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Research article

GENETIC VARIABILITY FOR SEED YIELD AND ITS COMPONENTS IN LINSEED (*LINUM USITATISSINUM* L.)

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ABSTRACT: Thirty diverse genotypes were studied for variability analysis with respect to yield and yield components in linseed under three environmental conditions *viz.*, rain fed, irrigated and late sown, respectively. Seed yield per plant showed highest genotypic coefficient of variation under all the three environments. High heritability was recorded for days to maturity under irrigated condition, while high genetic advance as per cent of mean was recorded for seed yield per plant under rain fed condition as well as under irrigated condition. High heritability coupled with high genetic advance was observed for 100-seed weight under irrigated condition.

Key words: Linseed, variability, heritability, genetic advance

INTRODUCTION

Linseed (*Linum usitatissimum* L.) is an important oilseed crop, which is extensively grown for its seed and oil in Chhattisgarh, India. The genus *Linum* is rich in genetic variation. The variability present in any crop forms the basis of crop improvement programme. So the study of genetic variability with the help of suitable genetic parameters such as genotypic coefficient of variation, phenotypic coefficient of variation, heritability estimates and genetic advance are necessary to start an efficient breeding programme. Therefore, the present study was carried out to estimate the extent of variability for seed yield and its ten yield contributing characters in linseed.

MATERIALS AND METHODS

The experimental material comprised of 30 promising linseed genotypes were grown under three different environmental conditions *viz.*, rain fed, irrigated and late sown, respectively during *rabi* season of 2002-03 in a randomized complete block design with three replications at Seed Research Farm, College of Agriculture, IGAU, Raipur. The plot size was 4m x 1m with 30cm row to row spacing. Observations were recorded on ten randomly selected plants in each genotype for days to 50% flowering, days to maturity, plant height, number of primary branches per plant, number of secondary branches per plant, number of capsules per plant, number of seeds per capsule, plant weight, 1000-seed weight (g) and seed yield per plant (g). The method used for the estimation of genetic coefficient of variation was as per the formula suggested by Burton (1952) and for heritability by Hanson *et al.*, (1956) and for genetic advance by Johnson *et al.*, (1955a).

RESULTS AND DISCUSSION

Analysis of variance revealed significant differences among the genotypes for all the characters studied except plant weight under late sown condition, indicating the presence of substantial variability among the genotypes. The results of genetic variability under rain-fed, irrigated and late sown conditions were presented in Table 1, 2 and 3. The range of variation was maximum for number of capsules per plant followed by days to 50% flowering and harvest index under rain fed condition; number of capsules per plant, plant height and harvest index under irrigated condition and number of capsules per plant, days to 50% flowering and plant height under late sown condition indicated the scope for selection for these traits.

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For most of the characters PCV was higher than the GCV indicating the environmental influence under the study. Highest genotypic coefficient of variation was observed for seed yield per plant followed by number of secondary branches per plant, plant weight and number of primary branches per plant for rain fed condition; seed yield per plant followed by number of capsules per plant for irrigated condition. High values of GCV indicated the scope for further improvement of these characters. Similar findings were also reported by Mahto and Mahto (1998) and Mishra *et al.,* (1996). Low GCV values were recorded for number of seeds per capsule and days to maturity under rain fed condition as well as irrigated condition. Under late sown condition plant height, number of seeds per capsule and days to maturity performed low GCV values.

Table 1 Genetic variability parameters for yield and yield components in linseed under rain fed condition

Characters	Mean	Range		PCV	GCV	Heritability	Genetic advance	Genetic advance as % of mean
		Minimum	Maximum					
Days to 50% flowering	51.66	44.87	67.87	11.78	11.52	0.957	11.99	23.21
Days to maturity	105.69	99.20	117.33	3.33	3.19	0.918	6.66	6.30
Plant height(cm)	42.18	33.50	52.83	12.44	10.78	0.752	8.12	19.25
No.of pri. br/plant	3.53	1.80	5.20	24.66	20.28	0.676	1.21	34.23
No.of sec.br/plant	9.75	6.40	16.60	29.62	23.89	0.651	3.87	39.69
No.of capsules/plant	29.37	19.50	47.33	25.99	19.65	0.572	8.99	30.61
No.of seeds/capsule	7.84	6.57	9.33	11.02	6.01	0.297	0.53	6.76
Plant weight (g)	4.47	2.73	6.33	28.45	20.51	0.520	1.36	30.39
1000 seed weight(g)	6.07	4.53	8.55	14.59	14.35	0.969	1.77	29.14
Harvest Index(%)	29.47	18.57	39.63	19.26	16.34	0.720	8.42	28.57
Seed yield/plant(g)	1.32	0.54	2.05	34.14	27.66	0.657	0.61	46.03

Table 2 Genetic variability parameters for yield and yield components in linseed under irrigated condition

Characters	Mean	Range		PCV	GCV	Heritability	Genetic advance	Genetic advance as % of mean
		Minimum	Maximum					
Days to 50% flowering	51.56	43.27	65.73	11.59	11.46	0.977	12.03	23.33
Days to maturity	108.11	96.07	119.67	5.11	5.06	0.979	11.14	10.30
Plant height(cm)	51.26	40.17	68.47	12.11	10.63	0.771	9.86	19.23
No.of pri. br/plant	3.63	2.70	4.70	16.00	10.75	0.452	0.54	14.89
No.of sec.br/plant	10.06	6.57	13.47	22.52	13.37	0.352	1.64	16.30
No.of capsules/plant	40.48	27.77	64.60	25.96	20.04	0.596	12.89	31.84
No.of seeds/capsule	7.50	6.20	8.47	11.55	5.41	0.219	0.39	5.20
Plant weight (g)	6.74	4.33	10.33	27.46	18.36	0.447	1.70	25.21
1000 seed weight(g)	6.88	4.98	9.62	16.31	16.03	0.965	2.23	32.41
Harvest Index(%)	29.45	15.00	42.07	23.95	19.63	0.672	9.77	33.17
Seed yield/plant(g)	1.93	1.04	3.36	32.89	26.77	0.662	0.87	45.05

Heritability and genetic advance are the important genetic parameters for selecting a genotype that permits greater effectiveness of selection by separating out environmental influence the total variance. Heritability estimates along with genetic advance are normally more helpful in predicting gain under selection than heritability estimates alone. High heritability coupled with high genetic advance observed for 1000-seed weight under irrigated condition revealed that the heritability is due to additive gene action and selection based on this character may be effective. Similar findings were observed by Mirza et al., (1996), Mishra and Yadav (1999) and Ramana et al., (2000).

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Table 3 Genetic variability parameters for yield and yield components in linseed under late sown condition

Characters	Mean	Range		PCV	GCV	Heritability	Genetic advance	Genetic advance as % of mean
		Minimum	Maximum					
Days to 50% flowering	51.21	42.80	65.60	11.91	11.70	0.965	12.31	23.68
Days to maturity	106.96	97.67	117.47	4.71	4.49	0.910	9.45	8.83
Plant height(cm)	46.56	37.20	57.87	10.17	8.35	0.674	6.57	14.11
No.of pri. br/plant	3.64	2.73	4.80	15.70	12.24	0.607	0.71	19.50
No.of sec.br/plant	9.85	6.77	14.27	21.95	18.03	0.675	3.01	30.56
No.of capsules/plant	34.83	26.93	50.87	22.56	17.48	0.600	9.72	27.91
No.of seeds/capsule	7.77	6.33	8.57	8.49	6.62	0.609	0.83	10.68
Plant weight (g)	5.65	4.20	8.00	21.53	16.39	0.580	1.45	25.68
1000 seed weight(g)	6.26	4.47	8.65	14.54	14.19	0.953	1.79	28.58
Harvest Index(%)	29.49	21.33	38.17	20.52	11.43	0.310	3.87	13.12
Seed yield/plant(g)	1.66	1.08	2.48	26.76	19.57	0.535	0.49	29.50

High heritability coupled with moderate genetic advance was observed for days to 50% flowering, plant height, 1000-seed weight and harvest index under rain fed condition; days to 50% flowering, days to maturity and plant height under irrigated condition and days to 50% flowering and 1000-seed weight under late sown condition, revealed that these characters seems to be more heritable and can be improved by selection, which was observed by earlier workers Singh and Dikshit (1988), Nie *et al.*, (1992) and Singh (2001).

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