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COLLECTING WILD SPECIES OF CROP PLANTS FROM ARAVALLI HILLS, RAJASTHAN, INDIA

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A germplasm collection mission to Aravalli hills was undertaken to collect mainly wild species of *Cucumis, Sesamum. Solanum* and *Vigna* during October 1996. The area showed wide distribution of wild species. *Cucumis hystrix* Chakra. was collected from Mount Abu, Sirohi and Udaipur hills. In all, 110 samples consisting of *Cucumis callosus* (28). *C. hystrix* (6), *Sesamum mulayanum* (59), *Solanum indicum* (1), *S. higrum* (4), *S. seaforthianum* (1), *S. surattense* (9) and *Vigna radiata* var *sublobata* (2) were assembled from Ajmer, Dungarpur, Jaipur, Jhunjhunu, Pali, Rajsamand, Sikar, Sirohi and Udaipur districts of Rajasthan. A wide range of variability was recorded in *Cucumis callosus* and *Sesamum mulayanum.* Collected germplasm may be utilized in the breeding programmes.

Key words : Collection; wild species; germplasm; variability

Plant breeders depend upon the germplasm of wild relatives of crop plants particularly for the incorporation of resistant traits into existing cultivars. The genetic base of crop germplasm has been narrowing at a rapid rate (Frankel and Bennet, 1970; Frankel and Hawkes, 1975 and Evans and Peacock, 1981). As a result of habitat destruction, there is and urgent need to conserve these germplasm (Simmonds, 1962 and Beadle 1980). The exploitation of wild relatives of crop plants to a large extent depends upon the exploration and evaluation of natural populations in centers of gene diversity (Jain, 1975; Harlan, 1976; Robbellen, 1979; Brezhnew *et al.*, 1980 and Feldman and Sears, 1981). But investigations on the variations in natural populations of wild species of crop plants of tropical origin are scarce (Walsh, 1991). Present paper deals with a mission which was undertaken to collect natural variability in wild species of *Cucumis, Sesamum, Solanum* and *Vigna* from Aravalli hills, in Rajasthan.

MATERIALS AND METHODS

This mission was carried out during October 15 to 27, 1996. Route followed and area covered are shown in Fig. 1. In all, 110 samples comprising of *Cucumis callosus* (28) *C. hystrix* (6), *Sesamum mulayanum* (59), *Solanum indicum*

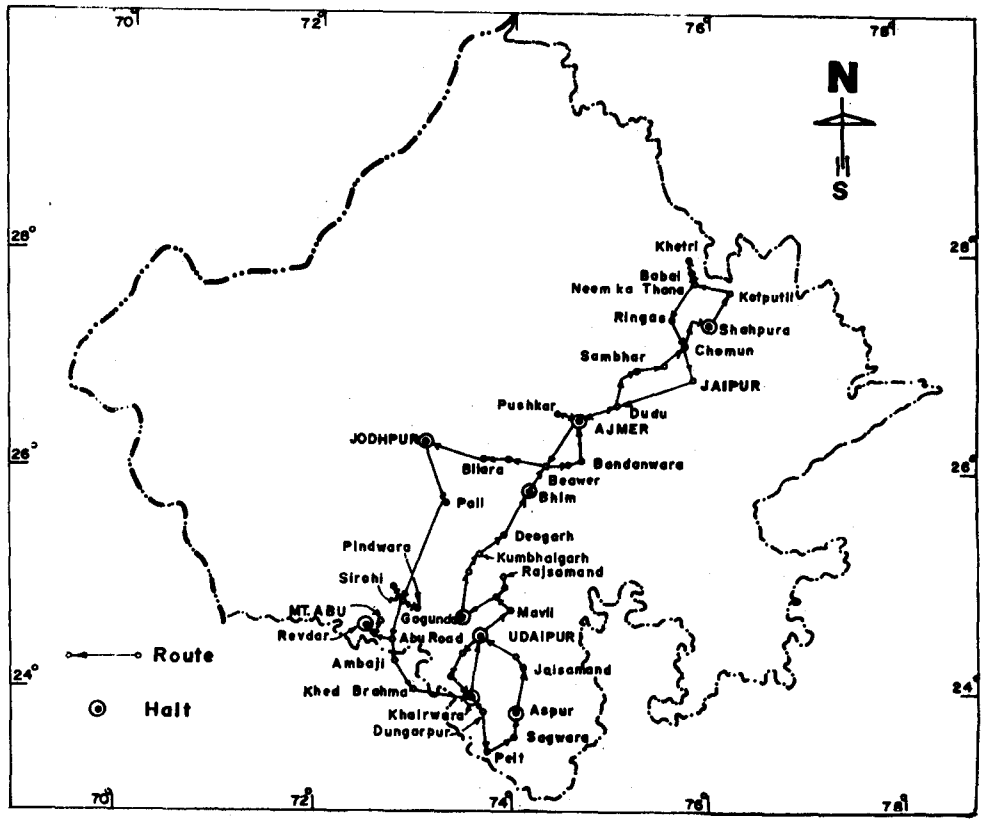

Fig. 1. Map showing route followed during collection of wild species of some crop plants from Aravalli Hills, Rajasthan

(1) *S. nigrum* (4), *S. seaforthianum* (1), *S. surattense* (9) and *Vigna radiata* var. *sublobata* (2) (Table 1) were collected from 62 diverse sites lying between 23°5′ to 28° North latitude, 72° to 76° East longitude and 280 to 1520 m altitudes in Ajmer, Dungarpur, Jaipur, Jhunjhunu, Pali, Rajsamand, Sikar, Sirohi and Udaipur districts of Rajasthan. The surveyed sites represented different agroecological zones and wide range of edaphic and environmental conditions. Biased, random and bulk sampling procedures were followed for collecting at least 100 fruits at each site. Passport data were recorded alongwith important plant characters. Ripe fruits were harvested and 20 fruits and 100 seeds from each sample were taken randomly for measuring size, shape and weight. Herbarium sheets were prepared for *Sesamum mulayanum, Solanum indicum, S. nigrum, S. seaforthianum, S. surattense* and *Vigna radiata* var. *sublobata.* One set of collected seed material was sent to NBPGR Headquarters New Delhi for getting accession numbers.

Table 1. Collection of wild species of some crops from parts of Aravalli hills in Rajasthan

Districts	Number of collections of different species								Total collections
	1	2	3	4	5	6	7	8	
Ajmer	-	-	03	-	-	-	01	-	03
Dungarpur	03	-	12	-	01	-	-	-	16
Jaipur	-	-	02	-	01	-	04	-	07
Jhunjhunu	-	-	01	-	-	-	-	-	01
Pali	-	-	01	-	-	-	-	-	01
Rajsamand	02	-	07	-	-	-	02	-	11
Sikar	01	-	04	-	-	-	-	-	05
Sirohi	04	02	06	01	01	01	01	-	16
Udaipur	18	04	24	-	01	-	01	02	50
09	28	06	59	01	04	01	09	02	110

1 = *Cucumis callosus*; 2 = *C. hystrix* 3 = *Sesamum mulayanum* 4 = *Solanum indicum*; 5 = *S. nigrum*; 6 = *S. seaforthianum*; 7= *S. surattense* 8 = *Vigna radiata* var. *sublobata*.

RESULTS AND DISCUSSION

Collection Sites

Collections were made from waste lands, roadsides, irrigated and rainfed farmer's fields, river banks, canal areas and annual or ephemeral ponds, terraces, slopes, valleys and hill tops. The important sites included are Andheri Deori, Makhupura, Masuda, Surajpura (Ajmer). Vagdari, Rampur, Ghata, Jorawerpura Nai Basti, Aod, Aspur, Sagwara (Dungarpur). Sambhar, Kaladera, Narina. Shahpura (Jaipur). Babai (Jhunjunu). Ranakpur (Pali). Mandiyana. Khamnor. Gattana. Bhim, Rajsamand (Rajsamand). Patan. Moods, Shri Madhopur, Sirohi (Sikar). Jhadoli, Nai Bhanwari, Swaroopganj, Abu road, Mount Abu, Revdar (Sirohi) Jhalara Kali Padi, Jaisamand, Gaonwali, Jagat, Sakroda, Kishmara, Tikaliya, Bavalwada, Mavli, Gogunda, Saira, Bemala, Tikwas, Garanwas, Dabok and Deogaon (Udaipur).

In-Situ Variability In Germplasm Collected

Cucumis callosus (Rottl.) Cogb.

In total 28 collections were made from different sites of Dungerpur (3), Rajsamand (2), Sikar (1), Sirohi (4) and Udaipur (18) districts at the elevation of 295, 490-600, 400, 280 and 285-375 m above msl respectively. A wide range

of variability was noticed in habit (trailing/climbing/runner), size, shape (lobed/sublobed/dissected) and colour (light green/intermediate/dark green) of leaves; size (small/medium/large), shape (ovoid/oblong/obovate/round/ trigonous/pear shaped/barrel shaped). Colur (light green/dark green/ greenish yellow/greenish white/brownish white/orange/reddish yellow/lemon yellow) and weight (3.5 to 198 g) of fruit, fruit skin texture (smooth/grainy/ warty) and ornamentation (striped/spotted/mottled/streaked/speckled) : fruit length (2.0 to 10.7 cm) and width (2.0 to 6.9 cm), thickness of mesocarp (thin/ thick) and pulp (1.5 to 5.4 cm); pulp colour (white/yellowish white/orange), size (3 × 4 to 9 × 4 cm), shape and colour (white/light/yellow/light orange) of seeds and 100 seed weight (0.853 to 1.813 g). Stripes if present are 10 in number and spread from anterior to posterior end). Local names noted are given in Table 2.

Cucumis hystrix Chakra.

Six collections were made from tribal areas of Sirohi (2) and Udaipur (4) districts located at the elevation of 1520 and 450 m above msl respectively. This species was found to climb on shrubs and trees in Mount Abu (Sirohi) and on fence and roof of huts in Garanwas tribal area (Udaipur). Variability was recorded in length (3.3 to 12.5 cm. width (3 to 7 cm), weight (25 to 168 g), shape (round/obovate/oblong/trigonous) and colour (light green/dark green/whitish green/whitish yellow/orange yellow/yellow) of fruits, number of deciduous spines on fruit skin (39 to 54), nature of stripes (complete/half the fruit length, number of seeds per fruit (86 to 186), size (5.5 × 2 to 11 × 4 mm) and shape (oblong/obovate) of seeds and 100 seed weight (0.887 to 1.741 g). Its two local names were noted down (Table 2).

Solanum indicum linn.

Single collection was made from road side towards Mount Abu at the elevation of 870 m above msl. The stem of this spiny shrub was much branched, compressed, stout and blackish green to purplish green in colour. Internodal distance varied from 2.3 to 5 cm. Leaves were of medium size (2 × 1.2 to 5.5 × 3.2 cm) lobed with spines on the nerve. Both alternate and opposite types of leaf arrangements were recorded. Blue coloured flowers were arranged in racemes of cymose. Berries were globose with red to yellow colour and of different size (6 × 7 to 10 × 10 cm). The length of fruit stalk was 1.2 to 1.6 cm. Number of seeds per berry varies from 75 to 20.5. Seeds were flat, whitish yellow, smooth and 3 mm in diameter.

S. nigrum Linn.

Four collections were made from Dungarpur (1), Jaipur (1), Sirohi (1) and Udaipur (1) districts at the elevation of 270, 405, 1350 and 440 m above msl respectively. Variability was recorded in plant height (15-41 cm), number

of branches (8 to 24), internodal distance (3 to 7 cm), size (1.8 × 2.2 to 4.5 × 2.5 cm), shape (ovate/oblong/sinuate-toothed/lobed and colour (light green/dark green/purplish green) of leaves; flower colour (white/white with yellow ting), number of flowers per cluster (3 to 10), size (4 ×4 to 6 × 6 mm) and colour (red/orange/black) of round fruits, number of seeds (50 to numerous) per fruit and size, shape and colour of seeds.

S. seaforthianum Andr.

Single collection of this naturalized exotic (native to Brazil) species in India (Velayudhan *et al.* 1996) was made from the forest of Mount Abu at an elevation of 1300 m above msl. Its upper leaves were lobed and lower pinnatisect. Flowers were bluish in cymose panicles. Red coloured berries grow in bunch (10 to 15). Number of seeds per berry varies from 26 to 31. Seeds were flat, whitish brown, round/remiform, hairy and 3 mm in diameter. It was found climbing on *Euphorbia caducifolia.*

S. surattense Burm.

Nine collections were made from seven different sites in Ajmer (1), Jaipur (4), Rajasamand (2), Sirohi (1) and Udaipur (1) districts. It was growing at the elevation of 260 m to 900 m above msl. Variability was noticed in plant habit (erect/spreading), stem colour (light green/dark green/purplish green); size (3 × 5 to 5 × 12 cm), shape (elongated/ovate/elliptic/sinuate or subpinnatified) and colour (dark green/light green/purplish green/silver green) of leaves, leaf base (round/unequal sided), distribution of prickles (sparse/scattered/thickly) nature of prickles (compressed/straight/somewhat curved), number of flowers per cluster (1 to 3), pedicel (straight/curved), flower colour (purplish blue/whitish blue), anther length (5 to 8 cm) size (7 to 21 mm in dia.), shape (round/ovoid) and colour (yellow or whitish with green streak) of fruit, number of seeds per fruit and size (1 to 2 mm in dia.) shape (ovoid/reinform) and colour (pale/brown) of seeds. Local names were recorded (Table 2).

Sesamum mulayanum Nair.

This species was found throughout the areas surveyed. Fifty nine collections were assembled from thirty three sites in Ajmer, Dungarpur, Jaipur, Jhunjhunu, Pali, Rajsamand, Sikar, Sirohi and Udaipur (Table 1). It was found in abundance in Dungarpur and Udaipur districts. A wide range of variability was recorded in plant height (2.5 to 15.7 ft), branching habit (single stem/basal branching/top branching), number of branches (0 to 24), stem colour (yellow/ straw/ brown/purple), stem hairiness (glabrous/sparse/hairy), stem shape (round/ square), leaf position (opposite/alternate/mixed), basal leaf shape (entire/lobed) and form (flat/bot shaped), leaf hairiness (sparse/hairy), flower size and colour (purple/whitish purple/violet), number of flowers per node (1 to 3), internodal

distance (0.8 to 3.5 cm), shape (tapered/narrow oblong/broad oblong/square), size (elongated/medium sized) and colour (straw/brown)/dark brown/purplish black) of dry capsules, number of capsules per node (1-3), number of ruptures in mature capsules (1 to 2), number of seeds per capsule (60-120), seed coat colour (light brown/brown/reddish brown/pinkish brown/greenish brown/light black/black) and roughness (less/more) and 100 seed weight (0.088 to 0.363 g). Variability was found prevalent in Dungarpur and Udaipur districts. Tallest and much branched collections were made from Udaipur and Rajsamand districts respectively. Maximum and minimum 100 seed weight was recorded in collection number NKD-2154 collected from Gogunda, Udaipur and NKD-2144 collected from Bavalwada, Udaipur respectively. Out of 59 collections six (3 each from Dungarpur and Udaipur districts) had more than 0.250 g 100 seed weight. Prabhakaran (1996) reported genetic diversity in wild sesame in south India. Local names recorded are given in Table 2.

Table 2. Local names of different crop species collected

Crop species	Local names
Cucumis callosus (Rottl.) Cogb.	*Chimari* (Sirohi), *Kachari* (rest of the areas)
C. hystreix Chakra	*Alwadia* (Sirohi), *Tenda* (Udaipur)
Solanum nigrum Lin..	*Lal Makoi, Kali Makoi* (sikar)
S. surattense Burm.	*Bu-rigani* (Rajsamand), *Bhu- ringani* (Ajmer), *Dhatari* (Udaipur), *Katali* (Rajsamand), *Katarpasali, Pesstakatali* (Jaipur), *Reengani* (Sirohi).
Sesamum mulayanum Nair	*Adak Tal* (Ajmer, Dungarpur, Pali, Jaipur, Sikar, Udaipur), *Adak Til* (Jhunj hunu, Sikar, Sirohi, Udaipur), *Adak Tol* (Dungarpur), *Bander ki Talli* (Dungarpur) Kag Tal (Sirohi), *Khetar Tal* (Udaipur), *Ram Til* (Udaipur), *Ran Tal* (Sikar), Vander Til (Udaipur).
Vigna radiata var. *Snublobata* (Roxb.) Verdc.	Adal moong (Udaipur)

Vigna radiata var. *sublobata* (Roxb.) Verdc.

Two collections (without any disease symptoms) were made from tribal areas of Sakroda and Tikaliya villages of hilly belts of Udaipur district at 450 to 520 m above msl. Both collections showed variation in size, shape and colour of leaves and seeds; number of pods per cluster; pod length; number of seeds per pod and 100 seed weight. Number of seeds per pod in this species can be employed in the improvement of yield in mungbean cultivar (Igracimuthu and Babu, 1984). This species is a putative wild progenitor of

V. mungo and probably of *V. radiata* (Lukokie *et al.*, 1980). Rajan and Janardhan (1993) reported that it shows close affinity with cultivated species *V. radiata* in plant height; number of seeds per pod and 100 seed weight. Besides similarities it shows difference in 'hairiness'; size, shape, pubescence and colour of leaves; flower colour and length and shattering habit of pods. Tribal people called it by local name (Table 2).

ETHNOBOTANICAL USES

Wild relatives of crop plants have important role and value in the lives of village and tribal people. Unripe fruits of *Cucumis callosus, C. hystrix* and *Solanum indicum* are used to prepare vegetables. Tribal people cut the fruits in small pieces, dry in shade and use them during rest of the year. Children eat ripened fruits. The leaves and young shoots of *Solanum nigrum* are eaten as spinach. The seeds of *V. radiata* var. *sublobata* are used to prepare vegetable as "dal". The smoke from burning fruits of *S. indicum* and *S. surttense* is know to relieve toothache. *S. nigrum* has antiseptic and antidysentric properties and given internally to cardalfia and gripe. The extracts of whole plant of *S. seaforthianum* affect the rate and amptitude of respiration and also the blood pressure (Anonymous, 1972). The anthers of *S. surattense* are used to cure cough, local people use whose plant of *S. nigrum* (black fruited) to cure respiratory disease. The boiled water with seeds of *V. radiata* var. *sublobata* is drunk to cure fever. While vegetable prepared out of unripe pods is eaten to cure piles by tribal people in Dungrpur and Udaipur districts. Seeds of *Sesamum mulayanum* are given to cow and goats to produce more milk.

The collected material with desirable traits may be used as a good source of breeding material to improve related crops for disease resistance and high yield.

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