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Variation and Character Association in Taramira (*Eruca sativa*)

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Abstract: From the various agroclimatic regions of Rajasthan state 83 accessions of taramira were collected and evaluated with two checks to assess the variability, heritability, genetic advance and correlations. All the characters viz., days to 50% flowering, days to 70% maturity, plant height, primary branches per plant, secondary branches per plant, number of siliquae per plant, siliquae length, number of seed per siliquae, seed yield per plant, test weight, biological yield, oil content and harvest index, showed highly significant variability. High heritability (broad sense) values were observed for plant height, days to maturity, number of siliquae per plant, primary branches per plant and oil content, whereas low heritability was observed for biological yield. Harvest index and secondary branches per plant showed high genetic advance, although it was very low for days taken to 70% maturity. The seed yield was significantly and positively associated with days to maturity, primary branches per plant, number of siliquae per plant, biological yield and harvest index.

Key words: *Eruca sativa*, character association, variation.

Taramira (*Eruca sativa* Mill), also known as "Rocket salad" and "duan", is mainly grown for oil which is used mostly for non-edible purposes, including manufacture of grease, soap, plastic, lubricants, etc. The left-over cake is used as a feed for animals. Taramira is the most neglected crop of rapeseed-mustard group, which is highly drought-resistant, requiring low inputs. The crop is suitable for cultivation in drought prone areas because of its efficient root system, which absorbs moisture from deep soil horizons. During the years of severe drought, taramira is the only alternative available for rabi season and is planted on soils having limited moisture supply.

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The present investigation was carried out to assess taramira germplasm for its variability in yield and yield-related traits.

Materials and Methods

The material for the present investigation consisted of 83 accessions of taramira, numbering from RTM-1 to RTM-87, being maintained in All India Co-ordinated Research Project on Oil Seeds (taramira unit), SKN College of Agriculture, Jobner. The accessions (henceforth called genotypes) were evaluated in RBD with two replications, accommodating two rows of each entry. The row to row distance was 30 cm. Plant to plant distance of 10 cm was maintained by thinning at 30 days after sowing. Observations on various morphological traits, as listed in Table 1, were recorded on a random sample of 10 plants from each plot. GCV, PCV, heritability in narrow sense, and genetic advance for each character were estimated and correlation coefficients between different pairs of characters were estimated.

Results and Discussion

The ANOVA of the 83 genotypes indicated existence of significant differences for all the 12 morphological traits and oil content (Table 1). Comparison of variability on the basis of coefficient indicated that the phenotypic coefficient of variation was higher than genotypic coefficient of variation in all the characters. The difference was, however, low for 5 characters, namely days to 50% flowering, days to maturity, plant height, number of siliquae per plant and oil content, indicating a very low effect of environment on the expression of these traits. For rest of the characters the effect of environment on character expression was high, the difference between PCV and GCV being higher. Wide differences between PCV and GCV are commonly reported in taramira (Yadav and Kumar, 1982; Nehra *et al.,* 1989; Rathore, 1995).

Estimates of heritability serve as a useful guide to the breeder. If the heritability of a character is very high, e.g., 70% or more, selection for such a character should be fairly easy. This is because there would be close correspondence between genotypic and phenotypic variations due to a relatively smaller contribution of environment to the phenotype. For a character with low heritability, say less than 40%, selection may be considerably difficult or virtually impractical due to the overriding effect of environment on the genotypic effect. High heritability (broad sense value >70%) was observed for plant height, days to maturity, number of siliquae per plant, primary

Table 1. Analysis of variance for seed yield and other characters in taramira

Character	Mean square		
	Replication (df = 1)	Genotype (df = 82)	Error (df = 82)
Biological yield (g)	275.81	1316.39**	870.13
Days to 50% flowering	2.43	23.22	4.34
Days to 70% maturity	1.25	18.31**	1.87
Harvest index	0.47	94.39**	29.46
Number of seeds per siliquae	0.26	15.63**	6.55
Number of siliquae per plant	0.25	2037.27**	213.19
Oil content (%)	1.92	26.84**	4.33
Plant height (cm)	31.88	222.07**	9.93
Primary branches per plant	0.01	6.72**	0.78
Secondary branches per plant	0.04	41.51**	7.01
Seed yield per plant (g)	0.13	8.31**	3.27
Siliquae length (cm)	0.11	0.28**	0.06
Test weight (g)	0.06	0.29**	0.07

Table 2. Coefficient of variation, heritability and genetic advance for various traits in taramira germplasm

Character	Coefficient of variation		Heritability in broad sense (%)	Genetic advance as per cent of mean
	Genotypic (GCV)	Phenotypic (PCV)		
Biological yield (g)	23.15	51.23	20.4	21.54
Days to 50% flowering	4.79	5.78	68.5	8.16
Days to 70% maturity	2.28	2.52	81.5	4.23
Harvest index	39.54	54.61	52.4	58.98
Number of seeds per siliqua	11.40	17.82	40.9	15.04
Number of siliquae per plant	21.53	23.92	81.1	39.39
Oil content (%)	8.68	10.21	72.2	15.18
Plant height (cm)	9.81	10.26	91.4	19.32
Primary branches per plant	21.66	24.34	79.2	39.74
Secondary branches per plant	26.26	31.22	70.8	45.56
Seed yield per plant (g)	19.61	29.77	43.4	26.60
Siliqua length (cm)	17.31	21.73	63.4	28.57
Test weight (g)	8.83	11.10	63.3	14.55

branches per plant, oil content and secondary branches per plant (Table 2). These findings are similar to those of Yadav and Kumar (1982) and Rathore (1995). Low heritability was observed for biological yield.

High genetic advance (>36%) was recorded for harvest index, secondary branches per plant, number of siliquae per plant and primary branches per plant. Moderate (>25%) genetic advance was recorded for siliquae length (28.7%) and seed yield per plant, while low genetic advance was obtained for days to maturity and days to flowering (Table 2).

The genotypic correlation coefficients between traits were generally higher than the respective phenotypic correlation coefficients. Genotypic correlation coefficients indicate a measure of genetic association between characters and, therefore, help in identifying the traits which are important and need to be considered for improvement of yield. Though a suitable test for significance of genotypic correlations is not available, their main usefulness lies in strengthening the interpretations based on phenotypic associations (Nehra *et al.*, 1989). Thus in the present investigation, major emphasis is placed on phenotypic correlations.

The seed yield per plant exhibited significant association with number of siliquae per plant and harvest index only (Table 3). The significant association of seed yield with siliquae and harvest index has been reported by Nehra *et al.* (1989) and Rathore (1995). Among the interrelationships, the number of siliquae per plant exhibited positive significant associations with primary branches per plant, secondary branches per plant, number of seeds per siliquae and biological yield per plant. The secondary branches per plant

Table 3. Phenotypic correlation coefficients among different characters in taramira germplasm

Character	Days to 70% maturity	Plant height	Primary branches per plant	Secondary branches per plant	No. of silque per plant	Siliqua length	No. of seeds per siliqua	Seed yield per plant	Test weight	Bio-logical yield	Oil content	Harvest index
Days to 50% flowering	0.126	0.122	0.165	0.107	0.137	0.305**	0.106	0.056	0.108	0.111	-0.032	-0.079
Days to 70 maturity		0.059	0.056	0.040	0.144	-0.029	0.128	0.058	0.068	0.016	-0.216	0.020
Plant height			-0.024	-0.061	-0.076	0.063	0.130	0.031	0.277*	0.036	0.051	-0.036
Primary branches per plant				0.542**	0.275*	0.067	0.246*	0.212	-0.036	0.142	-0.190	0.073
Secondary branches per plant					0.585**	0.243*	0.300**	0.216	0.081	0.273	-0.021	-0.056
No siliquae plant^{-1}						0.164	0.240*	0.261*	0.061	0.248*	0.003	-0.094
Siliqua length							0.385**	0.135	0.274*	0.114	0.120	-0.024
No. of seeds siliquae^{-1}								0.196	0.144	0.113	0.092	0.080
Seed yield/plant									0.105	0.128	0.020	0.383**
Test weight										0.170	0.123	-0.123
Biological yield											-0.042	-0.474**
Oil content												-0.029

* Significant at P = 0.05 and ** significant at P = 0.01.

also exhibited significant associations with primary branches per plant, number of siliquae per plant and biological yield. The number of siliquae per plant exhibited significant positive association with primary branches per plant, secondary branches per plant and siliquae length. This may indicate that primary branches per plant, secondary branches per plant, number of siliquae per plant, number of seeds per siliquae as the important yield determinants. However, among these only number of siliquae per plant exhibited significant associations with yield. Such associations are well supported by the results of Rathore (1995).

It can thus be concluded that traits like primary branches per plant, secondary branches per plant, number of siliquae per plant, number of seeds per siliquae and siliquae length are the important yield determinants in taramira. The significant negative association between biological yield and harvest index is interesting and expected too. As harvest index represents a ratio between the seed yield and total biological yield, negative association is desirable as it indicates higher seed yield due to higher partitioning of photosynthate into the sink organs. Thus, harvest index is another important yield determinant.

References

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