Oilseeds, spices, fruits and flavour in the Indus Civilisation

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ABSTRACT

The exploitation of plant resources was an important part of the economic and social strategies of the people of the Indus Civilisation (c. 3200–1500 BCE). Research has focused mainly on staples such as cereals and pulses, for understanding these strategies with regards to agricultural systems and reconstructions of diet, with some reference to ‘weeds’ for crop processing models. Other plants that appear less frequently in the archaeobotanical record have often received variable degrees of attention and interpretation. This paper reviews the primary literature and comments on the frequency with which non-staple food plants appear at Indus sites. It argues that this provides an avenue for Indus archaeobotany to continue its ongoing development of models that move beyond agriculture and diet to think about how people considered these plants as part of their daily life, with caveats regarding taphonomy and culturally-contextual notions of function.

1. Introduction

By 2500 BCE the largest Old World Bronze Age civilisation had spread across nearly 1 million km² in what is now Pakistan and northwest India (Fig. 1). The importance of agriculture to the Indus Civilisation has been noted by numerous authors (Marshall, 1931; Wheeler, 1968; Fairservis, 1961, 1967; Vishnu-Mittre, 1974; Vishnu-Mittre and Savithri, 1982; Chakrabarti, 1988; Weber, 1999, 2003; Fuller and Madella, 2002; Singh et al., 2008; Weber et al., 2011a; Petrie, 2013; Petrie et al., 2016, 2017; Petrie and Bates, 2017; Bates et al., in prep.). However, our understanding of Indus agriculture, specifically the strategies relating to plants, derives from an archaeobotanical record that has likely been biased towards the remains of cereals and pulses that have a better chance of survival (Hillman, 1981, 1984; Jones, 1984a, 1984b; Jones, 1985; Weber, 1991, 1999, 2003; Stevens, 1996, 2003; Fuller, 2002; Fuller and Madella, 2002; Harvey and Fuller, 2005; Fuller and Harvey, 2006; Margaritis and Jones, 2006; Fuller and Stevens, 2009; Reddy, 1994, 1997, 2003; Fuller et al., 2014; Bates et al., 2017a). Such skewing of the literature fails to take into account a more holistic understanding of the aims of agricultural strategies - the creation of food. This article aims to synthesise the existing primary archaeobotanical data on oilseeds, spices and fruits, and to explore how these have been interpreted in Indus archaeobotany. It will consider how these approaches have affected our understanding of Indus archaeobotanical datasets and outline how the developing field of Indus Civilisation foodways is changing this and is beginning to redress imbalances in interpreting different archaeobotanical remains.

2. Traditions in Indus archaeobotany

There is a long tradition of Indus archaeobotany. As summarised in Fuller (2002) it can be divided into three phases: ‘consulting palaeobotanist phase’ (pre-1947–1974), ‘professional archaeobotanists phase’ (1974–1988), and ‘self-critical archaeobotany phase’ (1988–present). Over 140 Indus sites have been excavated, with over 60 reporting archaeobotanical remains (Fuller and Madella, 2002; Possehl, 2002; Weber et al., 2011b; Bates, 2016; Petrie and Bates, 2017; Bates et al., in prep.). This rich archaeobotanical tradition has resulted in a wide array of data and discussions of the roles of plants in the Indus Civilisation, with their use in environmental reconstruction (Madella, 2003; Madella and Fuller, 2006; Weber et al., 2011a; Farooqui et al., 2013; Petrie et al., 2017), discussions on their role as material culture and technology (Kenoyer, 2004; Lancelotti, 2010, 2018; Lancelotti and Madella, 2012; Wright et al., 2012), through to models of Indus agriculture and subsistence (Vishnu-Mittre, 1974; Vishnu-Mittre and Savithri, 1982; Saraswat, 1992; Reddy, 1994, 1997, 2003; Weber, 1999; Weber and Fuller, 2008; Pokharia et al., 2014; Petrie et al., 2016; García-Granero et al., 2016, 2017a, 2017b; Bates et al., 2017a, 2017b, 2017c; Petrie and Bates, 2017), to name but a few. A wide variety of species have been reported (Bates, 2016), with over 260 genera/species noted across published reports of Indus and Painted Grey Ware period sites (Bates, 2016; Petrie and Bates, 2017; Bates et al., in prep.). The vast majority of these however are incidental finds, single seeds, or reported simply in presence/absence form, preventing further analysis (Fuller and Madella, 2002; Weber et al., 2011b; Bates, 2016; Bates et al., in prep.). In many cases the finds are rarities — present only at a single site rather
than pan-regionally (Fuller and Madella, 2002; Weber et al., 2011b; Bates, 2016; Bates et al., in prep.). In recent years attempts to bring together the systematically collected, quantified records have shown interesting patterns of Indus agricultural strategy. Weber et al. (2011a) and Petrie and Bates (2017) explored how Indus farmers may have exploited their environmental setting to create more complex seasonal and multi-cropping strategies according both to regional and micro-ecological variation. In-depth quantified analyses at sites such as Harappa (Weber, 2003), Rojdi (Weber, 1989, 1991), Oriyo Timbo and Babar Kot (Reddy, 1994, 1997, 2003), Farmana (Weber et al., 2011b), Shortughai (Willcox, 1991), Kunal and Bala (Saraswat and Pokharia, 2001, 2002), Loteshtwar, Datrana and Vaharvo Timbo (García-Granero et al., 2015, 2016, 2017a, 2017b), Kanmer (Kharakwal et al., 2008, 2011), and Masudpur I, Masudpur VII, Dabli vas Chugta, Burj and Bahola (Bates, 2016; Petrie et al., 2016; Bates et al., 2017a, 2017b, 2017c; Petrie and Bates, 2017), amongst others, have allowed for an exploration of plant origins, crop processing, and individual agricultural strategies utilised by different Indus communities. As Weber (1999) has commented, these studies however, have tended to focus on the often better preserved remains, the cereals and pulses, rather than rarer elements of assemblages. These biases relate both to the quantity of remains – cereals and pulses make up a far greater number of the remains (see sections SI.3–SI.7 in Petrie and Bates, 2017: supplementary information and Tables 5.3.a–c in Weber, 2003 for example) – but also to the way they have been interpreted – cereals, and to a lesser extent pulses, are viewed as the staple food source, the basic fare of Indus life.

Indeed, Weber (1999: Fig. 4) modelled the relationship between Indus archaeobotanical remains, creating a tiered system of importance. Tier I plants were, he argued, those “most abundant species recovered and those most crucial to the subsistence system” (Weber, 1999: Fig. 4). Looking across to Weber (1999: Table 1) in which the tier system is equated to finds from Harappa and Rojdi, Tier I plants include wheat and barley at Harappa and millets at Rojdi. Tier II plants under Weber’s (1999) scheme are “cultivated crops of lesser importance” (Weber, 1999: Fig. 4), such as peas, lentils, some oilseeds like flax, and fruits like jujube at both Harappa and Rojdi (Weber, 1999: Table 1). Tier III on the other hand includes “a mix of cultivated and wild species that play a minor role in subsistence” (Weber, 1999: Fig. 4) such as melon at Rojdi and Harappa or even rice at Harappa (Weber, 1999: Table 1). However, while Weber (1999: Table 1 & Fig. 4) discusses the presence of Tier II and III crops at Harappa and Rojdi, with a greater focus on pulses than fruits when thinking about the Tier II crops, he goes on to focus throughout the rest of the paper on “only the main cereal grains found at each site, those taxa that account for the majority of the recovered seeds in most samples and top the hierarchy in each model” (Weber, 1999: 821).

It is perhaps timely then to return to the published primary archaeobotanical literature to explore what Tier II and III plants were
Discussions in the literature being unclear as to their use in Indus life—fruit. This differing level of identification has resulted in many of the taxa identified further to species level, such as *Allium sativum* (garlic), found in clove form at Balu and Farmana (Saraswat and Pokharia, 2000), to spices like *Trigonella foenum-graceum* (fenu-greek) at Rohira (Saraswat, 1986), Kunal (Saraswat and Pokharia, 2002) and Banawali (IAR 1994–5; Saraswat and Pokharia, 2000), and fruits like *Juglans regia* (walnut) at Hulas (Saraswat, 1993).

Microbotanical datasets (Supplementary Data Table 2) have also been adding to our understandings of Tier II and III plants in recent years. Starch analysis in particular, seen at Farmana (Kashyap and Weber, 2010; Weber et al., 2011b) and Datrana (García-Granero et al., 2017a), has provided insight in plants that might otherwise not have survived archaeologically. At Farmana a range of spices including *Zingiber* sp. (ginger) and *Curcuma* sp. (turmeric) were noted along with soft tissue vegetables like *Solanum* sp. (eggplant) and fruits like * Mangifera* sp. (mango) on grinding stones, pottery and teeth (Kashyap and Weber, 2010; Weber et al., 2011b), Weber et al. (2011b: 820) point out that through this method they can not only identify hidden plant use but also explore associations between plants (getting closer perhaps to recipes) and between plants and material culture. It is interesting that ginger was also noted, though only through one starch grain, at Datrana (García-Granero et al., 2017a). Phytolith analysis at several sites has supported macrobotanical finds of date palm, cannabis and sugarcane (Madella, 1997, 2003; García-Granero et al., 2015, 2016, 2017a, 2017b; Bates, 2016; Bates et al., 2017a), while also suggesting that banana may have been utilised as *Musa* sp. leaf phytoliths have been found (Madella, 1997, 2003; García-Granero et al., 2015, 2016, 2017a, 2017b; Bates, 2016; Bates et al., 2017a; see Fuller and Madella, 2009 for discussion of banana origins, spread and use in the Indus and in South Asia more broadly).

### 2.1. A review of the published data

Given the diverse sampling and quantification methods present in the Indus archaeobotanical publication record current to October 2017 (Weber et al., 2011b; Bates, 2016; Petrie and Bates, 2017), rather than trying to compare and quantify the records across sites for Tier II and III plants, this paper will instead focus on looking at what plants were potentially available and how they have been presented in the primary literature. Table 1 summarises the findings of the literature review. Full data can be found in Tables 1 and 2 of the Supplementary Information.

Table 1
Summary of literature review data.

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<th>Number of macrobotanical taxa</th>
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<tr>
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<table>
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<tr>
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<th>Overall</th>
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<tr>
<td>Identified to family</td>
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<td></td>
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<tr>
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<td></td>
</tr>
<tr>
<td>Identified to species</td>
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<table>
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<tr>
<td>Early Harappan</td>
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<tr>
<td>Mature Harappan</td>
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</tr>
<tr>
<td>Late Harappan</td>
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<td>Harappan (generic)</td>
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<tr>
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<tr>
<td>PGW</td>
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<thead>
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<th>Number of sites (microbotanical)</th>
<th>Overall</th>
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Table 1 in the Supplementary Information outlines the macrobotanically preserved genus/species noted by authors as possible (human) foods at Indus sites that fall into Weber’s (1999: Fig. 4) Tier II and III, barring cereals and pulses. Those taxa identified only to Family level were not included (e.g.; Papaveraceae or Brassicaceae). The majority of these are seed remains, with the exception of *Allium sativum* (garlic), found in clove form at Balu and Farmana (Saraswat and Pokharia, 2001; Kashyap and Weber, 2010; Weber et al., 2011b). In total 62 accessions have been identified that have the potential to have been used as foods or food additives (spices or for adding flavour). In some cases the plants have been identified to genus level such as *Brassica* sp. (mustard type) and *Papaver* sp. (poppy type), but others have been identified further to species level, such as *Ziziphus nummularia*, *Ziziphus jujube* and *Ziziphus mauritiana*, species of jujube or ber fruit. This differing level of identification has resulted in many of the discussions in the literature being unclear as to their use in Indus life—e.g. at Rojdi, Weber (1989: 241) notes the presence of *Saccharum* sp. which he notes could be either sugar or noble cane, a possible fodder or food in times of scarcity dependant on species or use. At Rojdi Areca sp. is another example of the fine line between exploring possible food and non-food plants in the Indus as this includes betel palm, but is only identified to genus level and is therefore not discussed further beyond listing presence (Weber and Vishnu-Mitre, 1989: 179). However alongside these less certain plants there are a wide range of plants that have been identified to a level that provide more confidence and that therefore can be explored as to their possible exploitation as foods or additives to Indus cooking, ranging from oilseeds like *Brassica juncea* (brown mustard) at sites like Banawali (IAR 1994–5; Saraswat and Pokharia, 2000), to spices like *Trigonella foenum-graceum* (fenu-greek) at Rohira (Saraswat, 1986), Kunal (Saraswat and Pokharia, 2002) and Banawali (IAR 1994–5; Saraswat and Pokharia, 2000), and fruits like *Juglans regia* (walnut) at Hulas (Saraswat, 1993).

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### 2.1. The utilitarian fallacy in archaeobotanical interpretation

One concern relating to the exploration of non-staple crops will always be the issue of the utilitarian fallacy, as discussed at length by Fuller and Madella (2002: 345–348) in relation to *Chenopodium album* at Rojdi (Weber, 1989, 1991) (see also Weber et al., 2011b for modern uses; and Fuller, 2002; Fuller et al., 2014 for further discussion of the utilitarian fallacy in archaeobotany). The notion that all seeds on site must have a function pervades the discussion of Indus archaeobotany (Fuller and Madella, 2002; Fuller, 2002). Several reports assume that all seeds had some function such as being famine food, medicine or fodder (Fuller and Madella, 2002; Fuller, 2002).

An example of the over-interpretation of archaeobotanical remains to explain their presence on site can be seen in the discussion of possible stimulants at Kunal (Saraswat and Pokharia, 2002: 133). Although only a single seed of *Cannabis sativa*, *Ephedra sp.* and two of *Datura stramonium* were found at the site, a discussion of their possible role as stimulants and for their “medicinal properties” is carried out, with reference to much later texts, religious practices and non-Indus references. This is not to say that these plants may not have been used for such functions at Indus sites, but that additional information such as assemblage and context is needed to determine this further.

Taphonomy is a critical aspect for understanding the formation of archaeobotanical assemblages (see Fuller et al., 2014 for a summary of previous discussions). There are multiple pathways for plant materials to reach a site, including both human action, environmental vectors and accidental factors. The possible causes of preservation by charring are not restricted to human cooking or use. Hillman (1981) suggested that...
plants generally reach fire through the drying or parching of crop products, burning diseased crops, use of dung fuel, or by accidents such as during cooking. Dung fuel could be a major source of plant matter at sites, including plants that have been identified as foods under a utilitarian approach. Cattle dung is often used as a fuel source in South Asian villages rather than wood (Harris, 2000). Herbivorous animals grazing on pastures or crop stubble, or being fed crop processing waste, produce a plant rich dung which, when dried makes a clean fuel that burns without smells. Further plant material can be added to the dung to increase the burn-potential of the dung. The impact that dung fuel has on charred macrobotanical remains has been explored previously by scholars such as Hastorf and Wright (1998), Miller (1984), Miller and Smart (1984), Rosen (2005), Lancelotti (2010) and Lancelotti and Madella (2012) but has been critiqued by scholars such as Reddy (1997) and Fuller et al. (2014). In particular Reddy (1997) and Fuller et al. (2014) highlight the possible range of other sources for seeds on archaeological sites beyond dung fuel, the disjunction between the interpretative models applied to different regions and between the interpretations made concerning similar hunter-gatherer and farming archaeobotanical assemblages. Recent research by Lancelotti (2018) has explored the fuel resources of several Indus sites and suggests that dung played an important role as a fuel source alongside wood, but the relationships between grazing, chaff inclusion and dung in the Indus is complex, requiring us to think carefully about how the taphonomic pathways of many plants are disentangled.

This holds true even for plants that may be considered ‘food’. At the site of Farmana Kashyap and Weber (2010) suggest that starch grains from dental calculus may show cattle eating similar foods to humans, including spices like turmeric and ginger, both identified at the site. Again however, there are many taphonomic pathways that could account for this, including animals eating human food scraps. It does however highlight the importance of considering the issue of dung fuel as a route for seeds entering a site, and thus for considering if a plant survived as a deliberate human food, in dung as animals eating human food, or as something that animals may have eaten while being deliberately foiled or while freely grazing.

This notion of grazing also brings to light another interesting taphonomic pathway for Indus oilseeds, spices and fruits — that of weeds, and the taphonomic pathway of crop processing. While defining plant remains as agricultural weeds is a difficult topic in archaeobotany as definitions of ‘weeds’ are culturally and practice specific, it is important to consider as crop processing is key route for seeds entering a site. Seeds can be accidentally gathered in during harvest and brought to site, and are then removed through the crop processing stages. Crop processing models have become an important tool for exploring social organisation through plant remains and agricultural labour organisation (Hillman, 1981, 1984; Jones, 1984a, 1984b; Jones, 1985; Weber, 1991; Stevens, 1996, 2003; Fuller, 2002; Harvey and Fuller, 2005; Fuller and Stevens, 2009; Reddy, 1997, 2003; Fuller et al., 2014).

Over-interpretative utilitarian approaches thus ignore the potential for seeds to provide information on other aspects of agricultural organisation such as crop processing, foddering and dung fuel, or even further to think about ecological information for exploring agricultural strategies like manuring or ploughing (e.g.: Jones, 1981, 1984a, 1984b, 1985, 1986; van der Veen, 1992; Stevens, 1996). These alternative approaches assume that non-crop remains do not necessarily have a ‘function’ but are instead sources of information more broadly and need to be explored in their own right.

In the case of the Cannabis sativa, Ephedra sp. and Datura stramonium at Kunal, Saraswat and Pokharia (2002) explore their presence as possible wild taxa growing in the area and their potential to provide information on cultivation practices or environmental conditions around the site. However Saraswat and Pokharia (2002:133) argue that “Early Harappans in all likelihood would have not afforded to neglect these plants” and favour instead the utilitarian interpretation based on later texts, religious practices and non-Indus references.

2.1.2. Discussions on preparation, use and origin

Assumptions about the role of fruits regardless of whether they are wild species or cultivated are often made (see for example discussions of Cordifolia grandis in Bates, 2016 and Petrie and Bates, 2017; and Grewia sp. in Tengberg, 1999). While infrequently identified taxa that have the potential to have been incorporated into the Indus archaeobotanical assemblage as either weeds or as part of human practices have sometimes been treated as insignificant or over-interpreted through a utilitarian lens, fruits have also often been over-interpreted. Despite being present on sites often in low numbers, they are commonly described as important parts of Indus food ways. For example, Saraswat and Pokharia (2002:128) comment that they “played a significant role” despite forming only a small proportion of the finds at the site of Kunal. How fruits were handled is often discussed without evidence for fruit preparation in the archaeological record — at Kunal “as in antiquity as today, both fresh and dried grapes were eaten. Fresh fruits are dried in the sun to form sweet raisins” (Saraswat and Pokharia, 2002:128) and at Balu jujube fruit are also noted as possible medicine as today “they are often dried and used in native medicine as cooling, anodyne and tonic” (Saraswat and Pokharia, 2001:168). Weber (1989:265) similarly describes the ways jujube is used today, from eating it to using it as a fodder to using the bark for tanning and medicine and building material. As Margaritis and Jones (2006) demonstrated in their study of grape processing, additional evidence such as skins and taphonomised seeds are required to explore such activities, and the preservation pathways of these are complex and uncommon. A lack of caution then in Indus archaeobotany has often been applied to ‘edible fruits’ (Tengberg, 1999:8).

The properties of plants are also sometimes of more interest than the assemblage or contextual associations of the archaeobotanical remains. This can be seen in the way Linum usitatissimum (linseed) is discussed. At Miri Qalat linseed is discussed as a fibre (Tengberg, 1999:8) while at Kammer (Pokharia et al., 2011:1844) and Masudpur I (Bates, 2016; Petrie and Bates, 2017) it is explored as oilseed. In all three cases a review of these interpretations is perhaps warranted with more in-depth contextual and artefactual reference. There is increasing evidence available from Indus and northern South Asian for fibre use, stretching back to the use of cotton at Neolithic Mehrgarh (see Mouliherat et al., 2002). Jute has been identified in fibre form at Harappa (Wright et al., 2012), and jute/hemp at Farmana (Weber et al., 2011b:815). In addition to this evidence not only for fibre exploitation and complex weaving systems (see Wright et al., 2012 for discussion of technologies), there is evidence for non-plant based fibre exploitation in the form of wild silk at Harappa and Chanhu Daro (Good et al., 2009). This suggests therefore that careful exploration of the full assemblage, context and taphonomy of any fibre/oilseed remains is essential for determining the use of plants such as Linum usitatissimum or even Gossypium herbaceum/arborem, both of which can be used for fibres but also for other functions such as oils (Singh et al., 1965).

Discussions about the origin of plants are often dominant in many studies. This also holds true for several of the Tier I plants as well, see for example Weber (1989), Weber and Fuller (2008), Pokharia and et al. (2014) on the origins of millets and Willcox (1991), Liu et al. (2017) and Lister et al. (2018) on wheat and barley. Tier II and III plants however are particularly explored in archaeobotanical reports as to whether they have exotic or native origins in South Asia. For example dedicated sections of the archaeobotanical reports of Kunal (Saraswat and Pokharia, 2002) and Miri Qalat (Tengberg, 1999) are devoted to exploring the domestication of Vitis sp. (grape) despite the small numbers of seeds at both sites. These discussions are perhaps prominent as they tie into wider debates for exploring social organisation and for the implications they have for understanding trade networks and value systems in the past (Fuller and Madella, 2002; Weber, 2003; Weber et al., 2011b; see also Boivin et al., 2014).
2.2. The problems of preservation and publication

The lack of study of Tier II and III plants may be due in part to the irregular use of flotation as a practice on Indus sites (see Kashyap and Weber, 2010; García-Granero et al., 2017a, 2017b). Weber et al. (2011b: 809) note that due to the lack of flotation and thus recovery “fibre and oilseeds producing plants (cotton, linseed and sesame) and that roots and tubers (ginger, turmeric and yams) have rarely been recovered at Harappan sites (Fuller and Madella, 2002). Tropical fruits (natives such as mango, jamun and amala) and spices (such as black pepper, nutmeg, cinnamon, clove and asafoetida) which might have been a part of the Harappan diet (Kenoyer, 1998) are also minimally represented or missing from archaeobotanical record”. This could, however, also be due to differential preservation. While cereals and pulses have both crop processing and cooking pathways that involve fire (parching, roasting boiling for example — see Hillman, 1981, 1984; Jones, 1984a, 1984b; Jones, 1985; Weber, 1991; Stevens, 1996, 2003; Fuller, 2002; Harvey and Fuller, 2005; Fuller and Harvey, 2006; Fuller and Stevens, 2009; Reddy, 1994, 1997, 2003; Fuller et al., 2014; Bates et al., 2017a), fruits, whose unprocessed spices and vegetal remains lies like leaves or identifiable tuber fragments are unlikely to regularly reach fire during preparation or cooking (Fuller and Madella, 2002; Fuller et al., 2014; see also Margaritis and Jones, 2006). The discovery of Allium sativum (garlic) cloves at Balu and Farmana (Saraswat and Pokharia, 2001; Weber et al., 2011b) therefore deserves recognition as it is rare that whole cloves undamaged by food preparation would reach fire in order to be charred. The presence of garlic at two sites suggests that this was a crop familiar to Indus people in the region, but that it may have been missed at other sites due to a lack of preservation or recovery.

Starch analysis has been raised as a method for adding new information in situations where the preparation method or preservation pathways of plants would result in a lack of macrobotanical preservation (Kashyap and Weber, 2011b; Weber et al., 2011b; García-Granero et al., 2017a, 2017b). The discovery of species previously unknown to the Indus such as Zingiber sp. (ginger) at both Farmana and Datrana (Kashyap and Weber, 2010; Weber et al., 2011b; García-Granero et al., 2017a, 2017b) have opened up new questions regarding cooking practices and ideas about recipes. However the practice of starch analysis has been called into question relating to the preservation pathways of starch in archaeological contexts (Briggs et al., 2006; Butts and Briggs, 2011; Mercader et al., 2018a). The wide range of destructive agents that can attack starch and the lack of data relating to the ways starch could be preserved over such long periods of time has been raised as an issue (Adu and Oades, 1978; Barton, 2009; Henry et al., 2009; Collins and Copeland, 2011; Crowther, 2012; Henry, 2015; Hutscheneuber et al., 2017; Mercader et al., 2018a), as has the theory of the protection of starch in micromines in artefacts given the size of the destructive agents (Dorn, 1998; Golubic and Schneider, 2003; Luef et al., 2015; Mehta and Satyanarayana, 2016; Pedergnana and Ollé, 2018; Xhuaflair et al., 2017; Mercader et al., 2018a), and problems relating to identification and cooking distortions, along with sampling strategies have been explored (Henry et al., 2009; Collins and Copeland, 2011; Copeland and Hardy, 2018; Mercader et al., 2018a). This therefore suggests that while the starch grains from the Indus have provided some interesting lines of enquiry for exploring Indus Tier II and III plants and their uses, some caution is needed, and more investigation of the preservation and analytical pathways is needed.

3. The future of holistic Indus archaeobotany?

What is apparent from the review of the published archaeobotanical literature is the wide range of these lesser discussed plants, including both wild and cultivated species of oil/fibre seed, fruits and spices. While these are not found in great quantities at most sites, they have been found at 45 sites, making them present across two-thirds of the sites in the published archaeobotanical literature (Bates et al., forthcoming). This suggests, as Weber et al. (2011b: 820) comment, that spices, flavourings and additions to the staple cereals and pulses were not rare or unusual but a regular part of the Indus diet.

The ubiquity of these plants across sites shows that it is important to explore them in great detail within future archaeobotanical analyses, as they affect our understanding of Indus agricultural strategies and aims (Weber et al., 2011a; Wright, 2010; Petrie and Bates, 2017; Bates et al., in prep.). These plants are not restricted by seasonality, for example Linum usitatissimum (linseed) is rabi (winter), Capparis decidua (karira) is saíd (summer) and Sesamum indicum (sesame) is khariff (monsoonal) in season (Chakrabarti, 1988; Kumar et al., 2002; Rai, 2004; Asawa, 2006; Kumar, 2006; Punia et al., 2011; Singh et al., 2011; Mondal et al., 2014; Petrie and Bates, 2017), nor are they all grown in a single year, as while Trigonella foenum-graceum (fenugreek) is grown as an annual, Ricinus communis (castor oil) grows as a perennial and the fruit trees only grow as long term investments in land (Petrie and Bates, 2017). These plants also grow in a range of environments and under different growing conditions (Petrie and Bates, 2017), affecting the kinds of labour invested in interacting with them (Petrie and Bates, 2017). As such they need to be incorporated into the main archaeobotanical discussions, interpretations and modelling of Indus environments, agriculture and ‘diet’.

Thinking about Tier II and III plants alongside staples might also allow us to move beyond agriculture and ‘diet’ to think about plant use as social construct. As Sherratt (1991: 50) has argued, “we do not eat species, we eat meals”, and these meals are, as Hastorf (2016: 2) has pointed out, made up of a series of categorisations of what is and is not classified as food. This notion of food and meals, rather than diet and agriculture, has become increasingly important in the wider field of archaeobotany (see Gumerman IV, 1997; Smith, 2006; Twiss, 2012; Hastorf, 2016), and is a burgeoning field in Indus archaeology as well.

Work by Chase (2012a, 2012b) has explored how different cuts of meat and animal products were used by Indus peoples as part of “inclusionary ideologies” but also markers of social difference. Chase (2012a, 2012b) has argued that at the site of Bagasra, Gujarat, the butchery and cooking technologies demonstrate social difference and inclusion, and that while the tools used for meat preparation do not seem to have differed across Bagasra, and the initial stages in meat butchery would suggest that people living inside and outside the walled areas of the site acquired meat from a common market source, the way this meat was processed and used shows different recipes, which could relate to different ideologies or identities. Fuller and Rowlands (2011; see also Fuller, 2005) have explored how cooking technologies may link to Indus identities. They argue that existing culinary traditions influence how readily new food items are adopted. This additive process is thus linked to the traditional culinary “template” (Fuller and Rowlands, 2011: 38) of the region. In South Asia in particular they suggest that a frontier between culinary styles existed, between grinding/bread technologies to the west and sticky/boiling technologies to the east. The Indus foodway, they argue, was influenced by the grinding/bread tradition (Fuller and Rowlands, 2011: Fig. 5.2). This may account for why rice, a sticky/boiling food, was not readily adopted in some areas of the Indus such as at Harappa. Madella (2014: 226) points out “Indus society constructed bonds and relationships through alternative and less obvious ways” and their use of crops may have been yet another part of this. The slow adoption of rice may have been linked to a social resistance to this crop, tastes or ideas of social identity, or indicate that rice was a restricted and controlled food, its consumption linked with social class or identities (Madella, 2014).

Microbotanical approaches are also addressing the notion of Indus foodways. Although there remain issues with starch analysis (see Mercader et al., 2018a), Kashyap and Weber’s (2010) and Weber et al.’s (2011b: 820) interpretation of the starch granules at Farmana went beyond discussing the individual components of the dataset to look at
the links between specific types of plants and different material culture, alongside evidence for people eating them from the analysis of starches trapped in dental calculus. It provided a demonstration of different food preparation and consumption practice (Weber et al., 2011b: 820; see also Goody, 1982: 37), and thought through ideas of food combinations and cooking methods. Such approaches, and those being trialled by Suryanarayan and colleagues using lipid and residue analysis (Suryanarayan et al. forthcoming) to look at cooking practices and recipes, are moving beyond faceless models to consider more agentic, humanised understandings of how people used food in the past. Combined with more rigorous quantified and contextual analysis of macro-botanical remains of all plant species from sites, these approaches will allow us to take the next step in building a picture of Indus plant use — one of the actual goals of Indus plant growing, the creation of food for cooking and eating.

Developing these ideas of Indus foodways is the next step, it is allowing Indus archaeology to move beyond ‘subsistence’ and ‘diet’. One further approach to bring to these models maybe to consider the notion of flavour. This will help in the goals laid out by Kashyap and Weber (2010), Fuller and Rowlands (2011), Weber et al. (2011b), Chase (2012a, 2012b, 2014), and Madella (2014) in creating this more agentive and realistic picture of the Indus Civilisation. Hastorf (2016) has noted that today we associate specific flavours with certain dishes, cuisines and even cultural groups, and that there is no reason to think that people in the past would not have done so as well. For example in the Han Dynasty tomb #1 of Lady Dia and the neighbouring tomb #3 in the Yangtze, the food stores and their bamboo tags have allowed archaeologists to identify both the seasonings favoured by Han nobility and their preparation methods: salt, sugar, honey, soy sauce and shiit (salted darkened beans), used to make keng stews of seasoned boiled grains and vegetables (Yu, 1977). Using a foodways approach (see for example Goody, 1982; Messer, 1984; Fischer, 1988; Gummerman IV, 1997; Smith, 2006; Twiss, 2012; Hastorf, 2016) and flavour principle as suggested by Rozin (1973, 1982), for example, could allow Indus archaeologists to be thinking about how foodways developed and were used as part of daily life in the expression of identity. Such a change in mindset, with caveats of caution regarding the interpretation of remains outlined in this paper, will perhaps create a more dynamic understanding of Indus plant use.

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Appendix A. Supplementary data

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References