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Correlation and path analysis for seed yield in linseed (*Linum usitatissimum* L.)

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SUMMARY

A field experimen was conducted at Oilseed Research Area, Department of Plant Breeding and Genetics, IGKV, Raipur (CG) during *Rabi* 2004-05 to study the association analysis for yield and its charcater in linseed. The genotypic and phenotypic correlation coefficient obtained between different traits were similar in direction, while in magnitude, genotypic correlations were higher than the corresponding phenotypic correlations. The traits, number of seeds per plant, number of secondary branches per plant, number of capsules per plant, number of primary branches per plant, 1000 seed weight and days to maturity had the strong positive association with seed yield. Path coefficient analysis revealed that importance of number of capsules per plant as major yield contributing component in linseed indicated that selection of desirable plant could be achieved.

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Key words : Association, Correlation, Path, Coefficient, Linseed

Linseed (*Linum usitatissimum* L.) is an important *Rabi* oilseed crop of Chhattisgarh. The irrigated linseed area in the state is very low. In Chhattisgarh linseed is grown mostly rainfed as utera as well as in crop fields. Though linseed is important oilseed crop in Indian economy due to its wide industrial utility, the average productivity is quite low as compared to other countries. Since yield is a complex quantitative character and is governed by a number of other character, the exact association between thses characters with yield must be known for effective selection. Therefore, the present investigation has been carried out to understand the genetic association of yield and its components.

MATERIALS AND METHODS

The experiment was conducted at Oilseed Research Area, Department of Plant Breedeing and Genetics, IGKV, Raipur with six parents namely, Solan, Kiran, R 552, LCK 88062, Polf 22 and SIKO 10 and their F_1, F_2 and F_3 generations of ten different crosses namely, Solan x R 552, Solan x LCK 88062, Solan x Polf 22, Solan x SIKO 10, Kiran x LCK 88062, Kiran x SIKO 10, Kiran x Polf 22, R 552 x LCK 88062, R 552 x SIKO 10 and R 552 x Polf 22. The hybrids F_1, F_2, F_3 were evaluated along with their parents in randomized complete block design with four replications. The above said material was employed in the estimation of genetic parameters for days to 50 per cent 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, number of seeds per plant and 1000 seed weight. Single row of 4 m length and 30 cm apart were planted for each generation *i.e.*, P_1, P_2 and F_1 whereas F_2 and F_3 generation were grown in 4 rows. The plant to plant distance was maintained at 10 cm. Each cross and its generations were surrounded by border rows of linseed variety LMH-62 with same spacing between plants and rows. Observations were recorded on single plant basis for each and every character for crosses under study. Five single competitive plants were observed for P_1, P_2 and F_1 but for F_2 and F_3, 20 plants were observed. Genotypic and phenotypic correlation were worked out according to Al-Jibouri *et al*. (1958) and path analysis as per Dewey and Lu (1959).

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RESULTS AND DISCUSSION

The results obtained from the present investigation as well as relevant discussion have been presented under following heads :

Correlation coefficient analysis:

The results revealed that the traits, number of seeds per plant, number of secondary branches per plant, number of capsules per plant, number of primary branches per plant, 1000 seed weight, days to 50 per cent flowering

and days to maturity had the strong positive association with seed yield (Table 1). Since, yield is the result of the multiplicative interaction of its components, hence, based on significant and positive association of seed yield with majority of the yield attributing traits, it is to be expected that the indirect selection based on component trait definitely improve the seed yield in linseed for Chhattisgarh plains. Almost similar findings have been reported by most of the workers in linseed (Naik and Satapathy, 2002, Muhammad *et al.*, 2003 and Joshi, 2004).

Path coefficient analysis:

The direct and indirect effects of genotypic path coefficients were higher in magnitude than the corresponding phenotypic path coefficients. The results of path analysis revealed that number of capsules per plant showed the higher and positive direct effect on seed yield (Table 2 and 3). The high magnitude of association of this trait with seed yield is the result of their direct effects on seed yield. On the contrary, number of primary branches per plant, number of secondary branches per

Table 1 : Phenotypic (P) and genotypic (G) correlation coefficients for yield and its components in linseed

Characters		Days to maturity	Plant height (cm)	Number of primary branches	Number of secondary branches	Number of capsules per plant	Number of seeds per capsule	Number of seeds per plant	1000 seed weight (g)	Seed yield per plant (g)
Days to 50% flowering	P	0.554*	-0.107	0.159	0.149	-0.615*	0.256	-0.495*	0.169	-0.498*
	G	0.628	-0.111	0.167	0.150	-0.645	0.281	-0.565	0.100	-0.601
Days to maturity	P		0.551*	0.252	0.463*	0.195	-0.162	0.445	0.232	-0.468*
	G		0.580	0.243	0.576	0.218	-0.183	0.451	0.255	-0.612
Plant height (cm)	P			-0.510*	0.214	0.347*	0.284	0.285	-0.109	0.241
	G			-0.551	0.228	0.565	0.309	0.305	-0.115	0.243
Number of primary	P				0.728*	0.141	-0.223	-0.621*	0.219	0.337*
branches per plant	G				0.756	0.083	-0.268	-0.676	0.301	0.559
Number of secondary	P					0.729*	-0.195	0.776*	0.289	0.837*
branches per plant	G					0.798	-0.214	0.783	0.291	0.859
Number of capsules	P						-0.278	0.718*	0.165	0.839*
per plant	G						-0.302	0.742	0.195	0.872
Number of seeds per	P							0.216	-0.047	-0.032
capsule	G							0.242	-0.048	-0.040
Number of seeds per	P								0.168	0.896*
plant	G								0.189	0.914
1000 seed weight (g)	P									0.558*
	G									0.601

* indicates significance of value at P=0.05

Table 2 : Estimation of path coefficient in F_3 generation based on phenotypic correlation coefficients

Characters	Days to 50% flowering	Days to maturity	Plant height (cm)	Number of primary branches	Number of secondary branches	Number of capsules per plant	Number of seeds per capsule	Number of seeds per plant	1000 seed weight (g)	Correlation with seed yield
Days to 50% flowering	-0.209	-0.113	-0.002	-0.015	-0.009	0.037	-0.002	-0.098	-0.279	-0.498*
Days to maturity	-0.110	-0.174	-0.003	-0.023	-0.041	0.074	-0.002	-0.405	-0.310	-0.468*
Plant height (cm)	-0.022	-0.038	-0.020	-0.047	-0.013	0.025	-0.005	-0.350	-0.053	0.241
Number of primary branches per plant	0.033	-0.054	0.010	0.102	0.014	0.024	0.003	0.020	-0.353	0.337*
Number of secondary branches per plant	-0.031	-0.142	0.004	0.021	0.161	-0.136	0.001	0.707	0.240	0.837*
Number of capsules per plant	-0.045	-0.092	-0.003	0.013	0.048	0.372	0.003	0.855	0.081	0.839*
Number of seeds per capsule	-0.054	-0.035	-0.009	-0.030	-0.006	0.048	-0.052	-0.015	-0.023	-0.032
Number of seeds per plant	0.022	0.095	0.008	0.002	-0.048	-0.161	0.058	0.135	0.082	0.896*
1000 seed weight (g)	-0.119	0.135	0.002	-0.066	-0.030	-0.028	0.089	0.153	0.127	0.558*

Residual effect: 0.17 * indicates significance of value at P=0.05 Diagonal values represent direct effect

Table 3 : Estimation of path coefficient in F_3 generation based on genotypic correlation coefficients

Characters	Days to 50% flowering	Days to maturity	Plant height (cm)	Number of primary branches	Number of secondary branches	Number of capsules per plant	Number of seeds per capsule	Number of seeds per plant	1000 seed weight (g)	Correlation with seed yield
Days to 50% flowering	-0.257	-0.145	-0.005	-0.020	-0.017	0.032	-0.031	-0.076	-0.323	-0.601*
Days to maturity	-0.140	-0.266	-0.008	-0.030	-0.075	0.058	-0.020	-0.285	-0.353	-0.612*
Plant height (cm)	-0.029	-0.048	-0.047	-0.067	-0.025	0.022	-0.056	-0.256	-0.062	0.243
Number of primary branches per plant	0.043	-0.065	0.026	0.122	0.022	0.011	0.040	0.048	-0.432	0.559*
Number of secondary branches per plant	-0.038	-0.180	0.011	0.024	0.192	-0.105	0.011	0.495	0.275	0.859*
Number of capsules per plant	-0.063	-0.116	-0.008	0.010	0.089	0.389	0.034	0.595	0.105	0.872*
Number of seeds per capsule	-0.072	-0.049	-0.024	-0.045	-0.012	0.041	-0.039	-0.007	-0.026	-0.040
Number of seeds per plant	0.031	0.120	0.019	0.009	-0.087	-0.124	0.001	0.141	0.102	0.914*
1000 seed weight (g)	-0.154	0.174	0.005	-0.097	-0.057	-0.026	0.005	0.120	0.139	0.601*

Residual effect : 0.15 * indicates significance of value atP=0.05

Diagonal value represent direct effect

plant, number of seeds per plant and 1000 seed weight exhibited low direct effects towards seed yield per plant although they showed positive association with seed yield per plant. Path coefficient analysis revealed that importance of number of capsules per plant as major yield contributing component in linseed. It had not only the maximum direct effect on seed yield but most of the other characters also, had positive indirect influence *via*. this character. These results are in the agreement with the finding of Chimurkar *et al.*(2001), Muhammad *et al.*(2003) and Joshi (2004). Hence, direct selection for the number of capsules per plant, number of primary branches per plant, number of secondary branches per plant, number of seeds per plant and 1000 seed weight may ultimately lead to the development of high yielding linseed genotypes from segregating populations.

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