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Short Communication

GENE ACTION FOR SEED YIELD AND ITS COMPONENTS IN LINSEED

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The material consisted of six crosses of linseed viz. Neela × Hira, Neela × J-23, RLC (U)-2 × Laxmi- 27, RLC (U)-2 × T-397, KL-178 × T-397 and KL-178 × Hira involving seven parents. The experiment with six basic populations (P_1, P_2, F_1, F_2, BC_1 and BC_2) of each cross was conducted in randomized block design with three replications at Crop Research farm, Mauranipur during *rabi* 1998-99. The parents and F_1 were sown in one row each, whereas backcrosses and F_2 were represented by two and six rows, respectively. Each row was of 3m length, spaced at 30 cm apart. Observations for five metric traits from each replication were recorded on five randomly selected plants from parents and F_1, 15 plants from backcrosses and 30 plants from F_2 generation. The scaling test [1] was used to detect the epistasis. Generation mean analysis [2] was followed to estimate the nature and magnitude of gene effects. In the absence of epistasis, three-parameter model [3] was used to estimate the mean (m), additive (d) and dominance (h) components.

The analysis of scaling test indicated existence of a simple additive-dominance model in crosses Neela×Hira, RLC (U)-2×T-397, KL-178×Hira for primary branches/ plant and in cross Neela×ira for capsules/plant and seeds/capsule (Table 1).

However, all the three scales were significant for capsules plant in Neela × J-23, for seeds/capsule in RLC(U)-2 × T-397 and for 1000-seed weight in Neela × Hira, RLC (U)-2 × Laxmi-27 RLC(U)-2 × T 397 and KL-178 × T-397. The significance of any one of three scales indicates the presence of non-allelic interactions. Partitioning of the genetic components of variances revealed that mean values were highly significant for all the characters in all the crosses. Number of primary branches/plant was predominantly under the control of dominance (h) gene effects in Neela × J-23, RLC(U)-2 × Laxmi-27 and KL-178 × T-397. The (1) type of component was positive and highly significant suggesting the greater role of dominance × dominance effects in these crosses. The positive sign of additive × additive (i) component in these crosses revealed that selection can be practised in early segregating generations. The opposite sign of (h) and (l) estimates indicated the presence of duplicate type of gene action.

For number of capsules/plant both additive and dominance gene effects were found to be operating in the inheritance of this trait. The other most prevalent gene interaction was additive × dominance (j) type. The magnitude of dominance and dominance × dominance components were considerably high in the crosses Neela × J-23, KL-178 × T-397 and KL-178 × Hira. Despite such high magnitude, dominance property of the genes would not be exploited because of duplicate type of epistasis. In case of number of seeds/capsule, additive (d) component was more important in Neela × J-23 and KL- 178 × Hira. The negative sign of additive × additive (i) component in all the six crosses suggested that selection should be resorted to when desirable recombinants become available.

For 1000 seed weight, both fixable and non-fixable gene effects were important particularly in KL-178 × Hira with duplicate type of gene interaction. Among the non-allelic interactions, all the three components (i), (j) and (1) were significant in the crosses RLC (U)-2 × Laxmi-27, RLC(U)-2 × T-97 and KL-178 × Hira.

Table 1. Estimates of gene effects for seed and its components in linseed

Cross	Scale			Genetic components						Type of epistasis
	A	B	C	m	d	h	i	j	l	
	No. of primary branches per plant									
C_1	0.00	1.00	−1.00	3.86**	0.58	1.51**	-	-	-	-
C_2	2.00*	7.33**	−2.67	3.33**	−2.00**	13.33**	12.00**	2.67**	−21.33**	D
C_3	3.00*	1.67*	−2.00	4.00**	0.67	9.00**	6.67*	0.67	−11.33**	D
C_4	0.00	0.00	−3.33	3.93**	0.29	0.64	-	-	-	-
C_5	2.00	1.00	−10.33**	2.67**	1.33	17.50**	13.33**	0.49	−16.33**	D
C_6	3.00	1.00	−3.33	3.70**	0.51	0.75	-	-	-	-
	No. of capsules per plant									
C_1	18.67	7.33	17.33	50.44**	6.22**	20.46**	-	-	-	-
C_2c	68.67**	125.00	−104.33**	30.33**	−22.33**	345.17**	298.00**	−28.17**	−491.67**	D
C_3	−6.67	−46.67	−44.00	81.33**	24.67**	73.99**	−9.33	20.00**	62.67	C
C_4	−28.67**	−3.33	−58.67*	72.33**	0.00	42.67	26.67	−12.67	5.33	C

C_5	–10.67	12.67	–122.00**	67.00**	8.00	167.67**	124.00**	–11.67*	–126.00**	D
C_6	–4.33	70.00**	27.67	82.33**	–13.67	77.17*	37.99	–37.17**	–103.67**	D
					No. of seeds per capsule					
C_1	–1.00	0.67	2.33	8.25**	0.04	0.45	-	-	-	-
C_2	0.33	–5.33**	–1.67	8.67**	3.00**	–4.17*	–3.33*	2.83**	8.33**	D
C_3	–1.33	–1.67*	–1.67	8.33**	0.67	0.50	–1.33	0.17	4.33	C
C_4	–1.67*	–3.00**	6.67**	9.33**	0.33	–12.00**	–11.33**	0.67	16.00**	D
C_5	–1.67*	–1.33	3.67*	9.33**	0.00	–6.17**	–6.67**	–0.17	9.67**	D
C_6	–2.00*	–2.00*	0.67	9.00**	0.99*	–3.67	–4.67	–0.00	8.67**	D
					1000-seed weight					
C_1	1.34**	–0.18*	1.09**	7.44**	–0.32**	0.51**	0.07	0.76**	–1.24	D
C_2	0.94**	1.97**	–2.85	6.06**	–1.05**	6.63	5.77	–0.52**	–8.68*	D
C_3	0.31**	–2.08**	–1.39**	1.17**	0.48**	–0.81**	–0.37**	1.20**	2.14**	D
C_4	–0.36**	0.93**	0.92**	7.58**	–0.41**	1.49**	1.49**	–0.65**	–2.07**	D
C_5	0.45**	0.37**	1.42**	7.38**	–0.23**	–0.96**	–0.59**	0.04	–0.22	C
C_6	2.52**	–0.02	–0.30	7.63**	0.19**	3.52**	2.80**	1.27**	–5.30**	D
					Seed yield per plant					
C_1	–2.33	–3.67**	–14.67**	2.67**	0.33	12.00**	8.67**	0.67	–2.67	D
C_2	0.33	4.33**	–1.00**	4.67**	–1.00	29.33**	20.67**	–2.00*	–25.33**	D
C_3	4.33*	–0.33	–5.33	8.00**	2.67*	18.00**	9.33**	2.33*	–13.33**	D
C_4	–2.33	–1.00	–9.33**	4.67**	–0.33	10.67**	6.00	–0.67	–2.67	D
C_5	–2.67	–8.00**	–7.33	10.00**	3.00**	1.67	–3.33	2.67*	14.00*	C
C_6	1.67	5.00*	12.67**	7.33**	0.33	27.00**	19.33**	–1.67	–26.00**	D

*,**Significant at 5% and 1% levels, respectively.
C_1-Neela × Hira; C_2 - Neela × J-23; C_3 - RLC (U) - 2 × Laxmi 27
C_4 - RLC(U)-2 × T-397; C_5-KL-178 × 397; C_6-KL-178 × Hira
D - Duplicate, C - Complementry

With respect to seed yield/plant, there was preponderance of dominance gene effects in almost all the crosses except KL-178 × T-397. However, additive and additive × additive components were also found to be important in two and four crosses, respectively suggesting that selection for seed yield/plant should be delayed till the fixation of dominance and epistatic components. The cross KL-178 × T-397 may show considerable amount of heterosis for seed yield/plant as it exhibited complementary type of epistasis. The gene effects for seed yield and its components reported by various workers also confirmed the present findings [4].

Keeping in view, the presence of both fixable and non-fixable genetic components as well as duplicate type of epistasis it appears worthwhile to intermate the selects in segregating generations, which would result in to the accumulation of favourable genes for seed yield and its components [5-6]. Hence, biparental mating or few cycles of recurrent selection followed by pedigree method of selection is suggested for the improvement of seed yield in linseed.

REFERENCES

1. K. Mather. 1949. Biometrical Genetics. Dover Publication, Inc. New York.
2. B. I. Hayman. 1958. The separation of epistatic from additive and dominance variation in generation means. Heredity., **12**: 371-390.
3. J. L. Jinks and R. M. Jones. 1959. Extimation of the components of heterosis. Genetics., **43**: 223-234.
4. S. S. Badwal and V. P. Gupta. 1970. Gene effects governing inheritance of yield and its components in linseed. Plant Sci., **2**: 36-51.
5. A. B. Joshi. 1979. Breeding methodology for autogamous crops. Indian J. Genet., **39**: 567-578.
6. J. E. Parlevliet and A. Van Ommeren. 1988. Recurrent selection for grain yield in early generations of two barley population. Euphytica., **38**: 175-184.