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Research Article

Genetic Variability for Grain Yield and its Various Components in Taramira (*Eruca sativa* Mill.)

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Abstract

80 accessions along with 4 check varieties of taramira (*Eruca sativa* Mill.) evaluated for grain yield during 2015-2016. Analysis of variance showed that accessions had significant differences for all the traits except days to 50 percent flowering and days to maturity. The checks varieties also exhibited significant differences for all the traits except days to 50 percent flowering, days to maturity and plant height; this indicated that check varieties had high variability among them. Wide range was observed for the character siliquae per plant, plant height, days to maturity, days to 50 percent flowering, number of secondary branches per plant, seeds per siliqua and oil content. The phenotypic variance was higher than the genotypic variance for each of the character studied indicating positive effect of environment on the expression of a character. High heritability coupled with high genetic advance was observed for siliquae per plant. High heritability and moderate to low genetic advance were observed for oil content, siliqua length, plant height, number of secondary branches per plant and seeds per siliqua. Coefficient of variance indicated that the variability was highest for seed yield per plant followed by number of primary branches per plant and number of secondary branches per plant. The lowest variability was observed for oil content, days to maturity, test weight, plant height, days to 50 per cent flowering, siliqua length, siliquae per plant and seeds per siliqua.

Keywords: Genetic variability, Taramira and *Eruca sativa* Mill

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Introduction

Taramira (*Eruca sativa* Mill.) is an important winter season oilseed crop of the family Brassicaceae. It is an introduced crop in India. South Europe and North Africa are believed to be the native place of it [1]. It has diploid number of chromosomes 2n = 22 and the chromosomes are very small. Taramira has desirable traits particularly resistance to powdery mildew that can be transferred to *Brassica campestris* and *Brassica juncea* both of which are important crops [2]. Taramira is an herbaceous annual, 2 to 4 feet tall and is a common cold weather oilseed crop of the drier areas of north-west India where it is commonly grown mixed with gram and barley. It does not require much preparatory tillage due to efficient and fast penetrating root system permitting extrusion of soil water from deep soil layers. It is a hardy crop that can be successfully grown in dry land areas and poor sandy soils with conserved moisture during the years of severe drought coupled with late *Rabi* rains, it is the only alternative available for sowing on soils having limited moisture supply [3]. The oil content in taramira ranges from 31.6 - 41.31% [4] which is affected by manuring, irrigation and disease status.

Taramira oil is mainly used in adulteration of mustard oil to increase pungency. The cake of taramira is used as manure for improving the soil physical condition and soil fertility and it can also be used as nutritional feed for animals. The success in any breeding programme depends on the amount of variability present for different characters in the population and its efficient management and utilization. Assessment of genetic variability is very important in order to know the possibility of improvement in characters under consideration. The estimate of heritability alone does not provide an idea of the expected grain in the next generation, however the variation could be find along with the greater degree of accuracy when heritability in conjunction with genetic advance.

Materials and Methods

The study was conducted using 80 accessions of taramira for seed yield and its related traits in Augmented Randomized Block Design [5], during rabi of 2015-16 at the Research farm of SKN College of Agriculture, Jobner. The experiment material was divided into 5 groups each of 20 accessions. Each group of accession was assigned to a separate block. Four check varieties i.e. RTM-1351, RTM-1355, RTM-314 and RTM-2002 were also assigned to each block. In each block, accessions and check varieties were sown in a plot size of 5 x 0.90m^2 accommodating 3 rows spaced 30 cm apart, after randomization the plant to plant distance was maintained at 10 cm by thinning.

Recommended cultivation practices were followed to raise a good crop. Ten plants randomly selected and tagged before flowering from each plot to record the data on Days to 50 per cent flowering, Days to maturity, Plant height (cm), Number of primary branches per plant, Number of secondary branches per plant, Siliquae per plant, Seeds per siliqua, Siliqua length (cm), Test weight (g), Seed yield per plant (g) and Oil content (%) was recorded on whole plot basis. Statistical analyses were done according to the standard statistical procedures [5].

Result and Discussion

Evaluation of 80 accessions along with 4 check varieties for assessing genetic variability present in the germplasm as well as to estimate the associations of seed yield with other morphological yield traits and to identify superior accessions. Assessment of genetic variability is very important in order to know the possibility of improvement in characters under consideration. Analysis of variance showed that accessions had significant differences for all the traits except days to 50 percent flowering and days to maturity suggesting that material had adequate variability to support the breeding programme for improving the seed yield **(Table 1)**.

The checks varieties also exhibited significant differences for all the traits except days to 50 percent flowering, days to maturity and plant height this indicated that check varieties had high variability among them. Partitioning of entries SS into entries SS, accessions and check v/s accessions indicated that the blocks had significant differences for all the traits except days to 50 percent flowering, days to maturity and oil content. Significant differences between accessions were noted for all the traits excepting days to 50 percent flowering and days to maturity. Check vs. accessions showed highly significant differences for all the characters except days to 50 percent flowering and days to maturity.

Wide range was observed for the character siliquae per plant, plant height, days to maturity, days to 50 percent flowering, number of secondary branches per plant, seed per siliqua and oil content, similar results of wider range were reported by [6, 7]. For number of secondary branches per plant, seed yield per plant, test weight and seeds per siliqua by [8-10] and for number of secondary branches per plant by [11]. Phenotypic, genotypic and environmental variances were estimated for various characters. The phenotypic variance was higher than the genotypic variance for each of the character studied, indicating positive effect of environment on the expression of a character (**Table 2**). [8, 9, 12, 13] had also observed same results in taramira indicating the role of environment in the expression of a character.

Coefficient of variance indicated that the variability was highest for seed yield per plant followed by number of primary branches per plant and number of secondary branches per plant. The lowest variability was observed for oil content, days to maturity, test weight, plant height, days to 50 per cent flowering, siliquae per plant and seeds per siliqua. Coefficient of variance indicated that the variability was highest for seed yield per plant followed by number of primary branches per plant, and number of secondary branches per plant. The lowest variability was observed for oil content, days to maturity, test weight, plant height, days to 50 per cent flowering, siliquae per plant and seeds per siliqua. High heritability (broad sense value > 70%) was observed for siliquae per plant, test weight, oil content, siliqua length, plant height, number of secondary branches per plant and seeds per siliqua. The similar results are finding by [8, 9, 12, 14-19]. High heritability coupled with high genetic advance was observed for seed yield per plant. On the other hand, high heritability and moderate to low genetic advance were observed for oil content, days to 50 per cent flowering, number of secondary branches per plant and seeds per siliqua. The similar findings by [6, 8, 15, 19];

Table 1 Mean squares and variances for different characters in taramira

Source of variation	d.f.	Days to 50 per cent flowering	Plant height (cm)	Number of pri. Branches	Number of Sec. Branches	Siliquae per plant	Siliqua length	Seeds /siliqua	1000-seed weight (g)	Oil content (%)	Days to maturity	Seed yield per plant (g)
Blocks (b-1)	4	5.435	156.644**	2.248**	6.492**	1256.871**	0.174**	9.004**	0.25**	0.758	28.815	4.609**
Entries (c+g)-1	83	8.042	70.885**	1.765**	6.518**	523.909**	0.073**	7.293**	0.107**	3.015**	13.447	1.141**
Checks (c-1)	3	4.333	25.93	2.438**	6.632**	1705.561**	0.225**	9.866**	0.105**	2.927**	18.183	2.84**
Accessions (g)	79	8.239	71.336**	1.706**	6.018**	475.747**	0.067**	6.827**	0.1**	2.779**	13.007	0.922**
Checks vs. Accessions	1	3.563	170.095**	4.376**	45.649**	783.736**	0.099**	36.391**	0.662**	21.872**	34	13.377**
Error (b-1) (c-1)	12	4.583	12.216	0.670	1.481	42.695	0.010	1.979	0.013	0.385	9.763	0.333
Genotypic variance (v_g)		3.656	59.120	1.036	4.537	433.052	0.057	4.848	0.087	2.394	3.244	0.589
Phenotypic variance (v_p)		8.239	71.336	1.706	6.018	475.747	0.067	6.827	0.100	2.779	13.007	0.922
Error variance (v_e)		4.583	12.216	0.670	1.481	42.695	0.010	1.979	0.013	0.385	9.763	0.333

* Significant at P = 0.05
** Significant at P = 0.01

Table 2 Overall mean, value of accessions, their range, genotypic and phenotypic coefficient of variations, heritability (broad sense) and genetic advance as percentage of mean for different morphological characters in taramira

Characters	Range	Mean	GCV	PCV	H^2(%)	GA	GA as % of mean
Days to 50 per cent flowering	46.90-60.40	51.91	3.68	5.53	44.37	2.62	5.05
Plant height (cm)	82.60-122.60	97.04	7.92	8.70	82.87	14.42	14.86
Number of pri. Branches/plant	4.60-11.45	6.63	15.35	19.69	60.73	1.63	24.64
Number of Sec. Branches/plant	6.40-16.20	10.74	19.83	22.84	75.39	3.81	35.47
Siliquae per plant	52.20-185.14	88.74	23.45	24.58	91.02	40.90	46.09
Siliqua length	1.56-3.02	2.13	11.22	12.17	85.07	0.45	21.32
Seeds /siliqua	14.57-24.14	18.77	11.73	13.92	71.01	3.82	20.36
1000- seed weight (g)	2.80-4.50	3.42	8.63	9.25	87	0.57	16.58
Oil content(%)	33.03-40.10	37.30	4.15	4.47	86.15	2.96	7.93
Days to maturity	131.35-148.0	139.43	1.29	2.59	24.94	1.85	1.33
Seed yield per plant (g)	2.66-6.89	4.58	16.75	20.95	63.88	1.26	27.58

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