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# Some Archaeobotanical Evidence for Environment, Plant Use, Agriculture, and Interregional Contact in Iran

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**Abstract**

**If we go through the evolution of human society, we will come to know that plants have always played important role in human life. Human settlement, quite often, shifted from one place to another in search of natural vegetation. Whether man was hunter, or concentrated on animal husbandry, or even became cultivators, they needed green surrounding for their day-to-day life.**

**The present paper tries to highlight the historicity of botanical environment on the basis of plant remains, from the different archaeological sites of Iran. To ascertain the relationship between human being and plants, in Iran or elsewhere, archaeologists followed various techniques and analyses such as pollen analysis, charred seeds and woods analysis, organic residue analysis as well as ethno- archeology. This paper, particularly on the basis of archaeobotanical analysis, tries to show how the plant and seed remains demonstrate cultural interregional contacts.**

**Keyword: Archaeobotanical Analysis, Environment, Interregional Contacts, Charred Remains, Iran.**

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Plants are basic to human life, so if we are to understand ancient societies, archaeologists must have some appreciation for their botanical environment. In Iran and elsewhere, pollen analysis, the analysis of charred seeds and wood, the analysis of organic residues, and ethnoarchaeology all provide useful techniques and approaches for learning about the relationship between people and plants in the past. For example, from pollen studies that were carried out on lake sediments in the Zagros mountains, we infer that much of Iran was so cold and dry during the Pleistocene that it was inhospitable to human settlement (van Zeist and Bottema 1997, 1991). Charred seeds from Ali Kosh on the Deh Luran plain in Khuzestan document, the rapid spread of agriculture from contact with farming societies to the west (Helbaek 1969; see also Bar-Yosef 1998). Organic residue analysis has identified very early evidence for fermentation in the remains of wine and beer from vessels found at Hajji Firuz and Godin dating to the Neolithic and Chalcolithic periods (Badler et al. 1990; McGovern et al. 1996). And ethnoarchaeological work at Malyan suggested that many seeds found on archaeological sites come from dung burned as fuel (Miller 1984). Newer techniques, such as phytolith analysis and DNA analysis, will undoubtedly provide information that will deepen our understanding of the relationship between people and plants in ancient Iran (for survey of archaeobotany in Iran, see Miller 2003; for discussion of crops, see Zohary and Hopf 1994).

Plant remains from archaeological sites reflect many aspects of the relationship between people, plants, and the environment in which they lived. This paper discusses information obtained from plant macro remains seeds and wood that are visible without a microscope. Most archaeological plant remains are preserved through charring, because in the absence of oxygen, burnt plant materials keep their shape constant instead of turning to ash. Identifiable remains consist primarily of wood charcoal and seeds which are extracted by flotation from archaeological soil samples. In order to interpret the material, we must consider their archaeological context, as well as the amounts and proportions of the various types. Plant remains do not precisely mirror the ancient environment or the way people used plants. One cannot simply say that if half of the wood remains are oak, the forest was 50% oak, or that if 90% of the grain is barley, barley was the most important crop. The plant remains we analyze, have passed through two cultural filters: First, most came onto the site through some human action, and second, at some point they were burned. Experience suggests that much of the material is incompletely burned fuel wood collected outside the site, and seeds that had been dung burned as fuel.

Once we understand the nature of the remains, archaeobotanical data can answer a wide range of questions. The most basic include what crops were grown? What was used for fuel? and do any of the plants come from distant lands? The plants do not speak for themselves, so it is important to understand the kinds of arguments that allow us to reconstruct land use and human impact on the environment, and evaluate evidence of interregional contact.

**Crop plants**

With the beginning of agriculture about 10,000 years ago, people created a new ecological niche that favored the spread of some plants. For example, wild emmer wheat grows under a fairly narrow set of growing conditions within a limited area of the Levant. But with cultivation, it may have taken as little as few hundred years for domesticated emmer to spread down the Taurus-Zagros arc, all the way to Ali Kosh (Helbaek 1969). The earliest plants cultivated in Iran include two-row barley, emmer wheat, and lentils.

By about 5000 BC other field crops become more prominent than they had been before, probably because irrigation became more widespread in western Iran. These crops, which either require or at least do better with irrigation, include six-row barley, bread wheat, and flax. Even though, many crop plants can thrive in a broader range of conditions than their wild ancestors, they are more suited to some environments and cultivation schedules than others. For example, with or without irrigation, wheat and barley are sown in the fall and harvested in the spring. Also, in general, barley is more drought tolerant than wheat, and two-row barley needs less moisture than the six-row type. Lentil and flax would be summer irrigated crops.

As every farmer knows, the weather is a major variable in agriculture, but there are many different ways of dealing with natural conditions. We can use archaeobotanical remains to identify the range of food production strategies people used. This section discusses the remains from four late fourth - and early third-millennium sites that I have analyzed (Table 1) Sharafabad (Wright et al. 1981), Farukhabad (Miller 1981), Godin (Miller 1990), and Malyan (Miller 1982). The Sharafabad, Farukhabad and Godin deposits are characterized as Uruk-period with cultural ties to Susa and Susiana. Sharafabad is in Susiana itself, Farukhabad is in the neighboring Deh Luran plain, and even though Godin is in the Kangavar valley in Kermanshah, it is thought to have been some kind of a trade outpost of Susa (Weiss and Young 1975). The Malyan samples are roughly contemporary Proto-Elamite. The sites are located in very different environments. Malyan and Godin are in the Zagros highlands, well within the rainfall agriculture zone. Rainfall agriculture would have been marginal at best at Farukhabad on the Deh Luran plain and at Sharafabad in Susiana.





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**Table 1** Summary of plant remains*

| | Farukhabad (Uruk levels) | Sharafabad (Uruk) | Malyan (Banesh) | Godin V (Uruk) |
|---|---|---|---|---|
| Wheat | 8 | 6 | 32 | 1460 |
| Barley | 28 | 52 | 112 | 440 |
| Cereal | 34 | n/d | 86 | 263 |
| Lentil | 1 | 47 | 4 | 5380 |
| Wild grass | 14 | 126 | 40 | 279 |
| Native legume | 257 | 2 | 21 | 22 |
| Other wild/weedy | 74 | 13 | 144 | 881 |
| Wild and weedy total | 345 | 141 | 205 | 1180 |
| Wheat/barley | 0.29 | 0.12 | 0.29 | 3.32 |
| Wild/cereal | 493 | 243 | 89 | 55 |

* cereal counts and estimated: 1 grain ≈ 0.01g

Source: Farukhabad (Miller 1981a), Sharafabad (unpublished laboratory notes), Malyan (Miller 1982), Godin (Miller 1990).

The four sites share many of the same crops, such as various kinds of wheat and barley, and lentil. It is not possible to compare the archaeobotanical assemblages directly because the archaeological contexts of the deposits varies. Most of the seeds come from ordinary settlement debris, and most samples have more wild and weedy seeds than crops. At Godin, however, many of the samples come from burned buildings with concentrations of crop remains. By quantity, lentil would seem to be the most important type there, but that may simply reflect the fact that many of the remains were accidentally burned food, rather than fuel. Is it significant that among the other three sites, only Sharafabad had more than a few lentils relative to other cultivated plants? Given the water requirements of lentil, it suggests that summer irrigation was important at both Sharafabad and Godin; Sharafabad is also the only site with flax, another summer-irrigated crop.

The set of crops recovered from the Iranian archaeological sites fit what we know about the environmental and historical conditions. But it is worth giving six-row barley a second look, even though it occurs on all four sites. (It is fairly easy to distinguish wheat from barley, but archaeological specimens of six-and two-row barley are harder to tell apart.) Six-row barley tends to be grown under irrigation as a winter crop; as one might expect, archaeological six-row barley does seem to be more prevalent in the irrigated lowlands of Iraq; it also seems to be the main barley at both Farukhabad and Sharafabad. Since irrigation is a lot of work, you might expect the





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six-row type to be less important in the moister highlands, where rainfall agriculture is more secure. And as expected, Malyan has very small amounts of it. In contrast, the Godin material has a relatively high proportion of the six-row type, which makes it resemble a lowland assemblage. An interesting question: along with summer-irrigated lentils, could six-row barley be another manifestation of connections between highland Godin and lowland Susa, an example of a lowland food preference carried by the Susian colonist-traders? The data are inconclusive.

This discussion of crops shows that even a simple catalog of cultivated plants considered in an environmental and cultural context is potentially informative about agriculture and food. But it should be remembered that we are dealing with charred material.

**Fuel**

The most likely material to be put into a fire is fuel, and wood is the most obvious fuel, we find in archaeological sites. Because it is not economical to transport wood more than about 50 km or so, wood charcoal analysis is the best way to figure out what kinds of trees grew near a site. For example, at about 3000 BC at Malyan, the closest woodland types were pistachio, almond and juniper (Miller 1985). At Farukhabad, the very small quantity of wood reflects its location in the more arid steppe-forest the charcoal was mostly tamarisk, which is not even a woodland species, but rather one which typically grows along streams and in wet areas.

But what about the charred seeds? People do not intentionally burn their food, so in general on sites in the Near East, there is good reason to think most of the seeds found in ordinary occupation debris originated in dung burned as fuel, and that dung provided a cheap and handy alternative to wood fuel (Miller 1984). The small quantities of wood charcoal relative to burned seeds at Farukhabad and Sharafabad suggest dung must have been used at those lowland sites. But even at Malyan and Godin in the heart of the Zagros forest zone, pieces of burnt dung were recovered from flotation samples.

With most of the seeds coming from wild plants rather than crops, and from animal fodder instead of human food, charred seed assemblages provide a window onto pasture and grazing practices. Seed analysis of three fourth-to second-millennium BC sites along the Euphrates river demonstrated that the distribution of plant remains across time and space may reflect agricultural practices (Miller 1997). In particular, the proportion of wild seeds to cereals may be calculated as a way to assess the relative dependence on herding and farming. If the figure is high, it suggests the animals are sent out to graze: that is, they eat more wild plants. If it is low, it suggests that fodder is being grown for the animals. In the dry-farming zone of the Euphrates, that means that as you go from the wetter north to the drier south, the number of wild seeds increases.

Applying the same reasoning to the Iranian sites, gives a useful perspective (Figure 2). Of the four sites, Farukhabad has the highest amount of wild seeds relative to cereals, which suggests an emphasis on pastoralism over agriculture there. This is fully consistent with what we know about




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the historic past and environmental conditions-pastoralism has always been important on the Deh Luran plain. This point is emphasized if one considers that the most significant category of wild seed is endemic (native) legumes, which provide high quality forage (257 of the 345 identified wild seeds: Table 1). These seed types were very common at the earlier site of Ali Kosh, at the very beginning of farming and herding. Therefore, the data suggest not only that pastoralism played an important role in the economy of Uruk-period Farukhabad, but that grazing had not yet severely affected on the natural vegetation.

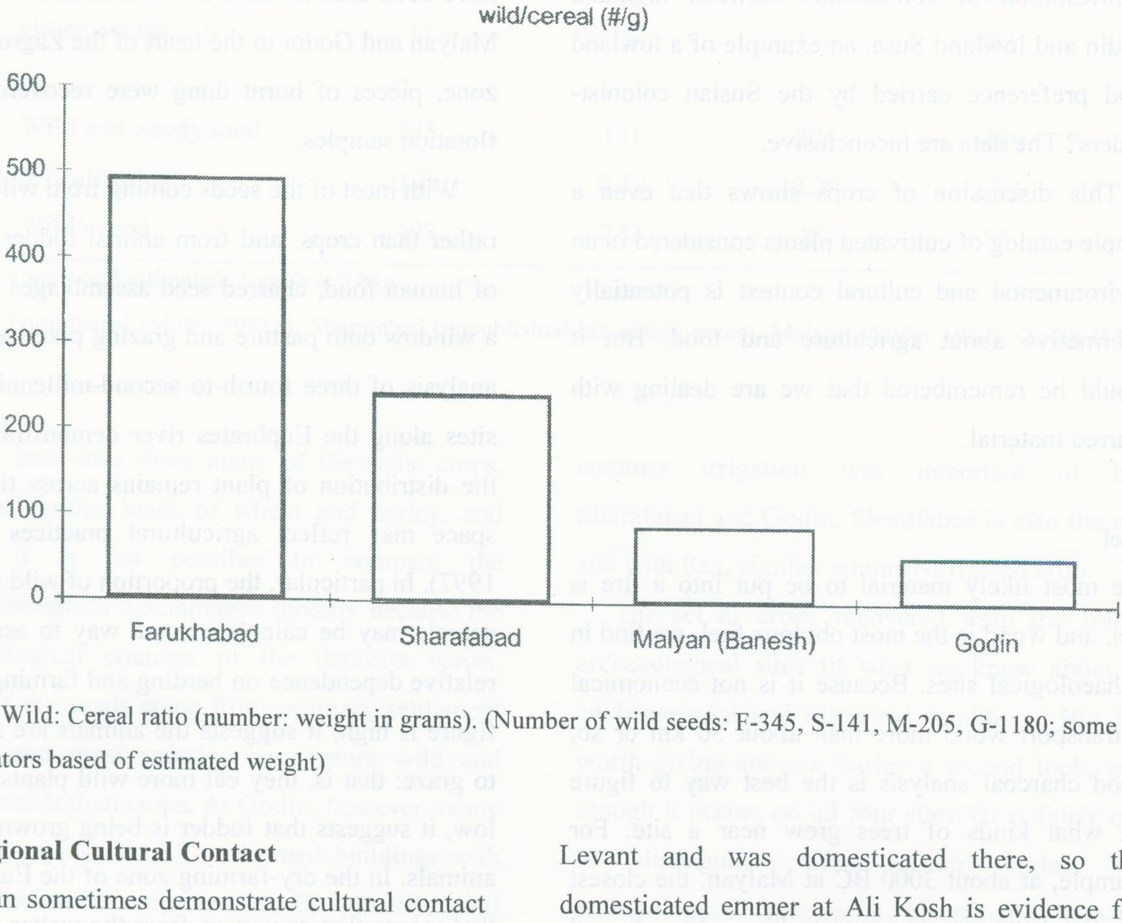


**Figure 2** Wild: Cereal ratio (number: weight in grams). (Number of wild seeds: F-345, S-141, M-205, G-1180; some of denominators based of estimated weight)

## Interregional Cultural Contact

Seeds can sometimes demonstrate cultural contact between regions. Since, plants have specific growth requirements and geographical distributions, it is sometimes possible to identify contact between different regions. I have already mentioned the very early contact between Iran and the west: Hans Helbaek (1969) pointed out that the wild ancestor of emmer wheat is restricted to the Levant and was domesticated there, so the domesticated emmer at Ali Kosh is evidence for the spread of farming cultures to the east. (Plant domestication began in the west and spread east, but animal domestication began in the Zagros and spread west [Hole 1984; Zeder and Hesse 2000].)

Sometimes, plant remains are more likely to be evidence of trade than of the expansion of cultivation. For example, the species of pistachio





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(*Pistacia vera*) reported by Lorenzo Costantini from fifth-millennium Tepe Yahya (Lamberg Karlovsky and Tosi 1989) is unlikely to have grown there for two reasons. First, Yahya is out of the natural range of the wild type, which is in Central Asia (Zohary 1963), and second, tree culture was in its infancy. Morphologically, the nuts could have grown either on wild or domesticated trees. In any case, those finds are most likely to have come from some kind of trade contact between the Iranian plateau and the north.

An example of short-range trade would be the single date pit from a second-millennium BC deposit at Malyan. The closest date-growing region is about 100 km or so from the site.

Finally, even after the development of agriculture, adoption of new crops may show cultural interaction over a distance, In this case, the site is Susa and the plant is rice (Miller 1981b). Rice was cultivated as early as the third millennium in the Indus valley. Trade contacts between Harappa and Mesopotamia are, of course, well-documented. But the Susa rice dates back to the Parthian period. Rice husk impressions in mudbrick (identified by Richard I. Ford; Robert Wenke pers. Comm.) show that the grain was threshed at Susa, and so was cultivated there. Perhaps rice could not be successfully grown in Susiana until an advanced irrigation technology and administration was in place. Rice cultivation does not appear to have spread further west until sometime later (Zohary and Hopf 1994).

Iran was both a source of agricultural innovation and a conduit through which plants moved. I hope this brief survey has shown how archaeobotanical analysis can inform and deepen our understanding of ancient granian culture. Plant remains can provide direct evidence for crops and other plants that grew near a site. The analysis of seeds and charcoal gives insight into ancient land use practices and also allow us to trace cultural contacts across regions and time periods. I only wish my examples had been more definitive. That they are not just means we need to do a lot more work. Iran's central location in Eurasia makes it one of the most fascinating areas in the Old World to study plant remains.

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