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ANCIENT PLANT ECONOMY AT CHALCOLITHIC TULJAPUR GARHI, DISTRICT AMRAOTI, MAHARASHTRA

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ANCIENT carbonized grains of seventeen wild and cultivated species of plants, some of them unique in the Indian subcontinent, are being reported from Tuljapur Garhi (21°10'N: 77°35'E), a Chalcolithic site in Amraoti district of Maharashtra. This is the only Chalcolithic site known and reported so far in the Vidarbha region of Maharashtra. It was excavated during 1985–86 by Sri B. P. Bopardikar, Superintending Archaeologist, Prehistory Branch of the Archaeological Survey of India. The site revealed 1.5 m thick habitational deposit belonging to the Chalcolithic culture. The entire range of pottery belongs to the wheel made category. Malwa and Jorwe ware are the main pottery assemblages in phase A and B respectively with signs of overlapping (personal communication from the excavator).

The plant remains have been critically investigated under a stereo-binocular microscope (Leitz-Wetzlar). The initial results (table 1) show that out of the assemblage of 17 plant species, 15 are botanically diagnosed whereas two species, in all probability wild, still remain to be determined. Of the 15 diagnosed species, 4 belong to the cultivated cereals, 8 to domesticated pulses, 1 to oil yielding plant and 1 to fibre cum vegetable plant. The remaining one can be assigned to a fodder plant species.

The excavator has furnished the following radiocarbon data on charcoal samples from habitational deposits with a half-life value of 5570 ± 30 years. (1) 2870 ± 100 years B.P. for a sample from Tr. A1 Qd.1, layer (3), depth 35 to 56 cm; (2) 340 ± 90 years B.P. for a sample from Qd.IV, layer (2). This date appears to be erratic; (3) 3310 ± 90 years B.P. for a sample from Tr. A4, Qd.II, layer (1), and (4) 2410 ± 100 years B.P. for a sample from Tr. C1 Qd.I, pit sealed by layer (1).

On the basis of viable radiocarbon dates and typology of the associated cultural materials like pottery and stone tools, it may be inferred that the levels yielding plant remains under study, belong to the first millenium B.C. rather than the late phase of the second millenium B.C. The plant remains are assignable to phase B (Jorwe period), except one sample Tr. A3 Qd.III, layer (3) which may belong to the transitional level between Malwa and Jorwe cultures.

The preliminary interpretation of the present investigations is based on an assumption that the domesticated species of various grains were actually cultivated by the Chalcolithic inhabitants in the vicinity of Tuljapur Garhi. It is clear that the ancient farmers around the site practiced agriculture in two seasons. They cultivated winter crops (wheat, barley, lentil, grass pea, gram) as well as summer (monsoon) crops (rice, great millet, hyacinth bean, horse gram, black gram, green gram). They also probably raised Deccan hemp (Kenaf/Roselle), perhaps for exploitation of fibres and as vegetables as can be conjectured from the ethnographic parallels. In view of the difficulties in separating seeds of these two related species under light microscope, the identification is tentative. Detailed examination of seed coat sculpturing of grains of *Brassica* type and *Hibiscus* sp. under scanning electron microscope will be undertaken for resolving them up to species level of diagnosis.

The presence of seeds of Indian gum arabic (babul) is interesting. This is the second occurrence of the species from any archaeological site in the Deccan. The author has noted seeds of babul in palaeoethnobotanical collections made from Malwa, Early Jorwe and Late Jorwe cultural deposits at Inamgaon (C. 1600–700 B.C.) in Pune district of

Table 1 *Summary of stratigraphic and samplewise plant economy at Chalcolithic Tuljapur Garhi, District Amraoti, Maharashtra*

Plant economy (grains)	Samples										
	a	b	c	d	e	f	g	h	i	j	k
Rice (*Oryza* sp. cf. *sativa* Linn.)	+	−	+	+	−	+	+	−	−	India, South-east Asia, South China	Summer/winter, indigenous
Great millet (*Sorghum bicolor* Mill sp.)	+	−	−	−	−	−	+	+	−	Africa	Summer, rainfed winter, introduced
Wheat (*Triticum* sp. cf. *aestivum* Linn.)	+	−	−	−	−	−	−	−	−	West Asia	Winter, introduced
Barley (*Hordeum vulgare* Linn.)		−	−	+	−	+	−	−	−	West Asia	Winter, introduced
Black gram (*Vigna mungo* (L.) Hepper)	−	−	−	−	+	−	+	−	−	India	Summer (monsoon), indigenous
Green gram (*Vigna radiata* (L.) Wilczek.)	−	−	−	−	−	+	−	−	−	India	Summer (monsoon), indigenous
Black gram/Green gram (*Vigna* sp.)	+	−	−	−	+	+	−	−	−	India	Summer (monsoon), indigenous
Common bean (*Dolichos lablab* Linn.)	−	−	+	+	−	+	−	−	−	India	Summer-winter, indigenous
Horse gram (*Dolichos biflorus* Linn.)	−	−	−	−	−	+	−	−	−	India	Summer, rainfed, indigenous
Lentil (*Lens esculenta* Moench)	−	+	+	+	−	+	−	−	−	West Asia	Winter, introduced
Grass pea (*Lathyrus sativus* Linn.)	−	−	−	−	−	−	+	−	−	West Asia	Winter, introduced
Gram (*Cicer arietinum* Linn.)	−	−	−	−	−	−	+	−	−	West Asia	Winter, introduced
Pigeon pea (*Cajanus cajan* Mill sp.)	−	−	−	−	−	−	+	−	−	Western India	Summer-winter, indigenous
Kenaf (Deccan hemp, Bimley jute)? or Roselle? (*Hibiscus* cf. *cannabis* Linn. *Hibiscus* cf. *subdariffa* Linn.?	+	−	−	+	−	−	−	−	−	Africa?	Summer, introduced
Indian gum arabic (Babul) (*Acacia* cf. *nilotica* (L.) Del.)	−	−	−	−	−	+	−	−	−	Africa, India (naturalised)	Wildly growing in dry plains of India, especially Deccan
Brassica type	−	−	−	−	−	−	+	−	+		
Indeterminate Type A (large, plump, single)	−	−	−	−	−	−	+	−	−		
Indeterminate Type B (large, flat, single)	−	−	−	−	−	−	−	+	−		

+ Indicates presence, − indicates absence.
a. Tr.A6, Qd I pit; b. Tr.XC1, Qd.II sealed by humus pit no. 1; c. Tr.XA4, Qd I, pit no. 4 sealed by layer (2); d. Tr.A4, Qd.II, pit no. 5 sealed by layer (1); e. Tr A6, Qd.I, pit sealed by layer (2), f. Tr.A3, Qd III, layer (3); g. Tr A6, Qd I, pit II sealed by humus; h & i. Tr.A4, Qd.III, pit no. 5 sealed by humus; j. Areas of origins of domestication; k. Cropping season and related remarks.

Maharashtra. Pods of this species have also been reported from Atranjikhera during O.C.P. period (C. 2000–1500 B.C.) in Etah district of Uttar Pradesh[1]. This is a tree species found in dry plains of India, especially in the Deccan. The gum obtained from the stem is used in the confectionary and baskets are made out of young twigs.

The occurrence of grains of great millet (sorghum millet) and pigeon pea is an important addition to our knowledge of agricultural economy of Jorwe

culture, especially in its later phase. Of these, the first one is introduced into India from Africa during second millenium B.C[2]. It is also archaeobotanically evidenced from a few second millenium B.C. sites like Harappan Rohira in Sangrur district of Punjab[3], Jorwe levels of Daimabad in Ahmednagar district of Maharashtra around 1000 B.C.[4] and also during Savalda levels of Daimabad (unpublished). The pigeon pea has a prominent archaeological record as noted at Megalithic Bhagimohari (C. 800–400 B.C.) in Nagpur district; Indo-Roman levels (C. 150–50 B.C.) of Nevasa, district Ahmednagar[5]; Satavahana and Post-Satavahana levels (C. 200 B.C.–300 A.D.) of Bhokardan[6] in Aurangabad district and Late Historical deposits of Mungi[5], district Aurangabad, all in Maharashtra. In view of this archaeobotanical record, the natural primary diversity of wild intercrossing extant relatives of pigeon pea (*Atylosia* spp.) in Western Ghats and consistent references in ancient Indian literature, it may be postulated that pigeon pea might have been locally domesticated pulse crop in Western India.

Most of the species of cultivated cereals and pulses except pigeon pea had come to light from Chalcolithic Inamgaon[7] (C. 1600–700 B.C.) in Pune district and Daimabad in Ahmednagar district during middle and late phases of 2nd millenium B.C.[4,8]. The present evidence obtained from Tuljapur Garhi demonstrates continuation of double cropping practices in the Vidarbha region of Maharashtra. Subsequent to this, we have well-dated evidence for the remains of crop plants such as rice, barley, wheat, common pea, lentil, grass pea, horse gram, common bean (lablab bean), black gram, green gram, job's tears (wild), etc. unearthed from Megalithic levels of Bhagimohari (C. 800–400 B.C.) (in press)[9]. Thus the present study is useful in illustrating sequential agricultural history and changing ancient food habits in northern Maharashtra in particular and in the Deccan in general. Detailed work on these plant remains is in progress.

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A NEW METHOD OF MASS REARING PREDATORY PHYTOSEIID MITES IN THE LABORATORY

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PHYTOSEIIDS have been cultured using pollen grains or tetranychid prey[1–3]. Shehata and Weiseman[4] developed an artificial diet for *Phytoseiulus persimilis* Athias-Henriot. Although adults were produced they did not lay eggs. Krishnamoorthy[5] developed a technique for laboratory rearing of *Amblyseius* (*Typhlodromips*) *tetranychivorus* Gupta. We developed a simple method of mass-rearing phytoseiid mites in the laboratory using tetranychid mites, and the same is described here.

The rearing unit consists of a glass tray or metal tray (20 cm diameter and 10 cm height), a glass vial (small used vials of antibiotics with rubber cork) and a small tube preferably the used ballpen refil. A small hole was made in the lid of the glass vial and about 2.5 cm of the used refil was inserted through the hole. A petiole of blackgram (or greengram or