Progressive Research – An International Journal
Vol. 4 (Special Issue) : 435-438 (2009), ISSN : 0973-6417

Society for Scientific Development in Agriculture and Technology, Meerut (U.P.) INDIA

CORRELATION AND HETEROSIS STUDY IN LINSEED (*LINUM USITATISSIMUM* L.)

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ABSTRACT

The six diverse genotypes of linseed were crossed in all possible cross combinations without reciprocal to generate 15 F_1's during rabi, 2007-08 and the 15 F_1's, 06 parents and 02 checks were evaluated in complete randomized block design during rabi 2008-09 at Agricultural Research Institute, Patna Farm of Rajendra Agricultural University, Pusa, Samastipur. Analysis of variance revealed significant differences among genotypes for all the characters indicating the presence of considerable amount of genetic variability. Correlation coefficients analysis showed higher genotypic correlation coefficients in magnitude and same direction in comparison to phenotypic correlation coefficients for most of the traits. This result indicated that grain yield had highly significant and positive phenotypic correlation with days to 50 per cent maturity (0.6540), number of primary branches per plant (o.4853**), number of capsules per plant (0.6606**), number of seeds per capsule (0.4769**) and 1000-grain weight (0.6056**). The heterosis over parent ranged from -14.97 to 20.61% for grain yield per plant., KL 248 x LCK 7035 was the best heterotic cross for grain yield(20.61%) and it also showed significant and positive heretosis for its yield components viz., number of primary branches per plant (18.39%), number of capsules per plant (24.48%), number of seeds per capsule (1.80%) and 1000-grain weight (12.12%).**

Key words : *Linseed, path analysis, correlation.*

Linseed (*Linum usitatissimum* L.) is the oilseed crops being raised during *rabi* in India Every part of the linseed plant is utilized commercially, either directly or after processing. It is the richest source of alpha-linolenic and having 1:3 ratio of omega3/omega 6 fatty acid. Linseed has also great medicinal values including anti-hyper cholesterolenic and anti-carcinogenic effects and is also beneficial for development of brain and retinal tissue of infants (Payne 2000). The oil cake is a good feed for milch cattle and poultries because it contains 36% protein, 85% of which is digestible. Linseed is globally cultivated for its fibres for raw material for textile and paper industries. The rough and strong linseed fibre can effectively be used for low-cost roofing tiles based on convertible polymers and for fibre-reinforced plastic.

Selection for high seed yielding genotypes of linseed is difficult because yield is a complex quantitative character which is affected by a number of its component traits and environment in which it is grown. Yield per unit area is the end product of several characters, which are polygenic in inheritance and thus are highly influenced by environment. Therefore, only little progress could be made over a long span of time through direct selection for yield. Indirect selection through yield components has been proved more effective (Ford 1964).The selection criteria take into account the information on interrelationship among agronomic characters, their relationship with grain yield as well as their direct influence on grain yield (Dewey and Lu 1959). Further heterotic pattern of yield and its components traits woid be helpful for selection of pattern for hybridizing.

Keeping this in view, the present investigation was aimed at to study associations and heterosis for yield and its traits in linseed genotypes.

MATERIALS AND METHODS

The present investigation was carried out at Agricultural Research Institute, Patna Farm of Rajendra Agricultural University, Pusa, Samastipur during rabi, 2007-08 and 2008-09. The materials comprising of six genotypes of linseed, namely, KL 248, LCK 7035, RLC 117, RL 26018, NL 260 and Shekhar were crossed in half diallel fashion to generate 15 F_1's during rabi, 2007-08. All the 15 F_1's, 6 parents and 02 checks, Shekhar and T 397 were evaluated in complete randomizedb design with three replications during rabi 2008-09. Each entry was grown in two rows of four five length with row to row spacing of 25 cm and

Table-1 : Analysis of variances for eight quantitative characters in linseed.

Source of variation	d.f.	Mean sum of squares							
		Days to 50% flowering	Days to 50% maturity	Number of primary branches per plant	Number of capsules per plant	Number of seeds per capsule	1000-seed weight	Oil content	Grain yield/ plant
Replication	2	1.85	8.45	0.43	281.39	0.11	0.07	0.19	1.80
Genotype	22	22.06	55.67	7.29	1850.33	5.90	2.98	10.88	14.05
Error	44	2.06	6.55	0.45	45.38	0.06	0.08	0.08	0.50

Table-2 : Estimates of phenotypic and genotypic correlation coefficients for eight characters in linseed.

Character	Days to 50% maturity	Number of primary branches/ plant	Number of capsules / plant	Number of seeds / capsule	1000-grain weight	Oil content	Grain yield/plant
Days to 50% flowering	0.3452* (0.3696)	0.1003 (0.0960)	0.0660 (0.0712)	0.2043 (0.2280)	-0.0750 (-0.0843)	-0.2596 (-0.3120)	-0.0570 (-0.0615)
Days to 50% maturity		0.4380** (0.4890)	0.4419** (0.5606)	0.5801** (0.6754)	0.3506 (0.3868)	0.3185 (0.3290)	0.6540** (0.7232)
Number of primary branches/ plant			0.5590** (0.5724)	0.0748 (0.0836)	0.0303 (0.0432)	0.3453* 0.3688	0.4853** (0.4996)
Number of capsules / plant				0.1640 (0.1950)	0.5242** (0.5529)	0.0895 (0.0935)	0.6606** (0.7756)
Number of Seeds/ capsule					0.3835* (0.4146)	0.3856* (0.3960)	0.4769** (0.5128)
1000-grain weight						0.1680 (0.1865)	0.6056** (0.6435)
Oil content							0.2836 (0.3190)

Note : genotypic correlation is given in the parentheses. *, ** significant at 5% and 1% level of probability, respectively.

plant to plant spacing of 05 cm, within row. The recommended agronomic practices were followed to ensure a good crop. The data were recorded number of primary branches per plant, number of capsules per plant, number of seeds per capsule and grain yield per plant on ten randomly selected plants from each plot of each replication. Days to 50 per cent flowering and days to 50 per cent maturity recorded on the plot basis, while 1000-grain weight and oil content per cent were taken from bulk seeds of each plot of each replication. The oil content in seeds was determined by NMR.

The replication wise mean values of character were subjected to statistical analysis using INDOSTAT software. The correlation coefficient between different characters was worked out according to method proposed by Johnson et *al.* (1955).

RESULTS AND DISCUSSION

The analysis of variance (Table-1) revealed significant differences among genotypes for all the characters indicating the presence of considerable amount of genetic variability which provide the scope for further study. Correlation coefficients analysis (Table-2) showed higher genotypic correlation coefficients in magnitude and same direction in comparison to phenotypic correlation coefficients for most of the traits. It indicates a strong inherent relationship among the characters studied. Similar findings were reported by Sohan *et al.* (2004). This result indicated that grain yield had highly significant and positive phenotypic correlation with days to 50 per cent maturity (0.6540**), number of primary branch per plant (o.4853**), number of capsules per plant (0.6606**), number of seeds per capsule (0.4769**) and 1000-grain weight (0.6056**). On other hand days to 50 per cent flowering had significant and positive correlation with days to 50 per cent maturity (0.3452*). Days to 50 per cent maturity had significant and positive correlation with number of primary branches per plant (0.4380*), number of capsules per plant (0.4419**) and number of seed per capsule (0.5801**). Number of primary branches per

Table-3 : Estimation of heterosis over better parent in fifteen crosses for eight quantitative characters of linseed.

Sl. No.	Cross	Days to 50% flowering	Days to maturity	Number of primary branches per plant	No. of capsules/ plant	No. of seeds/ capsule	1000-grain weight (g)	Oil percent	Grain yield/ plant (g)
1.	KL 248 x LCK 7035	-6.54**	-3.29**	18.39**	24.48**	1.89*	12.12**	-5.70**	20.61**
2.	KL 248 x RLC 117	-3.26**	1.25	4.61**	6.51**	-2.09**	-1.22	-7.20**	3.97**
3.	KL 248 x RI 26018	-5.98**	8.88**	-12.40**	-14.94**	-4.33**	-10.56**	-14.27**	0.44
4.	KL 248 x NL 260	-7.42**	5.65**	-18.16**	-11.08**	-12.45**	6.30**	-7.85**	-3.38**
5.	KL 248 x Shekhar	-8.38**	-4.07**	-20.25**	2.06**	-3.54**	-1.52	-1.08	-4.23**
6.	LCK 7035 x RLC 117	-7.46**	0.47	9.66**	10.15**	-0.47	12.45**	1.54	18.26**
7.	LCK 7035 x RL 26018	-6.28**	3.74**	-16.51**	-30.41**	0.70	10.80**	-0.76	-6.05**
8.	LCK 7035 x NL 260	-4.40**	-1.21	-13.19**	-1.54	-7.55**	-0.34	-9.31**	-10.20**
9.	LCK 7035 x Shekhar	-13.54**	-8.35**	-22.63**	-25.12**	-11.05**	-21.43**	-9.83**	-20.94**
10.	RLC 117 x RL 26018	-5.22**	-6.68**	-32.68**	-10.05**	-18.54**	13.21**	-10.14**	0.12
11.	RLC 117 x NL 260	-12.32**	-11.03**	10.14**	18.88**	-6.36**	13.84**	-5.34**	16.61**
12.	RLC 117 x Shekhar	-14.64**	-2.05*	6.85**	5.76**	-14.27**	9.52**	-0.31	4.08**
13.	RL 26018 x NL 260	-7.96**	-0.86	9.75**	8.63**	-5.55**	8.86**	1.91	15.17**
14.	RL 26018 x Shekhar	-4.48**	-6.76**	-32.58**	-27.02**	-32.05**	-18.36**	-16.72**	-14.97**
15.	NL 260 x Shekhar	-3.54**	-2.89**	12.34**	15.78**	6.81**	13.26**	-1.76	13.23**

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

plant had significant and positive correlation with number of capsules per plant (0.5590**) and oil content (0.3453*). Number of capsules per plant had significant and positive correlation with 1000-grain weight (0.5242**). Number of seeds per capsule had significant and positive correlation with 1000-grain weight (0.3835*) and oil content (0.3856*). The positive correlation occurs due to coupling phase of linkage of gene (s) between the corresponding traits. Similar results were reported for most of the traits under studied by Muduli and Patnaik (1994), Couper *et al.* (2006), Kant *et al.* (2008) and Nagaraja *et al.* (2009). Therefore, days 50 per cent maturity, number of primary branches per plant, number of capsules per plant, number of seeds per capsules and 1000-grain weight could be due weightage for improvement of seed yield.

Among the different types of heterosis, heterosis over better parent indicates real advantage of heterosis of cross combination. The percentage of heterosis over better parent for seed yield and its component characters is presented in Table-3. The heterosis over parent ranged from -14.97 to 20.61% for grain yield per plant. Six crosses viz., KL 248 x LCK 7035 (20. 61%), LCK 7035 x RLC 117 (18.26%), RLC 117 x NL 260(16.61%), RL26018 x NL 260 (15.17 %), NL260 x Shekhar (13.23%), RLC 117 x Shekhar (4.08 %) and KL 248 x RLC 117(3.97%) had significant and positive for grain yield per plant. These crosses had also significant and positive heterosis for its most of the yield components especially for number of capsules per plant. The best cross, KL 248 x LCK 7035 had also significant and positive heretosis for its yield components viz., number of primary branches per plant (18.39%), number of capsules per plant (24.48%), number of seeds per capsule (1.80%) and 1000-grain weight (12.12%). Heterosis for yield was reflected through heterosis in yield components especially number of capsules plant confirming the earlier findings of many workers reported high degree of heterosis for seed yield in linseed *viz.,* Foster *et al.* (1998); Kurt and Evans (1998).

ACKNOWLEDGEMENT

The authors are thankful to Regional Director, ARI, Patna to provide support for conducting experiment.

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