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Short Communication

CHARACTERIZATION OF TORIA GERMPLASM (*Brassica campestris* ssp *oleifera* var. *toria*)

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The short note deals with identification of several promising accessions for different economic traits, viz, days to 50% flowering, maturity, plant height, primary branches per plant, main shoot length, seeds per siliqua, siliqua length/breadth, biological yield, yield per plant, harvest index 1000 seed weight and oil content etc. It revealed that potantial of existing germplasm in developing high yielding genotypes through hybridization followed by selection to combine the desirable traits of different promising accessions.

Key words : Germplasm, toria, seed yield, oil content, harvest index, variability.

Toria (*B.campestris* ssp *oleifera* var *toria*) belongs to the rapeseed-mustard group which is the second major oilseed crop of India after groundnut. Toria being a short duration crop (70-100 days), is mainly grown as a catch crop in northern India in the states of Punjab, Haryana, Uttar Pradesh, Rajasthan and Madhya Pradesh. It is also suitable for multiple cropping system. Wheat and chickpea can successfully be grown after harvesting of toria. Due to its early maturing nature, it escapes from major pests and diseases of rapeseed-mustard. Further, in Eastern India, particularly in the North-eastern hill Region, Assam, Orissa and parts of Madhya Pradesh (Chhattisgarh, Bastar region) it is grown as a sole crop during *rabi* season.

Germplasm provides the base material for crop improvement. Modern cultivation practices employing the high crop intensity have resulted in the loss of diversity, particularly that of short duration crops. Efforts have been made to preserve the rapeseed-mustard germplasm (Anon. 1983; Kumar, 1987 and Yadav *et al.* 1997), however, information on evaluation and characterisation of toria germplasm is scanty. Present investigation was undertaken to evaluate the toria germplasm maintained at this centre for yield, yield contributing traits and oil content to assess their potential value in cultivar development programme.

Two hundred thirty lines of toria germplasm, obtained from different centres were grown in an augmented design during *Rabi* 1997-98 at NRCRM, Bharatpur in a two row plot of 3 m length with row to row and plant to plant spacings of 30 and 10 cm, respectively. PT303 and T-9 were used as checks. The observations were recorded on five randomly selected plants for days to emergence, days to 50% flowering, days to maturity, plant height, primary branches per plant, secondary branches per plant, main shoot length, number of siliquae on main shoot, seeds per siliqua, siliqua length, siliqua beak length, biological yield, yield per plant, harvest index and

1000 - seed weight. Oil content of 107 lines was estimated by nuclear magnetic resonance.

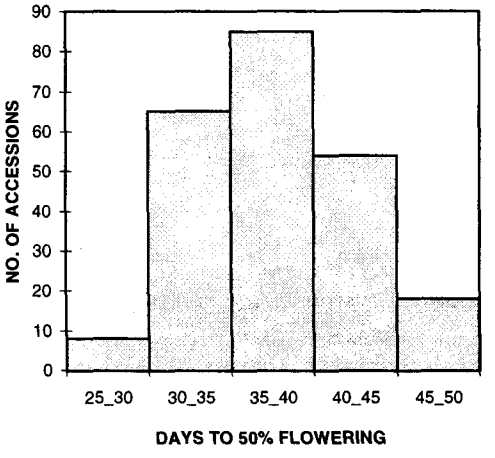


FIG.1.1

All the characters except days to emergence, days to maturity and oil content, showed significant amount of variability in the germplasm (Table 1). Highest variability was recorded for number of primary branches per plant (CV 91.4%) followed by yield per plant, number of secondary branches per plant and biological yield per plant, while lowest variability was recorded for oil content (CV 2.6%) followed by days to maturity and days to emergence.

Days to maturity is an important character in toria. As a catch crop, the varieties maturing in less than 80 days are to be developed to fit into the existing cropping systems. But in the present germplasm the range for days to maturity was 89-106 days with a low estimate (3.5%) of

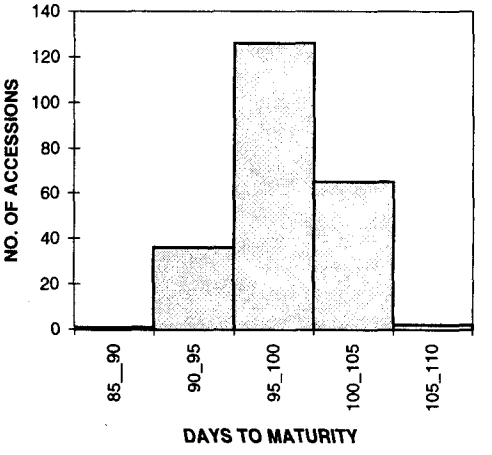


FIG.1.2

co-efficient of variation, indicating the need of further exploration and collection of germplasm for this character for its utilization as a catch crop. On the contrary, days to flowering exhibited wide range with moderate variability. Eight entries flowered in less than 30 days (Table 2). Flowers appeared within 35-45 days in 65 lines while 139 lines (60%) flowered (Figure 1.1). Despite such variability for flowering all lines matured in more than 90 days except NRCT-15 (Fig. 1.2). This may be due to the influence of weather conditions at the time of maturity. A sudden rise in the temperature, perhaps, resulted in fast maturity while cloudy weather prolonged the

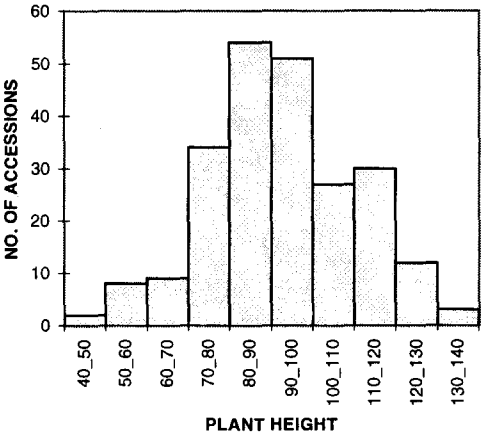


FIG.1.3

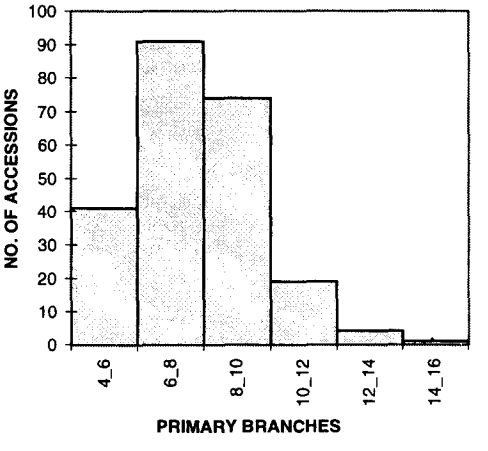


FIG.1.4

duration of maturity. Plants with low height are preferred in toria. Moderate variability with a range of 46.6-133.6 cm was recorded for plant height. Ten lines were of less than 60 cm tall (Table 2, Fig. 1.3). Two promising cultures, namely, NRCT-136 and NRCT-186 were less than 50 cm tall. Variability for number primary branches was greater than for number of secondary branches. On the contrary, range was wider for secondary branches than for primary branches. Majority of lines had less than 10 primary branches (89.6%) and less than 20 secondary branches (93%) per plant (Fig. 1.4, 1.5). Main shoot length and siliquae on main shoot are interrelated traits. Both the characters showed large extent of variability (Table 1).

Majority of the lines fell in two class intervals, i.e. between 30-40 and 40-50 cm for main shoot length (76%, Fig.1.6) and between 20-30 and 30-40 for number of siliquae (70% FIg.1.7) on main shoot. NRCT-5, NRCT-6, NRCT-20, NRCT-96, NRCT-127, NRCT-206 and NRCT-224 were promising lines bearing more than 50 siliquae on main shoot (Table 2). Seeds per siliqua and siliqua length are also inter-related characters. The variability was also almost equal for both the characters as depicted by the estimates of coefficients of variation (Table 1). Only three lines, viz., NRCT-22, NRCT-37 and NRCT-112 had more than 20 seeds per siliqua. Ninety eight lines fell in the range of 10-20 seeds/siliquae (Fig. 1.8).

The longest siliquae were recorded in NRCT-22 (7.7cm) followed by NRCT-112 (7.2cm) and NRCT-37 (6.4cm). Majority (93%) of lines had siliqua length between 4-6 cm (Fig.1.9). Siliqua beak length showed more variability than siliqua length. However, only one line had less than 0.5 cm beak length. 218 lines (95%) had beak length between 0.5 to 1.5 cm (Fig.1.10). Seed weight showed moderate variability (CV 18.7%) and most of the lines had less than 3.0 g seed weight (Fig. 1.11). Only eight lines recorded more than 3.5 g seed weight.

Table 1. Range, mean and coefficient of variation (CV) for different quantitative traits in toria (*B. campestris* var. *toria*)

Trait	Range	Mean ± SE	CV(%)	Mean values of Checks	
				PT 303	T9
Days to emergence	3-4	3.4 ± 0.03	6.9	3	3
Days to flowering	25-46	36.8 ± 0.31	12.8	33	35
Days to maturity	89-106	98.0 ± 0.23	3.5	97	99
Plant height (cm)	46.6-133.6	92.5 ± 0.07	19.2	76.7	89.7
Primary branches/ plant	4.2-15.0	8.4 ± 0.51	91.4	7.4	7.8
Secondary branches/ plant	2.2-44.4	11.1 ± 0.38	51.7	14.9	13.9
Main shoot length (cm)	16.6-63.8	38.9 ± 0.57	22.1	33.9	38.3
Siliquae per main shoot	13.6-56.0	31.9 ± 0.62	29.7	24.9	32.7
Seeds/ siliqua	9.3-24.2	14.7 ± 0.15	15.1	15.3	14.8
Siliqua length (cm)	3.6-7.7	4.9 ± 0.04	12.3	4.8	5.2
Siliqua beak length (cm)	0.4-2.0	1.0 ± 0.02	25.6	0.9	0.9
Yield/plant (g)	2.1-12.0	4.1 ± 0.14	52.9	3.8	4.9
Biological yield (g/plant)	4.6-61.2	16.5 ± 0.56	51.6	14.4	15.5
Harvest index (%)	13.6-47.7	25.5 ± 0.42	24.8	26.5	31.6
1000-seed weight (g)	1.6-3.6	2.6 ± 0.03	18.7	2.8	2.7
Oil content (%)	35.7-42.3	40.2 ± 0.10	2.6	41.7	42.5

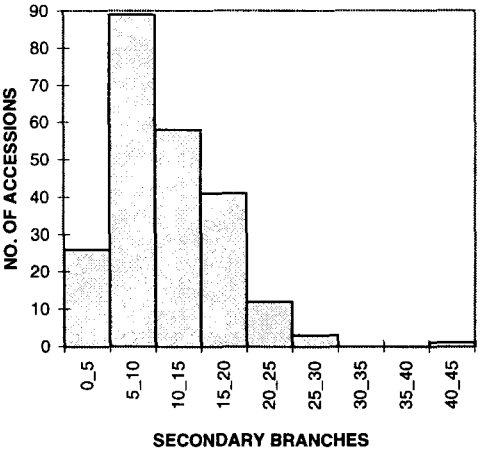


FIG.1.5

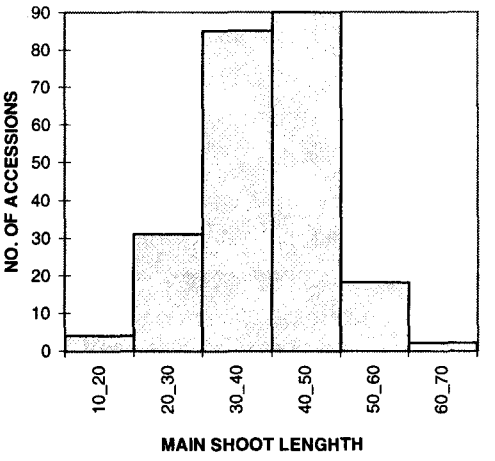
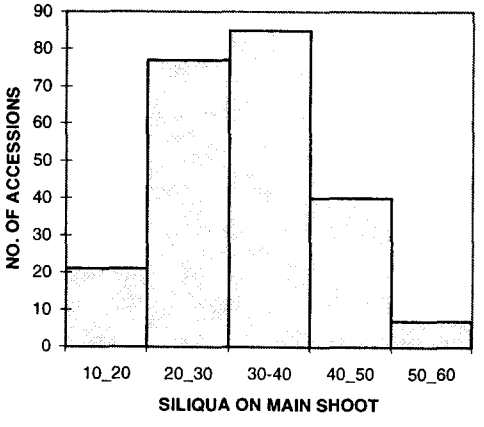


FIG.1.6



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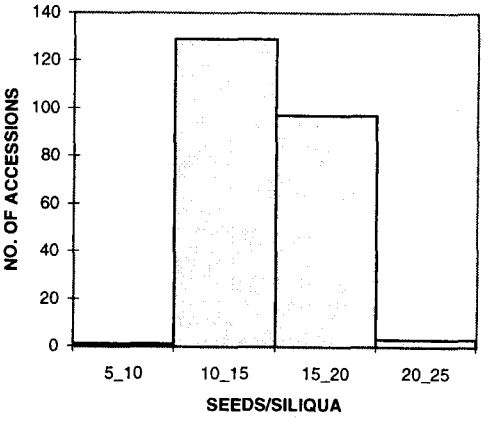

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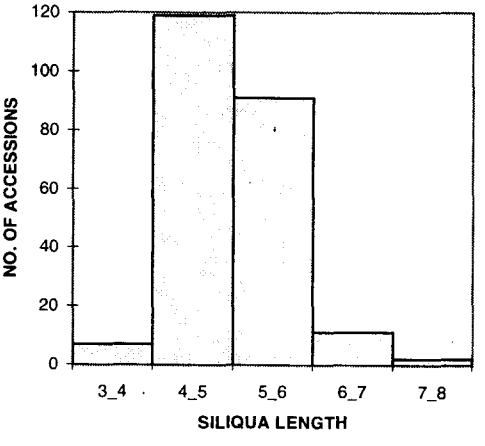

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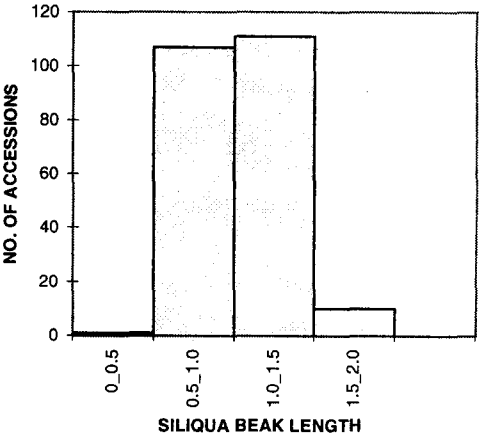


FIG.1.10

It shows the need of further exploration of the germplasm for bolder seeds. Variability for yield per plant was high (C.V. 52.9%), however, only three lines namely NRCT-93, NRCT-120 and NRCT-123 produced more than 10 g per plant, while 73% lines yielded less than 5.0 g/plant (Fig. 1.12).

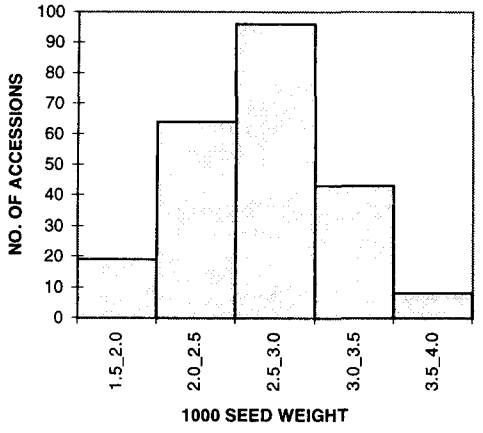
Biological yield has gained much importance in selecting high yielding plant. A high biomass

Table 2. **Promising accessions of toria for different economic traits**

Trait	Germplasm accessions
Days to 50% flowering (< 30 days)	NRCT-30, NRCT-93, NRCT-131, NRCT-203, NRCT-204, NRCT-205, NRCT-236, NRCT-237
Plant height (< 60 cm)	NRCT-136, NRCT-138, NRCT-154, NRCT-186, NRCT-190
Primary branches/ plant (> 12)	NRCT-8, NRCT-95, NRCT-120
Secondary branches/ plant (> 25)	NRCT-21, NRCT-120, NRCT-185
Main shoot length (> 55 cm)	NRCT-7, NRCT-31, NRCT-79, NRCT-87, NRCT-96, NRCT-105, NRCT-123, NRCT-127, NRCT-206
Siliquae on main shoot (> 50)	NRCT-5, NRCT-6, NRCT-20, NRCT-96, NRCT-127, NRCT-206, NRCT-224
Seeds/siliqua (> 20)	NRCT-37, NRCT-22, NRCT-112
Siliqua length (> 6 cm)	NRCT-5, NRCT-17, NRCT-22, NRCT-30, NRCT-37, NRCT-40, NRCT-45, NRCT-112, NRCT-147, NRCT-185, NRCT-229.
Biological yield/plant (> 40 g)	NRCT-23, NRCT-74, NRCT-109, NRCT-111, NRCT-120, NRCT-127
Harvest index (> 40%)	NRCT-29, NRCT-100, NRCT-141, NRCT-150, NRCT-235

with high harvest index is desirable for a high yielding genotype. In the present study, biological yield, showed high variability, but variability for harvest index was low, indicating thereby the need of improvement of harvest index, particularly that of high biomass genotypes, so the larger portion of the photosynthates could be mobilised to the seeds. Fig. 1.13 represents the distribution of germplasm lines for biological yield in a wide range of class intervals. The range observed in the germplasm for harvest index was 13.6-47.7. One hundred thirty three accessions showed the harvest index between 20-30% (Fig. 1.14). Five lines namely NRCT 29, NRCT 100, NRCT 141, NRCT 150 and NRCT 235 showed more than 40% harvest index (Table 2). However, these lines were poor seed yielders. It was observed that these lines were poor in biomass, therefore, it would be appropriate to improve the biomass of those lines which had high harvest index. Oil content could be analysed only in 107 lines. Least variability was observed for oil content (CV 2.6%), with a range of 35.7 to 42.3%, indicating the need of further exploration of germplasm for oil content.

Several promising accessions were identified on the basis of present study for different economic traits (Table 2). It reveals the potential of existing



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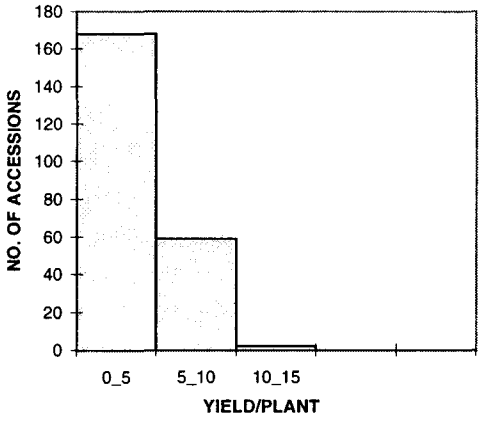

FIG.1.12

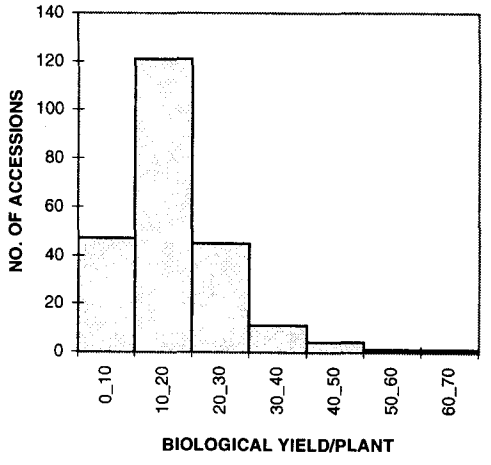

FIG.1.13

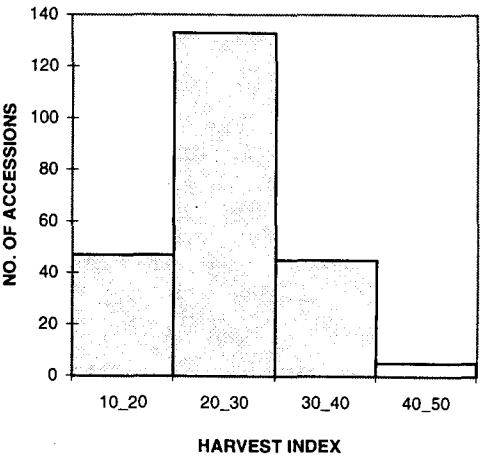

FIG.1.14

germplasm in developing high yielding genotypes through hybridization followed by selection to combine the desirable traits of different promising accessions. However, further exploration of germplasm is required for high oil and early maturing types.

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