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CHARACTERIZATION OF GENETIC RESOURCES OF INDIAN MUSTARD

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Evaluation of 360 indigenous accessions of Indian mustard (*Brassica juncea* L. Czern. & Coss.) for yield contributing traits and oil content indicated an appreciable range of variation. Secondary branches/plant, 1000 seed-weight and primary branches/plant had high variability (CV.20.8-32.3%). Oil content varied the least (CV.3.3%). Except for days to maturity and plant height, the remaining traits exhibited moderate variation. Several useful accessions for various morpho-agronomic characters and oil content were identified which can be utilized in the breeding programme to improve seed and oil yield.

Key words: Genetic resources, morpho-agronomic characters, oil content, oilseeds, Indian mustard, *Brassica juncea*

Indian mustard is second important oilseeds crop of India after groundnut. There has been a phenomenal growth in mustard production and productivity during the last 10 years. It accounts for 13 per cent of the country's gross cropped area and 30 per cent of the total oilseeds production. It is a major source of edible oil in Indian diet besides its oilcake serving as livestock feed and a major source to earn foreign exchange. Efforts have been made to evaluate, characterize, preserve and catalogue the genetic resources of rapeseed-mustard (Anon., 1983; Kumar, 1987 and Kumar and Singh ,1978). Improvement of seed and oil yield in this crop to meet the increasing demand of oil is foremost. Therefore, there is a need to intensify efforts to search for appropriate donors for utilization in the breeding programme. In the present paper, attempts have been made to characterize the genetic resources of Indian mustard maintained at this Centre to assess their potential use in cultivar development programme.

MATERIALS AND METHODS

Three hundred and sixty accessions of Indian mustard (*Brassica juncea* L. Czren. & Coss.) were sown in augmented design during **rabi** 1995-96 season at National Research Centre on Rapeseed-Mustard, Bharatpur. The accessions were grown in 2 rows (0.4g/m^2) of 5m length with plant-to-plant and row-to-row

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spacings of 15 and 30 cm, respectively. Forty Kg N and full dose of phosphorus were applied at the time of sowing while remaining 40 kg of nitrogen was top-dressed just after irrigation (40 days after sowing). Standard agronomic practices were followed and plant protection measures were adopted as and when required.

Observations were recorded on 5 competitive randomly selected plants for days to maturity, plant height (cm), primary branches per plant (No.), secondary branches per plant (No.), main shoot length (cm), siliqua per main shoot (No.), siliqua length (cm), seeds per siliqua (No.), 1000-seed weight (g) and oil content (%). Seed counting of 1000 seeds was done by an electronic seed counter ("L" Systems, Old mill Co., USA) and weighed and the oil content was analysed by nuclear magnetic resonance (Oxford 5000).

RESULTS AND DISCUSSION

All the characters except days to maturity, plant height and oil content exhibited considerable variability in the collections investigated (Table 1). Plant height and maturity are the two important varietal traits determining its suitability in a production system. Varieties with shorter height and early maturity are the preferred ones. Plant height in the present collections ranged from 89.2 cm (JMG 110) to 227 cm (JMG 73). This character, however, showed low variability. Most of the accessions (82.2%) had the plant height varying from 150 to 200 cm. (Fig. 1A). Nevertheless, about 16.1 per cent of the accessions showed more than 200 cm plant height. Majority of the accessions (72.3%) took 121-135 days to mature, (Fig. 1B) but maturity varied from 118 (JMG 151) to 143 days (WRR 3-1). Seventy-seven accessions were of early

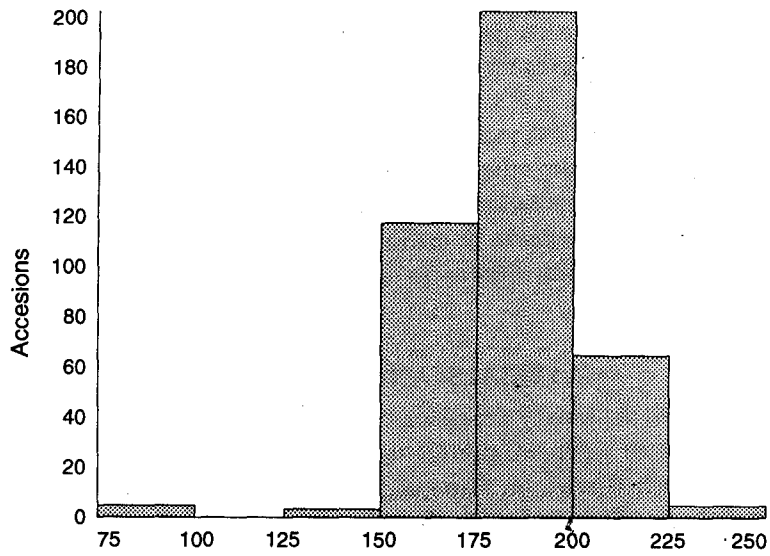

Fig. 1A : Plant height (cm)

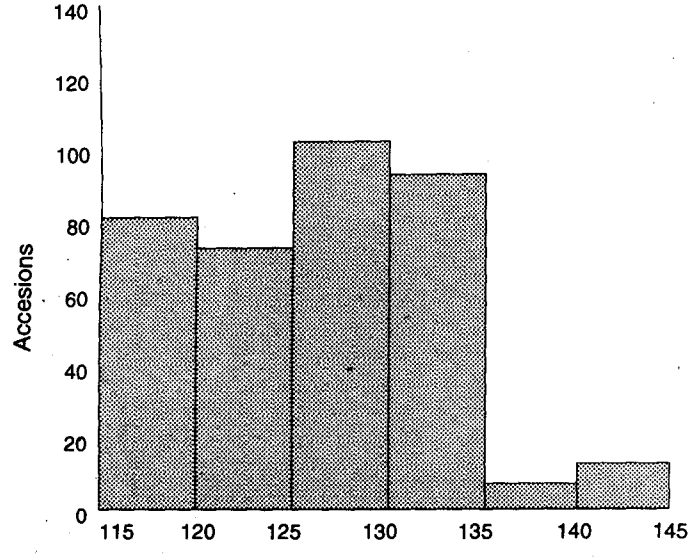

Fig. 1B : Maturity (days)

maturity (120 days). Only 22 were late maturing type (> 135 days). This character had low variability (Table 1).

Table 1. Range, mean and coefficient of variation (%) for various morpho-agronomic traits and oil content in Indian mustard

Character	Range	Mean ± SEM	Coefficient of variation (%)
Days to maturity	118-143 (JMG 151) (WRR 3-1)	126.9 ± 0.3	4.9
Plant height (cm)	89.2-227.0 (JMG 110) (JMG 73)	183.2 ± 0.9	9.34
Primary branches/plant (No.)	4.0-14.0 (JM 162) (JMG 39)	7.8 ± 0.86	20.8
Secondary branches/plant (No.)	4.4-25.8 (CSR 117) (JMG 127)	11.9 ± 0.2	32.3
Main shoot length (cm)	37.0-112.4 (CSR 128) (JMG 236)	82.7 ± 0.6	12.6
Siliquae main shoot (No.)	28.4-82.2 (CSR 102) (JMG 109)	43.7 ± 0.4	16.4
Siliqua length (cm)	3.2-5.8 (JMG 160) (JMG 63)	4.2 ± 0.02	10.3
Seeds/siliqua (no)	9.8-23.8 (JMG 196) (JMG 63)	14.0 ± 0.1	15.5
Seed weight (g)	2.26-7.87 (JMG 211) (JMG 151)	4.8 ± 0.06	24.5
Oil content (%)	35.0-42.9 (CSR 46) (JMG 78)	39.1 ± 0.10	3.0

Main shoot length had moderate variation (CV. 12.6%) in the present collection. The accession CSR 128 had the shortest main shoot (37 cm), whereas JMG 236, the longest (112.4 cm). About 61 per cent of the accessions had main shoot length in the range of 71 to 90 cm (Fig. 1C). Number of primary

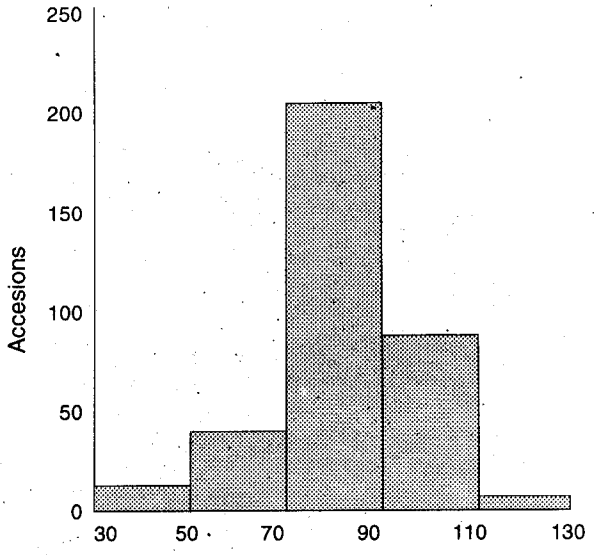

Fig. 1C : Main shoot length (cm)

and secondary branches per plant are the major seed yield contributors in this crop. The secondary branches per plant varied the most (CV. 32.5%). Primary branches per plant also exhibited appreciable variation (CV. 20.8%). In majority of the accessions (78%), primary branches ranged from, 6.1 to 10, only 1.7 per cent had the heighest number of primary branches (> 12) (Fig. 1D). Accession JMG 127 had the maximum secondary branches per plant and the mean was 11.93 ± 0.21. Eleven accessions (3.1%) had very high (20-24) number of secondary branches (Fig. 1E). Variability for siliquae on main shoot was moderate (Table 1) and ranged from 28 (CSR 102) to 82 (JMG 109) with an average of 43.7 ± 0.38. Most of the accessions (63.9%) had a range of 40 to 60 (Fig. 1F). The coefficients of variation for siliqua length and seeds per siliqua suggested moderate variation (Table 1). The maximum and minimum siliqua length was recorded in the accession JMG 63 (5.8 cm) and JMG 160 (3.2 cm). In general, siliqua length varied from 4.1 to 5.0 cm (207 accessions). Seeds per siliqua ranged from 10 (JMG 196) to 24 (JMG 63). This character had narrow range of variation (10-15) in 77.8% of the accessions (Fig. 1H). Three accessions had more than 20 seeds per siliqua (Fig. 1I). Seed weight is an important character in determining seed yield. Therefore, developing bold-seeded varieties is the foremost in the mustard cultivar development programme. Hence, identification of suitable donors with high seed weight is quite imperative. The present collections exhibited high variability for this trait

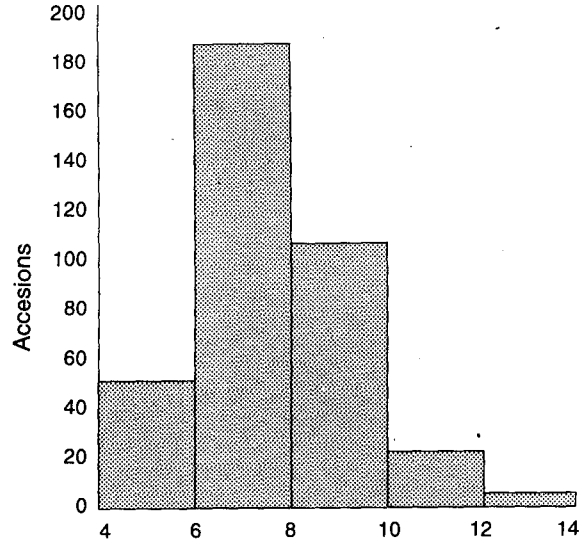

Fig. 1D : Primary branches/plant

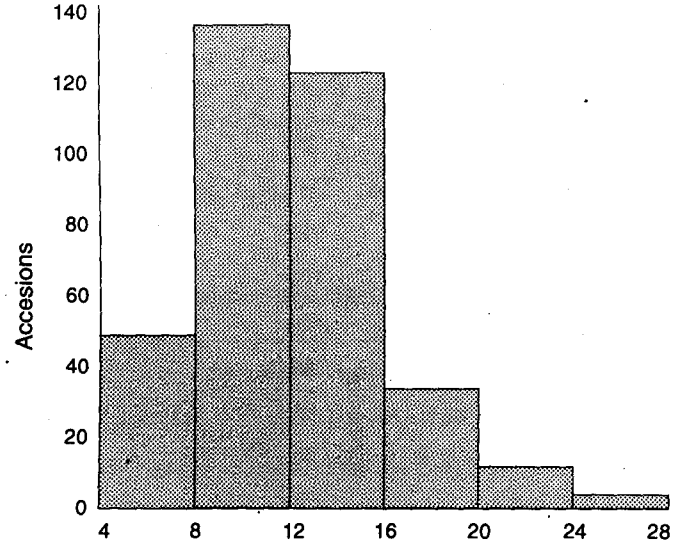

Fig. 1E : Secondary branches/plant

(CV. 24.5%). The range and mean were 2.26 (JMG 211) to 7.87 (JMG 151) and 8.4 ± 0.06, respectively. Thirteen of the 360 accessions could be the potential donors for high seed weight (> 7.0 g; Fig. 1J). The accessions showed the least variation (CVI. 3.3%) for oil content, although it varied from 35.0 (CSR 46) to 42.5% (JMG 78) of the three hundred sixty accessions, 319 (88.6%) exhibited a range of 37 to 41 per cent and only 23 (6.4%) had oil content >

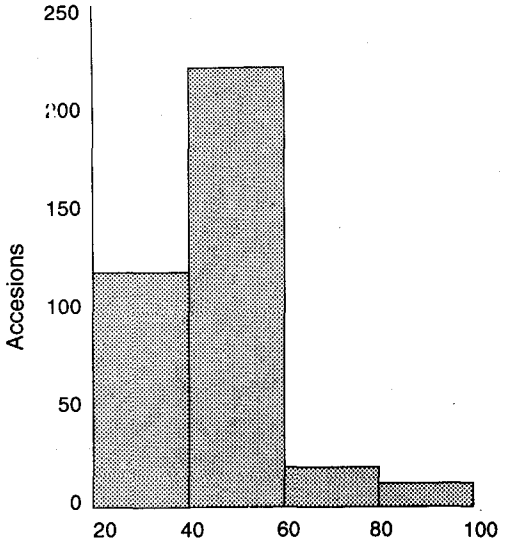

Fig. 1F : Siliquae/main shoot

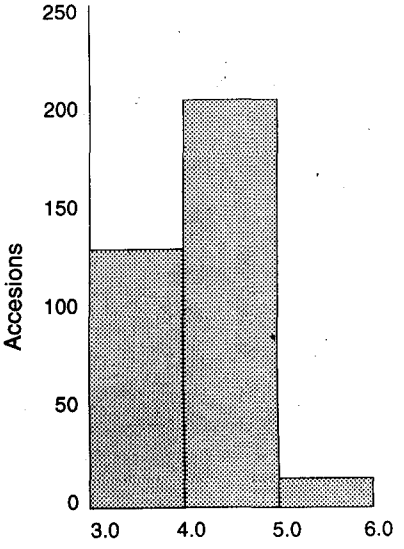

Fig. 1G : Siliquae length

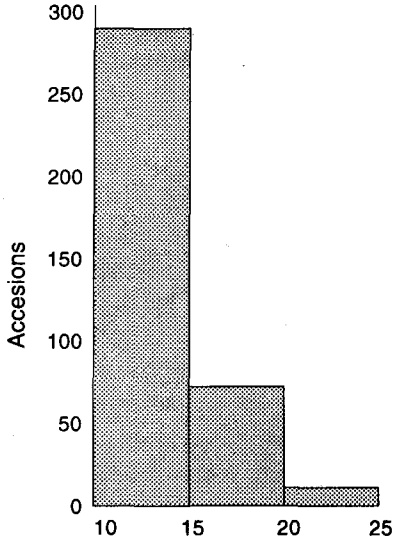

Fig. 1H : Seeds/siliquae

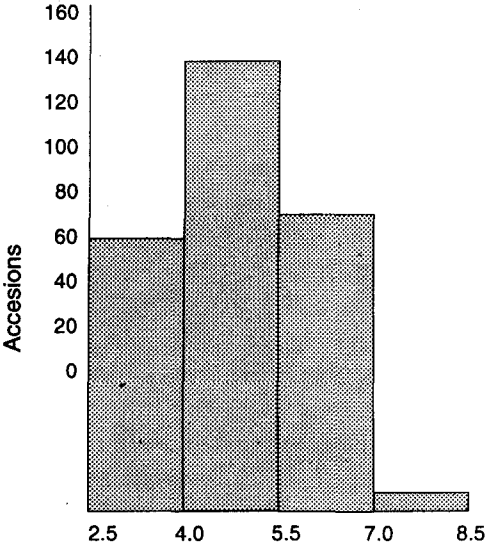

Fig. 1J : Seed weight

41% (Fig. 1K). Similar pattern in respect of oil has been observed earlier (Annonymous, 1983).

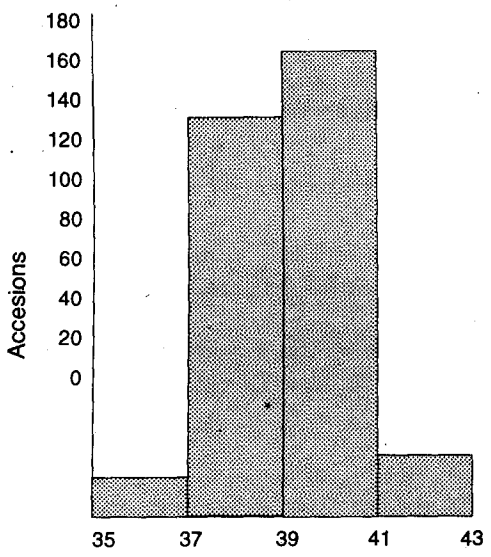

Fig. 1K : Oil content (%)

The present collections proved to be an important gene pool for different morpho-agronomic characters and many accessions (Table 2) could be utilized for rational hybridization programme to improve seed yield. Besides seed yield, oil yield determines the commercial success of a variety. Thus development of improved germplasm with high oil content remains the top priority of

Table 2. Donors for various morpho-agronomic characters in Indian mustard

Characters	Donors Accessions
Plant height (< 155 cm)	JMG 110, BACR 50, JMG 248, CSR 128, JMG 365
Primary branches/plant (≥ 12cm)	JMG 39, B 29, CSR 57, JMG 122, CSR 156
Secondary branches/(Plant (≥ 18 cm)	JMG 127, JMG 105, JMG 226, JMG 88, B 48
Main shool length (≥ 99 cm)	JMG 236, CSR 72, CSR 14, JMG 226, CSR 50
Siliquae main shoot (≥ 62 cm)	JMG 109, JMG 239, JMG 236, JMG 161, JMG 386
Siliqua length (≥ 5.4 cm)	JMG 63, JMG 79, JMG 64, JMG 117, JMG 67
Seeds/siliqua (≥ 20)	JMG 63, JMG 74, JMG 68, JMG 64, CSR 147
1000 seed weight (≥ 7.5 g)	JMG 151, CSR 64, JMG 238, JMG 369, JMG 98

breeders. Ten top high oil yielding accessions alongwith their morpho-agronomic characters have been identified (Table 3).

Table 3. Characterization of high oil content accessions of Indian mustard

Accession	Oil content (%)	Days to maturity	Plant height (cm)	Primary branches/ plant (No.)	Secondary branches/ plant (No.)	Siliquae main shoot (No.)	Siliqua length (cm)	Seeds/ siliqua (No.)	Seed weight (g)
JMG 78	42.9	179	170	5	38	38	4.5	15	5.9
JMG 88	42.8	119	166	23	41	41	5.0	13	4.9
CSR 156	42.3	132	221	13	56	56	3.3	12	4.7
JMG 221	42.2	116	181	22	52	52	4.6	15	3.0
JMG 237	42.1	119	173	14	41	41	4.1	13	3.4
JMG 279	41.7	126	204	8	49	49	4.2	13	4.3
JMG 19	41.6	119	168	10	47	47	3.9	13	6.0
JMG 211	41.6	117	187	12	40	40	3.7	15	2.3
JMG 96	41.5	118	173	16	44	44	4.5	16	5.9
JMG 282	41.4	123	167	11	39	39	4.0	13	3.1

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