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TRANSGRESSIVE SEGREGATION OF YIELD AND YIELD COMPONENTS IN LENTIL

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ABSTRACT

The experimental materials consisted of 13 diverse parents and 30 F_2 and F_3 bulk populations. In general exotic × indigenous crosses had higher frequency of transgressives for plant height where as indigenous × indigenous crosses exhibited higher frequency of transgressives for primary and secondary branches per plant in both the generations. None of the crosses showed transgressive segregates for 100-seed weight in the F_2 generation. Amongst the exotic × indigenous crosses; E-258 × Pant L-234 exhibited highest frequency of transgressive segregates in the F_2 generation for yield per plant (47%), followed by E-153 × K-75 (33%) and E-153 × Pant L-234 (27%). These crosses also had high frequency of transgressive segregates in the F_3 generation for yield per plant and pods for plant. Highest number of transgressive segregates in the F_3 generaton for yield per plant was observed in the crosses of IC-784013 and IC- 78415 with the testers. The indigenous crosses; Pusa-4 × K-75, Pusa-4 × Pant L-234 and 1363 × K-75 were promising because in addition to yield per plant, these crosses expressed transgressives for important yield components in both the generations.

Key words : *Lens culinaris*, yield components, transgressive segregation

Lentil (*Lens culinaris* L. Medikus) is one of the important drought hardy pulse crops of India. It is grown on all kinds of soils in *rabi* season (October/November to February/March). In recent years in northern India, the area under lentil is increasing even under late sown condition i.e., December sown, after the harvest of late sown rice crop. There is a need to develop suitable varities for this situation and to achieve this, the crosses may be identified. Therefore, the F_2 and F_3 bulks from 30 diverse crosses were evaluated in this situation and the frequency of transgressive segregates is reported in this paper.

MATERIALS AND METHODS

The experimental material consisted of 13 diverse parents. Of the 10 lines, four were exotic type. Ten lines were crossed with three testers viz., Pant L-406, Pant

L-234 and K-75 to make 30 combinations. Parents and their 30 F_2 populations were sown in 1992 and the parents and F_3 populations were sown in 1993 after the harvest of rice (*Oryza sativa* L.) and were grown in randomized block design with two replications. The parents were grown in single row plots and the F_2s/F_3s were grown in a 3-row plots. The row length was 3m. Five competitive plants from each of the parental lines and 15 plants (5 from each row) from each of the F_2/F_3 population were randomly selected and observations recorded for seven quantitative traits. Percentage of transgressive segregation in the F_2 and F_3 generations was obtained by the defining extreme progeny as significantly transgressive segregates (i.e. the lines that exceeded their better parent mean and L.S.D. at 0.05 probability). Analysis and comparisons were made, based on the value of individual plants. The transgressive segregates were calculated in favourable direction only.

RESULTS AND DISCUSSION

Frequency of transgressive segregates in different crosses for yield and its components in the F_2/F_3 generation of 18 indigenous × indigenous crosses and 12 exotic × indigenous crosses is presented in Table 1.

The transgressive segregates are produced by accumulation of plus or favourable genes affecting yield and some other characters. In general, exotic × indigenous crosses had displayed higher number of transgressive segregates for plant height in both the generations and indigenous × indigenous crosses had higher number of transgressive segregates for primary and secondary branches per plant in both the generations. In the F_2 generation, exotic × indigenous crosses gave higher number of transgressive segregates for yield per plant and indigenous × indigenous crosses gave higher number of transgressive segregates for pods per plant. Both exotic × indigenous and indigenous × indigenous crosses had shown almost equal frequency of transgressive segregates for pods per plant, seeds per pod and yield per plant in the F_3 generation. None of the crosses showed transgressive segregates for 100-seed weight in the F_2 generation. This showed that most of the parents had similar constellation of the genes for 100-seed weight. In the F_3, however, NDL-1 × Pant L-406 exhibited highest frequency of transgressive seregates (53%) followed by Pusa-4 × Pant L-406 (47%).

Breeding for yield generally aims at recovery of transgressive segregates. Amongst the exotic × indigenous crosses; E- 258 × Pant L-234 in the F_2 generation exhibited highest frequency of transgressive segregates for yield per plant (47%) followed by E-153 × K-75 (33%) and E-153 × Pant L-234 (27%). In the F_3 generation, these crosses also expressed high frequency of transgressive segregates for yield per plant and pods per plant and had high mean and high variance for these characters [1].

Table 1. Percentage of significant transgressive segregates for yield and yield components in the F_2 and F_3 generations of lentil

Cross	Generation	Plant height	Primary branches per plan	Secondary branches per plant	Pods per plant	Seeds per pod	Yield per plant	100-seed weight
IC-784013 × Pant L-234	F_2	7	27	13	7	7	0	0
	F_3	7	0	7	0	20	47	0
IC-784013 × Pant L-406	F_2	0	0	7	0	47	0	0
	F_3	20	7	40	13	7	47	0
IC-784013 × K-75	F_2	0	0	13	33	0	0	0
	F_3	0	40	20	27	47	47	0
EC-151015 × Pant L-406	F_2	7	0	7	0	0	0	0
	F_3	40	7	20	53	60	60	0
EC-151015 × Pant L-234	F_2	0	0	13	7	0	0	0
	F_3	0	0	7	13	0	27	0
EC-151015 × K-75	F_2	0	7	33	7	13	0	0
	F_3	7	33	13	33	20	40	0
IC-78415 × Pant L-406	F_2	0	0	7	0	0	7	0
	F_3	7	0	7	47	0	47	27
IC-78415 × K-75	F_2	0	7	33	0	0	9	0
	F_3	13	0	53	33	0	60	0
IC-78415 × Pant L-234	F_2	0	33	27	40	40	0	0
	F_3	7	7	20	20	7	27	0
1363 × Pant L-406	F_2	0	0	0	0	0	0	0
	F_3	13	0	20	20	47	20	7
1363 × Pant L-234	F_2	0	7	33	7	0	0	0
	F_3	6	20	7	60	20	7	0
1363 × K-75	F_2	0	7	53	33	20	7	0
	F_3	0	53	27	73	20	47	0
Pusa-4 × K-75	F_2	0	13	7	14	53	20	0
	F_3	0	40	7	67	0	13	0
Pusa-4 × Pant L-406	F_2	0	13	7	7	27	0	0
	F_3	0	13	7	53	27	7	47
Pusa-4 × Pant L-234	F_2	0	0	47	47	33	7	0
	F_3	20	7	67	73	60	13	20
E-153 × Pant L-406	F_2	0	7	13	14	7	0	0
	F_3	20	13	7	67	0	27	0
E-153 × Pant L-234	F_2	33	7	7	20	7	27	0
	F_3	0	27	0	53	13	33	0
E-153 × K-75	F_2	0	13	7	13	47	33	0
	F_3	33	33	7	53	13	7	7

(*Table 1 contd.*)

NDL-1 × Pant L-234	F_2	0	0	27	0	0	0	0
	F_3	0	7	20	20	20	0	0
NDL-1 × L-406	F_2	0	0	20	0	0	0	0
	F_3	0	20	13	47	20	0	53
NDL-1 × K-75	F_2	6	7	0	20	0	0	0
	F_3	0	20	20	53	53	7	0
Precoz × Pant L-406	F_2	7	0	7	0	53	0	0
	F_3	47	13	7	73	53	0	0
Precoz × Pant L-234	F_2	27	7	7	7	7	0	0
	F_3	0	7	7	27	13	20	13
Precoz × K-75	F_2	0	0	33	7	0	0	0
	F_3	0	0	20	27	27	13	13
Ranjan × K-75	F_2	0	27	20	13	0	7	0
	F_3	0	0	13	20	53	7	13
Ranjan × Pant L-234	F_2	0	13	20	27	20	0	0
	F_3	0	0	0	13	20	0	7
Ranjan × Pant L-406	F_2	0	7	13	27	0	0	0
	F_3	0	0	13	27	7	7	0
E-258 × Pant L-234	F_2	0	0	40	0	0	0	0
	F_3	0	0	13	7	7	20	7
E-258 × K-75	F_2	0	0	33	0	0	47	0
	F_3	7	0	13	7	20	7	0
E-258 × Pant L-406	F_2	0	0	20	0	0	0	0
	F_3	0	7	13	20	20	13	20

Transgressive segregates in the F_2 may arise due to dominance and dominance interactions in addition to additive × additive interaction which is fixable or due to recombination of genes with positive effects and responsible for the production of transgressive segregates in the F_3 generation. The findings, therefore, also reveal that the parents differed for many genes and introgression of genes from exotic germplasm lines created large amount of genetic variability for yield and yield components in some of the crosses suggesting the scope to use these materials and the crosses.

Highest number of transgressive segregates in the F_3 generation for yield pea plant was observed in the crosses of IC-784013 and IC-78415; indigenous lines with the testers. Amongst indigenous × indigenous crosses, Pusa-4 × K-75, Pusa-4 × Pant L-234 and 1363 × K-75 were promising because in addition to yield per plant these crosses expressed transgressive segregates for important yield components in both the generations.

The crosses which gave high frequency of transgressive segregates for yield per plant and pods per plant in both the generations may be preferred over the other crosses in an on-going breeding programme.

REFERENCE

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