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Genetic variability and characters association analysis in taramira *(Eruca sativa* Mill)

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Abstract : A study of variability and interrelationships in Taramira *(Eruca sativa* Mill.) indicated that seed yield per plant, secondary branches per plant, seeds per siliqua and siliquae per plant possessed higher estimates of genotypic coefficient of variation, phenotypic coefficient of variation, heritability (bs) and genetic advance expressed as percentage of mean. The association analysis revealed that seed yield was positively and significantly correlated with all the traits except days to 50% flowering at both phenotypic and genotypic levels. Siliquae per plant had maximum direct positive effects on seed yield per plant followed by siliqua length, secondary branches per plant, seeds per siliqua and primary branches per plant.

Key words: Genotypic and phenotypic coefficient, heritability, genetic advance.

Introduction

Taramira (*Eruca sativa* Mill) is a oilseed crop of drier regions of north-western India during *rabi* season. It is a hardy crop that can be successfully grown on dry land areas in poor sandy soils with conserved moisture. Taramira oil is mostly used in the manufacture of grease, soap, plastics, lubricants, paints and chemicals. The cake is used as manure for improving the soil physical condition and soil fertility and can also be used as nutritional feed for animals.

Due to limited variability and knowledge of genetics for yield and its components no concerted efforts have been made on the genetic improvement of taramira. Hence an experiment was conducted to know the genetic variability for seed yield and its relative component traits and their association with seed yield

Materials and Methods

In the present study ninety-two genotypes of taramira were evaluated in an Augmented Complete Block Design in four blocks at S.K.N. College of Agriculture, Jobner (Rajasthan Agriculture University, Bikaner) during *rabi* season 2003-04. Each genotype was grown in a double row of 5 m length spaced 30 cm apart with a 10 cm distance between plants with in row. Ten competitive plants were selected at random in each entry for recording the observations on plant height (cm), primary branches per plant, secondary branches per plant, siliqua length (cm), seeds per siliqua, siliquae per plant, 1000 seed weight (g) and seed yield per plant (g) while data relating to days to 50% flowering was recorded on whole plot basis.

Results and Discussion

The entire success of plant breeding programme in any crop largely depends on

Table 1. Estimates of range, mean and genetic parameters for nine characters in Taramira genotypes

Characters	Mean	Range	Genotypic coefficient of variation (GCV)	Phenotypic coefficient of variation (PCV)	Heritability in broad sense (%)	Genetic advance as percent of mean
Days to 50 % flowering	59.58	52.04-70.32	5.65	6.10	85.90	10.80
Plant height (cm)	66.32	48.13-87.21	11.47	12.40	85.61	21.87
Primary branches per plant	5.70	2.42-9.41	16.01	16.84	90.41	31.37
Secondary branches per plant	6.61	2.42-13.51	24.90	27.01	84.92	47.27
Siliqua length (cm)	1.99	1.36-2.52	9.89	10.75	84.55	18.73
Seeds per siliqua	12.19	7.45-19.13	23.38	23.86	95.98	47.19
Siliquae per plant	82.02	47.79-157.6	21.84	22.25	96.32	44.16
1000 seed weight (g)	3.28	2.93-3.93	6.41	6.90	86.42	12.29
Seed yield per plant (g)	6.51	3.07-13.17	25.62	26.41	96.44	52.43

the range of variability owing to genetic and non-genetic causes, present in that crop (Vavilov, 1951). Hence the present investigation was conducted to assess the genetic variability in taramira germplasm for 9 characters to identify top genotypes. Analysis of variance indicated significant difference between the genotypes in respect of all the morphological traits. The characters *viz,* secondary branches per plant, seed yield per plant, seeds per siliqua and siliquae per plant were observed to possess high phenotypic coefficient of variation (PCV) and genotypic coefficient of variation (GCV) estimates (Table-1), indicating that the selection based on these characters would facilitate easily, the successful isolation of desirable genotypes. The GCV alone is not sufficient for the determination of amount of heritability variation. Burton (1952) suggested that GCV together with the heritability estimations would give the best picture of the extent of advance to be expected by selection. In the present study high genotypic coefficient of variation estimates coupled with high heritability were recorded in secondary branches per plant, seed yield per plant, seeds per siliqua and siliquae per plant. High heritability estimates (>80%) were observed in all nine characters, while high values of genetic advance (>40%) were observed in seed yield per plant, secondary branches per plant, seeds per siliqua and siliquae per plant. Similar findings were reported by Yaday and Kumar (1984) and Rathore (1995) and Meena (1996).

In the present investigation the phenotypic correlation coefficients were of greater magnitude than the genotypic correlation coefficients (Table-2). The seed yield was positively and significantly correlated with all the traits while this character had a negative and non- significant correlation with days to 50% flowering suggesting that yield is the function

Table 2. Genotypic and phenotypic Correlation coefficients between different characters in Taramira

Characters	P/G	Plant height (cm)	Primary branches per plant	Secondary branches per plant	Siliqua length (cm)	Seeds per siliqua	Siliquae per plant	1000 seed weight(g)	Seed yield per plant (g)
Days to 50% flowering	P	-0.111	0.031	-0.009	-0.043	-0.085	-0.021	0.073	-0.061
	G	-0.074	0.028	-0.013	0.006	-0.075	-0.029	0.056	-0.066
Plant height (cm)	P		0.253*	0.229*	0.326**	0.275**	0.332**	0.202	0.353**
	G		0.258	0.225	0.298	0.284	0.315	0.189	0.327
Primary branches per plant	P			0.389**	0.216*	0.297**	0.378**	0.327**	0.371**
	G			0.385	0.184	0.297	0.381	0.309	0.364
Secondary branches per plant	P				0.085	0.133	0.367**	0.256*	0.366**
	G				0.016	0.124	0.356	0.286	0.357
Siliqua length (cm)	P					0.328*	0.158	-0.008	0.341**
	G					0.302	0.151	-0.098	0.321
Seeds per siliqua	P						0.242*	0.153	0.366**
	G						0.239	0.128	0.352
Siliquae per plant	P							0.382**	0.591**
	G							0.359	0.588
1000 seed weight (g)	P								0.245*
	G								0.243

* Significant atP = 0.05 and **Significant at P = 0.01

Table 3. Direct (diagonal) and indirect effects (non-diagonal) of different characters on seed yield per plant in taramira at genotypic level.

Characters	Days to 50% flowering	Plant height (cm)	Primary branches per plant	Secondary branches per plant	Siliqua length (cm)	Seeds per siliqua	Siliquae per plant	1000 seed weight(g)	Genotypic correlation with seed yield per plant (g)
Days to 50% flowering	-0.0429	0.0030	0.0014	-0.0020	0.0012	-0.0106	-0.0125	0.0015	-0.0669
Plant height (cm)	-0.0032	0.0404	0.0128	0.0332	0.0573	0.0399	0.1361	0.0050	0.3279
Primary branches per plant	-0.0012	0.0105	0.0495	0.0566	0.0355	0.0418	0.1641	0.0082	0.3650
Secondary branches per plant	0.0006	0.0091	0.0191	0.1468	0.0032	0.0175	0.1539	0.0076	0.3578
Siliqua length (cm)	-0.0003	0.0121	0.0092	0.0024	0.1920	0.0425	0.0654	-0.0026	0.3207
Seeds per siliqua	0.0032	0.0115	0.0148	0.0183	0.0581	0.1403	0.1033	0.0034	0.3530
Siliquae per plant	0.0012	0.0128	0.0188	0.0524	0.0291	0.0336	0.4314	0.0095	0.5889
1000 seed weight (g)	-0.0024	0.0077	0.0153	0.0421	-0.0189	0.0181	0.1550	0.0265	0.2433

* Significant atP = 0.05 and **Significant at P = 0.01

of these characters and selection for these characters would be effective. These results were in conformity with the findings of Nehra *et al.* (1984), Rathore (1995), Meena (1996) and Kaushik (1998).

Seed yield, a complex character, depends upon other component characters which exert their effects directly and indirectly. Direct effects of any character on seed yield gives an idea about effective selection that can be made to bring improvement in the latter. The indirect effect indicates the interrelationship of component characters towards contribution to yield. In the present investigation siliquae per plant had the highest positive direct effects followed by siliqua length, secondary branches per plant, seeds per siliqua and primary branches per plant at genotypic level (Table-3). These traits also had strong positive association with seed yield, indicating importance of direct selection for these traits. Similar results were reported by Nehra *et al.* (1989), Rathore (1995), Meena (1996) and Kaushik (1998).

From the foregoing discussion it could be inferred that secondary branches per plant, siliquae per plant and seeds per siliqua are the major yield contributing characters in taramira. Therefore, due emphasis should be given to these characters in the selection programme to evolve high yielding genotypes of taramira.

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