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DIVERSITY IN *SESAMUM* GERMPLASM OF SOUTHERN AND WESTERN DISTRICTS OF ORISSA

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Sesamum occupies an important position among oilseed crops of Orissa. it is grown in high lands in June-December in hilly districts and in lowlands in January-April (dry season) after harvest of paddy. Cultivated sesame mostly belongs to *Bhadei* (May-July), *Maghi* (Aug-Nov/Dec) and *Nilaji* (January-April) types. During a survey to collect, evaluate and conserve the genetic resources of this important crop, sesamum growing belt consisting o seven districts of eastern ghat and central plains region of Orissa was explored during November 1992. The areas explored are situated between 70o 31′ to 22o 34′ N latitude and 81o 24′ to 87o 21′ east longitude, with topography varying from hilly undulating in eastern ghats to plain areas in central table land, between 135 to 700 m elevation. In total forty eight accessions of cultivated sesamum consisting of 2 accessions of *Bhadei*, 43 accessions of *Maghi* and 3 accessions of *Nilaji* and 2 accessions of wild *Sesamum* were collected. The paper presents details of the variability collected.

Key words : Sesame, diversity, collection, characterization, ethnobotany

Orissa is rich in diversity of both wild and cultivated sesame. The crop is grown in the highlands of hilly districts during the wet season (June - December) and also in the low lands of coastal plains during the dry season (Jan. - April). The large scale cultivation of high yielding varieties like *Kalika, Kanak* and *Vinayak* posed a serious threat to the existence of local cultivars. The tribal pockets of peninsular India are still rich sources of wide genetic diversities of wild relatives, landraces and traditional cultivars. In an exploration undertaken during November 1992, the eco-geography of the areas explored, the diversities observed, the ethnobotanical information gathered and the mode of genetic erosion observed are enumerated in this paper.

ECOGEOGRAPHY OF THE REGION

The area explored is situated between 17° 31′ and 22° 34′ N latitude and 81° 24′ to 87° 20′ east longitude. The topography of the area is hilly, undulating

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with lush green valleyes and forests in the interior districts and plain lands in the central plain region. The region experiences annual precipitation of 1534 mm to 1710 mm. The soil is sandy loam to red calcareous in Koraput, Nawarangpur districts and black in Kalahandi district of Orissa. The pH of the soil varies from 4.9 to 5.5 in high altitude regions (Similiguda, Pottangi) and 5.6 to 6.5 in Nawarangpur and Umerkote area. The Nawarangpur and Umerkote belt are rich in iron and aluminium but deficient in micronutrient content. The altitude of the areas varies from 120 to 940 m. But the *Sesamum* cultivation was observed only between 300 ft. to 2100 ft. above mean sea level. Repeated minikit trials of different cultivars of sesame were failure in regions beyond 640 m above sea level.

METHODOLOGY OF COLLECTION

Prior information about the ecogeography, occurrence of wild relatives and their distribution pattern were surveyed from the flora and literature (Haines, 1925; Hooker, 1885; Mooney, 1950). The collection time coincided with the maturity time of *Sesamum*. Collection the farmer's fields, farm store and partly hilly and forest areas in the south of Ganjam and continued in Rayagada, Koraput, Malkangiri, Nawarangpur, Kalahandi, Bolangir and Sambalpur districts. The traditional old farmers were contacted to know about the occurrence of wild *Sesamum*. Both random and bulk sampling were followed.

Table 1. District-wise collection for *Sesamum* germplasm in Orissa

Collection area / Districts	No. of sites visited	Altitudinal range (above msl)	No. of samples collected cultivated	wild	Total
Ganjam	1	33-380	1	-	1
Rayagada	5	240 - 410	4	-	4
Koraput	6	530 - 1020	3	-	3
Malkangiri	7	130 - 285	5	1	6
Nawarangpur	13	66 - 640	5	-	5
Kalahandi	11	240 - 340	8	-	8
Bolangir	14	148 - 760	12	1	13
Sambalpur	14	130 - 285	10	-	10
Total	71	33 - 1020	48	2	50

SAMPLES COLLECTED AND VARIABILITY OBSERVED

During the mission, a total number of 50 samples were collected from 71 sites spread over a distance of 2365 kms. Diversity includes of *Sesamum*

indicum as well as *S. mulayanum*. Cultivated sesame belong to three major duration groups *viz., Bhodei* (May - July), *Maghi* (August - November/December) and *Nillaji* (January-April). Majority of collections (43) belonged to the *Maghi* duration group next in order being *Nillaji* (3), *Bhodei* (2) and wild group (2). Considerable variation was observed in the *Sesamum* cultivars with regards to colour of corolla, and stem at the time of maturity, pattern of branching, number of locules per capsule, shape of capsule and colour of seeds. The flowers are mostly solitary and the size of the flower varied among the accessions. The total number of four loculed, six loculed and eight loculed sesame accessions were 44, 3 and 3, respectively including the wild sesame having four loculed capsules. Variation in seed colour (black and red) and duration was observed within the *Bhodei* group. The height of the black seeded plants was 5' - 6', stem were square shaped, branched and capsules were narrow oblong type. The morphological characteristics of the red seeded *Bhodei* were same as the black seeded types except the seed colour and duration. Variability was observed with respect to morphological and quantitative traits among the *Maghi* duration group. The diversity was exhibited in height of the plant, dwarf (34.0 cm) to tall (118.0 cm), basal to top branching type, pattern of fruit bearing (alternate or opposite), hairiness in leaf, stem, capsule and corolla. The capsules were mostly broad oblong and four loculed. But six and eight loculed capsules were also collected. The majority of the four loculed capsules have black coloured seeds and few have white coloured seeds. The six loculed capsules have only white coloured seeds. Colour of the seed varied from grey, red, black to shiny black in *Maghi* til. Popular local types were *Malkangiri local, Krishna* til, *Athagharia Jhumi, Jhunti* and *kalia* til. The *Nillaji* or *Kharatia rasi* were collected from farm stores. The varieties are grown after harvesting of late paddy where there is some moisture. The seed colour was red.

IN-SITU VARIABILITY

A wide variability in different characters was observed among the forty eight accessions of cultivated (*S. indicum*) species collected during the course of exploration (Table 2). The *in-situ* variation in quantitative characters like plant height ($\bar{x}$ = 68.4 cm. range 34.0 - 118.0 cm), number of branches per plant ($\bar{x}$ = 4.02, range 22.00 -13.0), number of capsules per plant ($\bar{x}$ = 14.2, range 5.0 - 98.0), the length of the 4 loculed capsule ($\bar{x}$ = 2.03, range 1.3 - 2.5), the length of the 6 loculed capsules ($\bar{x}$ = 1.85, range 1.8 - 1.9), the length of the 8 loculed capsule ($\bar{x}$ = 2.35, range 2.0 - 2.7), the width of the 4 loculed capsuled ($\bar{x}$ = 0.59, range 0.4 - 0.7); 6 loculed capsules ($\bar{x}$ = 0.58, range 0.5 - 0.6), 8 locules capsules ($\bar{x}$ = 0.65, range 0.6 - 0.7), number of seeds in the 4 loculed varieties ($\bar{x}$ = 40, range 32.0- 44.0), 6 loculed varieties ($\bar{x}$ = 70, range 51.0 = 86.0), 8 loculed varieties ($\bar{x}$ = 79, range 72.0 - 86.0), the weight

of the capsule of 4 loculed varieties ($\bar{x}$ = range 9.5 - 10.0) 6 loculed 6 loculed ($\bar{x}$ 11.0, range 11.0 - 12.0g), 8 loculed ($\bar{x}$ 11.6, range 11.5 - 12.0 g). The 100 seed weight of 4 loculed varieties ($\bar{x}$ = 240.0 mg, range 225.0 - 250.0 mg), 6 loculed varieties ($\bar{x}$ = 195.0 range 165.0 - 227.0 mg) and 8 loculed varieties ($\bar{x}$ = 180.0, range 180.0 - 220.0 mg) were quite wide. These characters observed in the field should not be considered as stable genetic characters since the plants were grown under very poorly managed areas.

Table 2. Variability of sesame cultivars

Characters	Range	Mean
Plant height (cm) (20)	34.0 - 118.0	68.4
Branches/plant (20)	2.0 - 13.0	4.02
Capsules per plant (25)	5.0 - 98.0	14.2
Length of the capsule (cm) (10 each)		
(4 loculed)	1.3 - 2.5	2.03
(6 loculed)	1.8 - 1.9	1.85
(8 loculed)	2.0 - 2.7	2.35
Width of the capsule (cm)		
(4 loculed)	0.4 - 0.7	0.59
(6 loculed)	0.5 - 0.6	0.58
(8 loculed)	0.6 - 0.7	0.65
No. of seeds in the capsule (10 each)		
(4 loculed)	32 - 44	40
(6 loculed)	51 - 86	70
(8 loculed)	72 - 86	79
Weight of the capsule (g)		
(4 loculed (10)	9.5 - 10.0	9.5
(6 loculed (10)	11.0 - 12.0	11.0
(8 loculed (10)	11.5 - 12.0	11.6
100 seeds weight (mg)		
(4 loculed)	225 - 250	240.0
(6 loculed)	165 - 227.0	195.0
(8 loculed)	180 - 220	200.0

Values in parentheses indicate number of samples studied

It is interesting to note that the 8 loculed capsules possessed double the number of grains than the 4 loculed capsules. Although the 100 seed weight for 8 loculed capsules was less than that of the 4 loculed capsules by 40.0 mg, the additional number of seeds contained in the 8 loculed capsules compensated the per capsule seed weight to the extent of 166 per cent. It is, therefore, advisable to incorporate the 8 loculed capsule characters to the high yielding background in order to achieve additional yield over the traditional 4 loculed capsules. These local collections might have possessed genes for resistance to various biotic and abiotic stresses which need further confirmation and exploitation.

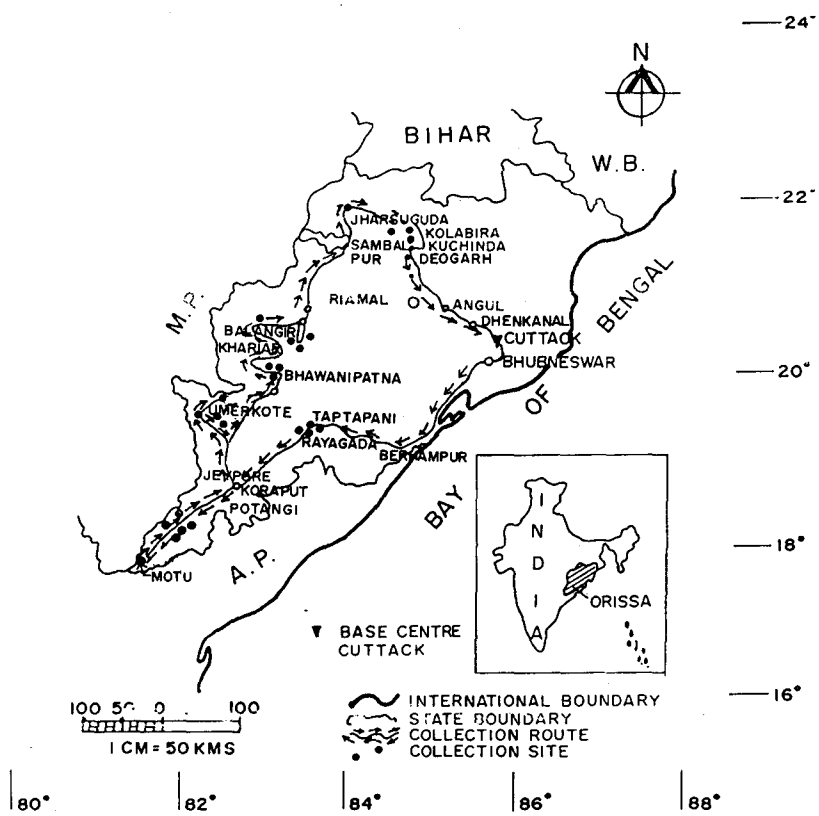

Fig. 1. Map showing the area/region explored, route and collection sites visited

OCCURRENCE OF WILD SESAME

During the mission, two accessions of wild til were collected. Wild *til* (D-1928) collected from *Malkangiri* showed tall habit (3-7 ft.), profuse branching of four loculed capsules, narrow and oblong type and black and small sized seeds. It was identified by the experts of BSI, Calcutta as a weedy accession of *S. indicum*. The other one (D-1951) collected from Bolangir, possessed a few to non-branching stems, with plant height of 2-3 ft. The capsules were broad oblong, four loculed, thick and triangular while the seeds were red with beautiful ornamentations on the seed coat. It was ascertained from the local inhabitants that this species was spontaneous and of rare occurrence in the hillocks of Sarmuhan, Bolangir. It has a shattering habit like any other wild species and is not used for any purpose. It was identified by the experts of BSI Calcutta as *S. mylayanum* Nair.

ETHNOBOTANICAL INFORMATION

Gingelly, in addition to its use in culinary has immense medicinal values. The local inhabitants use til oil for curing of constipation in cattle @ 250 ml a single dose per cattle. Til oil mixed with liquid Ammonium forte and turpentine oil is used for curing sprain in cattle as well as men. Til oil cake is widely used by local inhabitants for curing *Fatua* disease in cattle. The oil of black seeded *til* was reported to have colling effect. In Hindu mythology the black seeded til mixed with gold is used in "yagna" to satisfy evil demons called "Tilatarpana". Sesame seeds with rice and honey are used to prepare the funeral cakes called "pindas" that are offered to the ancestors in the *shraddha* ceremonies by the relations of the deceased (Dymock *et al.* 1893). The offering of sesame seeds is considered effective in removing sins (Gupta, 1971).

GENETIC EROSION

Different types of loss of genetic resources were observed in the locality explored. Firstly, the introduction and cultivation of high yielding varieties (HYV's) has proved to be quite profitable. Such a practice of switching over to HYV's has resulted in forceful loss of valuable traditional genetic resources. Secondly, switching over to certain other remunerative cash crops is another cause of loss of germplasm. Thirdly, the frequent failure of monsoon resulting in drought spell and complete loss of the crop in these localities is another cause of loss of traditional varieties. In view of such genetic erosion regular collection, evaluation and conservation of the germplasm is essential.

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