

Harappan plant economy in the Rann of Kutch, Gujarat*

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The food grains of *Eleusine coracana*, *Pennisetum typhoides* and *Triticum aestivum* along with a large number of seeds and fruits of weeds and other wild taxa from two sites of Harappan culture at Surkotada and Shikarpur in the Rann of Kutch are recorded. The weeds and wild taxa are of particular significance, not only to the actual determination but also for sketching the state of soil conditions and a general picture of ground vegetation around these settlements during the Harappan times (Ca. 2500 to 1700 B.C.).

Key-words—Archaeobotany, Harappan economy, Kutch, India.

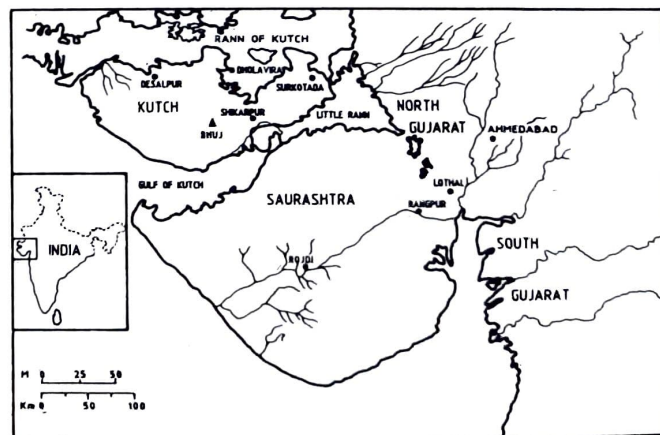
INTRODUCTION

THE limits of Harappan Empire have enormously expanded in the light of the exploration of many more new sites. Presently, the archaeobotanical investigations have been carried out from Shikarpur and Surkotada in the Rann of Kutch, excavated by the State Archaeology Department of Gujarat. The mound near the village of Shikarpur in Kutch District is named Valamiyo Timbo which is an important key site of Harappan culture in the Rann. It was excavated under the overall supervision of Dr. M.H. Raval in two seasons (1988-89 and 1989-90). The site (Lat. 23°15' N, Long. 70° 39' E) is located at a distance of about 310 km. from Ahmedabad. The dates range from Ca. 2,500 to 2,200 B.C. The botanical finds are from five trenches, two trenches (H & K) in mound I with depth of 0.71 to 2.20 m. and three (B, E & F) on mounds II & III with depth ranging between 0.41 to 1.48 m.

The other site Surkotada (Lat. 23°37' N, Long. 70° 50' E) lies near Adesar in Kutch and is dated to 1660 B.C. The carbonised material from Surkotada in the form of charred lumps (TF-1307, Agarwal, 1972; Joshi, 1972) which yielded numerous seeds mainly of wild plants was discovered in an earthen pot from Locus X A 4., Qdt. 1, layer 5, Depth 1.6 m. The material was worked out by Vishnu-Mittre and Savithri (1982) and Savithri (1976). For further verification of identification Dr. Vishnu-Mittre passed on the material to the present author (Chanchala, 1984).

MATERIAL AND METHOD

The sizeable amount of botanical material from Shikarpur has been found in utterly fragile, highly burnt and mutilated state of preservation. The high salinity of the soil posed the problem in making comprehensive collection of botanical remains by floatation technique. The results of the study are therefore based on the small quantity of material. Out of the total collection there were twenty one samples of carbonised seeds and fruits recovered in two seasons of excavation work. The dust was removed from the material with the help of brush in dry state.



Map 1. Location of Shikarpur (Lat. 23° 15'N, Long. 70° 39'E) & Surkotada (Lat 23° 37'N, Long. 70° 50'E) in Kutch and other Harappan sites excavated in Gujarat State.

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It was possible to recover as many as 740 complete seeds from 3 lumps from Surkotada. As many as 638 seeds have been referred to wild grasses. These comprise a major proportion of the total assemblage of seeds and fruits recorded. It was an arduous task to separate the individual seeds and fruits from the lumps. However, they could be successfully sorted out with the help of fine needle. The remains were identified on the comparative data based study.

DESCRIPTION

The identification of seeds and fruits from Surkotada and Shikarpur follows as under

Family-Poaceae

Andropogon sp. (Blue stem grass)
Pl. 1, fig. 15

Elongated caryopses in carbonised state, measuring 1.5 to 2 mm in length and 0.5 mm in breadth, are somewhat rounded at the lower end and gradually tapering towards upper end. Hilum scar noticed on the dorsal side of rounded end, is not distinct due to excessive carbonisation. In morphological appearance they are comparable with some species of *Andropogon*.

Brachiaria sp. (Crab grass/Buffalo grass)
Pl. 1, fig. 14

Broadly elliptic grains having smooth-surfaced pericarp, measuring 0.80 to 1.20 mm in length and 0.70 to 0.80 mm in breadth, are comparable to *Brachiaria* species.

Dactyloctenium aegyptium (Linn.)
Beauv. (Crow-foot grass)
Pl. 2, fig. 9

Single ovoid caryopsis with rugose surface and hilum scar on the dorsal side of extreme apex, measures 1.00 mm in length, 0.80 mm in breadth and 0.50 mm in thickness. On morphological grounds, it is comparable to that of *Dactyloctenium aegyptium*.

Eleusine coracana (L.) Gaertn. (Finger millet)
Pl. 1, fig. 1; Pl. 2, fig. 5

Globose to sub-globose carbonised grains having inverted 'V' shaped embryonal position on flattened dorsal side and the surface roughened by minute tubercles arranged in concentric and wavy rows, belong to ragi-millet (*Eleusine coracana*). The grains measure 1.00-1.10 mm in length, 0.75-1.10 mm in breadth and 0.30-0.75 mm in thickness.

Panicum sp. (Panicum grass)
Pl. 1, fig. 18; Pl. 2, fig. 8

Broadly elliptic grain measuring 1.25 mm in length, 1.00 mm in breadth and 0.75 mm in thickness is flattened on one side, roundish dot evidently near one end. General morphology of the grain brings it close to some *Panicum* species.

Pennisetum typhoides (Burm. f.) Stapf. & C.E. Hubbard (Pearl millet or Bajra)
Pl. 1, fig. 8

Caryopses vary in shape from oblong-obovate to subglobose. Obovate grains are thickened towards the top, whereas oblong ones flattened dorso-ventrally. Hilum-scar distinctly visible on the acuminate end. Caryopses measure 1.25-1.50 mm in length and 0.75-1.25 mm in breadth. The caryopses compare closely with those of pearl-millet (*Pennisetum typhoides*).

Poa sp. (Meadow grass)
Pl. 1, fig. 5; Pl. 2, fig. 11

Grains somewhat elliptical in shape with rotund ends and measuring 1.00 mm in length, 0.60 mm in breadth and 0.50 mm in thickness are referred to *Poa* sp.

Setaria sp. (Bristle grass)
Pl. 1, fig. 4; Pl. 2, figs 4, 4a

Seeds are ellipsoidal, measuring about 1.10 mm in length, 1.00 mm in breadth and 0.60 mm in thickness. Both lemma and palea show granulation making irregular rugose pattern occasionally anastomosing. The embryo reaches all the way from the bottom to the top. They are referred to *Setaria* sp.

Plate 1



- Carbonised seeds from Surkotada, Kutch Dist.
1. *Eleusine coracana* (L.) Gaertn. (African millet), x 10.
 2. 9, 10, 11, 12, & 17. Wild grasses, x 10, x 13, x 13, x 13, x 11 & x 10 respectively.
 3. Spike fragment, x 9.
 4. *Setaria viridis* Beauv. (Green Fox-tail), x 10.
 5. *Poa* sp. (Meadow grass), x 7.
 6. *Eleusine* sp., x 9.
 7. *Pennisetum typhoides* Stapf. & Hubbard (Pearl millet), x 9.
 - 13& 19. *Indigofera* sp., x 11.
 14. *Brachiaria* sp. (Crab grass), x 10.
 15. *Andropogon* sp. (Blue stem grass), x 8.
 16. Glume, x 7.
 18. *Panicum* sp. (Panicum grass), x 10.
 20. *Trianthema* sp., x 8.
 - 20a. Extant material of *Trianthema pentandra*, x 8.
 21. *Euphorbia pycnostegia* Boiss, x 8.



Plate 1

Triticum aestivum L. emend. Thell (Bread-wheat)
Pl. 2, figs 6, 6a

Caryopsis is elongated, narrower towards both ends and slightly broader in the middle. The dorsal side is smooth and slightly raised. It measures 4.00 mm in length, 3.00 mm in breadth and 2.00 mm in thickness. Hilum is steeply placed on the dorsal side. On the characteristic morphological grounds, the grain belongs to *T. aestivum*.

Family-Cyperaceae

Carex spicata Huds. (Sedge)
Pl. 2, figs 2, 2a, 2b

Six nuts biconvex and ellipsoid in shape, smooth surfaced and having narrowed apices, measure 2.00-2.50 mm in length and 1.00-1.25 mm in breadth. They are enclosed within a perigynium, having 6-8 longitudinally running ribs. Eight seeds varying in appearance from elongate-triangular to lens-shaped, measure 1.75-2.50 mm in length and 1.00-1.75 mm in breadth.

In general morphology and the measurements (Martin & Barkley, 1961), the nuts and seeds compare closely to those of *Carex* sp. (cf. *C. spicata*).

Cyperus sp. (Flat sedge)
Pl. 2, figs 1, 1a

About three dozens of triangular to elongate-triangular nuts are 1.00-1.90 mm in length, 0.75-0.90 mm in breadth and 0.60-0.80 mm in thickness. Seeds liberated from nuts are trigonous and small, 0.75-1.10 mm in length, 0.40-0.60 mm in breadth and 0.35-0.45 mm in thickness. The nuts and seeds closely compare with those of *Cyperus* sp.

Scirpus maritimus Linn. (Bulrush)
Pl. 2, figs 3, 3a

A single nut ovate in outline and somewhat trigonous with wrinkled surface measures 2.00 mm in length and 1.50 mm in breadth. The pointed style base present at the top brings it closer to bulrush and distinguishes it from other members of Cyperaceae. It is found comparable to *Scirpus maritimus*.

Family-Fabaceae

Desmodium sp. (Tick-clover)
Pl. 2, fig. 13

Single ovate seed. laterally compressed and having centrally placed small, circular hilum on almost straight edge, measures 1.00 mm in length and 0.50 mm in breadth. One end is relatively broader than the other. The seed shows general similarity with some species of *Desmodium*.

Indigofera sp. (Indigo)
Pl. 1, figs 13, 19; Pl. 2, fig. 12

Ovoid to spheroid seeds, about 1.00-2.00 mm in diameter and showing the characteristic circular hilum in the middle of one marginal side, have been identified to *Indigofera* species.

Melilotus indica Linn. (Sweet-clover)
Pl. 2, fig. 15

Broadly oval seeds, measuring 1.50 mm in length and 1.00 mm in breadth and thickness, show tuberculated surface. They are comparable to those of *M. indica*.

Family-Euphorbiaceae

Euphorbia pycnostegia Boiss
Pl. 1, fig. 21

Nearly twenty two seeds, obtusely four-angled.

Plate 2

Carbonised seeds and fruits from Surkotada, Kutch District.

1. Nuts (lower row) of *Cyperus* sp. (Flat-sedge) and their seeds (upper row), x 7.
 - 1a. Extant nuts of *Cyperus iria* Linn., x 7.
 2. Seeds of *Carex* sp., (sedge) x 9.
 - 2a. Nuts of *Carex* sp., x 7.
 - 2b. Extant material of *Carex spicata* Huds and their seeds, x 8.
 3. Nuts of *Scirpus maritimus* Linn. (Bulrush), x 8.
 - 3a. Extant material of Bulrush, x 8.
- Carbonised seeds from Shikarpur, Kutch Dist.
- 4 & 4a. *Setaria* sp. (Bristle-grass), x 12 & x 8 respectively.
 5. *Eleusine coracana* (L.) Gaertn. (African millet), x 8.
 6. *Triticum aestivum* Linn. emend Thell (bread-wheat)-ventral view, x 7.

- 6a. *Triticum aestivum* Linn. emend Thell (bread-wheat)-dorsal view, x 7.
- 7 & 10. Wild grasses, x 20 x 15 respectively.
8. *Panicum* sp., x 12.
9. *Dactyloctenium aegyptium* (Linn.) Beauv. (Crow-foot grass), x 12.
11. *Poa* sp. (meadow grass), x 11.
12. *Indigofera* sp., x 20.
13. *Desmodium* sp. (Tick-clover), x 20.
14. *Silene* sp. (Catchfly), x 22.
15. *Melilotus indica* (Linn.) All (Sweet-clover), x 15.
16. *Trianthema* sp., x 18.
17. *Ziziphus nummularia* W. et A. (wild jujube), x 5.



Plate 2

notched at the hilum region, measuring 1.50-2.00 mm in length and 1.25 - 1.50 mm in breadth, are comparable to those of *E. pycnostegia*.

Family-Aizoaceae

Trianthema sp.

Pl. 1, figs 20, 20a; Pl. 2, fig. 16

The compressed and orbicular seeds are characteristically beaked near hilum and exhibit transversely tuberculated surface. They measure 1.00 to 1.50 mm in length and 1.00 mm in breadth and 0.50 mm in thickness. They are comparable to those of some species of *Trianthema*.

Family-Caryophyllaceae

Silene sp. (Catchfly)

Pl. 2, fig. 14

The round to reniform seeds, measuring 1.00 x 0.75 mm in diameter have ridged margins with acute edge. The surface has characteristic tubercles in concentric rows. They are referred to *Silene* sp.

Family-Rhamnaceae

Ziziphus nummularia (Burn.f.) Wight & Arn. (Wild-jujube)

Pl. 2, fig. 17

There are small pieces as well as complete fruit-stones of jujube which appear to be spherical in shape and 5.00 to 5.50 mm in diameter. Outer surface is somewhat tuberculated. They are comparable to small-sized, spherical drupes of *Ziziphus nummularia*.

Spike fragment and glume

Pl. 1, figs 3, 16

The graminaceous spike fragment (Pl. 1, fig. 3) measuring 2 mm in length and 1 mm in breadth has remained unidentified. A thin glume (Pl. 1, fig. 16) measuring 1.7 mm in length and 1.2 mm in breadth has also been recovered at Shikarpur.

TABLE 1.

Taxa recovered	Surkotada	Shikarpur
1. <i>Andropogon</i> Linn.	+	
2. <i>Brachiaria</i> Griseb.	+	
3. <i>Dactyloctenium aegyptium</i> (Linn.) Beauv.		+
4. <i>Eleusine coracana</i> (L.) Gaertn.	+	+
5. <i>Panicum</i> Linn.	+	+
6. <i>Pennisetum typhoides</i> (Burn. f.) Stapf. & C.E. Hubbard	+	
7. <i>Poa</i> Linn.	+	+

8. <i>Setaria</i> Beauv.	+	+
9. <i>Triticum aestivum</i> L. emend. Thell		+
10. <i>Carex spicata</i> Huds.	+	
11. <i>Cyperus</i> Linn. -	+	
12. <i>Scirpus maritimus</i> Linn.	+	
13. <i>Desmodium</i> Desv.		+
14. <i>Indigofera</i> Linn.	+	+
15. <i>Melilotus indica</i> Linn.		+
16. <i>Euphorbia pycnostegia</i> Boiss	+	
17. <i>Trianthema</i> Linn.	+	+
18. <i>Silene</i> Linn.		+
19. <i>Ziziphus nummularia</i> (Burn.f.) Wight & Arn.		+

+ = present

DISCUSSION AND CONCLUSION

With the carbonised seeds and fruits recovered from the Harappan Surkotada and Shikarpur (Ca. 2500-1700 B.C.), which represent the accidentally scorched portion of larger amount, it has somehow been possible to set up a fair-sized collection of different taxa growing around these settlements. Weeds and wild forms predominate in the collection. Cultivated foodgrains include ragi-millet (*Eleusine coracana*), pearl-millet (*Pennisetum typhoides*), italian-millet (*Setaria italica*) and a single grain of wheat (*Triticum aestivum*). Domination of millets gives an impression that these are outcome of the Harappan agriculture practices in which inadequacy of rainfall and the management and control of water for irrigation might have been the important factors in the Rann of Kutch. Millets recorded from Oriyo Timbo in district Bhavnagar and Rojdi in district Rajkot also (Wagner, 1983; Weber, 1991) indicate that the cultivation of drought resistant summer crops of millets played an important role in the subsistence strategies, particularly in the areas where rainfall was not enough and the irrigation could also have not been practiced. These millets are drought resistant and adopted for cultivation under adverse climatic conditions of soil, and also less exacting in their nutritive requirements than other crops of wheat, barley, lentil, pea, etc.

The accidental inclusion of a wheat grain in the remains from Shikarpur suggests that the west Asian cereals and also the pulses in all likelihood occupied their place in the dietary of the settlers. In association of the millet-remains their presence is well documented at Harappan Rojdi in Gujarat (Weber, 1991). It is a question how much crop husbandry including the cultivation of wheat, barley and other pulse crops could at all be performed in Gujarat as a whole, and in the Rann of Kutch in particular. An internal grain-trade within the Harappan

communities may also have existed from the Rajasthan and Indus Valley region.

By far the majority of wild seeds and fruits from Surkotada and Shikarpur, are found in mutilated and highly distorted condition as a consequence of heat and wear. A fraction of the collection in healthy state of preservation has permitted safe identification to the species of *Andropogon*, *Brachiaria*, *Panicum*, *Poa*, *Setaria* and *Dactyloctenium aegyptium* of the family Poaceae; sedges belonging to *Cyperus* sp., *Scirpus* sp. and *Carex spicata* of Cyperaceae; *Desmodium* sp., *Indigofera* sp. and *Melilotus indica* of Fabaceae; *Euphorbia pycnostegia* of Euphorbiaceae; *Silene* sp. of Caryophyllaceae; *Trianthema* sp. of Aizoaceae and *Ziziphus nummularia* of Rhamnaceae. It cannot be said for certain how they came to be in the deposits. In prehistoric times, man was dependent on wild plants for food, medicine, ceremonial and other requirements; in fact these are still in use. Therefore, the role of some of the plants in the economy of Harappans cannot be ruled out. *Ziziphus nummularia* may be regarded to have been collected by settlers for eating. Weeds of *Silene*, *Trianthema*, *Dactyloctenium* and leguminous species might have arrived with the crop produce. A good number of grasses and sedges must have been of so frequent occurrence around the settlements in the fields and fallow land that their seeds may be expected to turn up in the collection even without human interference. The remains of wild species are only a fraction of the biological material. Therefore, reconstruction of the environment cannot be attempted on the basis of them alone. A sectorial reconstruction of the vegetation around the settlements can, however, be surmised. There appears the presence of open vegetation around the sites in which grasses and sedges represented the important flora, along with other herbs and shrubs, on dry soil. The weeds may be taken as reliable evidence of the state of agricultural

fields. When considered in the framework of other data, the millet cultivation and the predominance of grasses and sedges indicate that the arid conditions must have prevailed around these sites in the Rann of Kutch, during the Harappan period. Further information would inevitably be of considerable significance in this regard.

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