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IMPROVEMENT OF SEED YIELD THROUGH CORRELATED TRAITS OF LINSEED (*LINUM USITATISSIMUM* L.)

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ABSTRACT

The experiments were carried out at Agricultural Research Institute, Patna Farm of Rajendra Agricultural University, Pusa, Samastipur. The six genotypes of linseed were crossed in all possible cross combinations without reciprocal to generate 15 F_1's during rabi, 2007-08. All the 15 F_1's, 06 parents and 02 checks were evaluated in complete randomized block design with three replications during rabi 2008-09. 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**). Phenotypic path coefficient analysis revealed that the direct effect on grain yield was high and positive for 1000-grain weight (0.3431) and moderate and positive for number of capsules per plant (0.3350), days to 50 per cent maturity (0.3266) and number of primary branches per plant (0.2485).**

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

Linseed (*Linum usitatissimum* L.) is the oilseed crops raised during *rabi.* It cultivated in India on 3.526 lakh ha with production of 1.480 tones having 4.20 kg/ha productivity during 2008-09 (Directorate of Economics and Statistics, New Delhi). 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. Nevertheless, selection for yield via highly correlated characters becomes easy if the contribution of different characters to yield is quantified using path coefficient analysis (Dewey and Lu1959). Knowledge of the extent and pattern of variability, particularly of genetic variability present in a population of a given crop is absolutely essential for its further improvement. Similarly, information on the extent and nature of interrelationship among character help in formulating efficient scheme of multiple trait selection.

Keeping this in view, the present investigation was aimed at to study associations and their cause-effect relationship among seed yield, yield related 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

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.

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 randomized block 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 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). The correlation coefficients were partitioned into direct and indirect effects using the path coefficient analysis according to method developed by Wright (1921) and elaborated by Dewey and Lu (1959).

RESULTS AND DISCUSSION

The analysis of variance (Table-) 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

Table-3 : Estimates of phenotypic path coefficient for eight characters in linseed.

Character	Days to 50% flowering	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	-0.2980	0.1115	0.0334	0.0493	0.0408	-0.0161	0.0220	-0.0570
Days to 50% maturity	-0.1132	0.3266	0.0907	0.1674	0.1158	0.0905	-0.0238	0.6540
Number of primary branches/plant	-0.0661	0.1239	0.2485	0.1662	0.0330	0.0059	-0.0261	0.4853
Number of capsules/plant	-0.1590	0.1345	0.1206	0.3350	0.0394	0.1965	-0.0064	0.6606
Number of seeds/capsule	-0.0580	0.1776	0.0146	0.0572	0.1934	0.1965	-0.0284	0.4769
1000-grain weight	0.0160	0.0968	0.0214	0.0616	0.0779	0.3431	-0.0112	0.6056
Oil content %	0.0836	0.0740	0.0783	0.0147	0.0760	0.0431	-0.0855	0.2836

Phenotypic R^2 = 0.5855, Residual effects = 0.2612

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 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.

Phenotypic path coefficient analysis (Table-3) revealed that the direct effect on grain yield was high and positive for 1000-grain weight (0.3431) and moderate and positive for number of capsules per plant (0.3350), days to 50 per cent maturity (0.3266) and number of primary branches (0.2485). These results were in accordance with the results of Stapathi *et al.* (1987) and Khan *et al*. (1998).

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