrus fruits, particularly lemons and limes, are used across South Asia to counteract the effects of the ‘evil eye’ and malignant spirits. This can take the form of ritually waving a citrus around a person, tying citruses above the doorway or halving them and laying them on either side of the threshold, the idea being that the use of sour or bitter objects averts misfortune.\(^803\) If the Assyrian “cones” were indeed citrons they may have been part of a specific ritual to protect the king’s person rather than generic sprinklers of blessings.

Figure 23: Deities with a citron, Somanathapura, South India, 13\(^{th}\) century CE (Source: Johannessen and Parker 1989)

\(^{802}\) Shah 1987: 49-50, 116-7, 125-6, 219, 229, 245, 250, 264-5, 269, 280, 281, 284, 287-8, 289-90; McHugh 2012: 68-9; Johannessen and Parker 1989 puzzled by these depictions of citrons have even spuriously identified them as New World maize. 

The evidence for citrons in Mesopotamia, both lexical and iconographic, is at present largely speculative. The archaeological evidence for citruses in Mesopotamia is not forthcoming either. Citron seeds were recovered from excavations at Nippur in southern Iraq during the last decade of the 19th century.\textsuperscript{804} The present whereabouts of the seeds, the excavation context and dating remains poorly defined. The Nippur finds are, however, not entirely isolated since citron seeds are known from a Late Bronze Age context in Cyprus. It is not improbable therefore that the Nippur finds could date back as early as the late second millennium BCE.

G. The Citron in Iran

Kisrā of his golden citron, Parvīz and his golden quince
Were swiftly carried off by the wind, and became as one with the earth.

- Khāqānī (d. 1199), An Elegy on Madāʾin (Persian)\textsuperscript{805}

\textsuperscript{804} Frimmel 1913: 187-8; Killermann 1916: 201; Townsend 1980: 468; Weisskopf and Fuller 2013: 1482.
There are no native Iranian records on the citron until the late Sasanian period but foreign sources (Greek, Arab, Hebrew) on Persia dating from the Achaemenid onwards (post- 5th century BCE) indicate that the citron was long familiar as an odoriferant, flavourant and comestible. It also acquired, as Khaqani’s elegy on the ruins of Ctesiphon indicates, strong associations with court ritual and royal symbolism. The earliest Greek term for the citron, ‘the Median or Persian apple’, already testifies for its importance as a cultivar in Iran. The plant was so esteemed that its seeds were seen as suitable gifts for envoys visiting the Achaemenid court.\(^{806}\) Palynological analysis of a 5th century BCE satrapal garden attached to a palace in Jerusalem indicates the localized cultivation of citrons.\(^{807}\) The citron probably grew in ornamental gardens across the length and breadth of the Persian imperial domains.

The earliest source to remark of its use in Iranian cuisine is Pliny who states that citron pips were added to Parthian dishes to flavour the breath.\(^{808}\) While the citron does not have much flesh, it was consumed on occasion much like an orange. An apocryphal story in the Babylonian Talmud reports that one Sasanian Persian king Shapur\(^ {809}\) offering his Jewish guests slices of citron.\(^ {810}\) Another omen-like statement in the Babylonian Talmud claims women who eat citrons produced fragrant children. The daughter of king Shapur, whose mother consumed citrons during her pregnancy, is curiously described as being brought out as a diffuser of fragrance in her father’s court.\(^ {811}\) In the Middle Persian court romance ‘Ḵosrow son of Kavad and his page’ (Xusraw ī Kawādān ud rēdag-ē), dating to the 8th or 9th centuries but set in and drawing on traditions from the late Sasanian period, the citron is listed among the best fruits for candying.\(^ {812}\)

The citron also had ceremonial roles in the Persian Zoroastrian tradition. During the feast of the autumnal equinox (\textit{mihrajān}), the chief Zoroastrian priest, who was the

\(^{806}\) Antiphanes ap. Ath. III.84a-b.  
\(^{807}\) Langgut et al 2013: 122-124; Langgut 2014: 5-6, 8-9.  
\(^{808}\) Pliny \textit{HN} XII.16: hoc est cuius grana Parthorum proceres incoquere diximus esculentis commendandi halitus gratia. \textit{HN} XI.278: sed sibi proceres medentur grano Assyrii mali cuius est suavitias praecipua, in esculenta addito.  
\(^{809}\) Probably the first or second king bearing the name Shapur.  
\(^{810}\) TB \textit{Avodah Zara} 76a-b.  
\(^{811}\) TB \textit{Ketubot} 61a.  
\(^{812}\) Aʾlam 2011a.
first to enter the royal audience hall, bore offerings of citron (*utrujjah*), quince, sugar cane, jujube, apple, grapes and branches of myrtle to the king. In the Middle Persian Bundahiṣn, a Zoroastrian cosmological text compiled in the 9th century but embodying a tradition from Sasanian times, the citron is described as one of ten fruits said to be edible both inside and outside. The fairly pedestrian references to citrons in early Islamic Iran indicate that it had by then a long history of cultivation and use. The esteemed 12th century poet Nizami, for instances, refers to the citron no less than forty-one times in his work. The citron is also one of the most commonly cited comestibles in Ferdowsī’s Šāh-nāma, the national epic of Iranian-speaking peoples.

**H. Conclusion: The Manifold Uses and Modes of Growing of Citruses**

‘She fetched bright candles to dispel the night
And laid a little feast on which to dine,
Red pomegranates, citrions, quinces and wine’

- Ferdowsī, Šāh-nāma, Prologue to the Story of Bizhan and Manizheh (trans. Davis 2016)

Arboriculture is a long-term investment since fruit trees only become productive after a few years and require constant attention, particularly so in the case of frost-intolerant tropical species like citruses growing in temperate zones. The allures of citrus cultivation, however, outweighed the potential difficulties of transplantation. While citrus species gained a multiplicity of functions, there is no doubt that the novelty and agreeability of its scent, the result of high concentrations of the organic compound limonene in the fruit, was its chief attraction. Much like today, the ancients devised numerous ways to transfer citrus scents onto the body and garments. Theophrastus remarks that the citron was placed among clothes to keep

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813 al-Nuwayrī *Nihāyat al-arab fī funūn al-adab* 1.188; Shaked 1986: 83.
814 A‘lam 2011a.
815 A‘lam 2011a.
816 van Ruymbeke 2007: 84-88.
817 Ghamarzadeh and Ghasemov 2015: 30.
them from being moth-eaten, a custom perhaps taken over from the Persians.\footnote{818} The chewing of citrus rind or the consumption of its juice as Theophrastus notes was the surest means for a fresh breath.\footnote{819} The Kāmasūtra likewise recommends the citron peel (Skt. mātuluṅgatvaca) as one of the necessary accouterments of a young urban dweller’s bedchamber.\footnote{820} Apart from the rind, the fragrant flowers and leaves of citruses were also used in the production of aromatic oils for perfumery.

The presence of citrus species in the context of funerary libations (Monte Sirai), votive deposits (Rome), religious ritual (Zoroastrian; Jewish) and myth (Greco-Roman Hesperid apples) argues for symbolic and spiritual roles which should not be overlooked in the spread and cultivation of citruses. The need for fresh citrons for use in the Jewish festival of Sukkot meant that diasporic Jewish communities throughout the Mediterranean and the Middle East cultivated citrons locally.\footnote{821} The sacred associations of citruses are already to be found in South Asian cultures. In South India, citruses are commonly strung into garlands for adorning fearsome goddesses as a ‘cooling’ fruit, impaled on weapons wielded by deities as sacrificial offerings or have their pulp removed and are filled with ghee for use as a ritual lamp.\footnote{822}

\footnote{818} Theophr. Hist. pl. IV.4.2: κἂν εἰς ἵματα τεθῆ τὸ μῆλον ἄκοπα διατηρεῖ; cf. Pliny HN XII.15.
\footnote{819} Ibid.
\footnote{820} Kāmasūtra I.4.4: tasya śiro-bhāge kūrca-sthānāṃ vedikā ca tatra ṛṣtri-śeṣam anulepanāṃ mālyaṃ siktha-karaṇḍakaṃ saugandhika-putikā mātuluṅa-tvacaś tāmbūlāṃ ca syuh.
\footnote{821} Isaac 1959.
\footnote{822} Author’s personal observation at South Indian temples in South India, Malaysia and Singapore. The sacred use of citruses in South Asian cultures has been poorly documented in academic literature. The ritual use of lemons and limes is cursorily mentioned in Hildebeitel’s study of the cult of the goddess Draupadi in northern Tamil Nadu, India (Hildebeitel 1991: 72, 75, 223, 444).
Figure 25: Mosaic depicting citrons (top left and right with possible depiction of trees as well) amidst sheep and gazelles, Church of the Apostles, Madaba, Jordan, 578 CE (Source: Ben-Sasson 2012: 17)

Citruses were also used to flavour food and beverages but they were rarely consumed on their own, at least not in the Greco-Roman Mediterranean. Plutarch notes that the elderly were still not used to consuming citruses.\(^\text{823}\) Pliny speaks of the citron having a ‘harsh taste’ (\textit{sapor asperrimus}).\(^\text{824}\) Athenaeus in the 2\(^{nd}\) century CE claims that ‘as recently as our grandfathers’ times no one ate it, but they stored it away like a great treasure in their chests along with their clothes’.\(^\text{825}\) The presence of organic residues derived from a citrus species in a wine jug from 6\(^{th}\) century BCE Monte Sirai, Sardinia (see above) indicates, however, for the early use of citruses in the flavouring of wine. The late Roman collection of recipes attributed to Apicius (2\(^{nd}\) – 4\(^{th}\) centuries CE) provides one such recipe for flavouring wine with citrus leaves, with the resulting flavour said to imitate rose-wine.\(^\text{826}\) In the modern Mediterranean, citrons are used to flavour liqueurs in Greece and Corsica (\textit{cédratine}).\(^\text{827}\) Dried citrus peels may have also been used to make aromatic herbal teas in antiquity much as they are throughout the modern Middle East.\(^\text{828}\) It is highly probable that the first acquaintance with citruses in the Middle East and the

\(^{823}\) Plutarch \textit{Quaest. Conv}. VIII.9.
\(^{824}\) Pliny \textit{HN} XV.110.
\(^{825}\) Ath. III.84a: ὅπου γε καὶ μέχρι τῶν κατὰ τοὺς πάππους ἡμῶν χρόνον οὐδεὶς ἠρθειν, ἀλλ’ ὡς τι μέγα κειμήλιον ἀπετέθηντο ἐν ταῖς κηφετοῖς μετὰ τῶν ἱμάτιον.
\(^{826}\) Apicius \textit{De re coquinaria} I.4.
\(^{827}\) van Wyck 2005: 142.
\(^{828}\) Nasrallah 2013: 553.
Mediterranean was in the form of such dried peels and leaves imported from South Asia.

Citrus flavours are useful in masking strong red meats like lamb or gazelle. Much of the information concerning the use of citruses in the flavouring of food, however, derives from medieval Arabo-Persian sources. Given the early presence of citrons in the Middle East, it is not unlikely that later recipes and food preparations have earlier precedents. In the 10th century Abbaspod cookbook (Kitāb al-Ṭabīkh) of Ibn Sayyār al-Warrāq, citron leaves, peels and pulp find use in fish and meat dishes, for the making of chutney (maqra), jams (murabba) and condensed juices (rubb) for medical and culinary use.\(^{829}\) An entire chapter is also dedicated to dishes using a sour stew made of citron pulp (ḫummādiyya).\(^{830}\) Lemon pulp is likewise also recommended for flavouring various meat dishes.\(^{831}\) Rabbinical sources of a slightly earlier date (middle of the 1st millennium CE) indicate that the rind of the citron was consumed in its pickled form or boiled into a pulp.\(^{832}\) Pickled citrons (Ta. kaṭārāi; nārttankāi) are incidentally still widely consumed in South India.\(^{833}\)

Ancient Greco-Roman sources from the 4th century BCE onwards also remark of the pharmacological potential of citruses. It was valued as an antidote to poison, a cure for shortness of breath, for counteracting the nausea of pregnancy, indigestion and various stomach ailments.\(^{834}\) Beyond its ritual, festive, comestible, pharmacological and odoriferous uses, citrus trees, like other fruit trees, also had secondary roles like providing shade, erosion prevention and boundary marking.

Citrus were, as Pliny notes, grown by sowing seed or through vegetative methods (Pliny HN XVII.64: grano et propagine). Citriculture may have even introduced the

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\(^{829}\) Nasrallah 2010: 150, 178, 189, 205, 211-3, 216, 248, 485, 487, 489; cf. citron jam in ‘Arib ibn Sa’d’s 10th century Calendar of Cordoba in Sato 2015: 31; On the use of citrons in medieval and modern Mediterranean cuisine see Brigand and Nahon 2016 (in press); on similar uses in modern Iraq see Townsend 1980: 468.

\(^{830}\) Nasrallah 2010: 278-281.

\(^{831}\) Nasrallah 2010: 234, 280, 324, 347, 351.

\(^{832}\) e.g. Suk. 36b; Ma’as. 1:4; Feliks 2007.

\(^{833}\) Naik 1963: 145; Kothari 2007: 92.

\(^{834}\) Theophrastus Hist. pl. IV.4.2; Nicolaus of Damascus De plantis 121; Nicander of Colophon Alexipharmaca 533; Virgil G. II. 126-135; Oppius ap. Macrobius Saturnalia III.19.4; Pliny HN XII.15-16, XXIII.105; Dioscorides Mat. Med. 1.115.5; Ath. 84d-85a; Galen, Aliment. fac. 2.37; For medieval sources on the pharmacological properties of citrus species see Arias and Ramón-Laca 2005.
new agricultural technology of detached scion-grafting in Middle East and the Mediterranean. As citruses are highly susceptible to frost, the spatial distribution of citruses was limited to zones with frost-free winters. Late Antique horticultural texts from the Mediterranean suggest, however, that the citron’s intolerance towards frost was circumvented by the indoor storage of potted trees during winter.

As citruses need moist well-drained soil, irrigation was required in the absence of sufficient rainfall. In modern Iraq, citruses are typically grown in irrigated date palm groves or on a smaller scale in domestic gardens. This was probably no different in antiquity. A late 3rd century CE papyrus from Oxyrhynchus in Egypt detailing the lease of a fruit garden notes that citrons were cultivated alongside dates, olives, peaches, figs and melons. In Petronius’s Satyricon, the nouveau riche character Trimalchio is said to have grown citrons and pepper on his estates, suggesting that citron cultivation, at least on a large plantation scale, was the preserve of the wealthy.

Whether in Seville or in Sicily, it is hard to imagine Mediterranean agricultural and garden landscapes devoid of citruses. Citrus species dominate fruit crop production today and account for over 8 million hectares of land globally. The present ubiquity of citrus fruits and their multifarious uses in regions west of South Asia can ultimately be traced back to the earliest dispersal of citrons to the Middle East and the Eastern Mediterranean sometime in the late 2nd millennium BCE. The lemon was carried westwards along the same routes much later towards the end of the 1st millennium BCE. Were it not for the archaeological data, the lemon would have remained invisible to historians of agriculture since it was not distinguished lexically from citrons until the middle of the 1st millennium CE. While citrons and lemons were not major calorific contributors in antiquity, they had important

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836 Townsend 1980: 466.
838 Theophrastus Hist pl. IV.4.3.
840 P. Oxy. 1631.
841 Satyricon 38.
842 Shan 2016: 7.
functions as ornamentals, flavourants, odoriferants, medicinal plants, and ritual accouterments.
VII. Cucurbitaceae: The cucumber (*Cucumis sativus*), the melon (*Cucumis melo*) and the luffa (*Luffa cylindrica*)

A. Introduction: South Asia as a centre of cucurbit diversity

Old World cucurbits are predominantly annual, herbaceous, frost-sensitive climbing or prostrate vines distributed throughout the tropical and subtropical zones of Asia and Africa. A great number of cultivated cucurbit species are native to northern India, hailing especially from the Himalayan belt and the Indo-Gangetic valley, and these include most prominently cucumbers (*Cucumis sativus*), snake gourds (*Trichosanthes cucumerina*), bitter gourds (*Momordica charantia*), Luffa or sponge gourd (*Luffa cylindrica*), angled or ridge luffa (*Luffa acutangula*), the pointed gourd (*Trichosanthes dioica*) and ivy gourds (*Coccinia grandis*). The cucumber, *Cucumis sativus*, which is one of the most widely consumed fruit-vegetables today is a native of the western Himalayan foothills where a closely related wild species is known to grow (*Cucumis sativus* var. *hardwickii*). Recent phylogenetic data also suggests two or more domestication events for melon (*Cucumis melo*), with the primary domestication event localised in India. The substantial genetic diversity of melon germplasm in India as well as the presence of wild melon species easily crossed with *C. melo* supports the Indian origin of the cultivated melon. The Himalayan wild melon species *Cucumis callosus* and *Cucumis trigonus* have been suggested to be the wild progenitors of domesticated melon. Africa, which was previously thought to be the origin of cultivated melons owing to the presence of numerous wild *Cucumis* species and the identical chromosome number of *C. melo* and African *Cucumis* species, is now considered a derivative centre of melon domestication with a limited impact on the melon diversification. Since *C. melo* was already brought into cultivation in the Middle...
East and North Africa by the mid-4th millennium BCE, the treatment of its cultivation in this chapter will be brief.

The rich vocabulary relating to cucurbits in South Asian languages (over 300 terms are attested in Sanskrit alone) testifies to the importance of cucurbits in early South Asian cultures. The ubiquity of cucurbits in South Asian culture was expressed in the language of ritual, poetic and everyday speech, whether it was a prayer for liberation likened to the quick snapping of a cucumber from its vine (Ṛgveda VII.59.12: urvṝrakamiva bandhanān), possessing proverbially beautiful lips in the crimson shade of the ivy gourd (Gītāgovinda III.14.3: bimbādhara-mādhurī) or even a verb likening the state of being useless to a putrid wax gourd (Skt. pūtikusuṃṇḍāyate).

B. Early Melons

Two subspecies are recognised within cultivated melon today on the basis of phenotypic and genotypic variations: subsp melo and subsp agrestis. The former has been thought to be a late development in Africa based on Asian ‘agrestis’ melons. Within these subspecific classifications, up to sixteen botanical varieties of melon have been acknowledged. The chronology and pathways for the westward dispersal of Asian cultivated melon are, however, unclear. Cultivated melons are already to be found in the archaeological and textual sources of Egypt and Mesopotamia, from the mid-4th millennium BCE onwards. The finds of melon seeds in Predynastic Hierakonpolis, Maadi and Adaima in Egypt (c. 3700 – 3300 BCE) offer the earliest archaeological evidence for melon cultivation in North Africa. These early finds of melon probably represent a separate domestication event based on locally available wild melons. The earliest melons attested in

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849 Decker-Walters 1999.
851 Serres-Giardi and Dogiment 2012; Pitrat 2013: 278.
852 The C. melo ssp. agrestis group includes chinensis, makuwa, momordica, acidulous and conomon (oriental pickling melon) while the C. melo ssp. melo group is composed of adana, ameri, chandalak, flexuosus (snake melon), cantalupensis (cantaloupe), inodorus (winter melon), reticulatus (muskmelon), tibish, chate, chito and duda'im types. See Pitrat et al. 2000 on these classifications.
855 See El Tahir and Yousif 2004 on wild melons in northeastern Africa.
Mesopotamia may, however, be of South Asian origin. Ten seeds of an unidentified cucurbit, probably those of melons, were found in Old Akkadian Tell Taya (c. 2300 – 2150 BCE). References to melons (ukuš) are already to be found in the earliest Sumerian lexical texts dating to the middle of the 3rd millennium BCE (Early Dynastic IIIa).

The non-sweet vegetable type melon varieties were predominant in the Middle East and the Mediterranean in antiquity. Melon fruits exhibit substantial phenotypic polymorphism ranging in shape from the globular to the elongated and possess a variety of exocarp textures and patterns (netted, warted, wrinkled, smooth, striped). Several elongate non-sweet varieties of melon, especially of the flexuosus, chate (adzhur) and conomen groups, resemble cucumbers in both morphology, colour and taste, leading to substantial confusion in the identification of the true cucumber in early Middle Eastern and the Mediterranean texts (see below). The large-fruited globular sweet ‘dessert’ melons (e.g. casabas, cantaloupes, muskmelons), which are the most familiar types of melon today, are believed to be a relatively late (9th century CE) Central Asian phenomenon, carried westwards to the Mediterranean by the 11th century CE. Central Asia still possesses the greatest variety of sweet and aromatic melon cultivars. The Mesopotamian lexical series UR5.RA = ḫubullu, whose manuscript tradition goes back to the 18th century BCE, is, however, already familiar with sweet (Sumerian kud, lal; Akk. matqu) and sour (Akk. emṣu) varieties of melon (Sum. ukuš; Akk. qiššû), suggesting an earlier selection of varieties for their tastes. The earliest manuscript of the bilingual (Sumerian-Akkadian) lexical series UR5.RA = ḫubullu, comes from Old Babylonian Nippur. The references to sweet cucumbers are also known from the Middle Babylonian recension from Alalakh and Neo-Assyrian copies which give the fullest (and no doubt updated) version of the text. See MSL 11, 110 (A) (CBS 03918 + CBS 03928) VI r v. 10; MSL 11, 110 (B) (CBS 11082 + N 7737) d ii 23; MSL 10, 36 W r iv 59; Neo-Assyrian UR5.RA = ḫubullu XVII 369-70.
The westerly diffusion of the cucumber remains nebulous especially on account of the lexicographic discrepancies pertaining to cucurbits in ancient languages and the misinterpretations of ancient cucurbit terminology. Semitic and Indo-European philologists alike have indiscriminately translated many terms relating to melons (Cucumis melo) like the Sumerian ukuš, Akkadian qiššu, Hebrew qišūt, Arabic qitha, Greek σίκους and Latin cucumis as ‘cucumber’, leading to the false impression that the Indian cucumber (Cucumis sativus) was widespread and well known in antiquity.\textsuperscript{864} Worse still are identifications of ancient Old World cucurbits with presently widespread New World species like squashes, pumpkins and marrow (Cucurbita maxima; Curcubita pepo; Cucurbita moschata).\textsuperscript{865}

\textsuperscript{864}e.g. Löw 1967 vol. 1 530 – 535; Thompson 1949: 82-86; Andrews 1956; Stol 1987; Beck 2005; Amigues 2007: 91; see fuller references to erroneous translations in Janick, Paris and Parrish 2007: 1453.

\textsuperscript{865}Dalby 2003: 162 e.g. LSJ s.v. κολοκύντη.
Ancient authors were themselves stymied by cucurbit terminology. Athenaeus, writing in the 2nd century CE, faced a conundrum in ascertaining the identity of the cucurbits mentioned by late Classical Attic authors:

‘Speusippus in his On Similar Things refers to the melon (πέπων) as a σικώα. Diocles (of Carystus) uses the word melon (πέπων) but then never refers to a σικώα. Whereas Speusippus uses the word σικώα but never mentions a melon (πέπων).’

Elsewhere Athenaeus states that Nicander of Colophon (2nd century BCE) called what his contemporaries called κολοκόντη as σικώα. Theophrastus, who is closer in date to Nicander, distinguishes between κολοκόντη and σικώα. This was not, however, an interspecific distinction but a morphological one. Ordinarily the κολοκόντη denoted the well-known bottle gourd (Lagenaria siceraria), a native of Africa and one of the earliest plants to be taken into cultivation. Theophrastus’s description of the σικώα as one that ‘takes the shape of the vessel in which it has been placed’ indicates his σικώα was probably nothing but a variant of the bottle gourd whose sheer malleability in growing into the shape of it mould has even rendered it eminently suitable as sculptural material for contemporary art installations (see Figures 27-28). Athenaeus also notes that the people of the Hellespont called long gourds σικώα and round ones κολοκόντη. Here, however, it is not entirely clear if both references are to the bottle gourd. The term σικώα is obviously related to its masculine equivalent σίκωος and may have also been applied on elongate melons as well. One Hippocratic author (5th - 4th centuries BCE) notes that the σίκωος too (note masculine form) grows into any shape it is forced to take, a description which could refer to either the bottle gourd or the melon and

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866 Ath. II.68e-f: Σπεύσιππος δ’ ἐν τοῖς Ὄμοιοῖς τὸν πέπωνα καλεῖ σικώαν· Διοκλῆς δὲ πέπωνα ὄνομάζει ὡς ἐπὶ καλεῖ σικώαν· καὶ ὁ Σπεύσιππος δὲ σικώον εἰπὼν πέπωνα ὥσικ όνομάζει.
867 Ath. IX.372d.
868 Theophr. Hist. pl. VII.2.9.
870 Theophr. Hist. pl. VII.3.5; The Greek papyrological evidence from Ptolemaic-Roman Egypt also indicates that both terms were used to describe the bottle gourd (Konen 1995: 47-48).
871 Ath II.59a.
873 Hippocrates Generation 9; cf. Pliny HN XIX.23.65.
one that no doubt testifies to the sheer semantic flexibility of most cucurbit terms in antiquity.

Figure 27: Dan Ladd, Silenus, composed of two naturally moulded bottle gourds (2009) (Source: http://www.danladd.com/moulded_gourds.html)

Figure 28: Andrew Mowbray, Modular gourd with cement forms, 2012 (Source: http://andrewmowbray.com/section/359035-Modular-Lagenaria-Gourds.html)
Polymorphism within the same cucurbit species, a rather common feature of bottle gourds (Lagenaria siceraria) and melons (Cucumis melo), was undoubtedly responsible for the diverse if not confused cucurbit terminology. Interspecific resemblances also led to the confusion and conflation of cucurbit-related terms. Several varieties of the melons including the snake melon (C. melo ssp. melo Flexuosus group) resembled cucumbers in both morphology and taste. These slender cucumber-like snake melons known as faqqous in Arabic are still familiar cultivars across much of the Middle East and North Africa where they are consumed raw, pickled or cooked. It is clear therefore that terms relating to several species of cucurbits were used flexibly in antiquity with usage governed by local familiarity and morphology rather than any kind of strict botanical taxonomy. On account of the inconsistencies in ancient cucurbit terminology, a species-specific identification on the basis of the lexical evidence alone is untenable.

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874 Paris 2016
ii. Distinguishing the cucumber from the melon

In a series of articles over the past decade Paris and Janick, two horticultural scholars along with their colleagues have argued using literary and iconographic evidence that *Cucumis sativus* only arrived in the Mediterranean and the Middle East in Late Antiquity beginning from around 500 CE.\(^{877}\) Our analysis of the textual and iconographic sources from both regions confirms the findings of Paris and Janick in establishing that the primary and default of meaning of the Sumerian *ukuš*, Akkadian *qiššū*, Hebrew *qišūt*, Arabic *qithā*, Greek *σίκους* and Latin *cucumis* should be melon and not cucumber. Paris and Janick who have not taken the archaeobotanical data into account, have, however, unfairly negated an early westward dispersal date for the cucumber. There are also a handful of ancient texts where references to the cucumber appear admissible. A combined reading of textual and archaeological data indicates that the cucumber was introduced into the Middle East and the Mediterranean at some point in the first millennium BCE and shared the same terminology with melons owing to morphological and gustatory resemblances.

To begin with the negative evidence, the depictions of cucumber-like fruits on Egyptian paintings of the late 2\(^{nd}\) millennium BCE and Roman mosaics of the early centuries CE are striped and furrowed, and neither features are characteristic of cucumber fruits but are more typical of melons.\(^ {878} \) Latin authors like Columella and Pliny as well as Hebrew rabbinical texts including the Mishna and Tosefta alongside medieval Arabic authors describe the fruits of *qishut*, *cucumis* and *qithā* as being hairy.\(^ {879} \) Cucumber fruits are usually glabrous or hairless while some species of melons especially snake melons (*C. melo ssp. melo Flexuosus* group) and ‘Carosello’ melons (*C. melo ssp. melo Chate* group) are hairy when immature.\(^ {880} \)

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\(^{879}\) e.g. Mishna *ʿOqazin* 2.1; Mishna and Tosefta *Ma‘asrot* 1.5; Columella *Rust.* X.389-393; Pliny *HN* XIX.70; Janick, Paris and Parrish 2007: 1444-7, 1454; Paris and Janick 2008b: 35-39 Paris and Janick 2010-2011; Paris 2012: 33; Paris, Daunay and Janick 2012: 118, 121; Nasrallah 2010: 792.

\(^{880}\) Pitrat 2008: 284; McCreight et al 2013; Paris 2016.
Figure 30: Late 2\textsuperscript{nd} millennium BCE Egyptian depictions of elongated melons or snake cucumbers (\textit{C. melo} var. \textit{flexuosus}) (Source: Janick, Paris and Parrish 2007)
Figure 31: Roman depictions (2nd – 5th centuries CE) of elongated melons or snake cucumbers (C. melo var. flexuosus) which can be mistaken for cucumbers (Source: Janick, Paris and Parrish 2007)

The Hippocratic author of ‘On Regimen’ notes that the unripe σίκυος is indigestible (Hippoc. Vict. II.55: σίκυοι όμοι δύσπεπτον), a description which cannot apply to the cucumber whose fruit is consumed immature. As the seeds of the cucumber are underdeveloped when consumed, the comments of another Hippocratic writer who speaks of passing sikuos seeds in the stool should also be taken to mean melon. One of the epithets provided for the melon in a Middle Babylonian manuscript of the lexical series UR₅.RA = ḫubullu from Alalakh is ‘stinking’ (ukaša ḫabšarr). Snake melons are known to have a sour taste when mature and do not keep fresh for long, suggesting that the malodourous cucurbit in question is the snake melon. Columella similarly remarks of the ‘foul juice’ (fetidus hic succo) of the cucumis,

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881 Hippocrates Morb. IV: 596-598.
882 MSL 10, 36 W r iv.55.
which is not characteristic of true cucumbers.\textsuperscript{884} The Pseudo-Aristotelian author of the ‘Problems’ (4\textsuperscript{th} – 3\textsuperscript{rd} centuries BCE) claims the sikuos was bitter (πικρός) towards the root.\textsuperscript{885} Even as late as the 7\textsuperscript{th} century CE, Isidore of Seville remarks that ‘cucumis’ are so called because they are sometimes bitter (amarus); they are thought to grow sweet if their seeds are steeped in honeyed milk.\textsuperscript{886} Theophrastus claims that the Megarians protected the σίκους from the etesian winds by raking dust over the fruits and hence made them sweeter (γλυκότερος).\textsuperscript{887} Cultivated cucumbers are neither bitter nor sweet indicating these descriptions can only refer to the melon.

A few other ancient remarks on plant morphology also tend to suggest the predominance of melons among commonly used cucurbits. Theophrastus’s comment on the sterile or male flowers of the σίκους supports identification with the melon rather than the cucumber as \textit{Cucumis melo} typically produces pistillate (female) or hermaphroditic flowers on the first few nodes of shoots while all apical nodes of the plant yield staminate (male) flowers.\textsuperscript{888} References to cucurbit fruit morphology frequently suggest a large spherical, ovoid or even snake-like types which are uncharacteristic of relatively short and elongate cucumbers. Among the gifts the pharaoh Akhenaten sent to his Babylonian counterpart were qiššû-shaped gold, ivory and stone vessels filled with aromatic oils,\textsuperscript{889} which suggests that the vessels were in the shape of a bottle gourd or globular melon capable of storing aromatic oils. Virgil speaks of the \textit{cucumis} swelling into a paunch, a shape and size atypical of cucumbers (Georgics IV.122: cresceret in ventrem cucumis). Columella describes a snake-like \textit{cucumis} (\textit{Rust.} VII.2: \textit{cucumeris anguinei}). The Greek equivalent of Columella’s “snake-melon” was the δρακοντίας, classed as a variety of the σίκους.\textsuperscript{890} These are undoubtedly references to the snake melons (\textit{C.melo} var. \textit{flexuosus}).

\textsuperscript{884} Columella \textit{Rust.} X.393. 
\textsuperscript{885} Pseudo-Aristotle, Problems XX.25: Διὰ τὸ τῶν περικαιρίων τὰ μὲν πικρότερα τὰ πρὸς τὴν ρίζαν ἔξει, οὖν σίκους. 
\textsuperscript{886} Isidore of Seville XVII.10.16; cf. Theophr. \textit{Caus. pl.} III.9.4; Pliny \textit{HN} XIX.23.65; Columella \textit{Rust.} XI.51. 
\textsuperscript{887} Theophr. \textit{Hist. pl.} II.7.5. 
\textsuperscript{888} Theophr. \textit{Hist. pl.} I.13.4. 
\textsuperscript{889} EA 14 i.57, iii.38, iv.5; Rainey 2015: 113-127. 
\textsuperscript{890} Euthydemus of Athens ap. Ath. III.74b.
There are, however, a few ancient descriptions of cucurbits which could argue for an earlier acquaintance with cucumbers. Cratinus in the fragmentary play Odysseuses refers to ripe melons (πέπων) as ‘seed-filled σίκυος’ (σίκυος σπερματίας) with the suggestion that some varieties of the σίκυος were less-seeded or seedless.\footnote{Ath. II.68c: ὅτι τοὺς πέπωνας Κρατίνος μὲν σικυοὶ σπερματίας κέκληκεν ἐν Οδυσσεισὶ.} This raises the possibility that \textit{Cucumis sativus}, which is typically consumed as unripe \footnote{Plato Laius ap. Ath. II.68d-e: σικυοῦ πέπωνος εὖνοειου κνῆμας ἤχον.} with immature seeds, may lurk behind some mentions of σίκυος already in the 4th century BCE. Athenaeus contrasts the ‘seed-filled cucumbers’ of Cratinus with ‘sterile or seedless melons’ (πέπων εὖνοχίας) which were likened by the Attic comic poet Plato to the shins of Leagrus, a character held in mockery.\footnote{Ath. II. 68d-e: ὃρραι τὸν ἐπαλά τῇ περικοπῇ σικυοῖς καὶ πέπων ἀνεί τοῦ σπέρματος, πεταμένον δὲ τὸ περικόπτῳ σικυοῖς καὶ πέπων ἀνεί τοῦ σπέρματος, ποτέ καί ἔρι μὲν ἄρρωτος, ἕρπο πῶς καὶ ἄρτη ἄρρωτη.} The comparison of ‘sterile or seedless melons’ (πέπων εὖνοχίας) to shins (κνῆμι) suggests an elongated rather than globular fruit but otherwise offers no conclusive link to \textit{Cucumis sativus}. Phaeinas distinguishes between σίκυος and πέπων from the gourds (κολοκύνθη) on the basis that ‘gourds are inedible when raw, but are edible if stewed or baked’ unlike ‘σίκυος and πέπων’ which are edible ‘once the flesh is soft’.\footnote{Greek Anthology XIII.197: Καρύν γυνήθη" σοφὸν τῶν ἐπά τις, εἰπε, Φιλαπύ: πάντα γὰρ ἄκμαζον᾽ ἐστὶν ἐραστήτερα καὶ σίκυους πρώτος ποι ἐπ᾽ ἀνόδηρους ὀραθεῖς, τίμοις, εἴτε συνὼν βρῶμα πεπαυμένους.} This description of the σίκυος and πέπων could easily apply to the cucumber as much as it does to the melon. Finally a later source of the 2nd century CE, Strato of Sardis almost certainly refers to cucumbers which were consumed unripe:

“Know the time” said one of the seven sages; for all things, Philippus, are more loveable when in their prime. A cucumber, too, is a fruit we honour at first when we see it in its garden bed, but after, when it ripens, it is food for swine. (Greek Anthology XII.197)\footnote{Ibn Waḥshiyah, Al-filḥah al-nabatiyah II. 891-92: Nasrallah 2010:788.}

Strato’s statement is echoed in the Arabic author Ibn Waḥshiyah’s remark that fully ripe cucumbers (khiyār) turn yellow and are not good.\footnote{Ibn Waḥshiyah, Al-filḥah al-nabatiyah II. 891-92; Nasrallah 2010:788.} The availability of other names for true cucumbers in Late Antique and medieval texts (e.g. khiyār in Arabo-Persian and Turkish; \textit{citruli} in medieval Latin; \textit{αγγουρί} or \textit{αγγουρια} in Byzantine...
and modern Greek) could suggest a later acquaintance with the cucumber. But it is salient to note that cucurbit terms like the Akkadian qiššu, Greek σίκους or Latin cucumis, while ordinarily denoting the melon, were semantically flexible enough to cover what a modern botanist would recognize as intraspecific and interspecific varieties. Both Theophrastus and Pliny admit that there were several varieties of the σίκους and cucumis plant.\footnote{897} Pliny notes that the cucumis ‘is composed of cartilage and a fleshy substance, while the bottle gourd (cucurbita) consists of rind and cartilage’.\footnote{898} Both cucumber and melon fit the criteria for Pliny’s cucumis. Similarly in Mesopotamian lexical texts dating between the 2\textsuperscript{nd} and 1\textsuperscript{st} millennium BCE, the Akkadian term qiššû was qualified with toponymic and descriptive adjectives to indicate a variety of cucurbits other than the melon, among which the cucumber could well be represented.\footnote{899} The qiššû merarû (bitter cucurbit) or qiššû ša ṣumameti (cucurbit of the desert) of the lexical tradition is, for instance, to be identified with the colocynth (\textit{Citrullus colocynthis}), a wild relative of the watermelon, whose native range extends from the southern Mediterranean to the Middle East.\footnote{900} Other varieties of the qiššû cited in cuneiform lexical corpus include the finger cucurbit (\textit{ubƗnu}), the Egyptian cucurbit (\textit{muṣrītu}) and the bull’s testicle cucurbit (\textit{iški alpi}).\footnote{901} These are no doubt references to both intraspecific and interspecific cucurbit varieties. In the absence of further contextual data or commentarial literature, however, much of the Mesopotamian lexical data does not allow for a species-specific identification and thus offers no firm evidence for the cucumber.

Since some species of melons are polymorphic and exhibit morphological and even gustatory similarities to cucumbers, it is unsurprising that terms relating to elongate melons (Akkadian qiššû, Hebrew qišūt, Arabic qithā, Greek sikuos, Latin cucumis)

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\footnote{896}{Paris, Janick and Daunay 2011: 474, 481-3; Paris, Daunay and Janick 2012: 119-122.}
\footnote{897}{{Theophrastus \textit{Hist. pl.} VII.4.6, VII.4.1; Pliny \textit{HN} XIX.64-68.}}
\footnote{898}{Pliny \textit{HN} XIX.61-62: sed cucumis cartilagine et carne constat, cucurbita cortice et cartilage.}
\footnote{899}{For a discussion and identification of various cucurbit terms in Sumero-Akkadian lexical texts see Thompson 1949: 81-86; Stol 1987 and CAD s.v. \textit{qiššû} (Note however the problematic interpretations of \textit{qiššû} and \textit{ukuš} as cucumber). The most important Mesopotamian lexical texts for cucurbits are the UR,RA = \textit{hubullu} series dating from the Old Babylonian period c. 1800 BCE onwards (Tablets XVII, XXIV in Landsberger et al 1970 – MSL 10: 97-98, 115; Reiner and Civil 1974: 87, 127-8, 158) and the MUR.GUD, an early first millennium BCE commentary to the UR,RA = \textit{hubullu} (Landsberger et al 1970: 104-6).}
\footnote{900}{McCreight et al 2013: 1082; Thompson 1949: 84-5. It is also known by the Akkadian names \textit{tigillû} and \textit{irru}.}
\footnote{901}{{See literature cited in footnote 899.}}
were applied to cucumbers, when the latter spread westwards. The shared vocabulary between melons and cucumbers in an earlier period is also intimated by Greek papyrological sources from Roman Egypt (1st – 3rd centuries CE) which attest to the local Greek dialect evolving diminutive forms of term sikuos (σικούος; σικοῦδιον) to distinguish true cucumbers from melons.\footnote{Konen 1995: 50.}

### iii. The archaeological evidence for cucumbers

The archaeological evidence for cucumbers is problematic but offers more concrete evidence in contrast to the textual sources where the cucumber has frequently been invisibilised by the shared and confused cucurbit terminology. Cucumber, as we have observed, is usually consumed raw as an immature fruit along with the under-developed soft seeds hence lowering the chances of archaeological preservation. Furthermore cucumber seeds are not easily distinguished in morphology from melon seeds in archaeological contexts and therefore all archaeobotanical identifications to one species or the other must be treated with caution.\footnote{Sebastian et al 2010: 14269.} There are, however, a few diagnostic features pertaining to cucurbit seeds (e.g. symmetry; seed coat patterning; position of the hilum and radicle exit) which offer the prospect of species-specific identification if the archaeological samples are well-preserved.\footnote{Frank and Stika 1988: 48–49; van der Veen 2011: 155; Šoštarić and Küster 2001: 229.} DNA sequencing of ancient cucurbit seeds also offers the promise of concrete identifications of cucumber in archaeological assemblages.

![Cucumis seed morphology](image)  

**Figure 32:** *Cucumis* seed morphology (sketch by Dorian Fuller, 2008)
Hans Helbaek identified two cucumber seeds (*Cucumis sativus*) dating to the last quarter of the 7th century BCE during Max Mallowan’s excavations at the Neo-Assyrian capital of Nimrud.\(^{905}\) Cucumber seeds were also recovered from a near contemporary chronological horizon at the 6th century BCE port of Greek Marseille\(^{906}\) but a later publication is less certain of the identity and suggests either *C. melo* or *C. sativus*.\(^{907}\) Another early find is the cucumber seed from the 4th century BCE necropolis of Tauric Chersonesus.\(^{908}\) If accepted as cucumber, the finds at Marseille and Tauric Chersonesos could suggest that new eastern cultivars were spread through Greek colonial networks. The older finds of cucumber seeds need, however, to be re-assessed in light of the recent diagnostic criteria proposed for distinguishing melon from cucumber before they can be confidently accepted as cucumber.

At present only more recently excavated archaeobotanical samples deriving from the Roman Mediterranean and Northern Europe can be confidently identified as cucumber. These finds establish the early Roman Imperial period as the terminus ante quem for the arrival of the cucumber in the Eastern Mediterranean.\(^{909}\) Cucumber seeds have been identified at early Roman Egyptian sites (1st – 2nd centuries CE) including Hawara,\(^{910}\) Mons Porphyrites, Mons Claudianus and the Red Sea ports of Myos Hormos and Berenike.\(^{911}\) van der Veen notes with reference to the archaeobotanical assemblages at Mons Claudianus and Myos Hormos that cucumber appears to be more common whenever it could be distinguished from the

\(^{905}\) Helbaek 1966: 615; Renfrew 1987: 162; I have attempted to locate these cucumber seeds to validate Helbaek’s identification but they are presently not to be found in Helbaek’s collection of Nimrud materials in Copenhagen. Mette Marie Hald who has re-examined the archaeobotanical remains from Nimrud stored at the National Museum in Copenhagen notes that Helbaek’s methodology was meticulous and his identifications are almost entirely accurate (Mette Marie Hald, personal communication). There is a remote possibility that the cucumber seeds were left to the National Museum of Iraq, Baghdad (Jane Renfrew, personal communication) if not treated as expendables after identification.

\(^{906}\) Ruas 1996: 97.

\(^{907}\) Marinval 2000: 186.


\(^{909}\) In light of the specialized terms developed for cucumber in early Roman Egypt, Konen had hypothesised that the cucumber was introduced into Egypt during the Greco-Roman period (Konen 1995: 49-50).

\(^{910}\) Newberry 1889: 52; Germer 1985: 130; The find needs to be re-examined in light of the age of the discovery.

melon. Cucumber seeds have also been attested at a number of Roman sites (1st – 3rd centuries CE) in the Mediterranean and Northern Europe including Vado Ligure (northern Italy), Mazières-en-Mauge (Maine-et-Loire, France), Longueil-Sainte-Marie (France), Cosne-sur-Loire (France), Toulouse (France), Oedenburg (French Alsace), the island of Veli Brijun (Croatia), Tongeren (Belgium), Maldegem-Vake (Belgium), Augst (Switzerland), Trier (Germany) and London.

The wide spatial range, especially the broad distribution beyond the Alps, of cucumber finds argues for an earlier acquaintance with the cucumber in regions further east. The finds of cucumber from Nimrud, which at present cannot be accepted uncritically, offer the real possibility that cucumbers were cultivated in the Middle East by the early 1st millennium BCE. The references to a cucurbit in the 7th century BCE Assyrian king Sennacherib’s inscriptions, otherwise exceedingly rare in Assyrian royal inscriptions, could refer to a new cucurbit species, perhaps the cucumber. Sennacherib describes the *pindû* stone, a fossiliferous limestone, as one whose texture is as fine-grained as a cucurbit seed (*pindû ša kîma zêr qiîšê šikinšu nussuqu*), perhaps alluding to the underdeveloped seeds of the cucumber which is consumed immature. Elsewhere in reference to the mutilation of his Elamite enemies in battle, he remarks: ‘I cut off their beards and ruined their pride and I cut off their hands like the sprout of summer curcurbits’ (*sapsapāte unakis-ma baltašun abut kîma bîni qiîšê simâni unakis qātišun*). The term used by Sennacherib to describe this plant is *qiîšu* which is, as we have remarked, a term whose default

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913 Arooba et al 2013.
914 Bouby and Marinval 2004: 85.
915 Marinval, Maréchal and Labadie 2002: 261.
916 Wiethold 2003: 274.
917 Bouby and Marinval 2002: 189.
918 Vandorpe 2010: 39, 50 (illustrated).
920 Vanderhoeven et al 1993: 188, 192 (illustrated).
922 Vandorpe 2010: 92.
923 König 2001: 73.
924 Willcox 1977: 270, 279; this report is substantially older than the other cited finds. The remains should be re-examined with the recently proposed criteria to distinguish melons from cucumbers.
925 cf. *naššabu* (bottle gourd) in Banquet Stela of Assurnasirpal (RIMA II A.0.101.30: 43); Sennacherib’s references to cucurbits are outside the context of consumption and gardening.
926 RINAP 3 34, 72; 49, 1; 50, 1.
927 RINAP 3 18, vi.1; 22, vi.2; 23, v.77b; 145, i.1; 230, 87b.
meaning is melon but is also used as a generic term in Akkadian for other cucurbits. There is not enough contextual evidence to establish that Sennacherib’s inscriptions refer to the cucumber and not the melon. A keen interest in the collection of new plants on the part of Assyrian kings, the rarity of cucurbit appearances in royal inscriptions and the oblique reference to soft immature seeds raise the possibility that the cucumber was already present in the Middle East by the 7th century BCE.

D. The Luffa (Luffa cylindrica) and other Indian cucurbits

Several much-overlooked Hellenistic Greek fragments not only designate certain gourds (κολοκύνθη / σικώα) as Indian but even recognise that their seeds were brought from India. Euthydemus of Athens in his treatise περὶ λαχάνων (on vegetables) of the late 4th or early 3rd century BCE notes that a gourd known his day was called ‘Indian’ since the seed was brought from India (διὰ τὸ κεκομίσθαι τὸ σπέρμα ἐκ τῆς Ἴνδικῆς).928 Another author of the same period Menodorus, a student of Erasistratus who worked as the court physician of Seleucus I, also distinguishes a gourd (σικώα) as Indian.929 Athenaeus who preserves these fragments in his gastronomic treatise of the 2nd century CE adds that the Cnidians of his day still referred to gourds (κολοκύνται) as ‘Indian’.930 As we have noted earlier, the terms κολοκύνθη 931 and σικώα were usually reserved for the bottle gourd, making it extremely unlikely that the ‘Indian gourd’ should be identified with the cucumber. A comic fragment of Hermippus indicates, for instance, that gourds (κολοκύνθη) were distinguished above all by their large size: What a size of head he has—as big as a gourd!932

An identification of the “Indian gourd” with the smooth luffa or sponge gourd (Luffa cylindrica),933 which is still of economic and cultural significance in the Middle East and the Eastern Mediterranean,934 seems probable. Menodorus’s comment on the Indian gourds being stewed is not typical of true cucumbers which are usually eaten raw but suggests a species like luffa or sponge gourd whose immature fruit is

928 Athen. II.58f.
929 Athen. II.59a.
930 Athen. II.59a.
931 On the etymology of κολοκύνθη see chapter IX.
932 Athen. II.59c.
consumed as a vegetable. As the modern name of the plant implies, the mature fruit of sponge gourd is also valued for its dry springy fibrous interior which is used as a cleaning scrub and stuffing for mattresses and saddles. Curiously this aspect of the plant is not remarked upon, if the Indian gourd of the Hellenistic authors is indeed the luffa.

Figure 33: Luffa or sponge gourd (*Luffa cylindrica*) (Source: http://luffalab.com)

The history of the luffa in the Middle East is presently unclear. Beaux has identified the luffa on reliefs in the temple of Amun at Karnak (Thebes), commemorating the exotic flora collected by the pharaoh Thutmose III (c. 1479 – 1425 BCE) during his campaigns in the Levant. While the reliefs undoubtedly depict an elongate and striate cucurbit broader towards the distal end, a specific identification with the luffa is not warranted, particularly since the depictions of the “luffa” bear few morphological differences from the fruits which Beaux identifies as elongate melons. Otherwise more secure identifications of the luffa in both iconographic and textual records are relatively late. Löw has identified the dark green coloured cucurbit named *qarmulin* or *qarumalim* in the Tosefta (late 3rd century CE) and

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Jerusalem Talmud (late 4th century) as *Luffa cylindrica*. The identification of luffa in the rabbinical texts is not in doubt as the fruit is clearly illustrated in late Roman-Early Byzantine (5th – 6th centuries) mosaics from Israel. More significantly, seeds of luffa have been recovered from a near-contemporary late Roman (3rd – 4th centuries CE) domestic context at the site of Kellis (Ismant el-kharab) in the Dakhla oasis of western Egypt.

Figure 34: Line drawing of cucurbits identified as luffa, Reliefs from the Temple of Amun, Thebes, Reign of Thutmose III (Source: Beaux 1990: 165)

A handful of references in Akkadian cuneiform texts to a vegetable named the *karkarātu* or *karkartu* have no Semitic equivalents but display strong lexical parallels with Indian cucurbit terminology (Sanskrit *karkāru, karkāruka, karkaṭī, karkaṭa, karkaścchadā, karkacirbhīṭā, kākamarda, kāravī, karkoṭaka, karkaṭikā*). On the basis of lexical parallels, it is highly probable that the Akkadian *karkarātu* or...

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942 *karkāru or karkāruka* (wax gourd; *Benincasa cerifera*), *karkaṭī* (kind of cucumber), *karkaṭa* (Gac fruit; *Momordica mixta*), *karkaścchadā* (a luffa species), *karkacirbhīṭā* (a kind of cucurbit), *kākamarda* (gourd; colocynth), *kāravī* (a small gourd), *karkoṭaka* (Gac fruit; *Momordica mixta*), *karkaṭikā* (a kind of plant).
karkartu represents an Indian cucurbit; perhaps the luffa if not another species like the wax gourd (*Benincasa hispida*) which is less well-known in the Middle East today. The wax gourd or winter melon remains, however, an important comestible in South and East Asia.\(^{943}\) The *karkaratu* or *karkartu*-vegetable is first attested in a late 13th century BCE tablet from Kassite Ur and then in two Neo-Assyrian texts: the ‘Banquet Stela’ of Assurnasirpal (r. 883-859 BCE) where it appears as a side-dish in a royal banquet and in a medical text as an ingredient in a remedy against the *mūšu*-disease.\(^{944}\) In its first extant appearance from Kassite Ur (late 13\(^{th}\) century BCE), the *karkatu* plant is named twice in a fragmentary maintenances account detailing comestible commodities issued to some eighteen individuals:

‘2 kor of barley, 1 kor of dried твор-plant, 3 seah of *muššu* (breast-shaped loaves?), 3 bushel(?) of *karkaratu* from the town of Hurri-űši, Ahu-abu and Arkāt-ili-lūmur, son of Sin-mušezib (received)’ (MBLET 52 Obv. 3-5; Gurney 1983: 140-142)

‘1 seah of *muššu* (breast-shaped loaves?), 3 bushel(?) of karkartu, 3 liter of cress from the town of Sin-kařābi-išme, Imbuassu received.’ (MBLET 52 Obv. 8-9)

While the identity of some plants is uncertain, the presence of barley, cress and pomegranates in the same text suggests that the unidentified comestibles were common enough to be included in a list of foods for regular supply. The appearance of *karkartu* as a vegetable in a royal Assyrian banquet indicates that it was valued for its taste. There is unfortunately not enough descriptive material in the cuneiform texts to establish the identity of the vegetable with any degree of certainty. Its identity as an Indian cucurbit remains speculative.

\(^{943}\) On wax gourds in India see Decker-Walters 1999: 105-6. 
\(^{944}\) MBLET 52: 4. 1; Grayson RIMA II A.0.101.30 129; Köcher BAM 117: 3; CAD s.v. *karkartu*. 

E. The case of the ‘cucurbit fly’

The appearance of a parasitic faunal species, especially where it predates on specific kinds of crops, can also serve as a useful index for the arrival of a new cultivar. A Neo-Assyrian manuscript (7th century BCE) of the lexical series UR₅.RA = ḫubullu (Tablet XIV), attests to a species of ‘fly that infests cucurbits’ (nim-ukuš). The entry for the ‘cucurbit i.e. cucumber and/or melon fly’ stands alongside two other kinds of agricultural pests, a generic vegetable-fruit fly (nim-nisig) and a fly infesting ghee (nim-inun). While the precedents of the UR₅.RA = ḫubullu lexical series date from as early as the Old Babylonian period (c. 1800 BCE), the entry for the ‘cucurbit fly’ appears to be an early 1st millennium updating of the lexical series since it is absent from earlier manuscripts of the text. The specific mention of a cucurbit fly in the updated lexical series suggests that insect predation of cucurbits must have been a significant agrarian concern in the early 1st millennium BCE.

945 CT 14, pl. 1-2: K 71A, r ii 19’; text and translation in Landsberger 1934: 24-25.
946 CT 14, pl. 1-2: K 71A, r ii 18’, 20”; Landsberger 1934: 24-25.
Both the logographic spellings nim-ukuš (cucurbit fly) and nim-nisig (vegetable/fruit fly) are equated with the Akkadian tambukku (var. tebukkan), a generic name for noxious insects, in the Neo- Assyrian manuscript of the UR₅,RA = ʰubullu. The tambukku-insect is attested in a handful of texts, the oldest dating to the late 2nd millennium BCE. Incidentally, the Akkadian tambukku may bear some distant relationship with a type of noxious fly known as tryambuka in Sanskrit. A westerly origin of this word in Sanskrit is suggested by the 4th century CE Gandharan Buddhist scholar Vasubandhu’s statement that Persians claim ‘snakes, scorpions and tryambuka-flies should be killed because they cause harm’ (Abhidharmakośa 240, 25). Yaśomitra, a commentator on Vasubandhu’s text glosses it as a kind of wasp (varaṭa) and the same meaning is suggested by a passage in the Mūlasarvāstivāda vinaya, a corpus of monastic regulations written in Sanskrit in the early centuries CE but largely surviving in Tibetan. Whatever the origins of the term, it is clear that tambukku was a generic name for unpleasant insects which was used as a synonym for the ‘cucurbit fly’.

The ‘cucurbit fly’ of the Neo-Assyrian UR₅,RA = ʰubullu manuscript is to be identified with either the Baluchistan melon fly (Myiopardalis pardalina), the melon fly (Bactrocera cucurbitae) or perhaps less plausibly the red pumpkin beetle (Raphidopalpa foveicollis), insects well known for their near-exclusive predation on cucurbit species. While the present geographical distribution of all three species covers parts of the Middle East, the Baluchistan melon fly (Myiopardalis pardalina) appears to be the more virulent pest of the three in Iraq and Iran. One government report describes the Baluchistan melon fly as the ‘worst pest of melon in Iraq’. It is also a major pest in neighbouring Iran (Pers. magas-e karboza ‘melon-fly’). While the distribution of both Bactrocera cucurbitae and Raphidopalpa foveicollis is more easterly and shows a distinct preference for

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947 CAD s.v. tambukku
949 Ibid.
950 Silk 2008: 116-7
951 The red pumpkin beetle is locally known in Iraq as the ‘little red one’ (Ar. humaira); Chakravarty and Jeffrey 1980: 198.
952 Rivnay 1962: 283.
954 Abivardi 2008.
tropical climes, Myopardalis pardalina prefers temperate zones, suggesting that the ‘cucumber/melon fly’ of the Neo-Assyrian UR₅,RA = ḫubullu is probably the Baluchistan melon fly (Myopardalis pardalina).

The appearance of the melon-fly in Mesopotamia might be associated with the landward spread of new eastern cucurbits although there is no certainty as to what species this might be, perhaps the karkartu-vegetable if this is to be identified as an Indian cucurbit. While Bactrocera cucurbitae is believed to originate from the Central-South Asian liminal zone, the original range of Myopardalis pardalina and the Raphidopalpa foveicollis is presently unclear. The severity of Myopardalis pardalina and Raphidopalpa foveicollis predations in modern South Asia and the Irano-Indian borderlands might suggest a similar eastern epicentre. An eastern origin for these species is also not surprising in light of the great diversity of cultivated cucurbits in South Asia.

While the text provides a terminus ante quem for the presence of the melon-fly in Mesopotamia (7th century BCE), it fails to shed light on the earliest appearance of the melon-fly in that region. At best, one can speculate that a new eastern cucurbit species (karkartu?) and a parasitic fruit fly arrived in the Mesopotamia sometime between the late 2nd millennium and the early 1st millennium BCE.

956 Virgilio et al 2010.
957 Stonehouse et al 2008.
F. Conclusion: The use and appeal of new cucurbits

Cucurbits rank among the most important vegetable-fruit plants cultivated globally both today and in the past. Cucurbitaceous vegetables represent low risk crops since they are easily grown in small household plots and occupy little space. The fast-maturing nature of cucurbits also made them attractive to cultivators. Cucumbers, for instance, start flowering in six to seven weeks. Much of the semi-arid Middle East is well suited to cucurbit cultivation, as most Old World cucurbits grow best in warm rainless summers. The early familiarity of melons in the Middle East and the Mediterranean meant that other eastern cucurbits were easily accommodated in the agricultural and dietary repertoire when they were transmitted westwards.

Cucumbers are typically eaten fresh in the Middle East and the Mediterranean. This can range from simply salting diced cucumbers, mixing grated cucumbers in yoghurt, salads and beverages or stuffing raw cucumbers with cooked food. Cucumbers are also pickled which extends their availability beyond summer. The 6th century Mesopotamian Syriac author Qūthāmā, preserved in an Arabic translation, reports that snake melons (qiththā’) and cucumbers (khiyār) were kept

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959 Charles 1987: 6; Paris, Amar and Lev 2012b: 24, 30..
960 A’lam 2011b.
961 A’lam 2011b; cf. Pliny HN XIX.24 on pickling cucurbits.
in storage and given as birthday presents in several districts of Iraq. The ability to store and preserve cucurbits in pickled form made favourable the large-scale cultivation of cucurbits in the summer season.

Cucurbits were not, however, simply seasonal supplements since they could also be grown out of season if the plants were protected from frost. Theophrastus and a Pseudo-Aristotelian author describe the planting of the sikuos (melon/cucumber) in baskets of soil which were carried out into the sun or placed near a fire for warmth in winter. Pliny and Columella attest to out-of-season production of melon for the emperor Tiberius in mica or talc containers that were wheeled out on sunny days and kept indoors during the cold season. In modern Iraq, cucurbits sown in winter are protected from the cold by covers made of palm fronds. In earlier periods, the out of season production of cucurbits was probably a luxury afforded by wealthier citizens.

Apart from the obvious comestible function of fleshy cucurbits, both the melon and cucumber are also valued for their oil-bearing seeds, as ornamental climbing or trailing plants and for their medicinal applications, particularly as a diuretic and remedy for heat exhaustion in summer. Among the non-comestible uses of cucurbits, the use of cucumbers, elongate melons and gourds as dildos, a practice well-attested in South Asia, is not entirely unknown in the pre-Islamic Middle East either.

This chapter has established, contrary to the claims of scholars like Janick and Paris, that the cucumber was indeed known in the Middle East and the Mediterranean by the late 1st millennium BCE at the latest but was confused and conflated with elongate melons which were familiar in the wider region from distant antiquity. The melon itself was in the mid-3rd millennium BCE an introduction from the east at least as far as Mesopotamia is concerned. Egyptian melons probably represent a

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963 Theophrastus *Caus. pl.* V.6.6; Pseudo-Aristotle Problems XX.15.
964 Columella *Rust.* XI.3.52-3; Pliny *HN* XIX.64; Paris and Janick 2008b.
966 Nasrallah 2010: 789; A’lam 2011b.
967 Kāmasūṭrā 7.2.13; Sanghadāsa *Bṛhatkalpabhaṣya* 1050-56.
968 Babylonian Talmud Megillah 12a.
separate domestication event in northeast Africa. A few other Indian cucurbit species spread westwards in the 1st millennium BCE if not earlier although the comparatively slight impression these species have left on the textual and archaeological sources indicate that they were not of great economic value. The sponge gourd or luffa (*Luffa cylindrica*), which remains important in the Middle East and the Eastern Mediterranean, was certainly among these new cucurbits diffusing westwards but its earliest appearance in the region remains unclear.

<table>
<thead>
<tr>
<th>Cucumber (<em>Cucumis sativus</em>)</th>
<th>Himalayan zone</th>
<th>σικώδα, σικώδον</th>
<th>αγγύρπι (Byzantine)</th>
<th>-</th>
<th>qiiššā?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Melon (<em>Cucumis melo</em>; mostly Austro-Asiatic zone; separate domestication event in North Africa)</td>
<td>σίκοςος, σίκοςα, σίκονος πέπων, μηλοπέπων</td>
<td>σίκοςος, σίκονος πέπων, δρακοντίας (sponge cucumber)</td>
<td>qiiš, melafe'ōn</td>
<td>qiišā (different varieties including ubānu (finger), ebārūtu (summer), kīṣātu (winter), mursirū (Egyptian) etc)</td>
<td></td>
</tr>
<tr>
<td>Bottle gourd (<em>Lagenaria sicerraria</em>)</td>
<td>Africa</td>
<td>κολοκύνθη, σικώα</td>
<td>σικώα</td>
<td>dela'at, qara</td>
<td>qurdīllu, namṣābu</td>
</tr>
<tr>
<td>Colocynth (<em>Citrullus colocynthis</em>)</td>
<td>Wild from South Asia through the Mediterranean and Northern Africa</td>
<td>-</td>
<td>κολοκύνθη, τολύπη ('globular fruit'), κολοκύνθα άγρια ('wild gourd')</td>
<td>pakkā'ōt sadeh</td>
<td>tigillā, qiiššā merarā (bitter cucumber), qiiššā ša šumameti (cucumber of the desert)</td>
</tr>
<tr>
<td>Squirming cucumber (<em>Ecballium elaterium</em>)</td>
<td>Mediterranean</td>
<td>-</td>
<td>σίκος άγριος ('wild melon')</td>
<td>yerokát ha-hamor (donkey's vegetable)</td>
<td>bīl bālti šādī (gum of the pudenda of the mountain)</td>
</tr>
<tr>
<td>Watermelon (<em>Citrullus lanatus</em>)</td>
<td>Africa</td>
<td>-</td>
<td>μηλοπέπων</td>
<td>avati'āh</td>
<td>-</td>
</tr>
</tbody>
</table>

Table 2: Summary of cucurbit terminology in ancient Middle Eastern and Eastern Mediterranean sources.
VIII. The Indian Lotus

*Nelumbo nucifera*

In this chilly winter time,
may your cooking pots be full
with paste of lotus stem and root,
bright and smooth as elephant tusk,
with fritters rich in pepper,
and pieces of šakuni-fowl.

- Vṛiddhi the Scythian ap. Subhāṣitāvali 395
  (dates unknown; before 7th century CE)

A. Introduction

The genus *Nelumbo*, the sole representative of the family Nelumbonaceae, consists of two widely recognised perennial aquatic plants: *Nelumbo nucifera*, the sacred Asian or the Indian lotus and *Nelumbo lutea*, the American lotus. The latter, as the name implies, is New World species native to eastern North and Central America. The Indian lotus, which is the subject of our present study, is widely distributed across eastern Eurasia as far south as northern Australia and as far north as the Amur region of Far Eastern Russia. While the Indian lotus is found in greater abundance in the tropical and sub-tropical zones of Asia, it is well suited to growing in temperate zones (e.g. northern China and Far Eastern Russia) as long as the rhizomes do not freeze over.

The westernmost natural distribution of the Indian lotus presently includes disjunct wild populations in the Talysh region of the southeastern Caucasus, the south Caspian zone and the Volga basin. These wild populations are relicts from a wider pre-Pleistocene glaciation (c. 2.5 million years ago) distribution. The vast spatial distribution of Nelumbo species is also borne out by macrofossil records across Eurasia and North America, with the earliest samples dating back to the Late

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969 He, Shen and Jin 2010: 159; Li et al 2014; Li et al 2014b.
970 Kintaert 2010: 488.
Cretaceous\)\(^{972}\). The ‘Caspian’ lotus, sometimes distinguished as a separate species *Nelumbo caspica*, is morphologically smaller than its East and South Asian counterparts and bears fewer edible seeds on the honeycombed fruit.\(^{973}\) The phenotypic disparity between the ‘Caspian’ lotus and its East and South Asian counterparts is perhaps a result of human selection for the larger seeded variety of lotus in tropical and sub-tropical Asia. Small isolated wild populations and the lack of consistent economic use of the lotus in the Caspian, Volgan and Caucasian regions meant that these lotus populations were not the source for the westerly anthropogenic spread of the lotus to the Middle East and the Mediterranean in the 1\(^{st}\) millennium BCE.\(^{974}\)

Figure 37: Cultivated lotuses, Hoi An, Vietnam (Source: http://i1.trekearth.com/photos/110018/picture_163_copy.jpg)

\(^{972}\) He, Shen and Jin 2010; Li et al 2014.
\(^{974}\) The eastern associations of the lotus in the Middle East are also suggested by the use of Sanskritic terms in later Arabo-Persian botanical vocabulary for the lotus and water-lily (Nymphaceae) species: *nīlūfar* from the Sanskrit *nīlotpala*.\(^{975}\) The earliest Persian materia medica, the *Ketāb al-abnīa ʿan ḥaqāʾeq al-adwīa* of Abū Maṣṭur Mowaffaq Heravi (late 10\(^{th}\) century) also describes the seeds of *Nelumbo nucifera* using another Sanskrit loanword: *aṭmaṭ* (A’lam 1989).
The Indian lotus is typically found in muddy, shallow stagnant lakes or slow-moving streams and is cultivated as a food crop across tropical and sub-tropical Asia. Both the acorn-like seeds (or nutlets) held in a large seedpod and the starchy rhizomes of the lotus are consumed. The large water-repellent leaves and showy and fragrant flowers ranging in colour from pink to white also make the sacred lotus an ornamental plant par excellence. Apart from its role as a comestible and ornamental plant, the lotus has also acquired an all-pervasive religious and symbolic role in Asian cultures, representing in particular the ideals of beauty, non-attachment and purity. In South Asian tradition, the lotus is the embodiment of Šrī or Lakṣmī, the goddess of sovereignty, abundance and prosperity, who in an early 1 \textsuperscript{st} millennium BCE hymn (Šrī Śūkta) is described as:

‘O one beloved of the lotus, possessing a lotus, of lotus-hands and lotus-face, with wide eyes (like) lotus petals\textsuperscript{977}

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\textsuperscript{975} Small and Catling 2005.
\textsuperscript{976} Garzilli 2003; Kintarert 2010; Kintarert 2011-2012; Cielas 2014.
\textsuperscript{977} RvKh 2,6.27a: padmānane padmini padmapatre padmapriye padmalāyatākṣi.
Even the closed and open lotus bud held symbolic spiritual meanings in Indic traditions. In the Sukhāvatīvyūha Sūtra, a utopian Buddhist text from the 1st century CE, morally perfected beings were reborn in the transcendental realm of Sukhāvatī (‘Land of Bliss’) on open lotus blossoms while those who had entertained doubts on earth though morally upright manifested in the closed womb-like lotus calyx (*padmeṣu garbhāvāsam*). The lotus probably held symbolic, ornamental and comestible functions already in the Harappan civilisation, the earliest urban culture of South Asia. Lotus seedpod faience models were found at late 3rd millennium BCE contexts at both Harappa and Mohenjo-Daro, suggesting that the plant was of some cultural importance to be reproduced in artistic mediums. The vast number of names applied on the lotus in Indic languages (e.g. Skt. *nalinī, padma, aravinda, tāmarasa, kamala, sarasīruha*) also testifies to its high rank in South Asian cultures.

**B. The ‘Egyptian bean’: *Nelumbo nucifera* in Egypt**

> Niliacum ridebis holus lanasque sequaces, improba cum morsu fila manuque trahes.

You will laugh at the Nile vegetable with its pliant threads when with tooth and hand you draw the unconscionable filaments.

- Martial, Epigrams XIII.57

While the Indian lotus (*Nelumbo nucifera*) is no longer cultivated as a food crop in modern Egypt or anywhere along the Nile valley for that matter, Greco-Roman literary and iconographic sketches of Nilotic landscapes invariably reserved a prominent place for the Indian lotus which by the 4th century BCE was toponymically styled the ‘Egyptian bean’ (Greek κόσμος Αἴγυπτος). The latter designation reflected both its importance as a comestible in late 1st millennium BCE

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978 Sukhāvatīvyūhaśāstrasam 41.
979 Vats 1940: 169, 467.
980 Schmidt 1913; Lienhard 2000.
Egypt and the fact that Greek visitors to Egypt had first encountered the plant in the Nile delta.

Amidst the crocodiles and hippopotami, temples and reed boats, one finds in the grand riverine vista of the late 2nd century BCE ‘Nile mosaic’ from the Italian city of Palestrina (Praneste), a profuse representation of the Indian lotus in every stage of its flowering.\(^981\) Mosaics, paintings, glass tiles, terracottas and textiles were some of media on which the Indian lotus came to be widely represented both in Egypt and elsewhere in the Greco-Roman Mediterranean.\(^982\) Callixeinos of Rhodes in his description of the magnificent riverine barge of Ptolemy IV Philopator of Egypt (221 – 204 BCE) refers to a hall supported by pillars whose capitals were adorned with representations of the Indian lotus and other Nilotic flora, a veritable mirror of the aquatic world on which the barge floated.\(^983\) The Indian lotus like the crocodiles and hippopotami was identified by Greek and Roman observers as one of the diagnostic features of Nilotic landscapes. Alexander the Great who sighted lotuses in the Akesines river (Skt asiknī; modern Chenab) in India had even mistakenly believed he had found the headwaters of the Nile.\(^984\)

\(^{981}\) Meyboom 1995.
\(^{983}\) Callixeinos ap. Ath. V.206b-c.
\(^{984}\) Nearchus ap. Strabo XV.1.25; Arr VI.1.2-6.
Figure 39: Indian lotuses in a Nilotic landscape (detail), Berlin fragment of the Palestrina mosaic, 2nd century BCE (Source: Andreae 2003: 107)
Figure 40a: Indian lotuses in a Nilotic scene amidst crocodiles and pygmies, Casa de Neptuno, Italica, southern Spain, late 2nd century CE (Source: author’s photograph)

Figure 40b: Detail of above (Source: author’s photograph)
Herodotus describing the customs of deltaic Egypt in the 5th century BCE is the first ancient author outside of South Asia to unambiguously remark of the Indian lotus in Egypt. He does not, however, assign a specific name to the plant unlike later Greek authors and simply considered it to be a variant of native Egyptian lilies/lotuses (κρίνον):

‘When the river is in flood and flows over the plains, many lilies, which the Egyptians call lotus, grow in the water. They gather these and dry them in the sun; then they crush the poppy-like centre of the plant and bake loaves of it. The root of this lotus is edible also, and of a sweetish taste; it is round, and the size of an apple. Other lilies grow in the river, too, that are like roses; the fruit of these is found in a calyx springing from the root by a separate stalk, and is most like a comb made by wasps; this produces many edible seeds as big as olive pits, which are eaten both fresh and dried.’

The first lotus whose fruit is described to have a ‘poppy-like centre’ is the native Egyptian *Nymphaea lotus* or white lotus which possessed an esculent rhizome like the Indian lotus. The ensuing description of a rose-coloured lily with a seedpod resembling a wasp’s nest (κηρίῳ σφηκῶν ἰδέῃ ὁμοιότατον) is unmistakably the Indian lotus. The Indian lotus has usually been considered an Achaemenid Persian introduction to Egypt on account of the lack of clear iconographic, textual or archaeological evidence in earlier periods. Herodotus’s description of the Indian lotus does not, however, betray its supposedly recent foreign origins. His casual remarks on its use as a food plant in deltaic Egypt suggests that the Indian lotus was a feature of Nilotic landscapes well before the Persian conquest of Egypt in 525 BCE. Hecataeus of Abdera in the late 4th century BCE classified the Indian lotus as

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985 Hdt. II.92: ἐπέαν πλήρης γένηται ὁ ποταμός καὶ τὰ πεδία πολεμήσῃ, φύεται έν τῷ ὑδάτι κρίνει πολλά, τὰ λιθίασποι κυσίον λωτὸν: ταῦτ᾽ ἐπέαν δρέψωσι αὐτάνουσι πρὸς ἢλον καὶ ἐκεῖ ἐκ τοῦ ἑκ μέσου τοῦ λωτοῦ, τῇ μήκος ἕν ἐμφερές, πετάντας ποιεῖται ἐξ αὐτοῦ ἄρτος ὅπως πυρί. ἔστι δὲ καὶ ἡ Ῥίθα τοῦ λωτοῦ τοῦτον ἑωδόμη καὶ ἐγγλύσσε ἐπωικέως, ὅν στρογγύλον, μέγαν κατὰ μῆλον. ἔστι δὲ καὶ ἄλλα κρίνεια βόδον ἐμφερέα, ἐν τῷ ποταμῷ γινόμενα καὶ ταῦτα, ἐξ ὅν ἐν καρπὸς ἐν ἄλλῃ κάλλικα παραφοριμένῃ ἐκ τῆς Ῥίθας γίνεται, κηρίῳ σφηκῶν ἰδέῃ ὁμοιότατον: ἐν τούτῳ τροκτά ὅσον τε πυρήν ἔλαις ἐγγίνεται συχρά, τρέχεται δὲ καὶ ἀπαλά ταῦτα καὶ αἰών.

986 cf. Theophrastus *Hist. pl.* IV.8.9-11; On the white (*Nymphaea lotus*) and blue lotus (*Nymphaea caerulea*) species of Egypt, which are well attested in Pharaonic iconography and literature, see Weidner 1985; Manniche 2006: 132-5; Pommerening, Marinova and Hendrickx 2010.

one of the ‘naturally occurring foods’ (τὰς τροφὰς αὐτοφυὲς) of the Nile, suggesting that its introduction could not have been so recent for its foreign origins to be overlooked.  

Figure 41: Harvested lotus seedpods at a market in Thailand (Source: https://media-cdn.tripadvisor.com/media/photo-s/07/db/4c/2a/fresh-lotus-seed-pod.jpg )

The lack of specific name in Herodotus’s account suggests, however, that Greeks were largely unacquainted with the plant before the 5th century BCE. The Indian lotus is first attested under the designation of ‘Egyptian bean’ (κύμος Αἰγύπτιος) in the passing remark of an anonymous Hippocratic author (5th – 4th centuries BCE), the account of Egypt provided by Hekataios of Abdera (late 4th century BCE) and in the lengthy survey of the plant provided by Theophrastus in his botanical enquiries (late 4th century BCE) quoted here:

‘The ‘Egyptian bean’ grows in the marshes and lakes; the length of its stalk at longest is four cubits, it is as thick as a man’s finger, and resembles a pliant reed without joints. Inside it has tubes which run distinct from one another right through, like a honey-comb: on this is set the ‘head,’ which is

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like a round wasps’ nest, and in each of the cells is a ‘bean’ which slightly projects from it; at most there are thirty of these. The flower is twice as large as a poppy’s, and the colour is like a rose, of a deep shade; the ‘head’ is above the water. Large leaves grow at the side of each plant, equal in size to a Thessalian hat; these have a stalk exactly like that of the plant. If one of the ‘beans’ is crushed, you find the bitter substance coiled up, of which the pilos (seed embryo) is made. So much for the fruit. The root is thicker than the thickest reed, and is made up of distinct tubes, like the stalk. They eat it both raw boiled and roasted, and the people of the marshes make this their food. It mostly grows of its own accord; however they also sow it in the mud, having first well mixed the seed with chaff, so that it may be carried down and remain in the ground without being rotted; and so they prepare the ‘bean’ fields, and if the plant once takes hold it is permanent.989

Apart from the detailed and botanically precise description, much lacking in Herodotus, the most striking observation of Theophrastus is that the Indian lotus was not simply a naturalised wild plant growing in the Nile but one that was deliberately cultivated in a riverine ‘bean’ field (κοαμόν). Additionally, while Herodotus had only remarked of the consumption of lotus seeds, Theophrastus notes that lotus rhizomes also formed an essential component of the deltaic Egyptian diet.990 The harvesting of lotus rhizomes, flowers and seedpods was done either by wading into the shallow water or more typically atop a canoe as depicted on the 2nd century BCE ‘Nile mosaic’ from the Italian city ofPalestrina.991 The remark that lotuses were farmed and not left to grow on their own accord is confirmed by the

989 Theophr. Hist. pl. IV.8.7-8: Ὁ δὲ κύαμος φύεται μὲν ἐν τοῖς ἔλεσι καὶ λίμναις, καυλὸς δὲ αὐτοῦ μήκος μὲν ὁ μικρότατος ἐς τέταρτα πῆχες, πάχος δὲ διακτιλιάδος, ὅμοιος δὲ καλάμῳ μαλακῷ ἀγονίατο. διαφόροις δὲ ἐνδόθεν ἔχει δὲ ἀλοι διαλημμένας ὁμοίας τοῖς κηρίοις· ἐπὶ τούτῳ δὲ ἡ κοιόδα, παρακομία σφηκία περιφερεῖ, καὶ ἐν ἐκάστῳ τοῦ κοιτάριον κύαμος μικρὸν ὑπεραίρον αὐτής, πλῆθος δὲ ὁ πλείστος τριάκοντα. τὸ δὲ ἀνθὸς διαλάσσων ὂς μίκροος, χρώμα δὲ ὁμοῖον ρώδε κατακορές· ἐπάνω δὲ τοῦ ἄνθος ἡ κοιόδα. παραφύεται δὲ φύλλα μεγάλα παρ’ ἐκαστὸν τῶν κύαμων, ὁν ὅσα τὰ μεγάλη πετάσου Θετταλική τῶν αὐτῶν ἔχοντα καυλὸν τῷ τῶν κύαμων. συντρίφαται δ’ ἐκαστὸν τῶν κύαμων φανερὸν ἀπὸ τὸ πικρὸν συνεπιστρέμμενον, ἐς οὐ γίνεται ὁ πλάτος. τὸ μὲν οὖν περὶ τὸν κυρίον τουατέ. ὡς δὲ ῥίζα παρατείρε τοῦ καλάμου τοῦ πυργοῦ καὶ διαφόροις ὁμοίοις ἔχουσα τὸ καυλὸ. ἐστίνυσι δ’ αὐτῆς καὶ ὅμην καὶ ἐρῆμη καὶ ὀστίνη, καὶ οἱ περὶ τῷ ἔλῃ τοῖς σίτῳ χρώματι. φύεται μὲν οὖν ὁ πολὺς αὐτομάτος· οὐ μὴν ἄλλη καὶ καταβάλλουσαν ἐν πηλῷ ἄχρονόστατος εὗ μάλα πρὸς τὸ κυτταράδια τε καὶ μείναι καὶ μὴ διαφορμήται καὶ οὔτοι κατασκευάζεσθαι τοῦς κυαμόνας· ἂν δ’ ὑπὲρ αὐτῶν ἀντιλήψηται, μεῖνε διὰ τέλους.; καὶ cf. Pliny HV XVIII.122 who quotes Theophrastus verbatim.

990 cf. Diod. Sic. I.10.1; I.34.7.

991 Meyboom 1995: 34.
eyewitness account of the Augustan geographer Strabo who suggests that the ‘bean fields’ were not small subsistence plots but large commercialized holdings with the prospect of substantial profit:

‘Accordingly, the (Egyptian) bean-fields afford a pleasing sight, and also enjoyment to those who wish to hold feasts therein. They hold feasts in cabin-boats, in which they enter the thick of the beans and the shade of the leaves; for the leaves are so very large that they are used both for drinking-cups and for bowls, for these even have a kind of concavity suited to this purpose; and in fact Alexandria is full of these in the workshops, where they are used as vessels; and the farms have also this as one source of their revenues - I mean the revenue from the leaves.’

Figure 42: *Nelumbo nucifera* rhizomes (Source: https://upload.wikimedia.org/wikipedia/commons/2/27/Lotus_root.jpg)

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992 Strabo XVII.1.15: οἱ οὖν κυμάτων ἠδεῖαν ὅφειν παρῇχουσι καὶ τέρψιν τοῖς ἐνευχεθέντες βουλομένους· εὐπροέντα δ’ ἐν σκέπαις θαλαμηγοῖς, ἐνδύοντες εἰς τὸ πύκνομα τῶν κυάμων καὶ σκιαζόμενοι τοῖς φύλλοις· ἔστι γὰρ σφόδρα μεγάλα, ἢστε καὶ ἀντὶ ποτηρίων καὶ τρυφέλιον χρῆσθαι· ἔχει γὰρ τινα καὶ κοιλοτητα ἐπιτήδειαν πρὸς τούτο· καὶ δὴ καὶ ἡ Ἀλεξάνδρεια μεστὴ τοῦτον ἔστι κατὰ τὰ ἐργαστήρια, ὡς σκεύεσι χρημάτων· καὶ οἱ ἄγροι μίαν τινὰ τῶν προσόδων καὶ ταύτην ἔχουσι τὴν ἀπὸ τῶν φύλλων.
Pliny like Strabo also remarks on the plaiting of lotus leaves into vessels of various shapes in Egypt. The use of the large peltate leaves of the lotus as receptacles for food and beverage or as packaging material is still well known across South, East and Southeast Asia. The literature of these regions from as early as the 1st millennium BCE already attests to use of lotus leaves as vessels and plates. Śākuntala, the eponymous heroine of the Sanskrit playwright Kālidāsa’s Abhijñānaśākuntalam speaks, for instance, of having sighted her paramour in a jasmine bower where he held a lotus leaf cup (*nalinīpatrabhājanam*) brimming with water. Strabo also alludes to the use of lotus leaves as shades, a practice which has textual and iconographic parallels in the Indian subcontinent.

The trade in the economically valuable parts of the lotus, whether the leaves, rhizomes or seeds is suggested by the anonymous author of the ‘diseases of women’, a Hippocratic gynaecological treatise dating to the 5th and 4th centuries BCE. The author comments on administering a herbal application to the womb the ‘size of the Egyptian bean’ (ὀσὸν αἰγύπτιον κύωμον). The ‘size of an Egyptian bean’ (c. 2.34 grams) appears to have become a standard unit of measurement for administering small doses of herbal applications since later Greco-Roman medical authors quote it as well. The use of the edible seed of the lotus as a measuring unit implies that they were fairly well known to medical professionals in the Eastern Mediterranean from as early as the 4th century BCE.

While the Hippocratic corpus is silent on the medical applications of the lotus, Greco-Roman physicians from the Hellenistic period onwards describe the nutritional properties of the lotus and also recommend its use in compound remedies. Diphilos of Siphnos, a physician at the court of the Macedonian king, Lysimachus (early 3rd century BCE) remarks that the ‘Egyptian bean’s root, called

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993 Pliny *HN* XXI.87: ut inplexis colocasiae foliis in variam speciem vasorum potare gratissimum habeant.
996 Kālidāsa, Abhijñānaśākuntalam 5.21: nanvekasmin divase navamālikāmaṇḍape nalīnīpatrabhājanagatamudakaṃ tava haste saṃnihtamāsiṃ.
998 Hippocrates *Mul.* 181: Ἐμεῖν δὲ μέλλῃ, καὶ ἔνων τῆσιν δαισίν ἀνακωκῇ, καὶ ὁσὸν αἰγύπτιον κύωμον προστίθηναι.
999 Celsus V.23.2-3, 25.6; Galen *Antid.* 1.1, 14.3K.
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a *kolokasion*, is tasty and nourishing, but is difficult to digest because it is rather astringent. The least wooly variety is the best. He says that the beans produced within the pods, when green, are difficult to digest, contain little nutrition, are laxative, and produce a great deal of gas; but after they dry, they produce less gas'.

Menophilus, a poorly known Hellenistic pharmacological author (c. 2nd – 1st centuries BCE) prescribes the bitter embryo of the Egyptian bean among other ingredients for the treatment of ear ulceration. Dioscorides notes that a meal of lotus seeds was recommended for those with colic and dysentery and like Menophilus recommends the bitter embryo of the seed for earaches. The loquacious physician Galen of the 2nd century CE had, however, a poor estimate of the Indian lotus whose seed and rhizome he considered unwholesome and of little nutritive value.

The Hellenistic physician Diphilos of Siphnos is incidentally the first extant author to describe the edible tubers of the lotus using the term *κολοκάσιον*. Early Latin authors applied this term, perhaps mistakenly, to describe the entire plant. The seedpod of the lotus was named the *κιβόριον*. The use of specialised terms for the economically valuable parts of the Indian lotus (rhizomes and seedpods) from the Hellenistic period onwards indicates a greater familiarity with the plant among Greek speakers in the eastern Mediterranean. The cup-like shape of the honeycombed fruit of the Indian lotus (*κιβόριον*) even inspired costly eponymous metal imitations for consuming wine in the Hellenistic period.

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1000 ap. Ath. III.73a-b: Δίφιλος δὲ ὁ Σίφνιος φησίν· ἢ τοῦ κυάμου τοῦ Ἀιγυπτίου ῥίζα, ἡ ἄρα λέγεται κολοκάσιον, εἰςτομάς τῇ ἐστὶ καὶ τρόφιμος· δυσέκκριτος ἢδὲ ἀπὸ τὸ παραστόφειν· κρείττον δὲ ἐστὶ τῷ ἵδεστα ἵπποδέσ. οἱ δὲ γίνομενοι, φησί, κύμαια ἐκ τῶν κυβόριων χλωριοῦ μὲν ἐστὶ δύσπεπτοι, ἐλιγότροφοι, διαχωριστικοὶ, πνευματικῶστατοὶ, ξιρανθέντες δὲ ἦτοι πνευματικοὶ.

1004 ap. Celsus VI.7.2c.


1003 Galen *Aliment. fac.* 39.

1004 cf. Nicander ap. Ath. III.72a-b; Dioscorides *Mat. Med.* II.106; See chapter IX for a discussion of the etymology of this term and its later semantic shift to mean taro.

1006 Martial XIII: 57; Virgil *Ecl.* IV.20; Columella *Rust.* VIII.15.4; Pliny *HN* XXI.87.

1007 Athenaeus 3.72b; XI.477e-f: Hegesander of Delphi claims that the poet Euphorion was having dinner with Prytanis, and Prytanis showed him some kibōria that seemed to be very expensively made. After the party had gone on for a long time, Euphorion, who had consumed a large amount of wine and was drunk, took one of the kibōria and urinated in it. Didymus says that this was a type of cup; perhaps it is to be identified with what are called skuphia because the lower part tapers to a nub like an Egyptian bean (*κιβόριον*).
Apart from the seeds and rhizomes, the fibres produced by the stalk of the lotus may have been harvested for fibre production. In India, lotus stalk fibres are spun into wicks used for lighting lamps, nowadays reserved for religious rituals.\textsuperscript{1008} Pliny notes that the fibres of the lotus stalk resembled the threads of spider silk \textit{(araneosus)} but does not suggest an economic use for them.\textsuperscript{1009}

\section*{C. The Indian Lotus Beyond Egypt}

While the importance of the Indian lotus as a cultivar in Egypt is clear from at least the middle of the 1\textsuperscript{st} millennium BCE, the routes and chronology of the \textit{Nelumbo nucifera}'s westward dispersal as well as its cultivation in neighbouring regions are less well studied. There is no unequivocal evidence for Achaemenid Persian agency in the introduction of the lotus to Egypt. Herodotus’s treatment of the Indian lotus as a common feature of Deltaic landscapes suggests a longer history of cultivation. It appears more likely that the lotus was introduced to Egypt under the cosmopolitan Saite rulers (664 – 525 BCE) who projected their naval power and expanded trade in the Mediterranean and the Red Sea zones as well as sponsoring a Phoenician-led naval expedition which circumnavigated Africa.\textsuperscript{1010} The earliest reference to cotton in Egypt, another eastern cultivar, quite significantly occurs in the context of the Saite pharaoh Amasis’s gift of an embroidered cotton corselet to the Spartans.\textsuperscript{1011}

It is quite probable that the lotus spread to Egypt via land or maritime routes leading from the Levant since the plant is attested in that region in a few Greek textual sources. Theophrastus in the 4\textsuperscript{th} century BCE observes that the Indian lotus ‘also grows in Syria and in parts of Cilicia’.\textsuperscript{1012} Dioscorides similarly notes that ‘the Egyptian bean which some call Pontic, grows abundantly in Egypt and it is found both in Asia and in Cilicia, in the marshes’.\textsuperscript{1013} According to the testimony of Claudius Iolaus, a shadowy Greek author of the first century CE, whose work on Phoenician history and myth survives in fragments, the lotus, greatly valued for its

\begin{flushleft}
\textsuperscript{1008} Arundhati, 1994: 29.
\textsuperscript{1009} Pliny \textit{HN} XXI.87.
\textsuperscript{1010} van de Mieroop 2011: 297-8.
\textsuperscript{1011} Hdt. III.47; see chapter IV.
\textsuperscript{1012} Theophr. \textit{Hist. pl.} IV.8.8.
\textsuperscript{1013} Dioscorides \textit{Matt. Med.} II.106.
\end{flushleft}
healing properties, grew in the Nahr Na’aman river (Gk. Belos) near the Phoenician city of Akko:

Claudios Iolaus, in Book 1 of his On Phoenician Matters says that it (the city of Akê) was named after Herakles: ‘For after being ordered by Eurystheus to undertake the most difficult labour, when he was drenched by the poison of the Lernaian Hydra, he was in pain with the wounds of the stings. So the Delphic oracle commanded him to go East, until he should find a river that waters a plant resembling the hydra. After striking it down, he would be freed from his wounds. He found the river and the plant prophesized by the Pythian god, of which the stem and the root were completely serpentine in their many colours and heads. For however many one cut off, new ones were immediately born. At any rate, they call the root kolokasion, and that which grows above it kiborion; it provided the Egyptians with a pleasant sight and edible veins. It grows abundant around the Nile, but the one that grows around Belos heals wounds that are hard to cure; for, when rubbed down by the root, it yields a white juice. With this juice,’ he says, ‘Herakles too was healed.’ And so they called the city ‘healing’ (Akê).’

The lotus was also cultivated in western Anatolia, Cyprus and Greece. Theophrastus attests to the lotus growing ‘about Torone in Chalcidice in a certain lake of small size’. Phylarchus states that the Indian lotuses growing in a swamp near the Thyamis river in Thesprotia attracted so much attention from locals snapping off the fruits that Alexander II of Epirus installed a guard to protect the plants. The latter anecdote suggests that lotuses were probably more of a botanical curiosity or

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1014 Stephanus of Byzantium, Ethnica, s.v. Akê; trans. López-Ruiz 2008


1016 ap. Ath. III.73b-c.
medicinal plant in parts of the Eastern Mediterranean rather than a common food crop. In Sicyon (Corinth), the lotus was held sacred to Athena as Athenaeus speaks of a temple to ‘Athena Kolokasia’ or ‘Athena of the lotus’. The remarks of Nicander of Colophon, a poet-physician associated with the late Attalid court in Pergamon (2nd century BCE), indicate that lotus rhizomes were prized as desirable elite food:

‘Sow the Egyptian variety of bean, so that in the Summer you can produce garlands from its flowers and, when the pods full of ripe fruit have fallen, put them into the hands of young men who are dining and have long been desiring them. As for the roots, I boil them and serve them at banquets.

The use of Indian lotuses to weave garlands is also noticed by the 2nd century CE Greek author Athenaeus, a native of Naucratis in Egypt, who states that Indian lotus garlands, locally dubbed honey-lotus garlands in Naucratis, were ‘fragrant and very cooling in the hot season’. In another passage, Athenaeus adds that the rose coloured lotus i.e. the Indian lotus was renamed the Ἀντινόειος, at the suggestion of the poet Pancrates of Alexandria, in honour of Antinous, the emperor Hadrian’s favourite, who accompanied the latter to Egypt and drowned in the Nile in 130 CE.

The ornamental rather than subsistence value of the lotus was probably more important in its spread further west into the Italian peninsula where it is attested by

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1017 Ath. III.72b: ἐστι δ’ ἐν Σικυώνι Κολοκασίας Ἀθηνᾶς ἱερόν.
1018 Ath. III. 72a-b: Ἐλεγεν εἶναι τῷ μεγάλῳ κακῷ. Κυβόρια. Νικανδρός ἐν Γεωργικῷ σπείρᾳ κυώνων Αἰγύπτων, ὡρα θερεῖς ἁνθέων μὲν στεφάνους ἀνόσιος, τὰ δὲ πεπιθότα ἁκμαίου κυρποῦ κυβόρια δαιμονίουσιν | ἐξ χέρας ἢθέουσι πάλαι ποθέουσιν ὄρεξις. βίζας δ’ ἐν θυνίν γενήσας προτίμημι.
1019 Ath. III.73a-b: γίνεται δ’ οὖς τῶν κυπαρίσσων καὶ ἁνθός στεφανοτηκών. καλοῦσι δ’ Αἰγύπτων μὲν αὐτό λοτόν, Ναυκρατίται δ’ οἱ Εύσ. λέγει οὖς οὖν Ἀθηνᾶς, μελλοτόν· ἀρ’ οὖ καὶ μελλόττινοι στεφάνοι | πάνω εὐδείς καὶ καυσόνος ὄρα ψυκτικῶτατοι.
1020 Ath. XV.677d-e.
the 1st century BCE. For the Augustan poet Virgil, the Indian lotus counted among
the ‘cradle of alluring flowers’ yielded by the earth (blandos fundet cunabula
flores). Columella in describing a pond for breeding waterfowl recommends the
growing of lotus as an ornamental plant and shade for fowl in the middle of the
pond: ‘On the other hand, the middle part of the pond should be of earth, so that it
may be sown with the Egyptian bean and other green stuff which lives in or near
water and provides shade for the haunts of the waterfowl’. Pliny who explicitly
notes that the lotus grew in Italy admired the flowering seedpod and the large peltate
leaves of the plant. The consumption of lotus in Italy is also suggested by
Martial’s scorn for its stringy rhizomes.

Of the lotus’s cultivation further east in ancient Mesopotamia and Iran we know
next to nothing. There are no convincing identifications for the Indian lotus in the
cuneiform record. Thompson matched Nelumbo nucifera with a medicinal plant
called the ankinutu in Akkadian. The attribution is spurious as the literal
meaning of the Sumerian correspondence for the Akkadian ankinutu, (Sumerian
ankinudi: ‘reaching neither sky nor earth), indicates a creeper or epiphytic plant and
not the lotus. An image of the Indo-Iranian god Mithra standing on an open lotus
from Sasanian Taq-i Bustan suggests the lotus’s sacral associations in Iran but this
image almost certainly draws inspiration from contemporary Brahmanical-Buddhist
iconography from Central Asia and India rather than reflecting earlier Iranian
attitudes to the lotus.

D. The Archaeological Data for Nelumbo nucifera

The silence of early Mesopotamian and Iranian records on the Indian lotus is
replicated in native Egyptian textual sources despite the prominence of the lotus in
Greco-Roman discourses on Egypt. The lotus was perhaps recognised as a variant of
the native lily species in the Egyptian language. Manniche notes that it is difficult to

1021 Virgil Ecl. IV.20.
1022 Columella Rust. VIII.15.4: Media rursus terrena pars esse debet, ut colocasiis conseratur, aliisque
familiaribus aquae viridibus, quae inopacant avium receptacula.
1023 Pliny HN XXI.87: thyrso autem, qui inter folia emicat, spectabili.
1024 Martial XIII.57; cf. Martial’s reference to the slender stalks of the lotus at VIII.33.
1025 Thompson 1949: 234.
1026 CAD s.v. ankinutu.
1027 Carter 1981.
even to distinguish between the native blue (\textit{Nymphaea caerulea}) and white (\textit{Nymphaea lotus}) lotuses (\textit{s\textsuperscript{\textit{sn}; n\textit{hb}}}) in Egyptian texts.\textsuperscript{1028} Fortunately, the lotus is better attested in the archaeological records of Greco-Roman Egypt.\textsuperscript{1029} Parts of the peltate leaf of the Indian lotus were recovered from an ibis-bird necropolis in Ptolemaic Saqqara.\textsuperscript{1030} A nearly complete seedpod, seeds and flower fragments were found at Greco-Roman Hawara in the Fairyyum oasis.\textsuperscript{1031} Finds of lotus seeds further east in the early Roman phases (1\textsuperscript{st} – 2\textsuperscript{nd} centuries CE) of Mons Claudianus in the Eastern Desert and the Red Sea port of Berenike indicate local trade in lotus seeds.\textsuperscript{1032} The earliest extant archaeobotanical finds of lotus derive, however, not from Egypt but neigbouring Cyprus. Several well-preserved carbonised nutlets of the lotus were recovered from funerary offerings in the late 4\textsuperscript{th} century BCE necropolis of the port-city of Salamis in eastern Cyprus.\textsuperscript{1033} These may represent either localized cultivation of the lotus or imports from nearby Egypt.

E. Conclusion: Chronology and Routes of Dispersal

While the archaeological data confirms the presence of the Indian lotus in the Mediterranean of the late 1\textsuperscript{st} millennium BCE, it fails to shed light on the pathways of the lotus’s westward dispersal. The functions of the lotus in the Mediterranean (e.g. consumption of rhizomes and nutlets; usage of leaves as vessels; medical and sacral uses) leave no doubt that the lotus was made familiar in the Middle East through contact with the Indic world where its uses were long familiar. The present invisibility of the lotus in the regions between the Levant and India in antiquity could either mean that the lotus has yet to be identified in the textual and archaeological records of regions like Mesopotamia and Iran or the sacred lotus arrived in Egypt through southerly Red Sea trading routes, bypassing much of the

\textsuperscript{1028} Manniche 2006: 132.
\textsuperscript{1029} There are no secure attestations of the lotus in Egyptian archaeological records before the Ptolemaic period. Renfrew tentatively reported a few lotus nutlets at the New Kingdom site of Amarna (14\textsuperscript{th} century BCE). Renfrew herself doubts the identification and suggests a match with the fruits of the native soapberry tree (\textit{Balanites aegyptiaca}). This identification appears more likely as the nutlets of the lotus are spherical and not columnar as are the samples published in Renfrew’s report (See Renfrew 1985: 186-7).
\textsuperscript{1030} Hepper 1981: 148; Germer 1985: 40.
\textsuperscript{1031} Newberry 1889: 52; Germer 1985: 39-40; Germer 1987: 246; Germer 1988: 17, 19; Germer reports of another lotus receptacle preserved in Leiden which has been mislabeled as a New Kingdom find from Deir el Bahari (Germer 1985: 40).
\textsuperscript{1032} Three seeds of the lotus were found at Roman Mons Claudianus (van der Veen 2001: 197, 181) and two at Berenike (Cappers 2006: 101-2).
\textsuperscript{1033} Hjelmqvist 1973: 244-5.
Middle East. There appears, however, to be no evidence for any kind of direct and regular maritime contact between Egypt and India before the Greco-Roman period. It seems more likely that the lotus travelled across Eurasian continental routes to reach the Eastern Mediterranean. As the lotus is already present in Egypt by the middle of the 1st millennium BCE, an earlier date for its dispersal to Mesopotamia and Iran appears likely. It may perhaps have been first introduced as an ornamental plant in Assyrian and Babylonian royal gardens.

There is some doubtful iconographic evidence for an earlier Late Bronze Age dispersal of the Indian lotus. Hjelmqvist draws attention to a dagger blade from Late Bronze Age Mycenae depicting a swampy landscape with plants bearing obconical fruits interpreted as lotus seedpods.\textsuperscript{1034} A diadem from contemporary Mycenae decorated with flowers interspersed with circular “fruits” with small globules has likewise been interpreted as the seedpod of the Indian lotus.\textsuperscript{1035} An unprovenanced faience model of a seedpod, allegedly of New Kingdom date (late 2\textsuperscript{nd} millennium BCE), has also been suggested to be the Indian lotus.\textsuperscript{1036} Hjelmqvist’s identifications are overly optimistic particularly since the depictions are highly stylized and there is no certainty that both Mycenaean objects depict “fruits” and not flowers. The faience model of a seedpod, now at the Walters Museum of Art in Baltimore,\textsuperscript{1037} is, on the other hand, a more credible representation of a lotus seedpod. It seems unlikely, however, that the faience model dates to the New Kingdom. As similar models of the lotus seedpod in glass and clay are known from Greco-Roman contexts,\textsuperscript{1038} a date in the later half of the 1\textsuperscript{st} millennium appears more plausible.

\textsuperscript{1034} Hjelmqvist 1973: 245.
\textsuperscript{1035} Ibid.
\textsuperscript{1036} Brovarski et al 1982: 42.
\textsuperscript{1037} Inv. No. 48.459.
\textsuperscript{1038} Goede 2005; Darby et al 1977: 635.
Figure 43: a. Marsh plants from a Mycenaean dagger blade mistakenly identified as lotus b. Decoration from a Mycenaean diadem purportedly depicting lotus flowers and seedpods (Source: Hjelmqvist 1973: 245)

Figure 44: Lotus seedpod faience model, late 1st millennium BCE, Egypt (Source: Brovarski et al 1982: 42)
Unlike other South Asian crops which dispersed to the Middle East and the Mediterranean in antiquity, the Indian lotus had no lasting impact on the diet and agriculture of either region. It disappears from cultivation in the Mediterranean and the Middle East sometime in the early medieval period. The modern botanical name of the lotus and its genus derives from the Sinhala *nelum(-ba)*. The Dravidian *tāmara* was also commonly encountered as a name for the lotus in 19th century European botanical literature.1039 The present familiarity of the lotus in the West was the result of the European study of Indian flora in the colonial period.1040 While commonly grown as an ornamental in temperate greenhouses, the lotus has no comestible value in the modern Mediterranean or the Middle East. Cooked lotus seeds are more likely to be encountered as a sweet stuffing in East Asian pastries or dim sum in the modern West.

Between the mid-1st millennium BCE and the mid-1st millennium CE, however, the lotus was widely cultivated as an important comestible in the Nile Valley. The importance of the lotus in Egypt is also manifest in its frequent representation across a range of iconographic mediums both within Egypt and in foreign representations of Egyptian landscapes. The lotus was also grown elsewhere in the Mediterranean for its edible seeds and rhizomes and as an ornamental plant. The lotus’s status across much of the Middle East, on the other hand, is unfortunately unclear owing to its invisibility in the extant textual and archaeological records, particularly with regards to Mesopotamia and Iran. Future archaeological work may rectify this lacuna in the history of the Indian lotus’s westward dispersal.

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1039 Smith 1814: 283; Cuvier et al 1828: 159.  
1040 See Desmond 1992 on early modern and modern European studies of Indian flora.
IX. Taro  
*Colocasia esculenta*

**A. Introduction**

Taro (*Colocasia esculenta*), also known as the dasheen or cocoyam, is a semi-aquatic herbaceous vegetable crop native to South and Southeast Asia.\(^{1041}\) It is found growing naturally in streams, lakes and ponds. Taro is primarily valued for its starchy edible corms or the swollen underground stem. It is widely cultivated and naturalized in tropical and subtropical Asia, sub-Saharan Africa, the Mediterranean and the Middle East.\(^{1042}\) The advent of the New World potato has, however, reduced the importance of taro as a comestible across much of its former range since both vegetables are cooked in similar ways.\(^{1043}\) Fried colocasia corms, a medieval Cairene favourite, were, for instance, eaten much like chips today.\(^{1044}\) The leaves and stalks of taro can also be consumed as vegetables.\(^{1045}\) Taro cultivars contain varying amounts of calcium oxalate, a toxic compound, which is removed by peeling and thoroughly cooking the corms. The taro plant’s large peltate leaves, which earned it the alternative name of ‘elephant’s ear’, have encouraged its use as an ornamental in gardens with aquatic features.

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\(^{1041}\) Sanderson 2005: 70; van der Veen 2011: 95; Hoogervorst 2013: 43.
\(^{1043}\) van Wyck 2005: 150.
\(^{1044}\) Lewicka 2011: 249; van der Veen 2011: 97.
\(^{1045}\) Simoons 1991: 105.
Figure 45: A field of taro in Hawaii (Source: http://images.floridata.com/hawaii/part52/Colocasia.jpg)

Figure 46: Taro corms (Source: http://www.qvm.com.au/wp-content/uploads/2013/04/Taro.jpg)
B. Colocasia: From Lotus to Taro – a late semantic shift

The earliest history and terminology pertaining to taro in the Middle East and the Mediterranean is much disputed if not confused in the secondary literature. The vernacular names of taro (e.g. Arabic qolqas; modern Greek κολοκάσια; Turkish gölevez, kolokas) as well as the modern botanical name of taro (*Colocasia esculenta*) derive ultimately from the ancient Greek term κολοκάσιον/-α (Latin colocasia) which was used in antiquity to describe the edible rhizomes of the Indian lotus (see above).

The speculation that the Greek κολοκάσιον derives from the Sanskrit kālakacu, one of several Indian terms for taro, is misleading. The adjective kālā meaning black or dark is rarely prefixed to the usual words for taro in Sanskrit (kacu; kacvī). The form kālakacu appears to be restricted to lexicographers. Even in the modern vernaculars of North India, the Sanskrit-derived kacu-forms predominate taro terminology (CDIAL 2609: Assamese kasu; Bengali kacu, Hindi kacū, kaccū).

While the precise linguistic affiliations of κολοκάσιον are murky, it is certainly a term of Eastern Mediterranean rather than Indian origin. Athenaeus explicitly remarks that the Alexandrians named the lotus rhizome as κολοκάσια, suggesting that the term was coined in early Hellenistic Egypt. The κολο- prefix, still familiar to us in the word ‘colossal’ (< Greek κολοσσός) is attested in a few other Greek words as well (e.g. κολοκύνθη, κολόκυμα) where the meaning is invariably ‘big’. The base word *κάσιον is perhaps related to κόρσιον or κορσαίον, the term used for the esculent rhizomes of the white lotus (*Nymphaea lotus*) rather than the Sanskritic kacu. κολοκάσιον thus translates as ‘big lotus tuber’ as opposed to the smaller rhizomes of the white lotus.

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1048 Ath. III.72a-b: ῶς δὲ λέγει Νικανόρος τι ὑπ’ Ἀλεξάνδρέων κολοκάσια καλούμενα ὡς ὁ ἀυτός’ καύμου λίγας κολοκάσιον ἐντιμάζει τε.
1049 Prellwitz 1905: 234; Kronasser 1960; Brust 2005: 350-1; Note also Isidore of Seville’s folk etymology for the colocynth, a cucurbit species: It is called ‘colocynth’ because it has a *spherical* fruit, and leaves like the common cucumber’s (Dicta autem colocynthis quod sit fructu rotundo atque foliis ut cucumis usualis; Isidore of Seville, Etymologies XVII.ix.32).
1050 Theophr. Hist. pl. IV.8.11; Strabo XVII.2.4; Diod Sic. I.10.1.
In Late Antiquity, the meaning of the Greek term κολοκάσιον and its cognates in other Mediterranean languages was extended to describe the esculent starchy underground storage organs of other wetland plants, including taro. The similar ways of consuming lotus and taro tubers were probably responsible for the application of terms relating to lotus on the taro. The expanded semantic field and confused identity of κολοκάσιον in later periods is exemplified by the comments of Aetius of Amida, an early 6th century CE Greek physician who curiously links the κολοκάσιον with the aubergine (μανζιζάνιον):

‘Kolokasion or aubergine. The strength of the root is similar to that of the turnip and the onion, its body is sticky so that it is used for cleansing and for easing the bowels.’ (Aet. Amid. Med. I.210 trans. Grimaldi).

The reference to the sticky body of the κολοκάσιον indicates that the plant in question is taro whose starch-rich tubers are sticky to the touch when peeled. Elsewhere Aetius lists the κολοκάσιον with other aroids including aron and dracontium in a list of plants with aphrodisiac properties, confirming the identification of κολοκάσιον with taro. While the association of κολοκάσιον with the aubergine (Solanum melogena; Gk. μανζιζάνιον from the Persian bādingān) in Aetius is puzzling, it intriguingly attests to the presence of another Indian cultivar, whose records in the pre-Islamic Middle East and the Mediterranean are extremely patchy.

By early medieval times, as the Indian lotus fell out of familiarity in the Mediterranean and Middle Eastern zone, the regional cognates of the Greek

1051 In this respect, the late Roman (2nd – 4th centuries CE) collection of recipes attributed to Apicius (De re coquinaria) contains references to colocasia whose mode of cooking (e.g. bulking out meat dishes and barley broth) could easily apply to both lotus rhizomes and taro corms (Apicius De re coquinaria III.4.2, VI.2.5, VI.8.10, VII.15).


1054 On the aubergine in the Late Antique and early medieval Middle East and Mediterranean see Watson 1983: 70-71; van der Veen 2011: 93-94.

1055 Woenig speculates that environmental changes and agrarian practices e.g. draining of swamps and lakes, siltation of canals, gradual elevation of the alluvium could have been responsible for the disappearance of the Indian lotus in the Nile valley (Woenig 1897: 45). Elsewhere in the Mediterranean, the lotuses reported by Phylarchus to be growing in the swamp near the Thyamis
κολοκάσιον came to exclusively denote taro. Taro is well attested in medieval Arabic authors\textsuperscript{1056} and desiccated remains of taro corms were also found at the medieval levels (11th – 13th centuries) of the Egyptian Red Sea port of Quseir al-Qadim.\textsuperscript{1057} As the term κολοκάσιον, was only used to describe taro from Late Antiquity onwards, it will have no relevance in the present discussion of the taro’s presence in the ancient Middle East and the Mediterranean.

C. Early Taro Terminology: οὐγγον, the Egyptian ἄρον and qarqas

In the absence of early archaeological data for the taro in the Middle East and the Mediterranean, the evidence for its spread and cultivation in these regions is derived entirely from ancient textual descriptions of edible tuberous crops in Greek, Latin and Hebrew. The prospect of identifying taro in ancient records is not, however, particularly dismal since there were few edible starchy tuberous crops of a non-bitter variety known in the ancient Mediterranean and the Middle East. The present discussion will assess three terms, the Greek οὐγγον and ἄρον as well as the Hebraic qarqas, which have been identified in the secondary literature as terms denoting taro.

i. οὐγγον

The earliest and most credible reference to taro is to be found in Theophrastus’s description of an aquatic tuberous crop in Egypt called the οὐγγον (manuscript variant οὐκτοῦν). The identification of οὐγγον as Colocasia esculenta has a long genealogy in classical scholarship and goes back ultimately to the Latin translation of Theophrastus by the celebrated Greek Renaissance humanist Theodorus Gaza (c. 1400 – 1475).\textsuperscript{1058} While Theophrastus’s description of the οὐγγον is short, the general morphological features and uses agree with those of taro. He notes that ‘its leaves are large and its shoots short, while the root is long and is, as it were, the fruit. It is an excellent thing and is eaten; men gather it when the river goes down by

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\textsuperscript{1057} van der Veen 2011: 78-9, 95-7.
\textsuperscript{1058} Sharples and Minter 1983: 155; Sharples 1989: 198.
turning the clods’.  

Theophrustus’s οὐδὲγγον/ οὐτον is reproduced in Pliny as the oetum. The account provided by Pliny appears, however, to be corrupt. While Pliny follows Theophrustus in describing it as an Egyptian plant with a large esculent root, he claims the leaves were few and small.  

The etymology of the term οὐδὲγγον is not known. The 5th century CE lexicographer Hesychius remarking of οὐτον, a variant spelling of οὐδὲγγον, notes that it was also called οίτον (οὐτόν: τὸ ὑπ’ ἐνίον ρίστον). The inconsistent orthography of the οὐδὲγγον betrays a foreign origin for the word. Theophrastus in fact remarks of it as an Egyptian word but no straightforward cognates have been found for the οὐδὲγγον in the ancient Egyptian language.

ii. The Egyptian ārov

The plant family Araceae (to which taro belongs) and the genus Arum derive their modern botanical names from the ancient Greek ārov and the Latin aron or arum which were used in antiquity to describe several wild herbaceous species with acrid and frequently poisonous rhizomes including Solomon’s lily (Arum palaestinum) and the cuckoo pint (Arum maculatum). The difficult task of getting rid of the toxins found in wild aroids through cooking and the invariably small size of the rhizomes meant that the different varieties of ārov/arum were typically consumed as famine foods or for their perceived medical benefits.

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1059 Theophr. Hist. pl. I.6.11: ὁμῶς δὲ καὶ τὸ ἐν Αἰγύπτῳ καλούμενον οὐδὲγγον· τὰ μὲν γὰρ φύλλα μεγάλα καὶ ὁ βλαστῶς αὐτὸς βραχὺς, ὡς δὲ χία μακρὰ καὶ ἐστὶν ὅσπερ ὁ καρπὸς, διαφέρει τε καὶ ἐσθίεται, καὶ συμβάλλοντι δὲ όσταν ὁ ποταμὸς ἀποθῇ στράφονες τὰς βύσσους.

1060 Pliny HN XII.89.

1061 Hesychius s.v. οὐτον.


1063 On arons see Theophrastus Hist. pl. 1.6.7-8; 7.9.4; 7.12.2; 7.13.2; Hippocrates Morb. 2.47; 3.15-16; Aristotle Hist. an. 611b; Dioscorides Mat. Med. II.197; Pliny HN XIX.96-7; Löw 1967: 213-218 for the Araceae in Hebraic sources; On the genus Arum see Bedalov and Küpfer 2005.

Pliny (1st century CE) and Galen’s (2nd century CE) descriptions of an edible non-bitter variety of the ἀρόν or aron from Egypt and neighbouring Cyrene (Libya), on the other hand, appear to be references to the taro. The use of the term ἀρόν to describe taro suggests, however, for a secondary acquaintance with the crop, probably limited to the edible corms which were traded over long distances:

Among the varieties of the bulb, too, there is the plant known in Egypt by the name of aron. In size it is very nearly as large as the squill, with a leaf like that of sorrel, and a straight stalk a couple of cubits in length, and the thickness of a walking-stick: the root of it is of a milder nature, so much so, indeed, as to admit of being eaten raw.

While it is clear that Pliny never saw the plant he describes, the account compares remarkably well with taro. The garden herb sorrel (Latin lapathum; Rumex acetosa) has sagittate or arrow-shaped leaves much like taro, although the leaves of taro are much larger than those of the sorrel. Likewise, the large bulb of squill (Latin scilla; Drimea maritima), a medicinal herb, easily matches the size of the taro’s corm. Pliny’s description of aron’s thick stalks and the corm’s mild acridity also supports identification with taro. Galen’s discussion of ἀρόν is much more extensive with references to several species, the majority being bitter in taste. The ἀρόν from Cyrene (Libya), which was imported to Italy, is described, however, as less acrid and eminently edible:

The root of this plant (ἀρόν) is eaten much the same as that of the turnip, but in certain regions it grows somewhat more bitter, so that it is very like the root of the edder-wort. In cooking, one should pour off its first water and add more hot water, as was described in the cases of cabbage and lentils. But in Cyrene the plant is the reverse of what it is in our country. For in those parts the arum has very little pharmacological activity and very little bitterness, so that it is more useful than turnips. Because of this they also export the root to Italy, on the grounds that it can keep for a very long time without rotting or

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1066 Grimaldi 2014.
1067 Pliny HN XIX.96: est inter genera et quod in Aegypto aron vocant, scillae proximum amplitudine, foliis lapathi, caule recto duum cubitorum, baculi crassitudine, radice molloris naturae, quae estur et cruda.
sprouting. It is clear that this sort is better as nutriment, but if one wants to cough up any of the thick, viscid fluids that accumulate in the chest and lung, the more bitter and more pharmacologically active root is better.

When boiled in water, it is eaten with mustard or with oil, vinegar and fish sauce, and of course with other mashed dishes, especially those prepared with cheese. But it is plain that the humour distributed from it to the liver and the body as a whole, from which animals are nourished, is somehow thicker, as was mentioned in the case of turnips. This is especially the case when the roots, like those from Cyrene, have no pharmacological activity. With us in Asia, many arums are more bitter and have a medicinal property.


Galen’s reference to the Libyan ἄρον being consumed with mashed dishes (ὑπότριμμα) is strongly suggestive of taro which assumes a mashable quality upon boiling. Mashed taro is well known today as a staple across the Polynesian world (Hawaiian poi). Galen’s comparison of the ἄρον with the turnip is also echoed in the 12th century Arabic author al-Bagdādī’s statement that Egyptians split taro ‘like a turnip’. The identification of edible varieties of ἄρον with taro is not a modern one but one that follows on the heels of late medieval and Renaissance interpretations of the term ἄρον/aron. A marginal note under the entry of ἄρον (II.197) in a 14th century manuscript of Dioscorides’s Materia Medica (Vaticanus Palatinus Graecus 77) notes, for instance, that ‘among the Cypriots aron was called

1068 Galen Aliment. fac. II.61: Ἐςτὶ μὲν ἢ ῥίζα καὶ τοῦτον τοῦ φυτοῦ παραπλησίον ἐκθομμένη τῇ τῆς γογγολίδος, ἐν χώραις δὲ τις φύεται ὀρμινέτα ποὺς, ὡς ἔγγος εἶναι τῇ τοῦ δρακοντίου. καὶ χρῆ τὸ πρῶτον αὐτῆς ἱδώρ ἀποχυνεῖ κατὰ τὴν ἔρησιν εἰς ἔτερον ἐμβάλλεινθυρμόν, ὡς ἐπὶ κράμῃς τοῦ ἄρον ἀπεβίωντο καὶ φακῆς ἐπίτητα. κατὰ δὲ Κυρήνην ἐμπάλαν έχει τὸ φυτὸν ὡς πρὸ τῇ τῆν παρ’ ἡμᾶν χώραν. ἥκετα γάρ ἐτί φαρμακώδες καὶ ὀρμῖ κῦ τὸ ἄρον ἐν ἐκείνοις τοῦ τόπῳ, ὡς καὶ τὸν γογγολίδον εἶναι κρητικώτερον. καὶ διὰ τοῦτο καὶ εἰς Ἰταλίαν κομίζουσι τὴν ῥίζαν, ὡς ἤν καὶ διαμένον πυθόμενον χρῶνον πλεονον χορφὴ τοῦ οἰκῆνα τα καὶ βλαστήτα. πρόδηλον δ’, ὅτι πρὸς μὲν τροφὴν ἢ τοιοῦτο κρεῖπτον ἐκεῖ, εἰ δὲ τὰ ἀνυπήμενα ἐκ ὀρομάκος τε καὶ πλεοτύρος βουλεύοτο τοὺς ἐν αὐτοῖς ἀθροιζόμενον ὑγρῶν παχοῖς ἢ γλύκερον, ἢ ὀρμινέτα καὶ φαρμακώδετα ἐξελέγειν. ἔκθεται δὲ δι’ ἰδίου ἐνθησίεα μετά νάσεως ἢ μετ’ ἰδίους τῶν νεκρῶν καὶ γάρῳ καὶ μέντοι καὶ μεθ’ ὑποτρήματον ἄλλων τε καὶ τὸν ἐλαίῳ καὶ γάρῳ καὶ μέντοι καὶ μεθ’ ὑποτρήματον ἄλλων τε καὶ τῶν διὰ τοῦ ἐκθομμένον. ὡς ἄδηλον δ’, ὅτι καὶ ὃ ἐξ αὐτοῦ ἀναδιδόμενος εἰς ἑκάταρ τοῦ καὶ ἄλλον τὸ σώμα χρύσος, ἢς ὁ ἀφέθη τὰ κράτα, παρατερεῖ τὸ ἐκεῖ, ἐκεῖ ἔπει τῶν γογγολίδον ἐδράειται, καὶ μάλιστο’ ὅταν ὁκεύ ναί μίσθαι, καθήπασα αἱ ἀπὸ τῆς Κυρήνης, αὐρακίαςκοις, παρ’ ἡμᾶς γάρ ἐν Ἀζίᾳ πολλά τῶν ἄρων ὀρμινέτα τ’ ἐκεῖ καὶ ἕδη φαρμακώδη τὴν δύναμιν ἔχει.

1070 Ifadäh 47; Lewicka 2011: 248.
1071 Grimaldi 2014: chapter VI.
kolokasion’ (παρὰ τοῖς κυπρίοις κολοκάσιον λέγεται). In his influential commentary on Dioscorides (I Discorsi), the Italian Renaissance botanist Pietro Andrea Mattioli (1565) described taro as the ‘arum of Egypt’ (aro d’Egitto) and remarks that the corms were called colocasia.

### iii. Qarqas

The crop named qarqas or qeriqas in the Mishna, the earliest work of rabbinical literature, (early 3rd century CE) has conventionally been interpreted as taro at least from the time of Maimonides (1135-1204) based on later equations of qarqas with qolqas, the Arabo-Hebraic term for taro (Ma’as. 5:8: קפקכ וקפקכ פק פוקי פק מי פק). While qolqas is ultimately derived from the Greek kolokasion (see above), the etymology of qarqas/qeriqas is unknown. It is said in the Mishna to be exempt from tithing alongside other cultivars foreign to the land of Israel (e.g. Baalbek garlic; Rikhpa onion; Egyptian lentils; Cilician grits). Judging from the limited geographical scope of the other cultivars named in the text, qarqas/qeriqas could not have come from beyond the Eastern Mediterranean zone. Otherwise there is little contextual information in the Mishna regarding the identity of the plant. Korkasi, the name of taro in the Coptic language of Egypt provides a remarkably close cognate to the Mishnaic qarqas/qeriqas as does the Arabic orthographic variant qorqas instead of the regular qolqas. The form qorqas is found, for instance, in the text of the 12th century Sevillian Ibn al-‘awwām’s Book of Agriculture. If qarqas/qeriqas is indeed an older Semitic term for taro, the phonetic similarities to the Greek-derived qolqas may have led to confusion and conflating of both terms.
D. Conclusion: Routes of dispersal and the utility of taro as a food crop

Like the Indian lotus, the ancient attestations of taro are centred on the Nile valley and immediately adjacent regions. Taro was certainly not grown in the Western Mediterranean, since Pliny is completely unaware that the Theophrastean oetum and his Egyptian aron are the one and the same. Galen, notes that the aron from Cyrene (Libya) was exported to Italy, indicating that while taro was consumed in Italy, it was not locally grown.\(^\text{1077}\) As for Mesopotamia and Iran, the taro remains invisible in native written and archaeological records much as the Indian lotus is. This means that taro was not grown in either region at least until the medieval period\(^\text{1078}\) or that it has yet to be identified in textual and archaeological materials. Consequently there are two potential routes of dispersal for taro to the Mediterranean: it either arrived in Egypt via sub-Saharan African trade routes or it traveled through the Middle East and reached Egypt via the Levant. It seems more probable that taro spread westwards along the Middle Eastern routes together with aquatic or semi-aquatic Asian crops like rice and the lotus.

The meagre references to taro in ancient textual sources may not necessarily mean that it was a rare food crop. Rather its estimation as low-status food probably accounts for its inconspicuousness in textual sources. Among cultures dependent on cereals for staples, the taro or indeed tuberous crops were often regarded as ‘poor man’s food’. The 14\(^{th}\) century Arabic author Ibn al-Ḥājj notes that ‘many of the weak, including old men, the poor and the young’ ate taro.\(^\text{1079}\) Taro was likewise considered inferior to a meal of rice in pre-modern China.\(^\text{1080}\) In light of its perceived inferiority in relation to cereal crops in later sources, the motivations for its westward spread remain puzzling. It could have perhaps arrived as a medicinal or ornamental plant or was a simply means to diversify cultivation in an aquatic environment. Like rice, taro could exploit swampy ecological zones unoccupied by the traditional cereal crops of wheat and barley, thus proving an attractive supplement to cultivators who had already taken up rice.

\(^{1077}\) Galen Aliment. fac. II.61.  
\(^{1079}\) Ibn al-Ḥājj, Madkhal IV.99; Lewicka 2011: 131.  
\(^{1080}\) Simoons 1991: 105-6.
X. Sissoo or Indian rosewood
*Dalbergia sissoo*

A. Introduction

They have a thousand uses and civilisation is impossible without them, declares Pliny of trees. The plant under consideration here is a tree crop but not the usual oil or fruit-producing type like olives or citruses but a timber-yielding species. While timber travelled over long distances from its forest home, mostly by sea or river, it was rarer for the timber-yielding tree itself to travel and acclimatise itself in foreign lands as sissoo did from South Asia and the Indo-Iranian borderlands to Mesopotamia and Eastern Arabia in the first millennium BCE. Sissoo, also known as Indian rosewood, is a tall grey-barked ovate-leaved deciduous tree which ranks as one of the most important timber-yielding species of South Asia. The durable termite-resistant dark-sheened heartwood of sissoo has long been valued as raw material for roofing and building construction, the manufacture of furniture, industrial and agricultural tools, kitchenware, the frames and wheels of carts and chariots and watercraft.

The natural distribution of sissoo extends from the sub-Himalayan tracts and river valleys of northern India to southeastern Iran between Baluchistan, Sistan and Kerman. The archaeological data from the Indo-Iranian borderlands and northwestern India indicates that settled populations in these regions were exploiting sissoo wood as raw material and fuel source from as early as the 5th millennium BCE. The sissoo charcoal fragments from a mid-5th millennium context in Mehrgarh and those from 4th millennium contexts in Shahi Tump and Miri Qalat in Pakistani Baluchistan are the earliest archaeologically attested specimens of sissoo. Sissoo charcoal and artefacts crafted from sissoo have also been recovered from 3rd and early 2nd millennium BCE contexts at Konar Sandal in eastern Kerman, Shahr-i-

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1081 Pliny *HN* XII.5: mille praeterea sunt usus earum sine quis vita degi non possit.
Sokhta in Sistan, Lal Shah in Baluchistan and Greater Indus Valley localities like Harappa, Mohenjo-Daro and Sanghol.\(^{1085}\)

A terracotta model of a sissoo leaf recovered from Harappa,\(^{1086}\) suggests some symbolic or cultural value ascribed to the tree in Harappan culture. Sissoo, known in Sanskrit as \(\text{śimsapā, kapila, picchila, bhasmagarbhā, yugapattrikā, mahāśyāmā and dhūmrikā}\) among other names, is well known in early Indic textual sources. The R\(g\)veda, the earliest decipherable document of Indian literature (mid- 2\(^{nd}\) millennium BCE), already attests to its use in constructing a cart or chariot.\(^{1087}\) A few other instances of its prominence in Indian texts may be cited: The Buddha famously preached the ‘Parable of the sissoo leaves’ in a grove of sissoo trees at Kosambi.\(^{1088}\) Elsewhere in a pivotal moment in the R\(ā\)m\(ā\)yaṇa epic of pan-Indian appeal, the kidnapped heroine Sītā spots her husband’s messenger, the monkey Hanumān, on a branch of a golden sissoo tree (\(kāṅcanīṃ \text{śimśupāṃ}\)).\(^{1089}\) Among the various love-potions recommended by V\(ā\)tsyāyana, the author of the Kāmasūtra, a 2\(^{nd}\) century CE treatise on erotics, is a mixture of calamus and mango butter soaked in the hollowed trunk of a sissoo tree.\(^{1090}\) The roots, leaves, bark and heartwood of sissoo have been ascribed with medicinal properties in India since antiquity.\(^{1091}\)

Although sissoo has a more westerly natural distribution compared to the other tropical and sub-tropical plant species we have examined thus far, it ought to be considered alongside crops like cotton and rice since it travelled along the same Persian Gulf trading routes to establish itself as a significant timber-yielding species in Mesopotamia and Eastern Arabia. Sissoo still grows in modern Iraq, southwestern Iran (Khuzestan) and Oman\(^{1092}\) but its importance as a source of timber is much diminished. In modern Oman, sissoo mostly grows as a relict population along

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\(^{1086}\) Vats 1940: 468.
\(^{1087}\) RV. III.53.19.
\(^{1088}\) Sa\(ṃ\)my\(y\)ut\(a\)n\(i\)k\(a\)y\(a\) 56: 31.
\(^{1089}\) V\(ā\)lm\(u\)ki R\(ā\)m\(ā\)ya\(na\) V.12.40; V.29.11.
\(^{1090}\) V\(ā\)tsy\(ā\)y\(a\)na K\(ā\)m\(a\)sū\(t\)ra VII.1.31.
\(^{1091}\) Warrier, Nambiar and Ramankutty 1994: 300-304.
wadis in the mountainous region of Jebel Akhdar. Sissoo wood whether local or imported remains, however, familiar to the Middle Eastern audiences to the present-day. The 19th century Lebanese novelist Faris al-Shidyaq casually refers, for instance, in his novel Saq 'ala al-saq or ‘Leg over leg’ (1855) to a well-appointed room with beds, alcoves, couches and chairs made from sissoo (Arabic sa'sam) among other commonly used woods.

B. Sissoo Terminology in the ancient Middle East

Sissoo wood was known in Mesopotamia as an imported wood from the last quarter of the 3rd millennium BCE onwards, long before it was locally cultivated for its timber. The Sumerian term for sissoo, mesmagana and its Akkadian equivalent musukkannu (var. mesukkannu, meskanu), literally meaning the ‘mes-tree of Magan’, indicate that sissoo was made familiar in Mesopotamia through the mediation of peoples living in the southern Persian Gulf, the toponym Magan referring to the region of modern-day Oman and occasionally the Persian coastline across the Straits of Hormuz as well (modern-day Makran of Iranian and Pakistani Baluchistan). The identification of the Sumerian and Akkadian ‘mes-tree of Magan’ with sissoo is not in doubt as a trilingual inscription (Akkadian-Elamite-Persian) of the Achaemenid Persian king Darius from his palace in Susa gives the Old Persian equivalent of the tree as yakā, a term which survives in New Persian as jag. Additionally, šeššap (še-iš-šá-ba-ut), the Elamite equivalent provided by the same inscription, is an eastern loanword related to the Sanskrit śimśapā (Prakrit sīsavā, sīsama) for sissoo.

Sissoo may have been introduced to the region of modern Oman by the late 3rd millennium BCE, hence the Mesopotamian designation ‘mes-tree of Magan’. It is more likely, however, that Oman was simply a point of transit for sissoo wood deriving from eastern Iranian and Indian ports. The earliest archaeobotanical finds of sissoo west of the Indo-Iranian borderlands are charcoal fragments and

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1094 trans. Davis 2013: 333.
wooden handles of two bronze daggers from the coastal settlement of Tell Abraq in the U.A.E dating between 2200 – 2000 BCE.\textsuperscript{1099} Tengberg and Potts contend that a local Arabian provenance for the sissoo found at Tell Abraq is not improbable.\textsuperscript{1100} Coastal eastern Arabia is, however, largely unsuited for growing sissoo trees which require well-drained sandy or loamy earth in the immediate vicinity of a perennial water-source.\textsuperscript{1101} It was not temperature but availability of water which limited the growing of sissoo trees in the vicinity of Tell Abraq. In this regard, it seems more probable that the earliest finds of sissoo in Bronze Age eastern Arabia were imports from eastern Iran or India.

C. Sissoo in Mesopotamia: Late 3\textsuperscript{rd} to 2\textsuperscript{nd} millennium BCE

The earliest appearance of sissoo in Mesopotamia, albeit obliquely as a generic wood from Magan, is in two inscriptions of Gudea, the local ruler of Lagaš in the late 22\textsuperscript{nd} century BCE who procured various exotic woods from the Persian Gulf and Indus region for the construction of a temple dedicated to the god Ningirsu:

Magan and Meluḫḫa (coming down) from their mountain, loaded wood on their shoulders for him, and in order to build Ningirsu’s House they all joined Gudea (on their way) to his city Ǧīrsu.

(Gudea E3 1.1.7 Cylinder A, column xv.8-10)\textsuperscript{1102}

A fragmentary eulogistic composition from 21\textsuperscript{st} century BCE Nippur (Ur III period) likewise exhorts the lands of Magan and Meluḫḫa to ship their timber to the royal or divine addressee.\textsuperscript{1103} As sissoo has always been identified in Mesopotamia as a product of Magan and Meluḫḫa, it seems highly probable that these early allusive passages refer to sissoo. The first explicit references to the wood derived from the ‘\textit{mes}-tree of Magan’, sometimes even said to be deriving from Meluḫḫa (i.e. Indus region) or even Dilmun (eastern Arabia; Bahrain), are found in several

\textsuperscript{1099} Tengberg and Potts 1999: 129; Tengberg 2002: 75-6.
\textsuperscript{1100} Tengberg and Potts 1999: 132; Tengberg 2002: 77.
\textsuperscript{1101} Tengberg and Thiébault 2003: 28; Andersen et al 2004: 225.
\textsuperscript{1102} cf. Gudea E3 1.1.7 Statue D iv 7-14: ‘Magan, Meluḫḫa, Gubin, and the land Dilmun – supplying him with wood – let their timber cargoes sail to Lagaš’.
\textsuperscript{1103} Michalowski 1988: 160, 163.
Mesopotamian texts dating from the 21st centuries BCE onwards. Textual sources from the Old Babylonian period (20th – 18th centuries BCE), ranging from dowry inventories of wealthy households to administrative dossiers, indicate that sissoo was used in the manufacture of tables, beds, chairs, eating bowls and other items of furniture. It is possible that sissoo was already imported into Mesopotamia during the so-called Early Dynastic IIIa period (c. 2550 – 2400 BCE). Tengberg, Potts and Francfort have identified the ovate leaf pendants with acuminate (pointed) ends in the headdresseses and necklaces of queen Puabi and her retainers at the Royal Tombs of Ur as representations of sissoo leaves. If the identification is correct, it would suggest that the sissoo tree had some symbolic significance to the elite of Early Dynastic Ur much as it did in the Harappan east.

Figure 47: Wreath necklace from PG1237 (‘the Great Death Pit’) at the Royal Tombs of Ur with gold sissoo leaf-shaped pendants (Source: Tengberg, Potts and Francfort 2008)

1106 Tengberg, Potts and Francfort 2008; Miller (2013: 130) disputes this view and maintains identification with the leaves of the poplar tree (Populus euphraticus).
1107 Ibid.
Figure 48: *Dalbergia sissoo* leaves (Source: http://indiabiodiversity.org/species/show/264596)

There is no evidence, however, for sissoo being cultivated in Mesopotamia during the late 3rd or 2nd millennium BCE. Its timber remained throughout this period an exotic and prestigious import from the Persian Gulf region. Even the dried leaves of the sissoo, which reputed to have medicinal properties, were traded across the Persian Gulf. The prescriptions of the early 13th century BCE Babylonian physician Rabâ-ša-Marduk for treating headaches contain, for instance, a recipe involving dried sissoo leaves, sourced perhaps from eastern Iran or the Indus region:

If a person experiences pulsating of the temples and his body hurts him, you crush (and) sift dried sissoo leaves. (You mix it with) *hallûru*-chickpea flour, *kakku*-lentil flour (and) *inninu*-barley flour. If you continually bandage him with (it mixed) with beer dregs, he should recover.

(c. 1300 – 1280 BCE; Scurlock 2014: 11.1)\(^{1108}\)

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\(^{1108}\) Scurlock 2014: 555 – 559 (BAM 11 = KAR 188); On the Babylonian physician Rabâ-ša-Marduk and the history of this tablet (written c. 1300 – 1280 BCE) which was removed from Babylon and brought to Assur by Tukulti-Ninurta I c. 1207 BCE see Heeßel 2009: 13-28.
Figure 49: *Dalbergia sissoo* trees in Palm Beach Gardens, Florida (Source: http://www.greenspacesconsulting.com/exoticwood.html)
D. Sissoo in Assyrian Sources: The early 1st millennium BCE

It is only in the 1st millennium BCE when explicit references to the growing of sissoo trees in Mesopotamia are encountered in Assyrian textual sources. A clay tablet from Kalšu containing an annalistic inscription of the Assyrian king Tiglath-Pileser III describes a plantation (kirû) of sissoo in southern Babylonia during the latter’s siege in 731 BCE of a town belonging to the Bīt-Amukkāni, an Aramaean chiefdom located on the lower Euphrates north of Uruk:

I confined Mukīn-zēri of (the land Bīt)-Amukkāni to Sapē (Ṣapīya), his royal city. I inflicted a heavy defeat upon him before his city gates. I cut down the orchards and sissoo-trees that were near his (city) wall; I did not leave a single one (standing).

RINAP 1 47 Obv.23b

The association of sissoo with southern Mesopotamia, specifically with the Aramaean chiefdom of Bīt-Amukkāni, is already made explicit in Assyrian sources of the 9th century BCE. An epigraph from a throne base of Shalmaneser III (858 – 824 BCE) from Kalšu indicates that the king received sissoo wood as tribute from Mušallim-Marduk, the chieftain of Bīt-Amukkāni and Adinu, the chieftain of Bīt-Dakkuri during his Babylonian campaign c. 850 BCE. While Shalmaneser III’s tribute report does not explicitly mention sissoo growing in the territory of Bīt Amukkāni and Bīt Dakkuri, there is no doubt that sissoo was cultivated in southern Mesopotamia in the 9th century BCE since Shalmaneser III’s father Aššurnasirpal II (883-859 BCE) reports in the so-called ‘Banquet Stela’ the growing of sissoo in his newly-established capital of Kalšu alongside other trophy trees he had collected through military campaigns and tribute missions. Aššurnasirpal II’s father and immediate predecessor Tukulti-Ninurta II (890 – 884 BCE) received furniture crafted from sissoo wood as tribute from the governor of Suḫu in the Middle Euphrates. This might suggest that either the sissoo tree was growing in the

1109 On the destruction of orchards in Assyrian warfare see Cole 1997 and Oded 1997.
1110 RIMA III A.0.102.61; cf. A.0.102.5 vi.7.
1111 RIMA II A.0.101.30: 43.
1112 RIMA II A.0.100.5: 68-72.
middle Euphrates region or the governor of Suḫu had sourced the wood from localities further downstream in southern Mesopotamia.

The strong association that sissoo had with the landscape of southern Mesopotamia is also demonstrated by the Assyrian king Sennacherib’s statement that he grew sissoo trees in his estates in Nineveh in an environment that was meant to evoke the marshlands (Akk. agammu) of southern Mesopotamia.1113 Sennacherib asserts that the locally cultivated sissoo trees were used in the construction of his Ninevite palace.1114 The king also received a tribute of large sissoo trees from Nabû-bēl-šumāti, the official in charge of the city Ḫararatu in northern Babylonia.1115 Sissoo is in fact amply attested in Assyrian sources of the 8th and 7th centuries BCE which if specified indicate that Babylonia was the most important source of sissoo. An official writing to Sennacherib’s father and predecessor, Sargon II (721 – 705 BCE), notes that there was not enough sissoo-wood for building construction in Babylon, revealing that sissoo orchards were present at several Babylonian localities including Babylon:

I [cannot] do [the work. There is] very [little] sissoo wood in Babylon for use in the work, (and) what they bring me from the city Birati [...] is all moist. [The king, my lord], knows that this work requires [a great deal] of sissoo wood … Now, [let them fetch] sissoo wood from Ki[ssik] or from wherever it is to be found.’  

- SAA 15 248 r. 2,10

Birati (lit. ‘fortress’) in northern Babylonia is a settlement near the city of Sippar which Assyrian state correspondence indicates is the same locality referred to in Sennacherib’s inscriptions as Ḫararatu where the king received a substantial tribute of sissoo logs from a local official.1116 Kissik like Birati/Ḫararatu has not been identified on the ground but Mesopotamian textual sources indicate that it was

1113 RINAP 3 8:4’; 16 viii 37; 17 viii 53; 18 viii 12’; 42: 49; 43:99; 46: 159;138 r ii’ 33.
1114 RINAP 3 8:7’; 16 viii 45; 17 viii 60; 18 viii 17’; 42: 50; 43: 100; 46: 160.
1115 RINAP 3 2:17; 3:17; 4:15; 8: 15; 15 i 38’; 16 i 75; 17 i 67; 18 i 1’; 22 i 54; 138 i 10’; 213: 56
1116 Dietrich 2003: xxii-xxiii.
located in the Sealand district of southern Babylonia close to the city of Ur.¹¹¹⁷ Two other 8th century Assyrian letters shed further light on the use of sissoo for building construction projects in the Assyrian heartland. An official writing to the king Sargon II requests for sissoo wood of varying sizes required in the construction of the newly established capital of Dur-Šarrukin:

(I need) six sissoo trees, each six cubits (3 m) long and one cubit (50 cm) in circumference; one haluppu fir tree, five cubits long, one cubit in circumference; ten sissoo trees, each of which are two qû measures thick; they may be either five or six cubits long’

- SAA 5 294: 9-12

The source of sissoo timber is not, however, specified in this instance. In an earlier letter from Nimrud (Kalhu) dating to the reign of Tiglath-Pileser III (744 – 727 BCE), the governor of Aššur province writing to Šarru-dūrī, the governor of the city of Kalhu (šakin Kalḥi) who was active between 734-728,¹¹¹⁸ notes that the latter had requested for sissoo-wood:

Tablet of the governor of (Aššur) province to Šarru-dūrī; health to my brother: About the sissoo-wood of which my brother wrote to me – when it has come up to me, I shall send a large quantity to my brother.

- ND 417; Postgate 1973: No. 189

It is clear that sissoo was not locally available in both cases and was almost certainly sourced from southern Mesopotamia. While Aššurnasirpal II had grown sissoo in Kalhu, it was little more than an exotic garden species in 9th century Assyria. Only Sennacherib’s inscriptions provide firm evidence for the large-scale cultivation of sissoo-trees in northern Mesopotamia although it appears that the sissoo trees were confined to well-irrigated royal estates in the capital of Nineveh. The references to sissoo in Assyrian textual sources in the period between the 9th and 7th centuries

¹¹¹⁸ On the dating of Sarru-duri’s governorship see Postgate 1973: 11.
BCE reveal that sissoo was valued as a material for manufacturing doors, roof beams, tables, beds and other items of furniture in both palatial and temple contexts. An inscription of Aššurbanipal notes, for example, his provision of furniture crafted from sissoo for the god Marduk (Bel) at his temple in Babylon sometime in the first half of his reign (668-648 BCE):

‘I had a canopy which reaches up into the heavens, made from sissoo-wood, an everlasting wood … I skilfully made a bed of sissoo-wood, an everlasting wood, that is overlaid with pašallu-gold and studded with precious gems, as a pleasure bed for the god Bel and the goddess Bēltiya’ (SAACT 10 31-54)

Aššur-etel-ilāni, Aššurbanipal’s son and successor, like his father presented the Babylonian god Marduk with sissoo furniture, in his case an offering table mounted with red šāriru-gold. Sissoo was even esteemed as a material for waxed writing boards (Akk. lē’u or daltu) on which Babylonian scholars copied literary and scholastic texts destined for the royal library of Aššurbanipal in Nineveh. Charred sissoo wood has in fact been recovered from a late Assyrian context in Dūr-Katlimmu (modern Tall Šēh Ḥamad), an important Assyrian provincial city in the Lower Ḥābūr valley of western Syria. One of these charred fragments belonged to a piece of furniture with bronze fittings, vividly confirming the textual references to furniture crafted from sissoo. The ample references to sissoo in Assyrian sources suggest that its cultivation in Babylonia was actively encouraged by the Assyrian state for use in large-scale constructions.

E. Sissoo in Babylonian, Biblical and Persian Sources: The mid-late 1st millennium BCE

With the demise of the Assyrian Empire in the last quarter of the 7th century, cuneiform documents from the south of Mesopotamia become the main witnesses for sissoo cultivation in the Middle East. Babylonian texts from private and temple
archives as well as royal inscriptions dating between the 6th and 5th centuries BCE attest to the use of sissoo in the manufacture of beds (eršu), chairs (kussû), lamp stands (bīt nûri), stands for large vessels (šiddatu), writing boards (lē’u; daltu), ceremonial brick moulds (nalbanu), ploughs (epinnu) and even a large bucket for use in a well (kannu). The inscriptions of the Babylonian king Nebuchadnezzar (605 – 562 BCE) refer to the use of sissoo for building work and furnishings at temples in Babylon and neighbouring Borsippa much as they had been used in Assyrian times. The furniture crafted from sissoo was, by this period, accessible to wealthier private citizens in Babylonia since it appears in marriage agreements as part of the dowry. One such marriage agreement from Borsippa dating to 493 BCE refers to an ornate ‘chest of sissoo wood (adorned) with the features of a gazelle’ (šā pāñī šaḇīṭī). Even the leftover shavings of sissoo wood were used in Babylonian temples for burning incense.

The author of Deutero-Isaiah, a Hebrew prophetic book dated to the late 6th century BCE and written in the context of the Judaean exile in Babylonia and the return under Cyrus the Great of Persia, decries idolaters and their images made of the mskn-wood (מְסַה), the Hebrew equivalent of the Akkadian musukkannu for sissoo (Isaiah 40.20). The Masoretic vocalisation in fact accurately preserves the Akkadian variant spelling mesukkannu. Deutero-Isaiah also describes the wood as one that will not rot (40.20: קַדָּמֵץכע), mirroring the description of sissoo as one that is ‘durable’ or ‘everlasting’ (Akk. dārê/ dārû) in Assyrian and Babylonian royal inscriptions. Deutero-Isaiah’s suggestion that images of deities, undoubtedly in reference to Babylonia, were fashioned with sissoo is confirmed by an early 1st millennium BCE Mesopotamian ritual text series called the mīs-pē or ‘washing of...
the mouth’ which refers to a divine image crafted from sissoo among several other woods. The Assyrian king Esarhaddon’s inscriptions detailing his building works in Babylon also note that the pedestal and footstool of the image of the goddess Tašmētu within the temple of the god Marduk was made of sissoo wood.

There is no doubt that the sissoo referred to in Babylonian texts continued to be sourced locally. Land lease documents from the archives of the Ebabbar temple in Sippar dating to the last quarter of the 7th century refer to orchards of sissoo trees located along canals in an estate owned by the temple at Bēl-iqbi, a riverside locality south of Babylon. Several late 6th century documents from the same archive name a sluice in a canal near Sippar as the ‘sluice of the sissoo-trees’ (biṭ qa-ša-musukkanni), indicating that a grove of sissoo trees was located in the vicinity of the city of Sippar as well. Sissoo orchards in the Sippar region were no doubt of great antiquity since the town of Birati/Hararatu in the vicinity of Sippar was already noted in Assyrian sources of the late 8th and 7th centuries BCE as a significant source of sissoo timber.

While Babylonian cuneiform documents dating to the early Achaemenid period indicate that the local sissoo orchards continued to be active in supplying domestic needs, there were apparently no sissoo trees growing in Babylonia of a size required for the construction of the monumental palace of king Darius at Susa. The foundation charter of Darius for his palace in Susa records that sissoo was sourced from its native habitat in Karmāna (modern Kerman) and Gandāra in northwest India for his construction needs. The fate of sissoo plantations in Mesopotamia in later periods is unclear. Greek texts refer to the export of sissoo timber from Indian ports to the Persian Gulf. The Periplus Maris Erythraei refers to the export of sissoo and other timbers to the Persian port of Omana (ῥαλαγγων σησσωμίνων). Two coffins from the site of Shakhoura in northern Bahrain, carbon-dated to the 1st century BCE, were made of sissoo. The 3rd century CE Samaritan Targum or translation of the Hebrew Bible into Samaritan, a western Aramaic dialect, provides

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1133 RINAP 4 48 r. 91; 51 iv 9.  
1134 Jursa 1995: 126-127 (BM 49930); Da Riva 2002: 111-5 (e.g. BM 50350; BM 114781).  
1135 cf. the 6th century ‘Christian Topography’ of Cosmas Indicopleustes (attributed) reports the export of sissoo from the port of Kalyana near modern Mumbai (11, 15: σησσωμα ζύλα).  
the equivalent of ‘gopher-wood’, the material out of which Noah’s ark was built, as sissoo (Gen. VI.14: Samaritan sysam).\textsuperscript{1137} It seems likely that sissoo continued to be grown on a modest scale in parts of Mesopotamia and eastern Arabia to service local needs but large-scale construction projects invariably required the import of timbers from eastern Iran and India.

F. Conclusion: Chronology of dispersal and the appeal of sissoo

The earliest Assyrian sources to document sissoo in southern Babylonia do not shed light on the issue of when and by whose agency sissoo was introduced into cultivation. All that can be surmised is that sissoo was growing in Babylonia by the late 10\textsuperscript{th} century BCE if not earlier since the Assyrian king Aššurnasirpal was able to procure sissoo saplings for his royal gardens in Nimrud in the early 9\textsuperscript{th} century. The long-standing familiarity of sissoo-wood in Mesopotamia means that it is unhelpful to credit any single polity with the introduction of sissoo as a cultivar. The rise of sissoo as a plantation crop in southern Mesopotamia was probably the result of experimentation within the context of royal and temple estates. It is likely that the sissoo tree established itself in Mesopotamia in a series of re-introductions rather than being rooted in a singular event.

The paucity of good timber in the semi-arid alluvial plains of southern Mesopotamia combined with the ease of water transportation are the most obvious factors motivating the introduction of sissoo as a local cultivar. Boat builders in the Persian Gulf region have relied on imports of tropical woods for constructing the frame of seafaring watercrafts up until the present-day.\textsuperscript{1138} The Persian Gulf and the Indus region were not, however, the sole sources for wood used in southern Mesopotamia. Land trade routes leading from the Zagros and the Caspian region in the east and from Lebanon and Anatolia in the west brought numerous other varieties of timber into Mesopotamia. The cedar of Lebanon (\textit{Cedrus libani}) is, perhaps, the best known of the exotic timbers used in ancient Mesopotamia for large-scale construction activity.\textsuperscript{1139} Not all exotic trees were, however, capable of growing

\textsuperscript{1137} Löw 1881: 65; Gershevitch 1957: 319.
\textsuperscript{1138} Willcox 1992: 5; cf. the 9th century CE Belitung shipwreck off Sumatra, a trading ship made in the Persian Gulf which was crafted from tropical wood species imported from Africa and India (Flecker 2008).
\textsuperscript{1139} Willcox 1992: 7.
locally. Sissoo is particularly well adapted to growing in Mesopotamia since it is a drought-resistant species, tolerant of cold winters and most importantly a fast-maturing species. Sissoo plantations already had a model in southern Mesopotamia in the form of irrigated date palm plantations. The uses of sissoo were largely limited to supplying good-quality timber needed for roofing large buildings, door construction, columns and high-quality furniture. It was too precious to be used as a fuel-source. The leaves were ascribed medicinal properties in both South Asia and Babylonia and could also be used as fodder for livestock. The oil extracted from sissoo seeds is presently used as insect-repellent and a treatment for skin diseases although it is not clear if this function was known in antiquity.

While the introduction of sissoo as a local cultivar was not the doing of the Assyrians, the frenzied building activity of the Assyrian state and its immediate successors ultimately encouraged the expansion of sissoo groves in southern Mesopotamia and, for a brief moment in the 7th century BCE, in the Assyrian capital of Nineveh as well. The later history of sissoo plantations in Mesopotamia and Eastern Arabia is presently unclear but the timber of this species remained familiar to Persian Gulf societies and the wider Middle Eastern world till present-day, testifying to its high estimation since antiquity.

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XI. Minor Crops – Sugarcane, Jasmine and Betel Nut

A. Introduction: Minor crops and dubious attributions

This chapter considers the case of three tropical Asian plants, the sugarcane, jasmine and the betel nut palm, which had a minimal impact on Middle Eastern and Mediterranean culture in antiquity. Unlike jasmine for which there is archaeobotanical evidence from Egypt, there is no certainty that the sugarcane and the betel nut palm were cultivated in the Middle East in antiquity. In the case of the betel nut palm, the identification of the tree in pre-Islamic sources is not entirely certain. If the sugarcane and the betel nut palm were cultivated in the ancient Middle East at all, both species were limited to the monsoonal littoral zones of South Arabia (modern-day Oman and Yemen).

Two other South Asian crops, the pigeon pea (*Cajanus cajan*) and the sebeseten plum (*Cordia myxa*), are reported present in the ancient Mediterraneo-Middle East zone but the data cited for both is problematic and hence will not be treated as positive evidence for east-west crop movements. Pigeon pea or red gram (*Cajanus cajan*) is a tall shrub with edible pulse-seeds originating in northeastern India (Odisha, Telengana, Chattisgarh) where the wild progenitor, *Cajanus cajanifolia*, is still to be found. A single seed among food offerings from a tomb at Thebes (Dra Abu el Nega) in Egypt dating to the 12th Dynasty (1994 – 1781 BCE) was identified by Schweinfurth in the late 19th century as pigeon pea. The find has been well published and the identification of the seed as *Cajanus cajan* has been reiterated by scholars of a more recent age. The exceptionally early age of the find raises, however, suspicion about its identity. The earliest archaeologically attested specimens of pigeon pea in India are two cotyledons from Gopalpur in Odisha dating to an early 2nd millennium BCE context. *Cajanus cajan* is subsequently attested at various Deccani and Odishan sites (Tuljapur Garhi, Peddamudiyanam, Sanganakkallu and Golbai Sasan) throughout the 2nd millennium BCE. It seems highly improbable that pigeon pea was transmitted to Egypt when it was only just

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1143 Schweinfurth 1884: 314-5.
1145 Harvey et al 2006: 29.
1146 Fuller and Harvey 2006: 225.
emerging as a significant crop in eastern India. Pigeon peas were, nonetheless, brought to East Africa at a later age but the chronology of the transmission is uncertain and beyond the scope of the present study. I propose that the Theban find is a misidentified legume.

The second problematic ‘South Asian’ introduction to the Middle East and the Mediterranean is the sebesten plum (*Cordia myxa*), also known as gunda or Egyptian plum. The sebesten plum is a deciduous tree, growing up to five metres in height, valued for its sweet and sticky orange-coloured fruits. The natural distribution of the sebesten plum extends from western India to eastern Iran. Sebesten plum seeds have been recovered from several Neolithic and Chalcolithic sites in western India and the Deccan, attesting to its consumption in prehistoric South Asia.

Numerous archaeobotanical finds from Egypt, dating as early as the mid-3rd millennium BCE have been claimed to be sebesten plums. Täckholm reports a sebesten fruit stone from Saqqara allegedly contemporary with the pyramid complex of the 3rd dynasty Pharoah Djoser (c. 2630 – 2611 BCE). Several *Cordia* fruit stones were found at the 5th Dynasty funerary complex in Abusir (c. 2465 -2323 BCE). More securely dated archaeological samples of sebseten plums, which include branch and fruit remains, derive from Middle Kingdom Thebes (early 2nd millennium BCE). For the latter half of the second millennium, sebesten is reported as fruit stones from 18th dynasty Deir el-Medina (c. 1550 – 1295 BCE). In later periods there is a profusion of archaeobotanical evidence for sebesten plums. Fruit stones if not whole dried fruits are known from the archaeobotanical assemblages of Greco-Roman sites like el-Hibeh (3rd – 2nd centuries BCE), the ibis sanctuary at Saqqara (3rd – 2nd centuries BCE), Mons Porphyrites (late 1st –

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1149 Asouti and Fuller: 57, 99.
1150 Täckholm 1961: 29; The dating has been accepted by some scholars (Wetterstrom 1984: 59; Cappers 1998: 318; Murray 2000: 626).
1153 Täckholm 1961: 29; Germer 1985: 159; Murray 2000: 626.
1154 Wetterstrom 1984: 59.
1155 Hepper 1981: 147.
The exceptionally early presence of an Indian species in Egypt is difficult to explain and it is extremely unlikely that a single species travelled such great distances without leaving any other traces of westward journey. Malleson proposes that the sebesten plums from Egyptian sites of the 3rd and 2nd millennium BCE are misidentifications of a related species, *Cordia sinensis*, which is a native of Africa. The Indian *Cordia* species is, however, certainly present in later samplings, particularly those of the Greco-Roman period which have been well published. Further research is needed to clarify the distribution of African and Asian *Cordia* species as well as their identification in the archaeological records before any judgment can be made on the timing, dispersal and use of the Indian sebesten plum in ancient Egypt. The sebesten plum will therefore be omitted from the present discussion.

### B. Arabian Jasmine (Jasminum sambac)

*Jasminum sambac*, while commonly called the Arabian jasmine, is a native of South Asia. The shrub, which grows up to two metres in height, is chiefly cultivated for its white flowers possessed of a sweet heady fragrance. Apart from functioning as an ornamental, the flowers are harvested for use in perfumery, medicine and the flavouring of food and beverages. It is widely cultivated across tropical Asia and is particularly favoured in India for use in worship and personal adornment. The Agni-Purāṇa, a Sanskrit text of mythological content, claims that the offering of jasmine to the gods absolves sin (AP 202.002cd: *mallikā sarvapāpaghnī*). Charcoal

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1156 van der Veen and Tabinor 2007: 93.
1157 van der Veen 2001: 180-3.
1158 van der Veen 2011: 153.
1160 Täckholm 1961: 30; Murray 2000: 626.
1161 Malleson 2013.
1162 van der Veen 2011: 151-3.
1163 Germer 1985: 152; Lim 2014.
1164 Lim 2014: 530.
from late Harappan Sanghol yielded evidence for a jasmine species, perhaps the *Jasminum sambac*.\footnote{Fuller and Madella 2001: 365; Saraswat 2014: 209}

In the modern Middle East, *Jasminum sambac* is commercially cultivated in Iran, Oman, Yemen and Egypt.\footnote{Green 1986: 413; Varisco 2002: 344; Edris et al 2008; Ghehsareh et al 2015.} Three dessicated *Jasminum sambac* flowers were identified in desiccated wreaths from the Greco-Roman necropolis of Hawara in the Faiyyum.\footnote{Newberry 1890: 47.} Another corolla of *Jasminum sambac* was identified among in an ancient Egyptian wreath procured by the Natural History Museum in Milan in the late 19th century but the date and context of the find is not known.\footnote{Germer 1985: 153; Schweinfurth 1884: 314; The bud is misidentified as a late New Kingdom find from Deir el Bahri in older publications.} Germer speculates that the Arabian jasmine was introduced to Egypt from India in the Greco-Roman period as a garden ornamental.\footnote{Germer 1985: 153.} It is likely that the jasmine was already growing in the regions of modern-day Oman and Yemen at an earlier date. Woelk proposed that an unnamed quick-fading fragrant plant of Arabia mentioned by Agatharchides of Cnidus\footnote{ap. Diod. Sic. III.46.2, Strabo XVI.4.19.} in his description of Arabia (2nd century BCE) is a reference to Arabian jasmine.\footnote{Woelk 1965: 238.} The Egyptian finds may thus represent a slow spread of this garden flower to regions further north rather than a direct import from India. Like other tropical garden flowers and fruit trees, *Jasminum sambac* needs a steady water supply and was probably cultivated within irrigated date palm groves much as it still is in modern Yemen and Oman.\footnote{Green 1986: 413.}

C. Sugarcane (*Saccharum* spp.)

Cultivated sugarcane is derived from a family of perennial grasses (*Saccharum*) distributed from India to Southeast Asia. *Saccharum robustum*, native to Papua New Guinea, and *Saccharum spontaneum*, native to northern India, are the wild ancestors of cultivated sugarcane varieties, which are invariably interspecific hybrids.\footnote{Bonnett and Henry 2011; Moore, Paterson and Tew 2014; Zhang et al 2014: 624.} *Saccharum officinarum*, the main genetic contributor to cultivated sugarcane is believed to be a selection from the wild New Guinean species *Saccharum*
Sugarcane is primarily valued for the high concentration of sucrose in the pith of its stem and accounts for the bulk of sugar production worldwide today. Sugarcane (Sanskrit *ikṣu*; Prakrit *ucchu*) is already referred to in Vedic texts dating from the late 2nd millennium BCE, but the tedious processing techniques leading to the production of dry granulated sugar, an Indian innovation, probably date to the late 1st millennium BCE. In ancient India, cane sugar like sugars derived from date, coconut and toddy palms typically availed itself as syrup and as jaggery, a solid unrefined sugar concentrate (see Table 3 for Sanskrit terms relating to processed sugar). It was this form of sugar which Megasthenes, the Seleucid ambassador to the Mauryan court, reported as a ‘frankincense-coloured rock sweeter than figs and honey.’

Table 3: English, Sanskrit and Chinese terms for processed sugar (Source: Daniels and Menzies 1996: 374)

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1176 Macdonell and Keith 1912: 74-5, Gopal 1964; Note also *ikṣvāku*, a personal name and the name of a clan derived from the term for sugarcane. The sugarcane is known by several other names in Sanskrit including *rasāla, puṇḍra* and *kāntāraka*. Southworth (2005: 218) proposes that the Indo-Aryan terminology relating to sugar and sugarcane is of Dravidian origin thus suggesting an earlier acquaintance with sugar and sugarcane in the Indian subcontinent. For references to sugarcane in early Buddhist and Jain texts see Malalasekara 1937: 341-2; Jain 1984: 117-8 and Mitra 1985: 373.
While Greek knowledge of the sugarcane began with the Indian campaign of Alexander,\(^{1179}\) the peoples of the Mediterranean were not familiar with the sugarcane plant or of processed sugar as an imported product until the 1\(^{st}\) century CE. The earliest Greek reports on sugarcane are vague and simply describe the plant as a honey-yielding reed (κάλαμος).\(^{1180}\) The Greek term σάχαρον (var. σάχαρ, σάκχαρο) and its Latin cognate saccharon, deriving from an Indian source referring to crystallised sugar (Sanskrit šarkārā; Prakrit sakkharā), are only attested in Greco-Roman texts from the 1\(^{st}\) century CE onwards.\(^{1181}\) The rarity and cost of imported cane sugar meant that it was not commonly used for sweetening food in the ancient Mediterranean for which honey, figs and dates were available but was instead applied as a medicinal ingredient.\(^{1182}\) It was not until the Islamic period when sugarcane was cultivated anywhere in the Mediterranean.\(^{1183}\)

It is likely that the Achaemenid Persian overlords of northwest India knew of sugarcane since Alexander’s informants were already aware of its economic use. The earliest history of the use of sugar and sugarcane cultivation in the Middle East is, however, unclear for lack of native sources on sugar until Late Antiquity. Dioscorides writing in the 1\(^{st}\) century CE claims that the sugarcane grew in both southern Arabia and India.\(^{1184}\) Pliny likewise remarks that Arabia produces cane sugar but that of India is more esteemed.\(^{1185}\) Both Dioscorides and Pliny were far-removed from the regions they described and hence potentially misleading on the cultivation status of sugarcane in southern Arabia (modern-day Yemen and Oman). It is possible that Arabia was simply a transit point for sugar exports from India and not a centre of sugarcane cultivation. The mistaken references in Greco-Roman texts to Indian and Southeast Asian spices like cassia, cinnamon and ginger being grown

\(^{1179}\) Nearchus ap. Strabo XV.1.20. 
\(^{1180}\) Nearchus and Eratosthenes ap. Strabo XV.1.20; the honey-yielding reeds of Theophrastus’s lost treatise on honey which was epitomized by Photius probably referred to sugarcane as well (Shariples 1995: 208-209); cf. Diod. Sic. II.36.5 (oblique reference to sugarcane as sweet roots in Indian marshes from an unnamed Hellenistic source), Lucan III.237 (tenera dulces ab harundine sucos) and Seneca Epistles 82.4 (apud Indos mel in arundinum foliis).

\(^{1181}\) Brust 2005: 565-6; The English word sugar and its European cognates ultimately derive from the same Indian terms albeit via the Arabic sukkar.

\(^{1182}\) Dioscorides Mat. Med. II.82.5; Pliny HN XII.32; Galen Simpl. med. 12.71; Oribasius Collections medicæ 15.1.12.15; Pseudo-Alexander of Aphrodisias Problems 3.2; further citations in Brust 2005: 563-4.


\(^{1184}\) Dioscorides Mat. Med. II.82.5.

\(^{1185}\) Pliny HN XII.32: saccharon et Arabia fert, sed laudatias India.
in Arabia caution against a straightforward acceptance of the references to Arabian sugar.\textsuperscript{1186} The Periplus Maris Erythraei of the 1\textsuperscript{st} century CE only speaks of Indian sugar exports to African ports and has nothing to say on sugarcane cultivation in Arabia.\textsuperscript{1187}

The earliest Arabic records for sugarcane cultivation in southern Arabia only date from the 9\textsuperscript{th} century CE onwards.\textsuperscript{1188} Sugarcane was known, however, to have grown at an earlier date in parts of the Sasanian Empire (3\textsuperscript{rd} – 7\textsuperscript{th} centuries CE), particularly in Mesopotamia and neighbouring Khuzestan (southwestern Iran), literally the ‘land of sugarcane (kuz)’.\textsuperscript{1189} It is quite possible therefore that sugarcane was cultivated on a modest scale in parts of Oman and Yemen even earlier around the turn of the 1\textsuperscript{st} millennium. Nonetheless it was only in the medieval period, particularly from the 10\textsuperscript{th} century CE onwards, when the cultivation of sugarcane became intensive and widespread across the Middle East and the Mediterranean.\textsuperscript{1190} The labour-intensive nature of sugarcane cultivation probably dissuaded its diffusion across the Middle East in earlier periods.

**D. Betel Nut Palm (Areca catechu)**

‘It grows in Linyi (southern Vietnam), where the people consider it valuable. Visiting relatives and guests of the family must first be presented with this. If by chance the presentation is overlooked or forgotten, it will induce enmity.’

- Ji Han, Nanfang caomu zhuang (Plants of the Southern Regions, c. 304 CE trans. Li 1979: 111)

The betel nut or areca nut palm (Areca catechu) is a slender pinnate-leaved palm species native to Southeast Asia.\textsuperscript{1191} The nut or more accurately the seed endosperm of the palm is chewed as a masticant, digestive, medicament and aphrodisiac in

\textsuperscript{1186} e.g. Pliny \textit{HN} 12.14.
\textsuperscript{1187} PME 14.
\textsuperscript{1189} Watson 1983: 26, 160; Floor 2009 (sources in Middle Persian, Chinese and Arabic).
\textsuperscript{1191} Fuller 2007: 427; Boivin et al 2013: 215; Rangan et al 2015: 137; Hoogervorst 2013: 47.
tropical Asia, the littoral zones of the Middle East and East Africa.\textsuperscript{1192} The pounded or sliced areca nut is typically wrapped in a betel leaf (\textit{Piper betle}), derived from a creeping vine native to Southeast Asia, along with slaked lime and spices like cardamom, nutmeg and clove. The chewed quid of the betel leaf and areca nut which reddens the gums and freshens the breath is not consumed but spat out. In traditional South and Southeast Asian societies, no auspicious event or festival went unmarked without the presentation of betel leaf and areca nut (Skt. \textit{tāmbūla}). Its role in social intercourse across classes was universal and the offering of betel and areca nuts represented a ‘sign of goodwill to guests, affection in courtship, and honour at court’.\textsuperscript{1193}

Figure 50: Fresh betel nuts with betel leaves, market in Chennai, South India
(Source: https://ta.wikipedia.org/wiki/P1030170.JPG)

Throughout tropical Asia, a distinctive and elaborate culture developed around the use of areca nuts and betel leaves as a convivial food. This custom has led to the production of distinctive equipment aiding consumption like betel quid spittoons (Skt. \textit{pūgapīṭha}), nippers or scissors to dice the areca nuts (\textit{ṣaṅkulā}), areca nut crackers (\textit{udvegakartarī}) and compartmentalized boxes in gold, silver, lacquer and other precious materials for holding betel leaves, areca nuts and aromatic accompaniments (\textit{sthagī, pūgapātra, tāmbūlakaraṅka, upahastikā}). There were not only peddlers of betel (\textit{tāmbūlīka}) but men of rank could even afford betel-bearers

\textsuperscript{1192} Zumbroich 2007.
\textsuperscript{1193} Danslip and Freeman 2002: 26.
(vāgguli; tāmbūlādhikāra). Owing to its carcinogenic properties and the invariable teeth staining, the consumption of areca nuts and betel leaves is greatly reduced today but it still holds a place on honour in ritualized settings like weddings, funerary offerings and religious ceremonies.\textsuperscript{1194}

Figure 51: Lacquered Burmese betel nut boxes (kun-it), late 19\textsuperscript{th} – early 20\textsuperscript{th} century CE (author’s collection)

The consumption of areca nuts is of great antiquity in Southeast Asia. Betel-stained human dental remains from the Duyong cave in Palawan in the southern Philippines attest to the chewing of areca nuts in a mid-3\textsuperscript{rd} millennium BCE context.\textsuperscript{1195} It is not clear, however, as to when the betel nut palm spread from Southeast Asia to India. The reconstruction of Proto-Dravidian terms for the betel nut suggest a familiarity with the palm species by the late 2\textsuperscript{nd} millennium BCE.\textsuperscript{1196} Betel nuts have been identified at the site of Sanghol in Punjab but these botanical remains date to the 1\textsuperscript{st} to 2\textsuperscript{nd} centuries CE\textsuperscript{1197} when the use of betel nuts was widespread throughout India as indicated by contemporary Indian literature.\textsuperscript{1198}

The earliest history of betel nut use and cultivation in the Middle East is unclear. As the betel nut palm does not tolerate temperature fluctuations, it will not grow in most of the Middle East except in the fertile monsoonal littoral of the Arabian Peninsula, namely the Batinah plain of Oman and coastal Yemen where it is still

\textsuperscript{1194} Gutierrez 2014.
\textsuperscript{1195} Zumbroich 2007: 99; Hoogervorst 2013: 48;
\textsuperscript{1197} Saraswat 2014: 211.
\textsuperscript{1198} Zumbroich 2007: 116-120.
cultivated.\textsuperscript{1199} Late medieval Yemeni agricultural treatises (13\textsuperscript{th} – 14\textsuperscript{th} centuries CE) testify for the local cultivation of the betel nut palm.\textsuperscript{1200} The 9\textsuperscript{th} century polymath al-Dīnawārī and the 14\textsuperscript{th} century explorer Ibn Battuta refer to the cultivation of the betel vine (\textit{Piper betle}) in Oman.\textsuperscript{1201} This creeper is not usually grown in isolation but is almost always cultivated together with the betel nut palm. Despite localized cultivation, India remained the main purveyor of betel nuts to the Middle East as suggested by the 12\textsuperscript{th} century letters of Egyptian Jewish merchants found among the documents of the voluminous Cairo Geniza archives.\textsuperscript{1202} One such 12\textsuperscript{th} century letter from the archive of a merchant named Abraham ben Yijū refers to the shipment of some six thousand areca nuts from India to Aden in Yemen.\textsuperscript{1203} A single archaeological specimen of an areca nut, radiocarbon dated to the late 12\textsuperscript{th} or early 13\textsuperscript{th} century, was recovered from the Egyptian Red Sea port of Quseir al-Qadim.\textsuperscript{1204} This find almost certainly represents an import from Arabia or India.

While it is clear that the areca nut was known in the Islamic Middle East, its use and cultivation in the pre-Islamic period remains a moot point. The single ancient author who cites a plant in the Middle East whose properties and uses precisely match with the areca nut is the Hellenistic scholar Pseudo-Democritus (2\textsuperscript{nd} – 1\textsuperscript{st} century BCE)\textsuperscript{1205} whose comments on exotic eastern plants are preserved in Pliny’s Natural History:

‘According to the same authority (Pseudo-Democritus) the \textit{hestiateris} is a Persian plant, so named from its promotion of good fellowship, because it makes the company gay; it is also called \textit{protomedia}, from its use to gain the highest position at court; \textit{casignete}, because it grows only in company with

\textsuperscript{1199} Scott 1946: 594.  
\textsuperscript{1201} Ubaydli 1993: 36-37; Rangan et al 2015: 137.  
\textsuperscript{1202} Goitein and Friedman 2008: 326, 347, 557-8, 566-7, 570, 598, 609, 612, 625, 629, 640, 648, 658-660.  
\textsuperscript{1203} Goitein and Friedman 2008: 659.  
\textsuperscript{1204} van der Veen 2011: 59-60.  
\textsuperscript{1205} See Keyser and Irby-Massie 2008: 238 on Pseudo-Demokritos.
its own species, and not with any other plants; also dionysonymphas, because it goes wonderfully well with wine.\footnote{1206} The French botanist René Louiche Desfontaines (1750 – 1833) in his Latin commentary to Pliny’s text was the first modern scholar to link Pseudo-Democritus’s \textit{hestiateris} with the betel nut palm.\footnote{1207} Later commentators have since cautiously echoed his proposal.\footnote{1208} None of Pseudo-Democritus’s names for this ‘Persian plant’ are eastern loanwords. Rather they are Greek words elaborating specific properties, thus indicating only a secondary acquaintance with the plant. \textit{Hestiateris} derives from the Greek ἐστία meaning hearth or home. All verbal and nominal derivatives of ἐστία have strong semantic associations with hosting, banqueting and entertainment (ἐστάω; ἐστίασις; ἐστιάτωρ; ἐστιατήριον; ἐστιατορία).\footnote{1209} \textit{Hestiateris} can thus be translated as the ‘the convivial plant’. The encouragement of conviviality among guests is, of course, among foremost roles assumed by the betel nut. Pseudo-Democritus’s plant was also known as \textit{protomedia} or ‘foremost among the Medes’ owing to its role in socializing at the Persian, presumably Achaemenid, court and \textit{dionysonymphas} or ‘bride (νύμφη) of Dionysus’ for its intoxicating effects in the manner of wine. The latter description fits well with the psychoactive properties of the betel nut. The fourth descriptive label κασιγνήτη, literally ‘sister’ or perhaps better translated as ‘kindred plant’, possibly suggests a cultivated plant grown in a plantation rather than a wild species.

The description of the unnamed Persian plant as one ‘of the hearth’ or as a sister and bride invokes a familial setting but also hints at gendered patterns of consumption. In this regard, one of the many synonyms in Sanskrit for the betel chewed with the areca nut is \textit{strīrañjana} or ‘favoured by women’. One Iranian bridal custom dictates that the bride should chew a mixture of ground cloves and areca nuts wrapped in a citrus leaf after the wedding dinner.\footnote{1210} In India, the betel leaf and areca nut hold

\begin{itemize}
\item \textit{Pliny HN} XXIV.165: Hestiaterida a convictu nominari in Perside, quoniam hilarentur illa, eandem protomedium, qua primatum apud reges obtineant, casigneten quoniam secum ipsa nascatur, nec cum aliis ullis herbis, eandem dionysonymphadum, quoniam vino mire conveniat.
\item \textit{Desfontaines} 1830: 462.
\item \textit{Bostock and Riley} 1856; \textit{Dymock, Warden and Hooper} 1893: 522; \textit{Bayer and Brodersen} 2004: 379, 384.
\item \textit{Hestiateris} – v. to receive at one’s home, feed, receive as guest, entertain; ἐστίασις – n. feasting, banqueting; ἐστιάτωρ – n. host of a banquet; ἐστιατήριον – n. banqueting hall; ἐστιατορία – n. feast.
\item \textit{Motta} 1993.
\end{itemize}
erotic symbolism, the nut having phallic associations and the acuminate leafs of the betel representing female genitalia. During the flirtatious nuptial games enacted between bride and bridegroom in India, an attempt is made to bite off a rolled betel leaf lined with areca from the mouth of either member.

While the *hestiates* of Pseudo-Democritus is remarkably similar to areca nuts in its properties, the plant cannot be identified with certainty. There is, however, additional cause to infer a pre-Islamic acquaintance with the betel nut palm in the Middle East. Medieval Arabic and Persian sources record the forms *fūfal, faufal* and *pūpal* for the betel nut which are all loanwords from the Sanskrit *pūgapāla* (lit. ‘fruit of the areca’). The renowned Abbasid physician Rhazes quotes, however, an alternative Persian form from a now lost 8th or 9th century CE Syriac treatise from Khuzestan, which leads one to suspect that the areca nut may have been known by other native names in the pre-Islamic period:

‘Areca, which in the Persian language is called *tašmīzaḵ*, is good to (counter) heat in the eye; it is (also) useful against ophthalmia and hot tumours of the eye.’

Additionally, the 5th century CE Chinese scholar Gu Wei, whose remarks are preserved in a commentarial text of Sima Zhen (7th century), lists the areca nut as an import from contemporary Sasanian Persia (*possu*), suggesting either for transit trade in areca nuts or localized cultivation along the Persian Gulf littoral. Whatever the case, the relative invisibility of the betel nut palm before the Islamic period suggests that it was not well-known or widely used in the ancient Middle East. This is also true of the sugarcane and the Arabian jasmine which unlike the other crops considered in this project were late arrivals with little economic importance.

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1211 Hoogervorst 2013: 48.
1212 Gutierrez 2014; An edible stick concealed within the betel-areca roll makes the task more arduous. This is one of the many modes of ‘biting’ enumerated in Vātsyāyana’s *Kāmasūtra*: II.5.11.
1214 Kahl 2015: 212.
XII. Evaluation: Motivations of Botanical Exchanges

Why did crops move across great distances? A few crop-specific features, which made them attractive to cultivators, have been considered in the individual chapters but now the phenomenon ought to be assessed collectively. In order to assess the impetus for the translocation of crops across the Eurasian continent, one firstly needs to look beyond the economic concept of subsistence i.e. production of food resources at the bare minimum to support existence over a long-term. The archaeologist Andrew Sherratt notes that subsistence ‘is actively constructed in opposition to an accurate depiction of everyday reality. Subsistence is, in short, a rhetorical rather than a scientific term, a utopian representation of a world without ostentation and cupidity’. Minimalist interpretations of the ancient economy, most conspicuously represented by the Finleyan school, painted a picture of an inward-looking economy based on ‘subsistence’ principles. This model conceived of long-distance connections as a marginal feature geared toward the provision of luxuries for the urban leisured classes, the palace, the temple and other such elite establishments in ancient societies. The commodities availed by this trade were invariably markers of affluence and social status – an anomalous trajectory in more mundane localized exchanges of subsistence goods. This has led to historians of the ancient economy ignoring the weighty biological effects of trade i.e. the spread of floral and faunal domesticates, pests and pathogens. The privileging of ‘subsistence’ also meant that non-subistence motivations for the acquisition of new biological resources were sidelined.

Biotic exchanges in antiquity were frequently intentional but not coordinated processes. The acquisition of a new crop was based on opportunism and a willingness to exploit plant resources for both calorific and non-calorific ends; the

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1216 Sherratt 1999: 12.
1217 Finley 1985; For a critique of Finley’s minimalist subsistence-centred interpretation of the ancient economy see especially Horden and Purcell 2000: 146-150; Harris and Lewis 2016: 1-36.
1218 Secord also underscores how modern readings of ancient identity, especially the uncritical acceptance of rhetoric about ‘purity’ and ‘autochthon’, has led to the sideling of regular biological exchanges which introduced tangibly foreign floral and faunal elements into the human landscape (Secord 2016: 210-1). The relative insularity of ancient history as an academic discipline, crudely equated with the history of Greece and Rome across much of Europe and the Americas, also meant a shrinking away from bio-histories, which are necessarily an interdisciplinary enterprise and involve a geographical scope beyond the Mediterranean. See Harris 1998 for a summary of the history of bio-historical studies concerning the domestication and dispersal of cultivated plants.
latter included medical, ritual, ornamental and prestige functions. Crop translocations as Sherratt emphasises are social processes and new additions to the agricultural regime need to be placed ‘within the sphere of competition, emulation, negotiation, performance and communication.’\footnote{Sherratt 1999: 27.} When exploring the reasons for why crops moved in the following sections, a facile division into political, economic, social and ecological factors is avoided and instead the focus will be placed on mentalities, agencies and values.

### A. The Cultivator: Subsistence and Profit

There is little evidence to suggest that tropical crops were adopted in the Middle East and the Mediterranean out of food stress. Rather, the new crops represent a case of ‘innovative intensification’, functioning as an additional calorific source, marketable surplus and a buffer against the risk of variable annual production and crop failures.\footnote{Horden and Purcell 2000: 201-224.} Crop features like quick maturation, high-yields, ease of harvest, disease resistance and storability could have appealed to cultivators.\footnote{Smith 2006: 481; Jones et al 2011.} Boivin, Fuller and Crowther make the pertinent point that pre-existing food processing and cooking technologies significantly influenced the choice of new crops which were expected to be processed and consumed in ways that were familiar.\footnote{Boivin, Fuller and Crowther 2012: 454.} Rice in the early Middle East was, for instance, processed and consumed as bread, cakes and porridge rather than as boiled grain as was the norm across the rest of Asia. Early varieties of the cucumber, which morphologically resembled non-sweet vegetable-type melons and even tasted similar, encouraged its spread and confusion with the melon.

Tropical cultivars were also able to exploit spatial and temporal niches unoccupied by the traditional calorific staples. Herodotus notes that the edible Indian lotus growing uncultivated in the Nile among other edible aquatic flora made the acquisition of food more economical.\footnote{Hdt. II.92: πρὸς εὐτελείην τῶν σπίτων.} Rice may have been adopted in southern Mesopotamia as a means to reclaim marginal swamplands unsuitable for barley cultivation. Additionally, being supplements rather than staples, tropical crops were
not subject to tithes imposed by the state in the earliest phases of their introduction. While this provided an added incentive for cultivation, it also means that new crops either leave an impressionistic paper trail or are completely invisible.

Tropical species also extended the farming calendar and thus increased annual food production since they were grown in summer while the traditional set of Middle Eastern-Mediterranean crops (e.g. wheat, barley, lentil, pea, chickpea) depended on the winter-rainfall complex. Diodorus Siculus, drawing on several Hellenistic sources on India including Onesicritus and Megasthenes (late 4th century BCE), claimed that famine never visited India since regular monsoonal rains combined with winter-summer double cropping ensured a secure food supply. While this is evidently a rosy sketch of Indian agriculture, it draws attention to an undercurrent of food insecurity in a Mediterranean context prompted by variable annual production and conflict, which siphoned off manpower and damaged agricultural fields. Diodorus explicitly contrasts his idealized Indians with the ‘rest of mankind’ (παρὰ μὲν γὰρ τοῖς ἄλλοις ἀνθρώποις) who harassed agriculturists and cut down orchards in times of conflict. The investment in summer crops thus could well have been a calculated means to allay food insecurities.

The availability of new subsistence options did not, however, translate to immediate and widespread adoption. Agricultural innovation was invariably a sluggish and incremental process and probably consisted of a series of re-introductions rather than a single introduction event. Adoptions of new crops often made little perceptible difference to the agricultural and dietetic repertoire in an individual’s lifetime. There could be a long time lag in between introduction and the adoption of a cultivar as a significant crop. Boivin, Fuller and Crowther view this lengthy acculturation process as a testament to the relative unimportance of the ‘subsistence factor’ in the earliest stages of crop introductions. Rice is, for example, only attested as a calorific staple in limited regions of the Middle East (e.g. southwestern

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1224 See Zohary, Hopf and Weiss 2012 on the traditional suite of Middle Eastern crops.
1225 Muntz 2012.
1226 Diod. Sic. II.36.5-7.
1227 Diod. Sic. II.36.6.
Iran) in the late first millennium BCE despite having been adopted almost a millennium earlier.

Even the biological consequences of the ‘Columbian Exchange’, although a relatively quicker event, were not immediately perceptible. The large-scale cultivation of New World crops in Europe only took off in the late 17th century.1231 Northern European peasants reviled the now-ubiquitous potato as an unwholesome cultivar even as late as the 18th century.1232 The Central American tomato (*Solanum lycopersicum*) was described by the Italian herbalist Mattioli as early as 1544 but long remained an ornamental plant owing to the perception that its fruits were unpleasant or even harmful if consumed.1233 Its widespread use in food in Southern Europe only dates to the 18th century while it took another century to acclimatise itself to Northern European tastes.1234

The impediments to the instantaneous adoption of new crops in antiquity were manifold. Peasant-cultivators, particularly those in insular regions, preferred predictability to change. Food habits display variations with age, gender and class as well as across space and time. The palate of rural, aged and non-elite groups was often markedly neophobic. Plutarch attests to entrenched foodways among the elderly who he claims were not fond of consuming exotic foods of Indian origin: ‘we know that many older people still cannot eat ripe cucumber, citron or pepper’.1235 The Alexandrian physician Chrysermus (1st century BCE) was even said, undoubtedly with great exaggeration, to be liable to a heart attack if he ever consumed pepper.1236 Consumables and consumption practices were inherently conservative as they constituted an essential expression of group membership, whether they be ethnic affiliations, gender constructs or social status.1237

1234 Ibid.
1235 Plutarch *Quaest. Conv.* VIII.9 1-5 (731-734).
1236 Sextus Empiricus *Outlines of Pyrrhonism* XIV.84.
Additionally there may have been sumptuary distinctions during the earliest period of new crop introductions. Cotton is first attested in temple and palatial contexts in Mesopotamia before becoming more widely available in the mid-1st millennium BCE, suggesting controlled access to the material in its earliest phase. Food crops, as we have observed, were markers of culture, identity and class and invested with cultural and social meaning beyond their nutritive value. Differential access to foods based on appearance, taste, rarity, cost and reputation, may have created a bottleneck in the adoption of new crops among peasant-cultivators. The processes of social emulation and peer polity interaction, however, eventually overcame elite monopolies to reproduce metropolitan dietary trends on a local scale. In some cases, elites may have been more of an advocate rather than obstruction to the adoption of new crops. Pliny notes that the Romans introduced a high-yielding variety of Indian millet in Italy during his lifetime.

Water- and labour-intensive crops like rice and cotton also posed limitations if unaccompanied by relevant prerequisites in the form of hydraulic technologies, pedological neutrality or a sizeable labour force needed to cultivate and process crops. Seasonal labour scheduling necessitated by building projects, canal construction or conscription for the army could have hampered the spread of labour-intensive crops. Southern Mesopotamia and southwestern Iran proved excellent hosts for cotton and rice since both crops simply grafted onto a pre-existing well-irrigated agricultural landscape which supported a large population. The sheer productive potential of the Mesopotamian landscape is articulated in the Genesis Rabba, a Late Antique Hebrew exegetical text, by none other than the personified Euphrates himself who declares: ‘If someone plants a plant near me, it brings forth produce in thirty days. If someone sows seed by me, it comes up in three days.’

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1239 Pliny. *HN* XVIII.55.
1240 Soil pH determines the solubility and availability of nutrients for plant intake. Neutral soils (pH 6.0-7.0) are ideal for most agronomic crops.
1241 Boivin and Fuller 2009: 162.
1242 On irrigation in Mesopotamia see the various articles in the 4th volume of the Bulletin of Sumerian Agriculture (1988) and more recently Wilkinson and Rayne 2010.
The prospect of risk and high capital inputs could also delay the widespread adoption of new crops. Cultivars like fruit and timber-yielding trees represent slow and expensive investments. Citrus trees have a long juvenile phase and only achieve maximum productivity in the second decade of growth.\textsuperscript{1244} The growing of such fruit trees and cash crops like cotton is an expression of calculated long-term production and trade strategies, frequently beyond the reach of the average householder.

Many other cultivars moved great distances but the environment posed an insurmountable barrier to local cultivation. This was the case with most Indian spice plants such as cassia, cinnamon and cardamom which could not grow in temperate climes. Pliny describes the failed experiments of Seleucus I who attempted to grow amomum, nard and cinnamon in Syria.\textsuperscript{1245} Cotton attested in the Assyrian heartland between the 8\textsuperscript{th} and 7\textsuperscript{th} centuries was probably a limited palace project as well since early varieties of tree cotton were not suited for the cold winters of Northern Mesopotamia.

\textbf{B. Non-calorific values and the ‘Prestige of Distance’}

‘In circulating, things, men and notions often transform themselves. Circulation is therefore a value-loaded term which implies an incremental aspect and not the simple reproduction across space of already formed structures and notions.’

- Markovits, C., Pouchepadass, J. and Subrahmanyam, S., Society and Circulation, 2003: 3

Markovits, Pouchepadass and Subrahmanyam’s notion of circulation as one of changing function and values aptly characterises the acculturative processes undergone by new crops. The new social, symbolic and cultural meanings gained by crops, sometimes bereft of calorific value, are equally important in their dissemination. Citrus trees and the lotus were probably valued more for their aesthetic and aromatic value in Middle Eastern gardens than as nutritional sources. Mythological constructs and religious beliefs also had a significant influence on food acceptability and crop usage. The citron’s sacred associations, in particular

\textsuperscript{1244} Zohary, Hopf and Weiss 2012: 114; Cooke and Fuller 2015: 453.
\textsuperscript{1245} Pliny \textit{HN} XVI.135-136.
with the feast of Sukkot, ensured a permanent foothold for the tree-crop in the gardens of Judaea.

Rice gains medical and magical properties in both the Middle East and the Mediterranean. The former function probably explains its rapid spread beyond the Alps with Roman legionaries in the 1st century CE. The 196 charred grains of rice from Roman Novaesium (Neuss am Rhein) in Germany were in fact recovered from a building identified as a military hospital (valetudinarium). The magico-medical if not miraculous appeal of exotic plants is perhaps best exemplified in Theophrastus’s superlative description of an unidentified Indian plant with aphrodisiacal qualities:

‘Most marvellous is the plant which Indos (‘the Indian’) had; they said that it keeps the penis hard, not by ingesting the plant, but using it for anointing; the power of this plant is so great that one can have sex with as many women as one likes - those who use it say as many as twelve. Indos himself, he was big and strong, actually said that he once had sex seventy times, but his semen came out drop by drop, and finally he drew out blood. Besides women are considerably more eager when they use this drug. This power, if true, is excessive.’ (trans. Preus 1988)

It is little wonder that Seleucus I (r. 311 – 281 BCE) received aphrodisiacs from the Mauryan king Chandragupta which were claimed to make men ‘as randy as birds’. The perceived nutritional, medical and even aphrodisiacal benefits of a newly imported or transplanted botanical product could well overshadow its

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1247 'Theophr. Hist. pl. IX.18.9; Ἐν συµµιασµωµένῳ ἀλλ’ ἀλευρισµενῷ ἐφάγα τὸ αὐτὸν ἐντεύνειθα, τὴν δύναµιν δ’ οὕτῳ ἔσχαται ἐνὶ ὀσθ’ ὁπόσας ἂν βούλοντο ἐπιšεξεῖν: τοὺς δὲ χρῆσαιµένους φάναι καὶ δόδεκα αὐτὸν γούν λέγειν - καὶ γὰρ ἐν ἰσχυρὸς καὶ μέγας - ὤτι ἰσοµικόντα ποτὲ πλησιµάει: τὴν δὲ πρόσκειν αὐτῷ τὸ σπέρµατος εἶναι κατὰ στράγγα, τελευτῶν δὲ εἰς αἷµα ἀγανέν. Ἐπὶ δὲ σφυοδροτέρως ὁµὺν τὰς γυναῖκας στιᾷς χρῆσαιται τὸ φαρµάκῳ. Αὕτη μὲν οὖν, εἴπερ ἄληθῆς, ὑπερβάλλονσα τὰς δύναµις. There are interesting parallels to the plant/drug mentioned by Theophrastus in Sanskrit erotic treatises. The last chapter of the Kāmasūtra devotes itself to the enumeration of plants and compound drugs used to increase virility and aid in the arts of seduction (by consuming them or using them as ointments): e.g. 'Scholars say: If you make a cake out of cock’s-head root, horse-eye bean, sugar, honey, butter, and wheat, and eat it until you are satisfied, you can make love with endless women.' (Kāmasūtra VII.1.42).
1248 Ath. I.18e.
importance as a daily comestible. Black pepper (*Piper nigrum*), a native of South India,\(^{1249}\) is, for instance, first attested in the Mediterranean as a medicament particularly for ocular conditions in Hippocratic pharmacopoeia (5\(^{th}\) – 4\(^{th}\) centuries BCE).\(^{1250}\) The earliest author to explicitly cite pepper in the context of cooking is unsurprisingly a physician: Diphilus of Siphnus who provides a recipe for sautéed scallops with pepper.\(^ {1251}\) The rabid popularity of pepper in the Greco-Roman world, which was traded for in gold,\(^ {1252}\) baffled the Elder Pliny:

> It is quite surprising that the use of pepper has come so much into fashion, seeing that in other substances which we use, it is sometimes their sweetness, and sometimes their appearance that has attracted our notice; whereas, pepper has nothing in it that can plead as a recommendation to either fruit or berry, its only desirable quality being a certain pungency; and yet it is for this that we import it all the way from India! Who was the first to make trial of it as an article of food?\(^ {1253}\)

The answer to Pliny’s conundrum lies not only in the inherent gustative qualities of pepper but the distance it travels and how this feature feeds into its desirability for consumers. The inverse relationship between value and spatial distance, particularly of botanical produce, is crisply articulated elsewhere by Argaṇṭha, an early medieval Sanskrit poet (ap. Subhāṣītāvali 452):

> To those who live on Malaya’s slope,\(^ {1255}\)
sandal is but firewood;
gems no more than rocks and stones
for denizens of the ocean’s shore;
the residents of Kashmir, too,
have no respect for saffron:

\(^{1249}\) Asouti and Fuller 2008: 47.
\(^{1250}\) e.g. *Morb. Mul.* I. 81, II.158; *Acut. Sp.* 34; *Epid.* V.67, VII.64; *Nat. Mul.* 32; Pepper is cited seventeen times in the Hippocratic corpus (Totelin 2009: 191, 194).
\(^{1251}\) Ath. III.90f.
\(^{1252}\) Pliny *HN* VI.101; XII.84; cf. Akanānūru 149.
\(^{1253}\) Pliny *HN* XII.29: usum eius adeo placuisse mirum est; in aliis quippe suavitatis cepit, in aliis species invitavit; huic nec pomi nec bacae commendatio est aliqua. sola placere amaritudine, et hanc in Indos peti! quis ille primus experiri cibis voluit aut cui in appetenda aviditate esurire non fuit satis?
\(^{1254}\) Dates unknown; before the 11\(^{th}\) century CE.
\(^{1255}\) Western Ghats of South India.
distance lends great value, and proximity breeds disdain.

Herodotus avows that the most outlying lands of the inhabited world were those that possessed the most beautiful and rarest things. He includes in this discussion Indian cotton which he describes to be better and more beautiful than wool from sheep. The anthropologist Mary Helms notes that distance-related phenomena, including long-distance commodities, were taxomised and valued by pre-industrial societies as ‘inherently superior or inferior, dangerous or superlatively beneficial to the home society.’ Distance was capable of amplifying pre-existing or adding new non-calorific functions to crops. While the prestige accrued by distance and foreignness only exercised its magnetising appeal in the earliest stage of crop introductions, it was crucial in determining the long-term cultural associations and non-calorific uses of the crop.

Unlike rice, cotton, cucumbers or citrus fruits, pepper never crossed the liminal zone from exotic import to familiar cultivar in the Middle East and the Mediterranean as the perennial climbing vine does not grow on any large-scale outside of the tropical belt. Consequently, it retained its extraordinary prestige throughout antiquity and beyond. Alaric, the leader of the Visigoths who famously sacked Rome in 410 CE, was pacified by the Roman Senate in the years preceding the conquest with a payment of 3000 pounds of pepper along with gold, silver and silk.

Almost half a millennium earlier, during the Roman general Sulla’s siege of Athens in 87/6 BCE, pepper was remarkably said to be in abundant supply even though the city’s...

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1256 Hdt. III.106: αἱ δὲ ἀγχαται κως τῆς οἰκομενής τὰ κάλλιστα ἔλαχον; Hdt. III.116: αἱ δὲ ὁν ἀγχαται ὅσασι, περικλησίουσα ἡν ἀlla χώρην καὶ ἔντος ἀπέργουσα, τὰ κάλλιστα δικόστα ἡμῖν εἶναι καὶ σκανώσατα ἔχων αὐτα.
1257 Helms 1993: 3.
1258 Rabbinical sources (early-mid centuries CE) claim that pepper was grown in Palestine (Ecclesiastes Rabbba 2.7, 11; Midrash Hagadol on Deut. 8.9; Löw 1967: vol. 3 51-52; Safrai 1994: 83, 91). The pepper grown in Roman Palestine was probably small-scale and experimental or more likely the cultivation of a substitute to true pepper. Löw (1967: 52) suggests the cultivation of Ethiopian or kimba pepper (Xylopia aethiopica) extracted from the pods of a tree native to Sub-Saharan Africa. Pliny in this respect remarks that pepper was so popular that the berries of other plants including juniper and myrtle were passed off as pepper (Pliny HN 12.29). In Petronius’s Satyricon, the nouveau riche character Trimalchio is said to have grown citrons and pepper on his estates (Satyricon 38). While citrons were indeed cultivated in Italy, this appears unlikely in pepper’s case. Petronius’s portrait is perhaps best seen as a lampoon rather than an accurate description of what rich Romans grew in their estates.
1259 Zosimus V.41.4.
olive oil and wheat supplies had been exhausted. Pepper was hoarded much like gold, silver and staples but it was not prohibitively expensive and its consumption cut across social classes. Gambax, a solider of humble rank, could purchase Indian pepper at a relatively trifling price of 2 denarii at Vindolanda on the periphery of Roman Britain. Black pepper has also been recovered from several Roman sites in northern Europe, including a latrine in a legionary camp near Oberaden in Germany. At Rome itself a specially designated commercial area, the Horrea Piperataria or pepper market, located in the porticoes of the Neronian Sacra Via, was the main trading site for pepper and a host of other imported spices and aromatics. As pepper remained outside of local agriculture, its prestige accrued of distance remained fossilized and thus serves as a useful case study for illustrating similar processes that other tropical flora would have undergone at the introductory stage.

Figure 52: A funerary inscription dedicated to Proculus and Marcellus, two workers at the Horrea Piperataria by their brother P. Veracius Firmus, 2nd century CE (Il Museo Epigrafico, Terme di Diocleziano, Rome; author’s photograph)

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1260 Plut. Sulla 13.3.  
1261 Tab. Vindol. II.184.  
1262 Kučan 1992; Cappers 1998: 313; Vandorpe 2010, 39, 49, 89; van der Veen 2011: 44.  
1263 The construction of the Horrea Piperataria is frequently attributed to the Emperor Domitian (81 – 96 CE) but he probably restored a pre-existing structure (Rickman 1971: 104-7; Richardson 1992: 194-5).  
1264 On this inscription see Zappata 1994.
C. Population Movements

Crops circulated together with mobile populations other than traders which, in antiquity, included slaves, deportees, refugees, soldiers, diplomats, colonists, professionals and specialists like physicians and augurs and even royal brides and grooms and their large entourages travelling over long distances. The role of these temporary and permanent population movements, both coerced and voluntary, must have played a crucial role in widening food choices and fostering a cosmopolitan outlook. The archaeological finds of citrus and cucurbits at Greek and Phoenician colony-sites across the Mediterranean and the Black Sea (e.g. Carthage, Cumae, Marseille, Tauric Chersonesus) indicate seaborne distribution of these cultivars through colonial networks (see chapters VI-VII). Some crop movements may even have been the ‘unintended consequence of food left over at the end of a journey’. The multi-ethnic character of Achaemenid and Hellenistic Babylonia which was host to military colonies of peoples as diverse as the Scythians, Carians, Lydians, Egyptians and Indians probably generated a vibrant gastronomic culture which is unfortunately invisible in the relatively insular cuneiform tradition of the late 1st millennium BCE.

Sometimes even strains of familiar crops moved. In Hellenistic Egypt, Greek settlers transplanted Aegean varieties of crops including cabbage from Rhodes, chickpeas from Byzantium, figs from Chios and garlic from Tlos in Lycia. Egypt was not lacking in these crops but the Egyptian varieties were held to be inferior in taste. The import of cabbage from Rhodes, for instance, was said to be necessary on account of the bitter taste of Egyptian cabbage to Greeks. Somewhat ironically conservative tastes could facilitate as much as they can hamper the spread of crops. The Egyptian case also highlights the importance of “crop branding” in the spread of cultivars, regardless of whether the superiority in quality was real or perceived.

1267 Crawford 1979: 139-140; Secord 2016: 215-218.
1268 Diphilus of Siphnos ap Ath. IX 369f.
The latter notion survives to the present-day and the Sicilian lemon, Egyptian cotton, Kashmir saffron and Longjing tea may serve as examples.

D. Botanical Imperialism

Political actors, unsurprisingly, played a major role as agents of crop diffusion. Political elites across history were fond of transplanting exotic flora as ideological assertions of their political clout and extent of their territorial and diplomatic reach. Exotic flora, particularly those with aesthetic, medico-magical and spiritual values, functioned as an extension of royal paraphernalia and thus contributed to the construction of social prestige among peers and subjects.

In some cases the royal collecting of plants was simply motivated by pleasure and sheer curiosity. Ancient sources betray a strong personal interest on the part of elites in horticultural activities. In Xenophon’s (c. 430 – 354 BCE) Oikonomikos, a treatise on household management, the Persian prince Cyrus the Younger, much to the surprise of his Spartan guest Lysander, actively engages in horticulture and even ranks it alongside warfare and competitive activities:

Cyrus personally showed him (Lysander) around his paradise at Sardis. Now Lysander admired the beauty of the trees there, the accuracy of their spacing, the straightness of the rows, the regularity of the angles, and the multitude of sweet scents that clung around them as they walked; and in amazement he exclaimed, ‘Cyrus, I really do admire all this loveliness, but I am far more impressed with your agent’s skill in measuring and arranging everything so exactly.’ Cyrus was delighted to hear this and replied, ‘Well, Lysander, the whole of the measurement and arrangement is my own work, and I did some of the planting myself.’ ‘What did you say, Cyrus?’ exclaimed Lysander, looking at him, and noting the beauty and perfume of his robes, and the splendour of the necklaces and bangles and other jewels that he was wearing; ‘Did you really plant part of this with your own hands?’ ‘Does that surprise you, Lysander?’ asked Cyrus in reply. ‘I swear by Mithras that I

1270 Boivin and Fuller 2009: 165.
1271 Boivin, Fuller and Crowther 2012: 454.
never yet sat down to dinner when in sound health, without first working up a sweat at some task of war or agriculture, or exerting myself in some sort of competition. (IV.20-24 trans. Marchant and Henderson 2013)

Plants could also arrive by way of diplomatic gifts, tribute, expeditions or even wartime loot. The literary records of the ancient Middle East and Mediterranean are replete with multiple instances of royally commissioned plant translocations. The Old Kingdom pharaoh Sahure’s (c. 2458-2446 BCE) transplanting of myrrh trees (nḥt nṯ ‘nd) from the land of Punt (Eritrea-Ethiopia corridor and eastern Somalia) to his royal garden was celebrated in relief in the king’s pyramid complex. This ranks among the earliest depictions of deliberate plant transplantations in the ancient world. It also substantially predates the better-known Egyptian maritime expeditions to Punt and the procurement of incense trees under the New Kingdom queen Hatshepsut (c. 1473 – 1458 BCE). The ability to possess and bestow rare products could sustain patronage networks and enhance the prestige of elites. In the case of the incense trees from Punt, the family of Senedjemibinty, a deceased Old Kingdom official, gratefully advertised the Pharaoh Djedkare’s (c. 2381 – 2353 BCE) provision of myrrh for embalming the deceased on the latter’s funerary biographical inscription with the hyperbolic remark that such an honour ‘never happened alike to any man before’. In the early Iron Age, the best attested examples of royal botanical collections are those of the Assyrian kings. The Assyrian royal garden from the end of the 12th century onwards took on a more pronounced political dimension than its Mesopotamian precursors. Drawing on the botanical resources of the empire and beyond, the Assyrian garden functioned as a microcosm of the known world. King Aššurnasirpal II (883-859 BCE) vaunts in the so-called Banquet Stela of his collecting of plants from various regions of his empire:

1274 The location of Punt was recently clarified through strontium and oxygen isotope analysis of ancient baboon tissue. See Dominy et al 2015.
1276 Creasman 2014.
1279 Amrhein 2015: 92
I irrigated the meadows of the Tigris (and) planted orchards with all kinds of fruit trees in its environs … In the lands through which I marched and the highlands which I traversed, the trees (and) plants which I saw (and collected) were: cedar, cypress, šimiššalû, burâšu-juniper … daprânu juniper, almond, date, ebony, sissoo, olive, şušînu, oak, tamarisk, dukdu, terebinth and murrânu, meḫru … tî’atu, Kaniš oak, ḫaluppu, šadânu, pomegranate, šallûru, fir, ingirašu, pear, quince, fig, grapevines, angašu-pear, šumlabû, ūripû, zanzaliqqu, swamp apple, ḫambuqqqu, nuḥurtu, urzînu and kanaktu. The canal cascades from above into the gardens. Fragrance pervades the walkways.  

Royal gardens like those of Aššurnasirpal II and his successors were effectively ‘warehouses of biodiversity’ much like modern botanical gardens. Crop experimentations within the confines of royal gardens could be the starting point for the wider dissemination of foreign crops, especially fruit trees and aromatics. Assyrian gardens were practical as much as they were political. The gardens supplied the royal table with fruits and vegetables, the perfume industry and temples with aromatics and physicians with pharmaceuticals. The inscriptions of the Assyrian king Sennacherib make unambiguous that cotton cultivation met the needs of a palace textile industry while sissoo trees in the royal estates were felled for palatial constructions in Nineveh (see chapters IV and X)  

Plants in royal estates could also become a significant source of revenue for the royal household. A profit-oriented motivation may have lain behind King Josiah of Judah’s (640 – 609 BCE) introduction of balsam trees (Commiphora opobalsamum), a native of South Arabia, at Ein-Gedi in the Dead Sea Region. The cultivation of balsam in the Dead Sea region remained a lucrative source of income for royal estates down to the Hellenistic and Roman periods. It was perhaps for the same reason that Theophr. Hist. pl. 9.6.1-4; Strabo XVI.2.41; Pliny HN 12.111-24; Safrai 1994 83-87; Dalby 2003: 43; Totelin 2012: 122-5.
reason that Seleucus I vainly attempted the cultivation of Indian aromatics in Syria.\textsuperscript{1285}

**E. Conspicuous consumption and culinary diversification**

By the mid-first millennium BCE an agonistic culinary tradition striving for innovation could have also led to widening repertoire of foods consumed by elites in the Middle East and the Mediterranean.\textsuperscript{1286} The emergence of cooks (Gk. μαγευτοί) as a professional class and cookery books as a distinct textual genre is best attested in Greek sources from the Classical period onwards.\textsuperscript{1287} A cook’s address to his companion in a fragmentary comedy by Baton (3\textsuperscript{rd} century BCE) expresses, no doubt with exaggeration, the burdens placed on cooks to innovate and perfect dishes attributed to eminent cook-gastronomes:

> Good for us, Sibyne, that we don’t sleep at night or even lie down. Instead, a lamp stays lit, and there are books in our hands, and we puzzle over what Sophon’s left behind, or Semonactides of Chios, or Tyndarichus of Sicyon, or Zopyrinus.\textsuperscript{1288}

The situation was probably no different in the Middle East although we have little by way of culinary texts in the cuneiform tradition of the 1\textsuperscript{st} millennium BCE.\textsuperscript{1289} Greek sources on the Persian king’s table hint at the enthusiasm for the consumption of new and exotic foods.\textsuperscript{1290} Xenophon claims that ‘men travel through the Persian king’s entire territory for him, trying to find wines he would enjoy drinking (and) countless people produce foods he might like to eat’.\textsuperscript{1291} Strabo stresses that the Persian king only consumed the finest foods – whether wheat from Assos, wine from Syria or even water fetched from the Eulaios in southwestern Iran.\textsuperscript{1292} While there is certainly a moralizing element to Greek descriptions of Persian gastronomic luxury, the cosmopolitan and neophilic nature of contemporary elite food culture is

\begin{footnotesize}
\begin{enumerate}
\item Pliny *HN* XVI.135.
\item Dalby 2003: 98-99, 102-103, 157-158.
\item Berthiaume 1982; Dalby 2003: 97-99.
\item ap. Ath. XIV.662c-d.
\item There is no doubt that a formalized culinary tradition existed in the Middle East since elaborate recipes for food preparation are already attested in cuneiform texts dating to c. 1700 BCE (Bottéro 1995; Milano 2004).
\item e.g. Aristoxenus of Tarentum ap. Ath. 545d; Clearchus ap. Ath. 529d; Plutarch *Quaest. Conv.* I.4; see also the discussion on Persian elite food in Briant 2002: 286-292.
\item Strabo XV.3.22.
\end{enumerate}
\end{footnotesize}
not in doubt. Changing consumption practices widened the gamut of crops in cultivation.

It is clear that the motivations for crop adoptions were complex, with social and prestige factors taking precedence over ‘subsistence’ functions at the introductory stage. A range of personalities, from the botanist-king to physicians, cooks and traders were responsible for the mobility of crops. Foodways were more conservative among non-elite rural segments of society. This hampered the introduction of new crops but it also meant that when populations moved, voluntarily or involuntarily, they brought their crops with them.
XIII. Conclusion: Impact and Implications

‘If we eat bread made of Canadian wheat and cheese from New Zealand, we are not only drawing upon resources that are geographically worldwide, but we are at the same time observing practices, the making of wheaten bread and the use of cheese, devised in the Ancient East more than fifty centuries ago. So also in most of the things we are eating and drinking, doing and thinking, at every moment of our lives we are paying unwitting tribute to the diffusion of culture in time and place’

- G.E. Smith, The Diffusion of Culture (1933: 8)

There is no doubt that the biological fallout of long-distance trade and connectivity between temperate and tropical Eurasia has substantially enriched the agroecologies of the Middle East and the Mediterranean. The tropical-temperate biotic exchange within Eurasia, the product of earlier processes of interaction and integration across long distances, led to some degree of hemispheric unity in the agricultural repertoire, and could thus retrospectively be considered an important step in ‘proto-globalisation’. (or a globalizing process).

In time, the movement of crops across Eurasia not only transformed the agricultural landscapes, labour regimes and cultures of the Old World but also those of the New World. The narrative of slavery in the Americas is, for instance, intricately tied to the cultivation of labour-intensive tropical crops like cotton, sugarcane and rice. Whether dictating fashions from Sulawesi to Scotland (think Paisleys) or sparking industrialising processes in Britain (which much to the dismay of local producers was flooded with Indian cottons before the 18th century), the cotton textile industry of India dominated and shaped global trade networks for at least two and a half millennia.\textsuperscript{1293} This changed, of course, with industrialisation in Britain and the attendant rise of the East India Company's political fortunes which effectively curtailed the lucrative export trade of South Asia in favour of mass-produced Lancashire cottons. As Karl Marx astutely observed in 1853, ‘till 1813, India had

\textsuperscript{1293} See essays in Riello and Roy 2009; Parthasarathi and Riello 2012.
been chiefly an exporting country, while it now became an importing one.\textsuperscript{1294}

Industrialisation in North America also tied in with cotton production, the first manifestation of this process being the New Engander Eli Whitney’s cotton gin (1793). What is significant to us is that these seminal events of a later age are connected to the ancient crop exchange under consideration here. The acquaintance of later-day Europeans with rice, cotton or sugarcane traces its genealogy back to the tropical-temperate crop exchange within ancient Eurasia.

Tropical crops in the Middle East and the Mediterranean underwent a long acculturation sequence, in which the earliest period is typically characterised by small-scale cultivation and adaptation to pre-existing agricultural strategies and food technologies. But this did not imply that agricultural landscapes remained static. The introduction of water-intensive summer crops like rice and cotton called for rigorous water management. In southern Mesopotamia’s case this meant the extension of pre-existing irrigation canals. Fruit orchards and the growing of ornamental plants would have also transformed the aesthetic appearance of cultivation ecologies. As crops arrived in piecemeal fashion, agrarian changes were incremental and spatially uneven. Great metropoles like Nineveh, Babylon, Susa and Athens consumed a far wider spectrum of botanical produce than their distant rural hinterlands. The pedological and hydrological heterogeneity of the Middle East and the Mediterranean also meant that the impact and distribution of new tropical crops was asymmetrical. Some crops, particularly spice-bearing plants, did not survive past the experimental stage owing to environmental incompatibility or the lack of sufficient capital and labour inputs.

The environmental archaeologist David Harris rightly observes that the ‘great diversity of available plant products is a very recent phenomenon, (and) the beginnings of the process lie far back in the prehistoric past.’\textsuperscript{1295} While the plants described in this thesis appear to be numerically limited to modern observers accustomed to a sheer variety of comestibles and botanical produce, it must be borne in mind that the traditional repertoire of founder crops used by Bronze Age sedentary societies in the Middle East and the Mediterranean was equally limited.

\textsuperscript{1294} Marx 1853.
and certainly narrower than the gamut of wild foods and fibres consumed by their hunter-gatherer predecessors. For those below elite ranks, plant-derived food was a fairly monotonous affair dominated by a handful of cereal, pulse, vegetable and fruit crops. In ancient Mesopotamia, barley, which produced both bread and beverage, was the unchanging staple of life and an inferior version of the same was to be expected in the afterlife. In an early 1st millennium BCE recension of the Akkadian poem ‘Ištar's Descent to the Netherworld’, the underworld goddess Ereškigal rhetorically asks if she should share the fate of the dead: ‘Shall I eat a loaf of clay for bread, shall I drink dirty water for beer?’ Over time the addition of new crops from adjacent biogeographic regions to two-cropping cycles served as a basis for increased food production, dietary diversity, nutritional enrichment and demographic growth. As foods and fibres, new crops also had a key role to play in the construction of cultural identities across Eurasia.

Figure 53: A South Indian meal reflecting the vegetal wealth of the tropics: plantains, amaranth, bottle gourds, wax gourds, moringa, aubergines, jackfruits, rice and black lentil fritters served on a banana leaf (Source: author’s photograph).

The crop exchange between tropical Asia and the temperate West continued long after the period considered in this paper, into Late Antiquity, the medieval period

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1297 trans. Foster 2005; Ištar's Descent to the Netherworld 33: kīma aklī akal ṭittā kīma šikƗri ašattā mé dalhūti
and beyond. In the age when Baghdad and Cordoba flourished as the twin poles of the Middle East and the Mediterranean, the cultivation of tropical flora was commonplace and extended to include a range of other tropical species including lime, bitter orange, shaddock, spinach, okra, banana, tamarind, indigo, mung bean, mango, coconut, jasmine and brown mustard.¹²⁹⁸

The incredible botanical diversity of the tropics meant that many other plant species consumed locally were unknown outside of South, East and Southeast Asia until recent times (Figure 53).¹²⁹⁹ Nonetheless the gradual tropicalisation of temperate agroecologies meant that the visual, olfactory and gustatory worlds of the Middle East and the Mediterranean from the Iron Age onwards were increasingly closer to our globalised world than to the earliest agricultural societies.

¹²⁹⁹ See Khoury et al 2016 on recent patterns of foreign crop consumption.
XIV. References

A. ABBREVIATIONS

i. ASSYRIOLOGICAL ABBREVIATIONS


BM – British Museum Tablets.


CBS - Museum siglum of the University Museum in Philadelphia (Catalogue of the Babylonian Section).


NCBT – Newell Collection of Babylonian Tablets (Yale University, New Haven).

ND - Field numbers of tablets excavated at Nimrud.


SURESHKUMAR MUTHUKUMARAN


Rm. - Museum siglum of the British Museum (Rassam).
SURESHKUMAR MUTHUKUMARAN


SU – Sultantepe Tablets at the Archaeological Museum, Ankara.

ii. **ABBREVIATIONS OF CLASSICAL AND HEBREW TEXTS**

Aeschylus *Supp.* - *Suppliants.*  
Aelian *NA* - *De natura animalium.*  
Aelian *VH* - *Varia Historia.*  
Amm. Marc. - Ammianus Marcellinus.  
Aretaeus *De curat. acut. morb.* – Aretaeus, *On therapy of acute and chronic diseases.*  
Ath. - Athenaeus, *The Learned Banqueters.*  
Columella *Rust.* – Columella, *On Agriculture.*  
Edict. Dioicl. – Diocletian’s Edict on Prices.  
HA – *Historia Augusta.*  
Hdt. – Herodotus, *The Histories.*
Hippoc. Epid. – Hippocrates, *Epidemics*.
Hippoc. Morb. – Hippocrates, *Diseases*.
Hom. Od. – Homer, *Odyssey*.
Horace Sat. – Horace, *Satirae*.
Josephus Ant. – Josephus, *Jewish Antiquities*.
ME – *Metz Epitome*.
Palladius Agr. – Palladius, *Opus Agriculturae*.
Paus. – Pausanias
Philostr. Vita Apoll. – Philostratus, *Life of Apollonius of Tyana*.
Phrynichus Praep. soph. – Præparatio sophistica.
Pliny HN – Pliny, *Natural History*.
Plut. Alex. – Plutarch, *Life of Alexander*.
Plut. Quaest. Conv. – Plutarch, *Quaestiones Convivales* (Table Talk).
P. Freib. – Mitteilungen aus der Freiburger Papyrussammlung (1914-1986).
P. Oxy. – *The Oxyrhynchus Papyri* (1898-In Progress).
PME – *Periplus Maris Erythraei*.
Pollux Onom. – *Onomasticicon*.
Ptol. Geog. – Ptolemy, *Geography*.
Schol. Ar. Eq. – Scholium to Aristophanes, *Equites*.
Serv. Aen. – Servius, *Commentary on Virgil’s Aeneid*.
TB – *Babylonian Talmud*.
TJ – *Jerusalem Talmud*.
Theophr. Caus. pl. – Theophrastus, *De causis plantarum*. 
iii. **ABBREVIATIONS OF DICTIONARIES**


**B. PRIMARY SOURCES**

i. **SUMERIAN, AKKADIAN, ELMITE AND OLD PERSIAN TEXTS**


### ii. **Greek and Latin Texts**


### iii. Greek and Latin Epigraphic and Papyrological Sources


### iv. Hebrew and Aramaic Texts


v. **ARABIC TEXTS**


vi. **NEW PERSIAN TEXTS**


vii. **SANSKRIT TEXTS**


**viii. PRĀKRIT (PĀLI; MĀGADHĪ; ARDHAMĀGADHĪ) TEXTS**


**ix. TAMIL TEXTS**


**x. CHINESE TEXTS**


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XV. Appendices

Appendix A: Rice in Akkadian and Elamite Texts

A.1: Letter of Erib-il to Kalbu
(Late Middle Assyrian c. 1100 BC; Kaţat/Tell Barri)

Obverse
1. a-na mKal-be
2. qî-bi-’ma’
3. um-ma mSU-D[INGIR]-ma
4. a-na a-a-ši šul-mu
5. ŠE.ku-ri-an-gu
6. i-ba-ši-i
7. la-šu-ū
8. ’a’-na ’i-ni’
9. ţe-ma

Reverse
10. la taš-pu-ra-ni
11. ’LÙ’ a-na UGU
12. mQâl-li-[i[a]
13. li-il-li̇k
14. A.MEŠ li-ri-su
15. liš-qi
16. a-ba-ru-ḥu
17. a-na mDÛG.GA-ši-[i[a]
18. di-na

Translation:

Speak to Kalbu, thus Erib-il: I am well. Is there rice or not? Why have you not written news to me? Let someone go to Qalliya and ask him for water and let him irrigate (the fields). Bring an abaruḥu1300 to Ṭab-ṣiyya.

---

1300 Possibly some kind of metal object (agricultural implement?); see Salvini 1998: 188 and CAD s.v. abaruḥu.
A.2: Letter to the governor of Kalhu (Bel-dan or Šarru-duri)
(744-728 BC; Governor’s Palace (Room S), Kalhu)
Edition: Postgate, 1973: No. 207 (ND 425)

Obverse
(beginning broken away)
1. ih-[tal-qu (…)]
2. a-na-ku ša URU.ŠE.x x x]
3. ar-ti-di-pi
4. ū-sa-ḫi-ra ṣa[n][x x x]
5. ša URU.ŠE.ṣ[i]-id-qi-[iʔ]
6. ir-ti-di-p[i]h-[tal-qu]
7. la-āš-šū la ἅ-[ma-gūr]
8. la ū-šu-bu
9. [Š]E.NUMUN-šū-nu la ἅ-[gūr]
10. la i-ru-šu

Reverse
11. ŠE.kur-an-gu ša i-za-r[u-ni]
12. ur-ta-me-[ε][e-ta-x[x x]
13. ṣa LÚ.MU.MEŠ ṣa’ […]
14. be-li e-mar te-lit ad-r[i]
15. a-mar ū-še-rab-u-n[i]
16. šum-ma be-li i-sa-ap-[a]
17. ina UGU GIŠ.za-qī-pe
18. [T]A* ṢA-bi’-šū-nu i-x-[x x x]

(remainder of the reverse broken)
(The text in the fragmentary three lines on the left hand edge deals with another matter.)

Translation:

[…] they f[led (…)]. I myself chased (those) of the vill[age GN] (and) brought (them) back. [PN] chased (those) of the village Šidqi, (but) [they escap]ed. None of them [agree] to stay (and) to cultivate their seed grain; they have abandoned the rice they were sow[ing] and have […]. Of the cooks (and) of the […], my lord will see the yield of the threshing-floor, how much they bring in. If my lord writes regarding the stakes among them […].
A.3: Letter to Tiglath-pileser III, the king of Assyria
(744-727 BC; Kalḫu)
Edition: Luukko 2012: No. 20 (ND 2675)

Obverse
1. (too fragmentary)
2. (too fragmentary)
3. [ina UGU] te-me ša LUGAL\' EN iš-ku-na-n[i]
4. [ma-a k]a-ra-ap-ḫi ma-ah-ḫa-ša
5. [ma]-a pu-ū-e ʿna-ki'-si
6. [k]a-ra-ap-ḫi maḫ-šu 2 KŪŠ
7. p[u]-ū-e ʿna'-ak-su ŠE gab-bu
8. ŠE.LIL.MEŠ i'-ta'-ša-[d]u\' [ke]l't'-tū
9. a-na-ku ŠEŠ\' [...]-ma
10. 1 ANŠE ŠE.GIS.Ī a-na [...]
11. mERIM-S[IG]\:\:. URU.bi[r]-tu\' [...]
12. [x š]a KUR.[a]r-sa-za-a- a x x x x x
13. ṝx\'-[a]-a ina 1 KŪŠ a-na 4* IM.ME[Š]
14. 6 Ř.ŠIĜ\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\:\\...
A.4: **URU.AN.NA = maštakal lexical series**  
(Neo-Assyrian compilation; manuscripts from Aššur, Nineveh, Kalḫu and Huzirina)\(^{1301}\)  
Edition: Köcher, KADP II III 65: VAT 9000 (Assur); BM 108860 = CT 37, 32 (Nineveh); CTN 4 192, 193 (Kalḫu); STT 2 391 (Huzirina)  
Column II, line 485: Ú.ŠE.LI.A = Ú.kur-an-gu (var. Ú.ku-ra-an-gu)  

A.5: **Practical Vocabulary of Aššur 23-4 (lexical series)**  
(Neo-Assyrian compilation; manuscripts from Aššur and Huzirina)  
Edition: Landsberger and Gurney 1957 (VAT 14264; VAT 14260; Aššur 13956 (Istanbul); SU 51/131)  
23. [ŠE].LIL = ku-ra-gi  
24. [ŠE].BA.RÍ.GA = ku-ra-gi  

A.6: **ḤAR.GUD Recension B (lexical commentary series)**  
(compilation of Neo-Assyrian date; Hellenistic manuscript from Uruk)  
Edition: SPTU III 116 iv 23  
Column IV, line 23. še.ba.ri.gim = MIN par-sik-ti = ŠE ia-an-gu  

A.7: **List of stones and other materia medica**  
(6\(^{th}\) century BC; Neo-Babylonian manuscript from Sippar)  
Edition: BM 93084 = CT 14 16  
Obverse  
1. NA₄.BAL NA₄.MUŠ-GIR  
2. NA₄.KUR.RA GIŠ.MA.NU  
3. NA₄.bu-uṭ-na-na Ú.kur-an-gu  
...  
Translation:  
Belemnite and serpentine  
alum and a wooden wand  
The terebinth-like plant and rice.  

\(^{1301}\) see Wilson 2005: 46
A.8: Administrative document
(575 BC; Ebbabar Temple, Sippar)
Edition: Jursa 1998: No. 13 (BM 63797)

1. 1 (pi) 1 bán 2 qa ŠE.GIŠ.İ
2. 1 (pi) 2 bán 3 qa ku-ur-ia-a-gu
3. mBA-šá-a šá UGU eš-ru-ú
4. a-na É.BABBAR.RA it-ta-din
5. ITU.GAN U₄-8-KAM
6. MU₃₀-KAM ¹AG-NÍG.DU-ÚRU
7. LUGAL TIN.TIR.KI

Translation:

Iqišaya, the tithe collector, gave 1 pānu 1 sūtu 2 qû of sesame (and) 1 pānu 1 sūtu 3 qû of rice to the Ebabbar temple on the 8th day of the month of Kislimu in the 30th year of Nebuchadnezzar, king of Babylon.

A.9: Administrative document in Elamite
(6th century BC, reign of Darius I; Persepolis Fortification Archive)

1 30 mi-ri-“zi”-
2 iš NUMUN.Ig nu-
3 tì-ka h.Li-u[d]-
4 du be-ul 23-
5 me-na

Translation:

30 (BAR of) rice was set aside (for) seed. (At) Liduma. 23rd year.
APPENDIX B: GRAIN CROPS ATTESTED IN AKKADIAN

abšu (or apšu) Nuzi, nA*; Hurr. pl. abšena - a grass seed; thought to be wild species by the CAD
alappānu Mari (nA lappānu, labbānu) – 1. Beer of bittersweet taste prepared from barley or emmer 2. A kind of barley from which the beer is made
arsānu (AR.ZA.NA) (arsanu, ansanu) oB onwards - peeled barley/ barley groats
arsu nA– a kind of cereal (Practical Vocabulary of Aššur: SE, är-sa-nu = är-si)
arsikkku (duḫnu) mB (in a single literary text) – a kind of grass (Borger RLA)/ millet? (CAD)
arsuppu (ŠE.GU₄) oB – barley beer (Borger RLA)/ a kind of cereal (CAD)
ašnan (EZINU) oB, mB, nB – generic term for cereal/grain
buqlu (MUNU₄) oB, oA, mB, nB, sB– barley malt
burrù oB (only in Mari texts) – wheat
buṭṭuttu – unhulled emmer/ type of cereal (CAD) NB/ a cereal preparation used in making bread Mari MB SB/ processed emmer
duḫnu (Ass. tuḫnu) mB (including Nuzi), nB – a kind of millet
elmeštu (elmessu) – a kind of grass (Sumerian šaddaru)
gulubūtu (gulbūtu) nA (only lexical)– Hulled barley (CAD)/ a type of emmer (Borger RLA)
hašlatu mA, nA– cereal groats and the beer made out of it
ḫinḫinu (ḫiḫḫinu) – a type of cereal and flour (Gaspa)/ a seed used for seasoning (CAD)
inninu (eninu) oB, sB – a type of barley
kaʾatu nA – a variety of barley (Gaspa)/ a cereal (CAD)
kibtu, kibẗu (GIG, GIG.BA) oAkk, oB and all later periods - wheat
kunšu (or kunšu, kunšu) (ZÍZ, ZÍZ.AN.NA) – emmer
kurângu (var. kuriangu, kurıggu, kurâggu) (ŠE.LI.A; ŠE.LIL; BA.RI.GA) - rice
pinigu nA, sB – a cereal or a product of a cereal
šegunu – a variety of barley (Borger RLA)/ a crop (CAD)
šuʾu (šeʾum) (ȘE) oAkk and all later periods – generic term for grain crops; also refers to barley
šiḫūšu (šeguššu, šegūšu) oB, mB, sB – a cereal crop (DAB suggests Lathyrus sativus or Vicia ervilia)
šuʾu (ȘE.BA.RA) – Emmer? (Borger RLA)/ pulse, chickpea? (CAD)
ṭuṭumeṣi nA– a grain, said to be a foreign word (CAD)
uṭṭetu, uṭṭatu (ȘE.BAR) – barley
### APPENDIX C: BABYLONIAN TEXTS WITH REFERENCES TO COTTON (KIŢINNŬ)

<table>
<thead>
<tr>
<th>Text</th>
<th>Genre</th>
<th>Date of Manuscript(s)</th>
<th>Provenance</th>
<th>Museum/ Publication No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nabû-apla-iddina’s regulations concerning garments for Šamaš</td>
<td>Royal decree (Cultic endowments)</td>
<td>Neo-Babylonian copy (c. 626-539 BC) of Nabû-apla-iddina’s (887-855 BC) regulations</td>
<td>Sippur</td>
<td>BM 91002 (Zawadzki 2013a: No. 175)</td>
</tr>
<tr>
<td>Cotton given to Iqišā for the šibtu-garments of the goddess Anunitu</td>
<td>Administrative</td>
<td>c. 627 BC (accession year of Sin-šar-šikun)</td>
<td>Sippur</td>
<td>BM 49188 (Zawadzki 2013a: No. 556)</td>
</tr>
<tr>
<td>Cotton for the lubāru-garment of Šamaš withdrawn from an old cultic textile</td>
<td>Administrative</td>
<td>613 BC (14th year of Nabopolassar) or 591 BC (14th year of Nebuchadnezzar)</td>
<td>Sippur</td>
<td>BM 56765 (Zawadzki 2013a: No. 558)</td>
</tr>
<tr>
<td>Cotton given to Rēmût-Bēl son of Bēl-uballit</td>
<td>Administrative</td>
<td>575 BC (30th year of Nebuchadnezzar)</td>
<td>Sippur</td>
<td>BM 56240 (Zawadzki 2013a: No. 557)</td>
</tr>
<tr>
<td>Cotton given to Balassu as his prebendary income</td>
<td>Administrative</td>
<td>572 BC (33rd year of Nebuchadnezzar)</td>
<td>Sippur</td>
<td>BM 83271 (Zawadzki 2013a: No. 583)</td>
</tr>
<tr>
<td>Receipt for wool and cotton</td>
<td>Administrative</td>
<td>560 BC (2nd year of Amēl-Marduk)</td>
<td>Sippur</td>
<td>BM 57567 (CT 55, 753)</td>
</tr>
<tr>
<td>Cotton given to Bēl-uballit</td>
<td>Administrative</td>
<td>Year unknown, Reign of Nabonidus (r. 555-539 BC)</td>
<td>Sippur</td>
<td>BM 100893 (Zawadzki 2013a: No. 564)</td>
</tr>
<tr>
<td>Cotton given to Bēl-śar-bullit, official-in-charge of royal rations</td>
<td>Administrative</td>
<td>Year unknown, reign of Nabonidus (r. 555-539 BC)</td>
<td>Sippur</td>
<td>BM 79359 (Zawadzki 2013a: No. 559)</td>
</tr>
<tr>
<td>Cotton given to Bakûa and Nabû-upniya for 2 šibtu-garments of the goddess Anunitu</td>
<td>Administrative</td>
<td>Year unknown, Reign of Nabonidus (r. 555-539 BC)</td>
<td>Sippur</td>
<td>BM 57801 (Zawadzki 2013a: No. 575)</td>
</tr>
<tr>
<td>Cotton given to Bēl-śar-usur, official-in-charge of royal rations</td>
<td>Administrative</td>
<td>555 BC (1st year of Nabonidus)</td>
<td>Sippur</td>
<td>BM 64991 (Zawadzki 2013a: No. 560)</td>
</tr>
<tr>
<td>Cotton given to the tailor Arrabi</td>
<td>Administrative</td>
<td>554 BC (2nd year of Nabonidus)</td>
<td>Sippur</td>
<td>BM 65041 (Zawadzki 2013a: No. 561)</td>
</tr>
<tr>
<td>Cotton given to Kalbã, the alphabetic scribe</td>
<td>Administrative</td>
<td>551 BC (5th year of Nabonidus)</td>
<td>Sippur</td>
<td>BM 60937 (Zawadzki 2013a: No. 564a)</td>
</tr>
<tr>
<td>Cotton given to the brewer Nabû-ahhe-šullim from his</td>
<td>Administrative</td>
<td>549 BC (7th year of Nabonidus)</td>
<td>Sippur</td>
<td>BM 60842 (Zawadzki 2013a: No. 563)</td>
</tr>
<tr>
<td>Description</td>
<td>Administrative Date</td>
<td>Place</td>
<td>Reference</td>
<td></td>
</tr>
<tr>
<td>----------------------------------------------------------------------------</td>
<td>----------------------</td>
<td>--------</td>
<td>-----------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Cotton given to Śamaš-zēr-ušabši</td>
<td>548 BC (8th year of Nabonidus)</td>
<td>Sippar</td>
<td>BM 75683 (Zawadzki 2013a: No. 565)</td>
<td></td>
</tr>
<tr>
<td>Cotton given to Nabû-aḫḫe-šulîm</td>
<td>548 BC (8th year of Nabonidus)</td>
<td>Sippar</td>
<td>BM 69861 (Zawadzki 2013a: No. 566)</td>
<td></td>
</tr>
<tr>
<td>Cotton given to Śamaš-mukîn-apli</td>
<td>548 BC (8th year of Nabonidus)</td>
<td>Sippar</td>
<td>BM 56833 (Zawadzki 2013a: No. 567)</td>
<td></td>
</tr>
<tr>
<td>Cotton given to the brewer Muṣezi-b-Marduk</td>
<td>546 BC (10th year of Nabonidus)</td>
<td>Sippar</td>
<td>BM 79346 (Zawadzki 2013a: No. 568)</td>
<td></td>
</tr>
<tr>
<td>Cotton given to Bēl-šar-bullû, official-in-charge of royal rations</td>
<td>546 BC (10th year of Nabonidus)</td>
<td>Sippar</td>
<td>BM 56399 (Zawadzki 2013a: No. 569)</td>
<td></td>
</tr>
<tr>
<td>Cotton paid as rent to the Ebabbar temple by the merchants Nāṣir and Šûlû</td>
<td>546 BC (10th year of Nabonidus)</td>
<td>Sippar</td>
<td>BM 75584 (Zawadzki 2013a: No. 570)</td>
<td></td>
</tr>
<tr>
<td>Cotton given to the brewer Muṣaller-Marduk and the overseers of the bakers Šamaš-ibni and Šillû</td>
<td>546 BC (10th year of Nabonidus)</td>
<td>Sippar</td>
<td>BM 77860 (Zawadzki 2013a: No. 571)</td>
<td></td>
</tr>
<tr>
<td>Cotton given to Aziya</td>
<td>546 BC (10th year of Nabonidus)</td>
<td>Sippar</td>
<td>BM 79669 (Zawadzki 2013a: No. 572)</td>
<td></td>
</tr>
<tr>
<td>Cotton given to Bakûa for the šibtu-garment of the goddess Anûnutû</td>
<td>541 BC (15th year of Nabonidus)</td>
<td>Sippar</td>
<td>BM 75270 (Zawadzki 2013a: No. 573)</td>
<td></td>
</tr>
<tr>
<td>A lubû-rû-garment of cotton and other supplies for the temple of Ištar-tašme</td>
<td>541 BC (15th year of Nabonidus)</td>
<td>Sippar</td>
<td>BM 60767 (Zawadzki 2013a: No. 574)</td>
<td></td>
</tr>
<tr>
<td>Account of prebendary payments made to bakers including cotton</td>
<td>541 BC (15th year of Nabonidus)</td>
<td>Sippar</td>
<td>BM 61478 (Zawadzki 2013b: No. 191)</td>
<td></td>
</tr>
<tr>
<td>Cotton given to Bunene-šimannû for the šibû-garment of the goddess Anûnûûû</td>
<td>534 BC (5th year of Cyrus)</td>
<td>Sippar</td>
<td>BM 57801 (Zawadzki 2013a: No. 576)</td>
<td></td>
</tr>
<tr>
<td>Account of prebendary payments made to bakers and brewers including cotton</td>
<td>533 BC (6th year of Cyrus)</td>
<td>Sippar</td>
<td>BM 65153 (Zawadzki 2013b: No. 198)</td>
<td></td>
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<tr>
<td>Cotton given to</td>
<td>531 BC (8th year of</td>
<td>Sippar</td>
<td>BM 74670</td>
<td></td>
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<tr>
<td>Description</td>
<td>Type</td>
<td>Date and Details</td>
<td>Location</td>
<td>Reference</td>
</tr>
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<td>----------------------------------------------------------------------------</td>
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<tr>
<td>Bunene-šimanni for the <em>sibtu</em>-garment of the goddess Anunitu</td>
<td>Administrative</td>
<td>538 BC (1st year of Cambyses as satrap of Babylon)</td>
<td>Sippar</td>
<td>BM 56882 (Zawadzki 2013a: No. 577a)</td>
</tr>
<tr>
<td>Cotton given to a measurer of staples</td>
<td>Administrative</td>
<td>529 BC (1st year of Cambyses)</td>
<td>Sippar</td>
<td>BM 60067 (Zawadzki 2013a: No. 578)</td>
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<tr>
<td>Cotton given to Sin-ilī</td>
<td>Administrative</td>
<td>527 BC (3rd year of Cambyses)</td>
<td>Sippar</td>
<td>BM 75968 (Zawadzki 2013a: No. 579)</td>
</tr>
<tr>
<td>Cotton given to Bēl-ēreš, the measurer of the Esagila temple</td>
<td>Administrative</td>
<td>526 BC (4th year of Cambyses)</td>
<td>Sippar</td>
<td>BM 74875 (Zawadzki 2013a: No. 580)</td>
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<tr>
<td>Cotton given to Ina-šili-Bēl</td>
<td>Administrative</td>
<td>524 BC (6th year of Cambyses)</td>
<td>Sippar</td>
<td>BM 79603 (Zawadzki 2013a: No. 577)</td>
</tr>
<tr>
<td>Sale of cotton to various individuals</td>
<td>Administrative</td>
<td>506 BC (16th year of Darius I)</td>
<td>Sippar</td>
<td>BM 64060 (Zawadzki 2013a: No. 581)</td>
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<tr>
<td>Cotton given to Erība for the <em>sibtu</em>-cover of the bed of Adad</td>
<td>Administrative</td>
<td>502 BC (20th year of Darius I)</td>
<td>Sippar</td>
<td>BM 56864 (CT 55, 834)</td>
</tr>
<tr>
<td>Cotton from the <em>lubāru</em>-garment of Šamaš given to Sūqaya to make a <em>sibtu</em>-cover for the bed of Šamaš</td>
<td>Administrative</td>
<td>501 BC (21st year of Darius I)</td>
<td>Sippar</td>
<td>Dar. 533</td>
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<tr>
<td>List of tithe revenue including barley and cotton</td>
<td>Administrative</td>
<td>497 (25th year of Darius I)</td>
<td>Sippar</td>
<td>BM 61150 (Zawadzki 2013a: No. 583a)</td>
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<tr>
<td>Cotton sold to Nidintu and Bēl-ittanu for the <em>lubāru</em>-garment of Šamaš</td>
<td>Administrative</td>
<td>Year unknown, reign of Darius (r. 522-486 BC)</td>
<td>Sippar</td>
<td>BM 71174 (Zawadzki 2013a: no. 584)</td>
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<tr>
<td>Cotton given to unknown person (lacuna)</td>
<td>Administrative</td>
<td>Year unknown, Late Babylonian</td>
<td>Sippar</td>
<td>BM 60955 (Zawadzki 2013a: No. 585)</td>
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<tr>
<td>Cotton given to Šillāya</td>
<td>Administrative</td>
<td>Year unknown, Late Babylonian</td>
<td>Sippar</td>
<td>BM 60719 (Zawadski 2013a: No. 586)</td>
</tr>
<tr>
<td>Cotton given to Mušezib for the garments of Adad</td>
<td>Administrative</td>
<td>Year unknown, Late Babylonian</td>
<td>Sippar</td>
<td></td>
</tr>
<tr>
<td>Letter mentioning a ritual water basin and a cotton towel (in a broken context)</td>
<td>Epistolary</td>
<td>Year unknown, Neo-Babylonian dynasty</td>
<td>Sippar</td>
<td>CT 22: 35 (BM 61858)</td>
</tr>
<tr>
<td>Sale of cotton</td>
<td>Administrative</td>
<td>Year unknown, Neo-Babylonian dynasty</td>
<td>Uruk</td>
<td>PTS 2679 (unpublished)</td>
</tr>
<tr>
<td>Letter ordering the provision of quivers</td>
<td>Epistolary</td>
<td>Year unknown, Reign of Nebuchadnezzar</td>
<td>Uruk</td>
<td>YOS 21 140</td>
</tr>
<tr>
<td>and cotton (towels?) for the king</td>
<td>Letter ordering the delivery of cotton along with the ritual offerings</td>
<td>Epistolary</td>
<td>Year unknown, Neo-Babylonian dynasty</td>
<td>Uruk</td>
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<tr>
<td>Inventory of garments for the deities of Uruk including cotton garments (ṣibtu; lubûru)</td>
<td>Inventory of garments for the deities of Uruk including cotton garments (ṣibtu; lubûru)</td>
<td>Administrative</td>
<td>Inventory covers the years 542 BC - 538 BC</td>
<td>Uruk</td>
</tr>
<tr>
<td>Letter of [...]-bullûšu to Nabû-ahḫê-iddin mentioning a ḫuṣannu-girdle of cotton</td>
<td>Letter of [...]-bullûšu to Nabû-ahḫê-iddin mentioning a ḫuṣannu-girdle of cotton</td>
<td>Epistolary</td>
<td>Year unknown, Neo-Babylonian dynasty</td>
<td>Uruk</td>
</tr>
<tr>
<td>Letter of Arad-Nanaya to Nabû-šarra-ušur mentioning a ritual water basin and cotton towel for the Lady of Uruk</td>
<td>Letter of Arad-Nanaya to Nabû-šarra-ušur mentioning a ritual water basin and cotton towel for the Lady of Uruk</td>
<td>Epistolary</td>
<td>Year unknown, reign of Nabonidus</td>
<td>Uruk</td>
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<tr>
<td>Letter of Bunenešar-ušur to Nadin and Mukin-apli ordering the provision of cotton</td>
<td>Letter of Bunenešar-ušur to Nadin and Mukin-apli ordering the provision of cotton</td>
<td>Epistolary</td>
<td>Year unknown, reign of Nabonidus</td>
<td>Uruk</td>
</tr>
<tr>
<td>Marriage agreement and itemisation of dowry for Amat-Nanâ</td>
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<td>Marriage agreement</td>
<td>281 BC (1st year of Antiochus I)</td>
<td>Babylon</td>
</tr>
</tbody>
</table>