vegetables like cucumber (Eindhoven, 1978) and Melon (Nagy, 1978).

In conclusion, with increasing the distance of female plants from the male plant, there is an increase in the vine length, number of branches per plant and leaf number, more number of female flowers and yield. However 15 female plants planted 150 cm away from the male plant placed at the centre is the optimum density for providing sufficient pollen to get maximum yield in a unit area.

REFERENCES

EINDHOVEN, V. (1978). The culture of late autumn cucumbers. Groenten en fruit. 34 (2) : 28-29.

GOMEZ, K.A. and GOMEZ, A.A. (1984). Statistical Method for Agricultural Research, Second Edition. John Willy and Sons. Singapore. 302- 307.

NAGY, J. (1978). Investigation on plant density and prunning severity of melons forced under plastics. Kerteszetic Egyetem Kozleminyei. 42(10) : 41-46.

YADHAV, J.P. KIRTI SINGH and JAISWAL, R.C. (1989). Influence of various spacings and methods of training on growth and yield of pointed gourd. (*Trichosathesis deoica.* Roxb.). Vegetable Science. 16(2) : 113-118.

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GENETIC ARCHITECTURE OF SEED YIELD AND YIELD COMPONENTS IN LINSEED (*Linum usitatissimum* L.)**

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ABSTRACT

Genetic analysis of seed yield and five yield components as well as oil yield per plant through 10 X 10 diallel excluding reciprocal revealed that all the characters were governed by both additive as well as dominance gene effects, with preponderance of additive gene effect for days to flower; equal importance of both gene effects for days to maturity and with greater magnitude of dominance gene effect for plant height,seeds per capsule, 500 - seeds weight, seed yield per plant and oil yield per plant. Asymetrical distribution of increasing and decreasing alleles was noticed for all the traits except seeds per capsule, seed yield and oil yield. More number of dominant genes were present (K_D/K_R > 1) for days to flower, days to maturity and plant height. The population improvement through reciprocal recurrent selection or biparental mating is suggested for increasing seed and oil yield.

KEY WORDS: Genetic architecture, Population improvement, Diallel analysis, Additive, Dominance.

The break-through in boosting yield has not occurred in oilseed crops in general and linseed in particular. The information regarding nature of gene effects and relative magnitude of components of genetic variance is useful in the choice of appropriate and effective breeding methodology for improving seed yield. Though linseed is an important industrial crop, it is neglected by most of the breeders. Hence such information is very meagre for this crop. Therefore, the present investigation was undertaken to study the genetics of some important quantitative characters in linseed.

MATERIALS AND METHODS

Forty five one-way diallel crosses along with their 10 parents *viz.*, LC 1048, LCK 88062, LCK 88511, LW 28-9, LCK 8605, AKL 79, RLC 29, RLC 35, Chambal and Triveni were evaluated in randomized block design with three replications during Rabi 1994-95 at Plant Breeding Farm, Gujarat

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Table 1 : Analysis of variance and estimates of t² values for different characters in linseed

Source	d.f.	Days to flower	Days to maturity	Plant height	Primary branches /plant	No. of caps./ plant	No. of seeds/ capsule	500 seed weight	Biological yield/ plant	Seed yield/ plant	Harvest index	Seed oil content	Oil yield /plant
Replication	2	5.57	43.79**	4.74	0.52	12.90	0.06	0.01	23.96*	0.04	0.004	0.10	0.007
Genotypes	54	130.75*	56.43**	62.49**	2.24**	5762.14**	2.28**	0.54**	80.42**	11.60**	0.01**	8.72**	2.23**
Parents	9	305.93**	119.44**	111.30**	2.30**	3364.24**	1.96**	0.30**	19.34**	9.12**	0.013**	9.72**	1.77**
Crosses	4	80.81**	44.12**	51.97**	2.06**	5314.89**	2.35**	0.53**	62.69**	9.72**	0.011**	8.11**	1.87**
Parents Vs Crosses	1	751.52**	31.30**	86.26**	9.95**	470491.72**	1.83**	3.25**	1410.12**	116.55**	0.002	26.81**	22.19**
Error	108	3.69	3.81	4.06	0.46	170.37	0.13	0.02	4.99	0.52	0.001	0.002	0.09
t² values	-	1.38	0.44	2.96	4.72**	5.30*	0.21	0.09	8.40**	0.51	4.40*	4.03*	0.43

* Significant at 5 per cent probability level.

** Significant at 1 per cent probability level.

Agricultural University, Anand. Each plot consisted of single row of 2.5 m length with inter and intra row spacing of 25 and 10 cm, respectively. Observations were recorded on 10 randomly selected competitive plants in each plot for all the characters (Table 1) except phenological traits days to flower and days to maturity, for these, observations were recorded on population basis. The data were analysed following Hayman (1954).

RESULTS AND DISCUSSION

The mean squares due to genotypes, parents, hybrids and parents Vs hybrids were highly significant for all the characters except parents Vs hybrids constrast for harvest index. The t^2 test was applied to confirm the validity of the assumptions undelying diallel analysis. It was non-significant (Table 1) for the characters days to flower, days to maturity, plant height, number of seeds per capsule, 500- seeds weight, seed yield per plant and oil yield per plant, which indicated homogenecity of W_r-V_r over the arrays.

Both additive (D) as well as dominance (H_1 and H_2) components of genetic variance were significant for all the seven characters. The average degree of dominance $(H_1/D)^{0.5}$ indicated preponderance of additive gene effect for days to flower ; equal importance of both additive and dominance gene effects for days to maturity ; whereas preponderance of dominance gene effect was observed for remaining traits. These results are similar to the findings of Singh and Singh (1979) for days to flowers, plant height, seeds per capsule and seed yield per plant. Kumar *et al.* (1980) also reported equal importance of both additive and dominance estimates for days to maturity. The findings for test weight are in accordance with Thakur and Bhateria (1991) ; whereas for oil yield per plant with Bhatnagar (1977).

The considerable differences in the magnitude of variance due to dominance (H_1) and due to dominance corrected for gene distribution (H_2) for various traits barring seeds/capsule, seed yield per plant and oil yield per plant implied asymetrical

Table 2. Components of genetic variance and related parameters for different characters in linseed

Components/ parameters	Days to flower	Days to maturity	Plant height	No.of seeds /capsules	500 - seeds weight	Seed yield /plant	Oil yield /plant
D	100.75**	38.54**	35.75**	0.61*	0.10**	2.86**	0.56*
	9.21	3.65	6.72	0.22	0.02	0.74	0.14
H_1	67.89*	40.72**	65.91**	2.90**	0.43**	10.85**	2.02**
	19.61	7.76	41.31	0.47	0.05	1.57	0.29
H_2	50.05*	31.22*	53.65*	1.65**	0.32**	9.80**	1.84**
	16.67	6.60	12.16	0.40	0.04	1.34	0.25
H^2	98.76**	3.68	10.91	0.23	0.43**	15.32**	2.92**
	11.16				0.03	0.90	0.17
F	65.90*	28.20*	34.46*	0.55	-0.02	1.13	0.18
	21.26	8.41	15.52				
E	1.23	1.27	1.35	0.04	0.01	0.17	0.03
$[H_1/D]^{0.5}$	0.82	1.03	1.36	2.18	2.14	1.95	1.90
$H_2/4H_1$	0.18	0.19	0.20	0.23	0.19	0.23	0.23
K_D/K_R	2.32	2.11	2.10	-	-	-	-
H^2/H_2	1.97	-	-	-	1.32	1.56	1.59

*, ** Significant at 5 and 1 per cent level respectively.

distribution of genes in the parental population, which was also supported by the quantity of $H_2/4H_1$ ($H_2/4H_1 < 0.25$) of respective trait. More than unit value of K_D/K_R, alongwith significant and positive value of F for days to flower, days to maturity and plant height suggested presence of more number of dominant alleles controlling the character and exhibiting dominance H^2/H_2 was inbetween 1 and 3 for all the traits except days to maturity, plant height and seeds per capsule.

The seed yield, a very complex character, was controlled by additive and dominance gene effect with preponderance of dominance estimate, hence direct selection in early generation for seed yield *per se* may not be rewarding. The population improvement programme such as reciprocal recurrent selection or biparental mating is suggested, which may utilize additive as well as dominance genetic variance simultaneously.

REFERENCES

BHATNAGAR, S.K. (1977). Combining ability and gene action studies in the inheritance of quantity and quality of oil in linseed (*Linum usitatissimum* L.) Ph.D. Thesis, University of Udaipur, Udaipur.

HAYMAN, B.I. (1954). The theory and analysis of diallel crosses,. **Genetics 37 : 789-809.**

KUMAR, S. CHAUHAN, B.P.S. and JAIMINI, S.S. (1980). Diallel analysis of flowering and maturity in linseed **Indian J. Agric. Sci., 50 (3) : 225-230.**

SINGH, K.P. AND SINGH, H.G. (1979), Combining ability analysis for quantitative traits in linseed. **Indian J. Agric Sci., 49 (8) : 573-578.**

THAKUR, H.L. AND BHATERIA, S. (1991). Line X Tester analysis for combining ability in linseed (*Linum usitatissimum* L.) **J. Oilseeds Res., 8 : 14 - 19.**

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