Indian J. Genet., 53 (2): 165–167 (1993)

STABILITY ANALYSIS FOR SEED YIELD, COMPONENTS OF SEED AND OIL IN LINSEED (*LINUM USITATISSIMUM* L.)

V. K. MISHRA AND M. RAI*

Department of Agricultural Botany, Janata Mahavidyalaya, Ajitmal, Etawah 206121

(Received: March 11, 1992; accepted: September 19, 1992)

ABSTRACT

The genotype X environment interaction was studied for 10 parents and their 45 F_1s for seed yield and 8 quality traits in linseed under 4 environments. Highly significant differences among genotypes, environments and E+(G X E) interaction for all the characters were observed. The nonlinear component of G X E was significant for all the characters except protein and oil contents. G X E (linear) interaction was significant for all the characters except iodine value and palmitic acid. The variety T 397 for seed yield per plant and oil content, R 552 for protein content, R 17 for palmitic acid and K 2 for stearic acid was considered as stable. Cross combination T 397 X LCK 152 was stable for all the characters except stearic and oleic acids. No correlation was observed among the three stability parameters for quality characters. Thus it was concluded that all the three parameters should be taken into account for improvement in quality traits in linseed.

Key words: Stability, seed yield, quality characters, linseed.

The interplay of genes and environment is of vital significance in the expression of a trait. The sensitivity to environmental variations points to the need of using multiple environments instead of single environment, to study the nature of genetic variability controlling the inheritance of components of adaptation. In view of this, 10 linseed varieties and their all possible crosses were studied for yield and quality attributes over 4 varying environments.

MATERIALS AND METHODS

Ten diverse linseed varieties were crossed in all possible combinations excluding reciprocals. Seeds of parents and their 45 F_1s were sown under irrigated as well as rainfed conditions at two locations, Ajitmal and Kanpur. The experiment was laid out in a

*Present address: Assistant Director General (Seeds), ICAR, Krishi Bhawan, New Delhi 110001.

randomized block design with three applications, keeping single row of genotypes with inter- and intrarow distance maintained at 25 cm and 5 cm, respectively.

Biochemical analysis was done using soxhlet procedure for oil content, Micro-Kjeldahl method for protein content and trans-esterification and gas liquid chromatography for fatty acid composition. The data were analysed statistically for stability parameters [1].

RESULTS AND DISCUSSION

The analysis of variance revealed large variations amongst the genotypes as well as environments studied. The mean squares due to E+(G x E) were significant for all the traits suggesting variable response of genotypes to changing environments (Table 1). High magnitude of environment (linear) effect in comparison to genotype x environment (linear) for all the traits was recorded [2] which may be responsible for high adaptation in relation to quality attributes in linseed.

Table 1. ANOVA (mean squares) of stability for nine characters in ten parents and 45 F_1s in linseed

Source	d.f.	Seed yield per plant	Protein content	Oil content	Iodine value	Palmitic acid	Stearic acid	Oleic acid	Linoleic acid	Linolenic acid
Genotypes (G)	54	6.9^{**}	11.4^{**}	3.8^{**}	50.7^{**}	1.18^{**}	0.65^{**}	11.5^{**}	5.72^{**}	14.6^{**}
Environments (E)	3	419.5^{**}	241.5^{**}	124.9^{**}	984.7^{**}	25.98^{**}	50.28^{**}	170.1^{**}	94.32^{**}	86.8^{**}
G x E	162	3.6^{**}	4.1	2.1	33.6^{**}	1.09^{**}	0.56^{**}	7.8^{**}	4.04^{**}	10.9^{**}
E+(G x E)	165	11.1^{**}	8.4^{**}	4.3^{**}	50.9^{**}	1.54^{**}	1.47^{**}	10.7^{**}	5.6^{**}	12.3^{*}
Environment (linear)	1	1258.6^{**}	724.2^{**}	374.4^{**}	2937.3^{**}	77.92^{**}	150.84^{**}	510.3^{**}	282.86^{**}	259.8^{**}
G x E (linear)	54	4.2^{*}	4.6^{*}	2.5^{**}	34.8	1.12	0.67^{**}	9.5^{**}	4.55^{*}	13.2^{**}
Pooled deviation	110	3.2^{**}	3.7^{*}	1.8	32.6^{**}	1.05^{**}	0.50^{**}	6.8^{**}	3.72^{**}	9.6^{**}
Pooled Error	432	3.2	8.6	5.6	13.1	0.40	0.48	3.1	3.06	4.7

*,**Significant at P = 0.05 and P = 0.01, respectively.

The observed high magnitude of genotype x environment (linear) component could lead to the identification of genotypes deviating from the regression line of unit slope. Accordingly, three kinds of linear responses (bi), namely, bi=1, bi > 1 and bi < 1 have been observed in all the characters. However, negative bi values were also observed. Such type of linear response could be attributed to inadequacy of the scale used for the analysis and/or the inherent behaviour of the genotypes investigated [3].

In the present set of genotypes, 12 for seed yield per plant, 8 for protein content, 13 for oil content, 1 for iodine value, 2 for palmitic acid, 5 for stearic acid, 1 for oleic acid, 3 for linoleic acid and 1 for linolenic acid showed unit or less than unit regression coefficient and nonsignificant S^2 di. Among 10 parents, T 397, Sweta and SPS 23-10 for seed yield per plant; R 552, LCK 152 and LS 2 for protein content; T 397, R 552, LCK 152 and LC 185 for oil content; R 17 for palmitic acid and K 2 for stearic acid were rated as stable.

The cross T 397 x LCK 152 was stable for all the characters except stearic and oleic acids. Sweta x LC 185 and LCK 152 x LC 185 showed adaptability for 5 to 6 characters. These cross combinations involved atleast one highly stable parent and are expected to throw good segregants in comparison to other combinations. There seems to be lack of general association between mean performance and stability (S^2_{di}) and between responsiveness (bi) and stability (S^2_{di}). This suggested that separate genetic systems were perhaps involved in the control of thêse parameters. The simple use of mean values for judging the stability of varieties for quality traits may not be useful in quality improvement programmes of linseed. As such it would always be realistic and more rewarding if mean is considered in conjunction of the other parameters to decide the breeding strategies in linseed.

REFERENCES

1. S. A. Eberhart and W. A. Russell. 1966. Stability parameters for comparing varieties. Crop Sci., **6**: 36–40.

2. M. Rai, S. A. Kerkhi, S. Pandey, P. A. Naqvi and A. K. Vashistha. 1989. Stability analysis for some quality components of seed and oil in linseed (*Linum usitatissimum* L.). Indian J. Genet., **49**: 291–295.

3. R. Knight. 1970. The measurement and interpretation of genotype x environment interactions. Euphytica, **19**: 225–235.