

NATURE AND MAGNITUDE OF GENETIC VARIATION IN THE MACRO × MICROSPERMA GENEPOOL OF LENTIL

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The experimental material comprised the progenies of three crosses, namely, HPL 4 × L 830 (123 progenies), HPL 1 × L 1282 (295) and HPL 3 × L 1282 (170) involving HPL 4, HPL 1 and HPL 3 as macrosperma and L 830 and L 1282 as microsperma types. The progenies were evaluated in Augmented Block Design. Data was recorded with respect to seed yield, harvest index, pod length seeds per pod, single seed weight, days to flowering and days to maturity. Mean performance of the progenies showed that 7 progenies in HPL × L 830, 18 progenies in HPL 1 × L 1282 and 14 progenies in HPL 3 × L 1282 cross for seed yield were found to be significantly superior to the best check viz., HPL 5 (Vipasha). Variance analysis revealed a wide range of variability for all the traits except phenological traits where the range of variation was narrow. The magnitude of co-efficient of variation (CV) was high for harvest index, seed yield, seeds per pod and seed weight, whereas it was least for days to maturity and days to flowering. Heritability (h²) was high for the traits and crosses studied. High heritability was found to be coupled with high genetic advance for seed yield, harvest index, seed weight and seeds per pod.

Key words : *Lens culinaris*, hybridization, analysis of variance

In lentil (*Lens culinaris* Medik.), the introgression of microsperma with macrosperma types is viewed as potentially productive area of hybridization. In order to define effective breeding and selection scheme that would have high probability of success, it is imperative to understand the nature and magnitude of genetic variation generated from the gene pool of micro-macrosperma lentils.

MATERIALS AND METHODS

The experimental material consisted of three crosses, namely, HPL 4 × L 830, HPL 1 × L 1282 and HPL 3 × L 1282 involving HPL 4, HPL 1 and HPL 3 as macrosperma and L 830 and L 1282 as microsperma types. One hundred and twenty three, 295 and 170 F₃ derived progenies of HPL 4 × L

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830, HPL 1 × L 1282 and HPL 3 × L 1282 crosses, respectively, along with five checks (including parents) were evaluated in augmented block design. HPL 5 (Vipasha), a released variety for the mid hills of Himachal Pradesh was used as standard check. Data were recorded with respect to seed yield per plant (g), harvest index (%), pod length (mm), sink efficiency (%), seeds per pod (no.), single seed weight (mg), days to flowering and days to maturity AND analysed with respect to various parameters of variability as per Federer (1956).

RESULTS AND DISCUSSION

Analysis of variance revealed that micro-macrosperma hybridization in lentil has generated a large amount of genetic variability for all the traits and crosses studied. The number of progenies which were found significantly superior to the best check (HPL 5) were 7, 10, 1 and 3 in HPL 4 × L 830; 18, 20, 10 and 12 in HPL 2 × L 1282 and 14, 17, 13 and 16 in HPL 3 × L 1282 cross for seed yield, harvest index, seed weight and seeds per pod, respectively. Various parameters of variability showed a wide range of variability and high amount of variances both at phenotypic and genotypic levels for all the traits except days to flowering and days to maturity where it was less (Table 1). Coefficient of variation (cv) both at phenotypic (PCV) and genotypic (GCV) levels in each cross revealed that the magnitude of variation was very high for seed yield, harvest index, seeds per pod and single seed weight, moderate for pod length and sink efficiency and low for days to flowering and days to maturity. Seed yield which is of direct interest to the breeders have the highest CV in HPL 4 × L 830 cross. In the present material the range of variation resulted almost in equal PCV and GCV, indicating little variation for majority of the traits studied, and that too were not much influenced by the environment. Therefore, selection based on phenotypic value of such stable characters is expected to be effective with equal probability of success. It also indicates that the differences between lines are due to their genotypic constitution. The present estimates of CV were sufficiently higher than those reported for world lentil germplasm with respect to seed yield, seed weight and seeds per pod, however, they were at par for phenological traits (Erskine, 1985). Similar estimates of genetic variability in lentil for most of the traits have also been reported earlier (Singh and Singh, 1969; Szucus, 1973; Todorov, 1980).

Heritability (bs) which decide the intensity of selection was very high (60-90%) for all the traits in all the crosses hence, the expression of these traits can be modified through hybridization, followed by selection. High heritability for some of these traits have also been reported earlier by Muehlbauer (1974). Genetic advance is another important parameter for determining the magnitude of expected genetic change that can occur due to selection. It also provides information on the relative contribution of environment on the

variation of a particular character. In the present material, harvest index, seed yield, seeds per pod and seed weight showed high genetic advance, the

Table 1. Estimates of parameters of variability in three crosses, namely, HPL × L 830 (1), HPL 1 × L 1282 (2) and HPL 3 × L 1282 (3) of lentil.

Traits	Mean	Range	Vp	Vg	PCV	GCV	Heritability(%)	Genetic advance as % of mean
Seed yield per plant (g)								
1	0.81	0.30-1.50	0.06	0.05	30.96	28.04	83.33	52.04
2	0.84	0.27-1.70	0.06	0.05	33.84	27.40	83.35	50.64
3	0.86	0.30-1.38	0.05	0.04	26.64	23.20	80.00	42.27
Harvest index (%)								
1	38.15	18.50-62.86	245.30	159.11	41.05	33.06	64.86	54.87
2	38.80	22.42-58.40	239.00	157.50	39.83	32.34	65.89	54.00
3	33.28	16.20-61.50	209.36	171.45	43.77	39.84	81.22	73.29
Pod length (mm)								
1	1.02	0.90-1.51	0.03	0.02	17.63	12.07	67.30	23.76
2	1.01	0.80-1.25	0.02	0.01	14.00	10.84	50.00	13.84
3	1.07	0.08-1.40	0.01	0.008	8.35	7.23	80.00	15.40
Sink efficiency (%)								
1	0.79	0.66-0.88	0.004	0.003	7.48	6.93	75.71	13.18
2	0.80	0.61-0.90	0.03	0.02	21.55	18.34	67.06	29.80
3	0.81	0.65-0.86	0.005	0.003	8.46	7.30	60.00	10.02
Seeds per pod								
1	1.39	0.90-2.15	0.11	0.09	24.18	21.82	81.81	40.85
2	1.41	0.90-2.14	0.10	0.07	22.75	19.03	70.00	32.80
3	1.20	1.00-2.00	0.20	0.18	37.26	35.35	90.00	67.09
Single seed weight (mg)								
1	39.59	21.10-58.75	89.04	64.25	23.84	20.28	72.19	35.44
2	35.39	20.26-49.73	42.09	29.89	18.35	15.10	71.09	26.81
3	37.05	23.96-52.92	76.22	60.00	24.56	20.65	78.71	38.20
Days to flowering								
1	126.69	121.00-127.00	1.25	0.82	0.81	0.93	65.60	1.23
2	121.32	117.00-126.00	1.79	1.41	1.10	1.00	78.75	1.78
3	120.52	121.00-125.00	6.64	5.20	2.14	1.87	78.31	3.45
Days to maturity								
1	163.65	155.00-170.00	43.66	30.38	4.04	3.37	69.35	5.77
2	165.24	156.00-170.00	36.00	24.51	3.63	3.00	68.35	5.13
3	164.67	159.00-178.00	34.47	23.40	3.57	2.94	68.00	4.99

improvement upon these characters can be made effective even by applying low selection pressure. High genetic advance for seeds per pod and seed weight has also been reported earlier (Singh and Dixit, 1970; Chowdhury *et al.*, 1976). High genetic advance was found to be coupled with high heritability for seed yield, harvest index, seeds per pod and seed weight. This shows the probable presence of additive gene action for these traits. Therefore, these characters could be considered important for the genetic amelioration of lentil crop because it enable the breeders to operate simple selection methods to improve such type of traits. On the other hand phenological traits indicate low CCV, due to high environmental fluctuations leading to low heritability and genetic advance and to improve upon such traits a proper combination of mass, family and progeny testing selection is needed.

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