Evaluation of Exotic Germplasm of Ethiopian Mustard and Rocket

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The exotic germplasm of crop plants is one of the important sources of some of the agronomical traits for the development of improved cultivars. In the present study, 35 and 26 exotic accessions of *Eruca sativa* (rocket) and *Brassica carinata* (Ethiopian mustard), respectively, were evaluated for various 14 agro-morphological and quality traits. Both these annual species are among the seven cultivated oilseeds of India, belonging to family Brassicaceae. These accessions were acquired from Germany. Among the 14 traits studied, the maximum variability was observed, for seed yield per plant and the least variability is observed for oil content in both the crop species. In rocket genotypes EC 447079 was identified as a useful donor for 1000 seed weight, harvest index and seed yield per plant. However, EC 447092 and EC 447123 were identified as donors for main shoot length and siliquae on main shoot in rocket and Ethiopian mustard, respectively. Identified promising donors for various economic traits can be further used for future breeding programme.

Key words: *Eruca sativa, Brassica carinata*, Exotic germplasm, Evaluation, Variability, Donors

Germplasm plays an important role in any breeding programme (Kumar *et al.*, 2004). A wider genetic base thus assumes priority in breeding research aimed at developing new varieties with desired traits. The exotic germplasm of crop plants are one of the important sources of some of the agronomical traits for the development of improved cultivars. Keeping these considerations, in the present study, 35 and 26 accessions exotic accessions of *Eruca sativa* (rocket/taramira) and *Brassica carinata* (Ethiopian mustard/karan rai), respectively, were evaluated. Both these annual species are among the seven cultivated oilseeds of India, belonging to family Brassicaceae and are limited to the drought prone/ drier areas of Haryana, Himachal Pradesh, Punjab and Rajasthan in India.

Materials and Methods

The exotic accessions of *Eruca sativa* and *Brassica carinata* were acquired from Federal Research Centre of Agriculture, Braunschweig, Germany through NBPGR, New Delhi. Seeds of 61 elite germplasm accessions were grown on 30 cmx10 cm spacing under augmented design with checks (RTM 314, T 27 for *E. sativa* and PC 5, PBC 9902 for *B. carinata*) during *rabi* of 2002-2003 at National Research Centre on Rapeseed–Mustard, Bharatpur-321 303 (Rajasthan). These germplasm accessions were evaluated for various agro-morphological and quality traits including initiation of flowering, 50% flowering, maturity, plant height, primary branches, secondary branches, main shoot length, siliquae on main shoot, siliqua length, siliqua beak length, seeds per siliqua, seed yield per plant, 1000-seed weight, harvest index, oil and protein content.

The observations were recorded on five randomly tagged five plants for different traits at appropriate growth stages. 1000-seed was counted by electronic seed counter (The Old Mill Company, USA) and weighed by electronic balance. Further, protein and oil content were analyzed by NMR (Dickey-John, USA). Range, mean, and coefficient of variation were computed using standard statistical methods (Gomez and Gomez 1984).

Results and Discussion

Among the traits studied, the maximum variability was observed for seed yield per plant (CV 58.1%) followed by harvest index (CV 37.1 %) and the least variability is observed for days to maturity (CV 2.5 %) followed by initial flowering (CV 5.4 %)in *B. carinata* (Table 1). The maximum variability in *E. sativa*, is observed for seed yield per plant (CV 42.3%) followed by secondary branches per plant (CV 39.8%), however, the least variability is observed for days to maturity (CV 1.3 %) followed by oil content (CV 2.6%) and protein content showing CV 3.7% (Table 2).

In *B. carinata* all the exotic accessions were late flowering as compared to best check PC 5, however, accessions EC447104, EC 447199 and EC447130 mature early than the best check PBC 9902. All these accession were dwarf in comparison of checks and showed more number of primary or secondary branches except two accessions. Accession EC447103 and

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Table 1. Range, mean and coefficient of variation (cv) for different agro-morphological traits in Karan rai (*Brassica carinata*) germplasm

Character	Range	Mean ± Sem	CV (%)	Mean values of checks	
				PC 5	PBC 9902
Initial flowering (days)	84-104	97.6±1.03	5.4	71.00	89.50
50% flowering (days)	95-120	108.7±1.60	7.5	85.50	109.00
Plant height (cm)	73-156	121.08±4.32	17.1	180.70	178.30
Primary branches (No.)	12-24	16.52±0.71	20.5	12.60	12.80
Secondary branches (No.)	5 - 41.7	26.51±1.94	35.1	15.20	16.30
Main shoot length (cm)	11.7-38.3	23.07±1.52	31.5	26.50	30.50
Siliquae on main shoot (No.)	11.3-26.3	16.54±0.81	23.5	18.70	14.40
Maturity (days)	146-158	152.7±0.75	2.5	154.00	153.50
Siliqua beak length (cm)	0.3-0.7	0.42±0.02	24.1	0.50	0.83
Siliqua length (cm)	2.9-4.9	3.90±0.13	15.7	4.90	4.99
Seed yield/ plant (g)	1.39-14.3	6.67±0.81	58.1	9.50	9.00
Harvest index (%)	6.4-23.8	11.86±0.92	37.1	16.40	16.25
1000-seed weight (g)	2.0-4.0	3.04±0.11	17.3	4.20	3.94
Seeds/ siliqua (No.)	8.3-25.4	19.09±1.10	23.8	15.20	15.55

Table 2. Range, mean and coefficient of variation (cv) for different agro-morphological traits in taramira (*Eruca sativa*) germplasm

Character	Range	Mean ± Sem	CV (%)	Mean values of checks	
				RTM 314	T 27
Initial flowering (days)	55-71	64.9±0.63	5.8	44.7	48.7
50% flowering (days)	67-77	73.9±0.36	2.9	58.7	64.0
Maturity (days)	123-130	126.2±0.27	1.3	134.0	134.0
Plant height (cm)	56-102	75.9±1.85	14.0	122.1	126.7
Primary branches (No.)	4.3-11	7.4±0.31	24.2	6.6	5.8
Secondary branches (No.)	3.7-26.3	13.6±0.94	39.8	8.1	6.6
Main shoot length (cm)	34.7-73.7	47.5±1.39	16.8	30.1	34.7
Siliquae on main shoot (No.)	16-37	24.6±0.78	18.1	19.9	21.1
Seed yield/ plant (g)	2.8-9.4	5.0±0.61	42.3	8.0	7.7
1000-seed weight (g)	2.0-4.0	2.7±0.12	19.4	2.8	2.7
Harvest index (%)	16.7-37.3	24.2±1.92	27.5	16.4	16.2
Protein content (%)	21.5-24.4	22.7±0.14	3.5	23.3	23.1
Oil content (%)	34.6-37.9	36.1±0.17	2.6	34.4	34.2

Table 3. List of promising donors identified

Character	DONORS	
	E. sativa	*B. carinata*
Plant height (cm)	–	≤ 91.0 : EC447109, EC447115, EC447121
Primary branches	≥ 10.7 : EC447085, EC447090	≥ 20.0 : EC447113, EC447117, EC447124, EC447128
Main shoot length (cm)	≥ 55.0 : EC447064, EC447073, EC447081, EC447092	≥ 30.0 : EC447101, EC447103, EC447122, EC447123
Siliquae on main shoot	≥ 31.3 : EC447064, EC447076, EC447075, EC447092	≥ 20.0 : EC447103, EC447111, EC447123, EC447128
Days to maturity (DAS)	≥ 124.0 : EC447061, EC447075, EC447080, , EC447085	≥ 147.0 : EC447130, EC447184
Seed weight per plant (g)	≥ 8.7 : EC447057, EC447079	≥ 12.1: EC447110, EC447117, EC447129, EC447133
Seeds per siliquae	–	≥ 23.0 : EC447101, EC447109, EC447124, EC447136
1000-seed weight (g)	≥ 4.1 : EC447079	–
Harvest index (%)	≥ 31.33 : EC447058, EC447057, EC447079	≥ 20.3 : EC447115, EC447129
Protein content (%)	≥ 24.1 : EC447067, EC447071	–
Oil content (%)	≥ 37.6 : EC447057, EC447061, EC447092	–

EC447123 had long main shoot as well as number of siliquae on main shoot in comparison with best check. Accept four accessions all showed high number of seeds per siliqua, but all had less test weight in comparison of checks.

The exotic accessions of *E. sativa* are dwarf and early maturing in comparison of checks. The main shoot length and siliquae on main shoot were recorded higher in genotype EC447092, EC447064 and EC447075. Besides these, genotype EC447075 was also early maturing. Seed

weight and seed per siliqua and harvest index were observed higher in genotypes EC447079 and EC 447057. Further, genotypes EC447079 and EC447057 were recorded for higher 1000-seed weight and oil content, respectively. Genotype EC447085 was observed for higher primary branches per plant and early maturity. Genotype EC447058 recorded higher harvest index and seeds per siliqua.

Similar trends of genetic variation have also been reported by various other workers in oilseed *Brassica* (Meena *et al.*, 2000; Misra *et al.*, 2004; Sharma *et al.*, 1991; Yadav *et al.*,1997).

Promising donors were identified (Table 3) for various economic traits which can be further used for future breeding programme. There has been wide variability for primary and secondary branches per plant, seed yield per plant number of siliquae on main shoot and seeds per silique. Some of these promising lines are being utilizing in the breeding programme.

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