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Nomadism, Pastoralism and Transhumance in the Archaeobotanical Record — Examples and Methodological Problems

Simone Riehl

The socioeconomy of nomadism

As is often remarked, the Bible attests a higher social rank of the stock farmer or pastoralist compared to the agriculturalist, expressed by God's higher appreciation of meat offerings (1. Mose 4,5). Social rank is subject to political change, and while nomads today are often considered as belonging to the fringes of society, in the Bronze Age they seem to have been part of a system of mutual exchange with states. The basic assumptions and preconditions regarding the potential of archaeobotanical analyses of prehistoric and historic Near Eastern nomadic societies on which this paper will be based are the following:

- Nomadism is a way of life with a producing economy adapted to specific ecological niches, and has always been a viable alternative to sedentism and agriculture in the Old World dry belt.
- Nomadism was an important factor in the cultural and environmental development during the Near Eastern Late Bronze and Iron Age.
- Nomadic economy is related to a transhumant, migratory lifestyle.
- Nomads in the Near East usually are and were pastoral nomads.
- Most modern pastoral nomads are semi-nomadic.
- There are no features of culture or of social organization that are exclusive to nomadic groups.

Ethnographic and written evidence for plant husbandry in nomadic and semi-nomadic societies

The available information on nomads in the Bronze Age is considerable. Cuneiform sources, in particular from the archives found at the palace of Mari, report on peaceful interaction and conflicts, e.g., on the demarcation of grazing areas and water distribution between nomadic and sedentary people. While traditional ap-

proaches often characterized nomadic-sedentary relations as being more or less hostile, modern works tend to take a more differentiated view.[1] In this context applying the term "dimorphic zone" has became popular over the last few decades, describing an area in which grazing of pastoral herds and agricultural sedentary life were both practicable.[2] Still, our understanding is hampered as the texts exclusively describe the nomadic-sedentary relationship from the perspective of the state's administration. Details on the concrete socioeconomy of nomadic groups are rare. Thus a comprehensive understanding of the nomadic subsistence economy and its interaction with ancient city states and environments has not been reached.

Concerning plant production, textual evidence provides conflicting information, reaching from the nomadic practice of surplus cereal production[3] to a complete lack of knowledge about cereal cultivation for some nomadic groups.[4] However, despite methodological problems in the interpretation of textual sources[5] cultivation by semi-nomadic groups is certainly indicated by Mari texts. Apart from more marginal areas, the nomads seem to have taken advantage of the large river valleys during part of the year. The use of simple irrigation techniques is reported for the banks of the Khabur or even more for the Euphrates.[6] It is interesting to note that only limited land was available to these groups in the Euphrates region, whereas for the Khabur area this problem is not mentioned. The cultivation of these fields seems to have taken place primarily under administrative control by the state.

Unfortunately, there is no mention in the texts of the number of people involved in the different economic activities, which is a critical factor when considering the yield of plant production. Particularly with additional wine production and the related considerable working expense (cutting and processing), as interpreted by Streck from the texts on Amorite (Amurrite) nomads[7] one would expect that at least part of the group would have lived permanently in the village, since garden crops need the presence of the cultivator the whole year round. The size of these fields is unknown so far, although differences according to social position and the number of animals to be fed are assumed to represent defining factors. As details on labour input and organization of surplus production are missing in the texts, it

1 Cf. Sader 1992; Schwartz 1995.

2 Rowton 1974.

3 Cf. Streck 2002.

4 E.g. in the Lugalbanda epos for the Martu/Ammurru nomads, Klengel 1972.

5 Cf. Klengel 1972.

6 Klengel 1972, 171.

7 Streck 2002.

remains to be discussed how surplus production could be successful if only a small number of people are involved in plant production.

There is a need to discuss whether surplus could have been on a limited scale and for immediate trade, because large scale storage needs an immense labour input and organization of storage protection to avoid pests and loss of stored products. Surplus production of cereals including exchange or even sale, would be an indistinct activity in the nomadic economy.[8] Thus other scientists emphasize a minor importance of crop cultivation, which was almost exclusively restricted to consumption.[9] Concerning the acquisition of cereals, the texts also mention the "razzia" as a normal practice in the nomadic economy. The nomads' necessity to acquire cereals on these raids also questions the effectiveness, or at least the extent, of their own surplus production. It seems possible that large acquisitions of domestic animals and crop plants from these "razzias" were later sold on the markets. However, as interpreted by Streck, it becomes clear from the texts that nomads and sedentary people were in close mutual dependency, or as he describes it quoting Michael Rowton, they formed a "dimorphic state".[10] In this role, the nomadic groups in Bronze and Iron Age Syria must have had an important impact on the cultural and environmental development of the region.[11]

Under the conditions of intense exchange, indicators for the various subsistence forms are difficult to identify in plant remains. Possibilities for the deposition of plant remains in this semi-nomadic everyday routine are as manifold as in fully sedentary societies. Those members of nomadic groups who stay in the village (usually during the summer and autumn months) cultivate, harvest and process cereals, vegetables and fruits. Those accompanying the flocks spend at least some time in gathering plants and their fruits. Under the conditions of a dimorphic state the production and acquisition of plants and the successive deposition of plant remains are evidence of an economically integrated society. While village and grazing land belong to the nomads, the city and its direct surroundings belong to the sedentary inhabitants. At least two relationships can be distinguished.

1. Nomads of the village and pasture in relation to sedentary people in the city

This relationship is of an economic nature. Agricultural and natural products (such as herbs, and gathered fruits and mushrooms) that are not available to the sedentary people may be acquired either from markets in the city or in the area the nomads are located. Nomads may need to buy specific instruments and other

8 E.g. Streck 2002, 173.

9 Klengel 1972, 168.

10 Streck 2002, 182.

11 Cf. Streck 2002, fig. 6.

rare goods in the markets. Botanical products sold by nomads may be reflected in the archaeological records of the city, but from a methodological perspective, they are difficult to attribute to nomadic origin. The same is valid for dung remains dropped on the urban crop fields that may either be derived from nomadic herds or from herds belonging to fully sedentary inhabitants of the city's surroundings. With a specific archaeobotanical research program applied on archaeological sites it may be possible to evaluate this relationship.

2. Nomads of the village and pasture in relation to the state

This relationship is of a political, economic and military nature. The state is interested in the acquisition of taxes and employing nomads during the cereal harvest or as military personnel. Consequently, the state tries to prevent the nomads from leaving.[12] A number of administrative measures exist to control the nomads. Where these are unsuccessful economic pressure or other hostile activeties are performed. On the other hand, there is a variety of information on organized raids of different groups of nomads joining together for such purposes and of the state's will to prevent this danger.

In conclusion, plant husbandry seems to have held a firm place in the semi-nomadic way of life in the Late Bronze Age Near East, and may be directly evaluated for its significance by archaeobotanical analysis of nomadic camp sites.

The archaeological evidence for plant production and economy in small settlements in the semi-arid and arid steppe zone

The sparseness of evidence for nomadism in archaeological records and its definite recognition is an important aspect in Near Eastern archaeology.[13] Unless research is not directed at questions about the way of living of ancient people, nomads are hardly recognized. As in many areas, the information on ancient society is very unbalanced. While the life and survival of the elite is rather well known, that of common people is far less well explored. This is partly the result of excavation strategies, as there is an ongoing preference by archaeologists and financing institutions to explore large sites with spectacular and precious art objects. Not many Near Eastern archaeologists are interested in the excavation of minor traces of the human struggle for life, unspectacular in their cultural arti-

12 E.g. as evident from the Mari texts for the Jaminites under Shamshi-Adad (Klengel 1972).

13 E.g. Cribb 1991; Frendo 1996; Guldin 2002.

facts.[14] Unlike in Central Asia, in the Near East "the archaeology of nomads is in its infancy", and although "numbers of camps [...] have been discovered from surveys [...], a feeling persists among many scholars that the activities of nomads are largely invisible".[15]

Even in research directed at nomads there are manifold problems regarding their recognition in the field. One problem is of geomorphological nature, as many areas are either covered by alluvial sediments or heavily eroded (e.g. in the Khabur area). Another hindering factor to detect and recognize traces of nomads in the field is that differences between nomads and the sedentary people in an area are ideological, organizational or economic, rather than cultural (assimilation processes).[16] In surveys similarities to materials from hunter-gatherer sites may lead to misinterpretations of remains of nomadic activity including the attribution of entire sites to an earlier period because of the paucity and simplicity of material remains. A particular problem is the reconstruction of migratory routes. The recognition of remains of the short-lived habitats of migrating nomads is further limited, if the number of people involved is small and the orbit of transhumance (i.e., the straight line distance between summer and winter pastures) is of a long distance character (100 km and more). Nevertheless, textual sources seem to indicate short distance routes as being the common pattern.[17]

Animal production and the processing of their products represent the main economic and subsistence branch in nomadic life, whereas plant production is of comparatively minor importance. Therefore we should not expect large amounts of plant remains from nomadic sites. Still, palaeobotany greatly helps to reconstruct landscape and human-environment interaction, e.g. by identifying indicators of open dry habitats, such as steppe, or agricultural products and their changing volumes. In Northern Syria, at least some smaller settlement structures have been discussed in relation with nomadism, such as smaller settlement structures in the vicinity of the Late Bronze Age urban site of al-Rawda.[18] Unfortunately, but perhaps typical for the state of the art, archaeobotany was restricted to the urban site, and consequently no information on plant economy is available for the rural settlements. However, archaeobotanical research revealed data of some palaeoenvironmental relevance, i.e., a strong presence of steppe elements from the charcoal remains (80 % Chenopodiaceae), and also amongst the seed remains representatives of a degraded vegetation were common (*Astragalus* spp.,

14 See e.g. Hole 1974; Hole 1998; Hole 1999.

15 Butzer 1995, 211.

16 Van Driel 2000.

17 Klengel 1972, 163.

18 Castel 2004.

Peganum harmala L.). The crop spectrum was similar to other Bronze Age cities in this area.[19]

Surplus production at smaller sites is sometimes discussed by archaeologists in the context of nomadic economy. The so-called "middle Khabur granary sites", like Tell Ziyadeh, are believed by some scholars to have played an important role in nomadic sale or even trade. Tell Ziyadeh and other small sites on the middle Khabur are interpreted as primarily functioning as extensive storage facilities. They form part of controversial discussions on the economic systems in the first half of the third millennium BC.[20] Hypotheses on the extension and use of the storage facilities reach from export systems to northern Mesopotamian sites such as Tell Brak and Tell Mozan and even to pastoralists storing grain to feed their herds in the lean season (late summer-early winter). Mari texts mention deliveries by nomads to the palace,[21] but these may have been sporadic and affordable on the basis of a normal household surplus. Hole and others prefer the hypothesis of storage for "local use" against that of export to the large city-states, which seems reasonable considering the highly unpredictable yield in an arid climatic zone where the mean annual rainfall is below 250 mm. An alternative explanation is favoured by some archaeobotanists who believe that in prehistory and early history cereal served to feed sheep and goat. For the small 3rd millennium sites at the Middle Khabur McCorriston concludes a specialized use of resources. This includes the focus on the cultivation of barley as animal fodder. Indeed a shift from a dominant representation of wheat to barley in the 3rd millennium BC is indicated in many sites, but there is no convincing argument to prove the use of barley predominantly as animal fodder on the basis of archaeobotanical remains alone.[22] The only argument for this hypothesis seems to come from administrative texts from Tell Beydar. A new analysis of the texts demonstrated that grain-fed animals were rare, compared to the large flocks which were exclusively fed by grazing. To cite Sallaberger: "A smaller part of the sheep and goats was kept separately and fattened by grain. These were later to be slaughtered for their meat.[23] It is very probable that the sheep and goats intended for slaughter were kept in the stables which were found on the slope to the north of the Official Block. But the regular flocks of seven thousand animals could neither be kept nor even plucked in the centre of the city".[24]

19 Herveux 2004.

20 Cf. Hole 1999.

21 Cf. Streck 2002.

22 McCorriston 1995.

23 The fattening of sheep is attested in Beydar texts: see Sallaberger 2004, especially, texts 7, 199 and 211; 33 and 34 refer to sacrifices of grain-fed sheep.

24 Sallaberger 2004, 21.

The aspect of feeding surplus grain to the herds in the lean season seems unfounded from an economic point of view, and as Hole states, "there is no reasonable way to estimate how much grain might have been reserved for herds whose size is unknown".[25] Similar to the consumption of a surplus by local residents or remote populations, this question may be solved only by further investigation. The example demonstrates that even with a multi-site archaeobotanical analysis it is extremely difficult to draw conclusions on the causes of some phenomena, such as the increase in barley cultivation over time as an indicator of an increased presence of flocks of sheep and herds of goats. But despite these methodological problems, on a more general basis McCorriston arrives at intelligible conclusions on landscape and human-environment interaction in the Middle Khabur drainage, i.e., that indicators of open dry habitats, such as steppe, increase, which was also observed at other sites, e.g. Tell Brak.[26] A solution to the question of what the animals were fed on might be found in the future by the application of geochemistry.[27]

Until today, plant production of nomadic groups was never directly investigated by comprehensive archaeobotanical research in any of the few probably nomadic sites. But there are other indirect means of exploring archaeobotanical indications for nomadic groups (see below).

The role of environmental change

Many theories on the evolution and distribution of nomadism are based on environmental and climatic conditions and changes. Changing environments have always been strongly influential on the organization as well as on the survival of nomadic societies. An important conclusion of ethnological research concerning the development of nomadism is that this kind of economy may evolve independently from any evolutionary stage of sedentary people anywhere in the world.[28] According to Neumann and Parpola, there is indication of environmental change and climate impact, such as probable droughts, in Upper Mesopotamia between 1200 and 1000 BC, which caused social stress and famines, and as a consequence, economic and political collapse.[29] Although there seems to be correlation at least with some palaeoclimatic records, such as the calculated rain-

25 Hole 1999, 275.

26 Colledge 2003.

27 E.g. Hobson 1999; Jim [et al.] 2004; Smith [et al.] 2002; see also Uerpmann, this volume, who suggests the direct recognition of migrating herds through the analysis of Strontium isotopes.

28 Scholz 1995, 20.

29 Neumann and Parpola 1987; Neumann 1993.

fall patterns for the Soreq cave in Israel[30] the issue of climatic change during prehistoric and historic periods is far from being solved. At the same time differing models are proposed by other scholars.[31] The main reason for such controversies is the relatively low chronological resolution of most palaeoclimate proxies. Investigation of rapid global climatic change presents only a rough sequence, while actual regional shifts in climate cannot be detected at this level. There may be some support for a drier climate during the Late Bronze Age in the fact that most of the Near Eastern sites with more than 400 mm annual precipitation provide archaeobotanical crop assemblages indicating barley-based economic systems, although modern agro-ecological zones with more than 325 mm of annual precipitation have wheat as the main crop, and barley only in poorer soils.

Not only are nomadic pastoralists are not only influenced in their movement by the environmental conditions, but they also make a great contribution towards shaping the environment. Aside from cultural and economic factors defining the preferences for specific sheep or goat breeds, there also seems to be an environmental selection for goats in more mountainous regions and drier climates, although in most cases mixed herds are best for the use of a variety of natural resources. A detrimental influence on the vegetation was often attributed to pastoralism. Although this obvious ecological problem was already recognized some time ago, it should not be forgotten that initial wood cutting to satisfy the need for construction and firewood created a landscape highly sensitive to grazing and browsing by animals. Independent of the kind of pastoralism involved (sedentary, semi- or fully nomadic), the effects of overgrazing are always the same, and can be summed up as follows.[32]

1. Forest/maquis area: wood vegetation is burned from time to time to obtain a herbaceous vegetation cover (initial stages of succession); if carefully grazed, the rather rich plant cover appears year after year; heavy rainfall results in strong soil erosion, which favours the establishment of non-pastoral dwarf-shrub formation; large areas of the Middle East have lost their arboreal vegetation forever;

2. Browsing of woody plants, chiefly by goats, results in a short habit of shrubs and trees (areas with usually larger trees become dwarfed down by permanent browsing); elimination of species which succumb to browsing;

3. Overgrazing of steppe and desert vegetation leads to the alteration of plant communities (e.g. a strong disappearance of grasses); species with no ability to sustain livestock appear; the bulk of the steppe and desert vegetation bears no palatable elements at present; only in depressions may patches of winter and

30 Bar-Matthews 1998.

31 E.g. Issar and Zohar 2004; Brentjes 1999.

32 Zohary 1973, 651.

spring pasture consisting of mainly annuals be present; selection for disanthropous and antizoic properties;

3.a) Anti-pastoral properties: anti-pastoral properties occur in hundreds of herbaceous species; these characteristics can be biochemical or morphological: morphological traits that render plants anti-pastoral are lignification and spininess (other properties range from vapidity, detestness to toxicity);

3.b) Antipyric properties: the excessive use of lignified plants for fuel has encouraged the spread of succulent shrubs and annuals unsuitable for burning, which at the same time encourages the use of dung for fuel.

The presence of these floristic elements over time is well visible in the archaeobotanical record, as for tragant (*Astragalus* spp.), which has many species dominating the thorn-cushion vegetation. Carbonized seeds of this genus are very common in archaeological sites of the Near East. It is interesting to note that they occur in the highest numbers, proportion and frequency during the Early Bronze Age, which points to a highly degraded landscape particularly during this period.

Archaeobotanical approaches to nomadism and transhumance

Various methodological problems occur, partially described in the sections above, while trying to characterize the archaeobotanical assemblage that would indicate the remnants of nomadic activities. Disregarding methodological problems, animal bones are often evaluated for their indication of pastoralism or nomadism[33] while plant remains are usually not. In fact, a large-scale archaeobotanical analysis of previously identified nomadic settlements has so far not been conducted. Due to an obvious lack in excavations of definitively nomadic settlements, even the most recent considerations on woodland exploitation by past societies are only able to provide theoretical models concerning the use of firewood by fully established food-producing nomadic pastoralists, in contrast to mobile food-extracting hunter-gatherers or sedentary agriculturists.[34] The main questions in relation to nomadism in Near Eastern history are:

- What was the concrete appearance of the nomadic subsistence economy in the Near East during the Bronze and Iron Age?

- What was the nomadic contribution to landscape change?

[33] E.g. sex and age structure of herds to indicate production goals.

[34] Cf. Asouti and Austin 2005.

- How can the answers to these questions be integrated with the information from textual resources to answer questions such as what the reasons are for mutual influence and conflict of nomadic and sedentary peoples in the region?

To address the questions using archaeobotanical methods, the following approaches may be useful:

- Direct evidence of mobility patterns, as potentially indicating nomadic pastoralism by means of the investigation of the archaeobiological remains from settlements (seasonality by fruiting times in general and in consideration of seeds from dung remains);

- Direct evidence of the nomadic subsistence economy and nomadic use of natural resources by investigating archaeologically identified nomadic camp sites;

- Indirect evidence of anthropogenic impact on the landscape during settlement hiatuses.

Direct evidence of mobility in the plant assemblage

Direct archaeobotanical evidence of nomadism is only imaginable in theory, e.g., if large amounts of the desert truffle (*Terfezia* sp.), which is known for its economic and even mythological importance for nomadic groups, would be excavated at archaeological sites. So far no archaeobotanical record of this mushroom has become available, which is again a matter of a methodological problem, since vegetative plant remains are only rarely sampled or identified by archaeobotanists.

Fig. 1. Desert truffle (*Terfezia* sp.).

Regarding mixed farming, ethnographic observations report that in some cases, the fields are visited twice for short periods only – once for sowing and then for

harvesting.[35] In a period of advanced agricultural technology, such as the end of the Bronze or Iron Age, this kind of "field control" should hypothetically show up clearly in the archaeobotanical record with a high number of weeds compared to the harvest of large city states as a result of neglecting intermediate steps in cultivation such as weeding on a regular basis. The uncertainty of the yield after a long absence from the area of cultivation may also have led the people to cultivate a diverse range of crops as a risk-buffering mechanism against crop failure.

Direct evidence for transhumant activity can be deduced under certain conditions from the archaeobotanical assemblage. Mobility of people in the surroundings of their settlement should theoretically be visible as a high proportion of gathered fruits. Indeed in some Near Eastern sites, but particularly in Eastern Mediterranean excavations, berries occur in large numbers. Hypothetically they might have been brought to the settlement by mobile groups. Whether they were collected by transhumant groups, professional shepherds or just sedentary people with specific preferences can only be specified further with additional data.

site name	taxon	seed number
Kastanas	*Fragaria vesca* L.	118
Assiros Toumba	*Rubus fruticosus* agg.	308
Mylouthkia	*Pistacia* sp.	173
Kuruçay Höyük	*Pistacia atlantica* Desf.	300
Malyan	*Pistacia* sp.	175

Tab. 1. Examples of food plants collected from the wild and consumed in Bronze Age settlements.

Another aspect that hampers the evaluation of the role of certain plant foods in the diet is the fact that very often crops of textually attested importance do not appear in archaeological sites, primarily for taphonomic reasons. Sesame and date palm, e.g., are regularly described as important crops during the Late Bronze Age, but rarely do they appear in the archaeobotanical record. In the case of *Sesamum* sp., there may be preservational reasons, as the oil-containing fruit potentially suffers from strong corrosion when burned. The small seed size may also be the reason that it was not collected during earlier excavations with recovery methods unsuitable for picking up small seeds. This explanation may not hold for the

35 Rafiullah 1966, 7.

large-seeded date (*Phoenix dactylifera* L.). Although regularly mentioned in the texts, dates do not appear in Syrian sites of that period.

To summarize, the lack of plant remains that could indicate a specific type of plant economy is not indicative of a lack in that economy. A high number of seeds from gathered plants in a fully developed crop plant producing economy indicates high mobility at least for some members of the society.

Direct evidence of transhumance by fruiting times and dung remains

Concerning the seasonality of a site, the wild plants (including weeds) may be of interest. An evaluation of the flowering times in wild plant assemblage may indicate the presence of people and animals in the settlement only during a specific time of the year only.[36] Sheep and goat dung remains, although not always easy to recognize, are very common in archaeological sites in areas with a reduced amount of firewood. They provide information not only indirectly on the state of the landscape, but through the ecological classification of wild plant remains preserved inside, also enable a consideration of ancient plant habitats that were browsed by the domesticated animals. Hypothetically, the range of the ecological habitats should be larger for mobile groups. As fruits and seeds can stay for several days in the ruminant's stomach, species from ecological habitats further away from the main settlement may be deposited in the form of dung remains.

A very straightforward example of the detection of transhumance from dung pellets derives from the alpine foreland.[37] At the Neolithic lake shore settlement of Horgen Scheller Akeret found dung remains exclusively containing plant remains from winter and spring grazing, while indicators for summer or autumn grazing were missing. Experiments have shown that seeds are very viable in passing through the digestive tract of ruminants. As seed ripening is restricted to several months in summer and autumn, they may indicate these seasons if found in dung pellets. A lack of seeds in relation to other finds, such as Rosaceae prickles at Horgen Scheller, for example, may indicate winter and spring grazing. Dung pellets belong to numerous finds in Near Eastern sites as well, but they were never systematically analyzed for the plant remains they contained. At the Middle Bronze Age site, Tell Mozan, some of the pellets did not contain any seeds, probably indicating grazing during the winter to spring season, whereas dung remains from Tell el-'Abd delivered a broad spectrum of different wild plant spe-

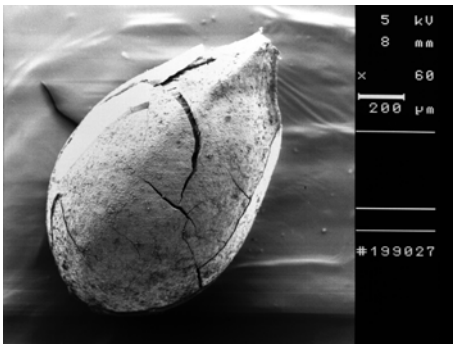
[36] E.g. Valamoti 2004.

[37] Akeret [et al.] 1999.

cies, mainly from moisture-indicating habitats, indicating grazing during late summer to autumn in the Euphrates valley.[38]

(a)

(b)



(c)

Fig. 2. Coprolite sample (a) from Early Bronze Age Tell el-ʿAbd, (b) the internal structure of one pellet; (c) *Rumex* sp.

[38] Riehl 2000; Riehl in prep. and unpublished data.

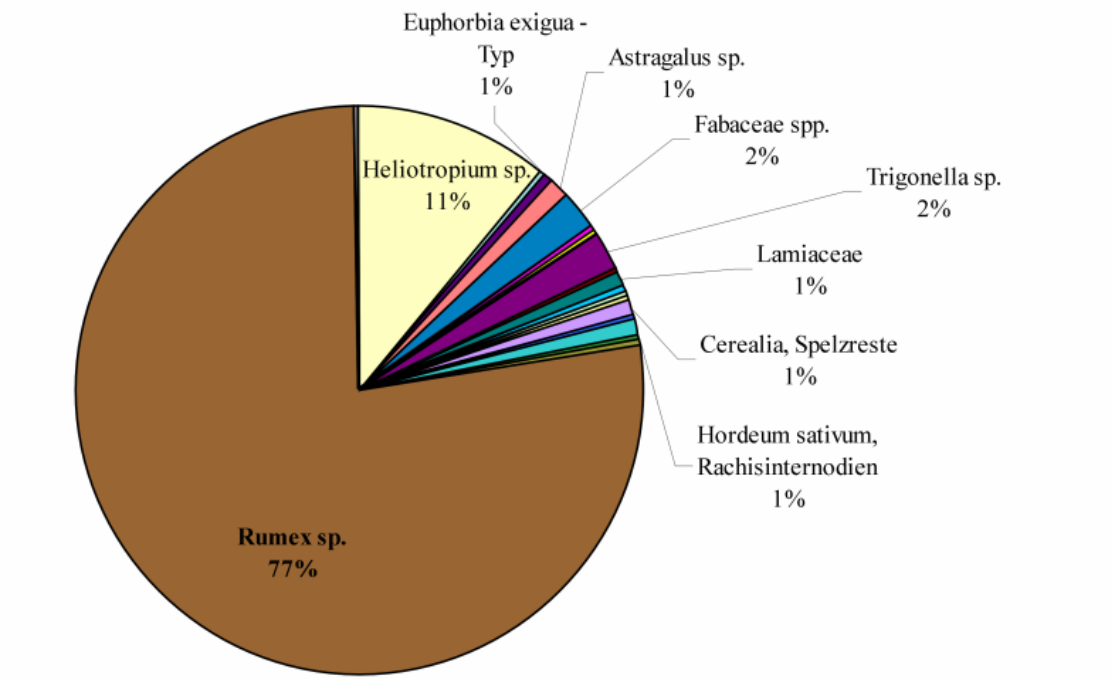


Fig. 3. Proportions of taxa in sheep/goat coprolites from Early Bronze Age Tell el-ʿAbd.

Although various archaeobotanical investigations of dung remains have been published,[39] there are only few that apply this potential in considering seasonal aspects. Transhumant pastoralism could be investigated by a systematic analysis of dung remains from Near Eastern sites in relation to seasonal aspects.

Indirect evidence

Indirect evidence for pastoralism

Indirect indications of pastoralism in the archaeobotanical record are the finds of plant remains with anti-pastoral properties. An example is provided by the occurrence of thorny burnet (*Sarcopoterium spinosum* (L.) Sp.) at Early Bronze Age levels of Kumtepe (B3) in the Troad, West Anatolia. Other taxa that may be the outcome of natural selection for anti-pastoral properties are tragant (*Astragalus*

[39] See e.g. various publications in *Environmental Archaeology* vol. 1, 1998.

spp.), which dominate the thorn-cushion vegetation. Such species are very common in archaeological sites of the Near East, but occur in large numbers only from the Early Bronze Age onwards.[40]

Generally, pastoralism and the use of dung remains as fuel should provide a much broader spectrum of wild plant taxa other than weeds. There are various methodological problems.

1. The sampling strategy with the number and size of samples, which defines the broadness of the species spectrum.

2. Even if the spectrum of species introduced into the site via dung remains is broad, an assessment of whether professional shepherds herded the flocks or whether the people were nomadic pastoralists is only possible with the inclusion of other archaeological data.

(a) (b)

Fig. 4. *Astragalus spinosus* (Muschl) in a Near Eastern landscape (a) and prehistoric seed of *Astragalus* sp., scale 1 mm.

[40] Riehl 1999.

(a) (b)

Fig. 5. *Sarcopoterium spinosum* (L.) Sp. in an Eastern Mediterranean landscape (a), and a prehistoric seed of the species from Chalcolithic Kumtepe B (b), scale 1 mm.

Indirect evidence for nomadism

Indirect evidence for nomadism is provided by the investigation of settlement hiatuses in archaeological sites, or, to be more exact, the investigation of the period before and after a hiatus.

For Bronze Age Tall-i Malyan in Iran Naomi Miller demonstrated that during a settlement gap of at least 400 years nomads must have had a strong influence on woodland vegetation.[41] The archaeobotanical record clearly demonstrates that juniper (*Juniperus* sp.) was an important fuel before the hiatus. With the new settlement, the inhabitants seem to be more dependent on dung as fuel. Alternatively, the ratio of charcoal to weed seeds is used by some environmentalists as an index for the dominant fuel used in a site, assuming that with decreasing woodland, people switched to using dung for fuel.[42] The disappearance of juniper in the records at Elamite Malyan, together with relatively large numbers of wild plant seeds, were interpreted as indicating decreasing woodland. There are, however, methodological problems, as dung in Near Eastern sites is often not preserved *in situ*. As there are also other ways wild plant seeds are introduced into

41 Miller 1982; Miller 1985; Miller 1996a; Miller 1996b.

42 E.g. Miller 2002; cf. Wilkinson 2003.

the settlement, not least being the large amount of weeds that are introduced with the crops, it is not possible to automatically attribute all wild plant taxa to dung remains.

Another example is provided by the small site of Kumtepe (less than 1.4 ha), approximately 5 km north-northwest of Troy, at the western limit of the Troia plain. Kumtepe was occupied from the Neolithic to the Early Bronze Age. Kumtepe A is considered to be late Neolithic (c. 5000–4600), Kumtepe B (3500–3000 BC) Chalcolithic, and Kumtepe C Early Bronze Age. Between Kumtepe A and B a settlement hiatus of at least several hundred years is indicated. The main differences in archaeobotanical sample composition between Kumtepe A and B are in the food plants, shifting from a legume and fruit based plant economy to a concentration on cereal crops (emmer and barley). Economic differences were also observed in the composition of the faunal assemblages, with a dominance of cattle and sheep during Kumtepe A and pigs and cattle in Kumtepe B,[43] suggesting a difference in the natural environment during these two periods. Beside this, there are comparable appearances in the wild plant flora. It is interesting to note that Kumtepe A was obviously a period with a higher representation of species from open vegetation, whereas Kumtepe B was highly dominated by woodland vegetation,[44] implying that after the abandonment of the Kumtepe A settlement no further destruction of the vegetation took place. As a regeneration of the flora is recognizable in the archaeobotanical assemblage, signs of continuing human influence on the vegetation during the settlement hiatus are missing.

Summary

Many models suggest a certain role of plant production in the nomadic economy, but as a result of under-investigation of nomad archaeology, there are nearly no archaeobotanical data from such sites, and thus no direct information on the role of plants in the diet of prehistoric nomads. Written sources rarely provide any details about the concrete socioeconomy of nomadic groups. Therefore, they do not allow a comprehensive understanding of nomadic subsistence economy and the interrelationship of this economy with ancient environments.

The general crop spectrum to be expected from nomadic sites should not be in large contrast to that of sedentary people. Nevertheless, the working hours and time invested during particular seasons in the cultivation of specific crops may have been very limited and variable from year to year. As garden crops generally

43 Uerpmann 2003 and M. Uerpmann [et al.], this volume.

44 Riehl and Marinova under revision.

need the presence of the cultivator the whole year round, their cultivation was probably very limited in a nomadic context, at best, albeit it does not mean that they were not consumed. They may have represented objects of exchange or just have been acquired from the fields owned by sedentary people (similar to the documented raids and the acquisition of cereals). Theoretically, there are different approaches to recognizing the presence of nomads in a landscape and to investigating plant husbandry in the semi-nomadic way of life. These are referred to as the direct and indirect approaches.

The direct approach includes the archaeobotanical investigation of formerly identified nomadic campsites and other smaller sites assessing the degree of mobility of the inhabitants. An indirect approach would be the examination of the fruiting times of the wild plant assemblages in smaller sites, as well as the systematic investigation of dung remains (mainly sheep and goat pellets). Besides the indication of ecological niches visited by the animals, dung pellets may also provide information about the time of the year the animals were present at the sites.

Finally, a neglected indirect approach to recognize nomadism in a landscape is the careful archaeobotanical investigation of deposits dating to a period or phase before and after a settlement hiatus. An ongoing deteriorating environmental change indicated in the seed and charcoal remains would strongly suggest nomadic activity for that area.

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