

Short Communication

Analysis of Seed Yield and its Attributes under Rainfed Environments in Lentil (*Lens culinaris* Medik.)

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A total of thirty diverse genotypes of lentil (15 *microsperma* and 15 *macrosperma*) were grown at the CCS Haryana Agricultural University, Hisar, during rabi (winter) seasons of 1997-98, 1998-99 and 1999-2000, which constituted three different environments, i.e., E₁, E₂ and E₃, respectively. In E₂ and E₃, sowing was done after applying *rauni* irrigation and after that the crop was raised under rainfed condition following normal cultural practices, whereas in E₁, even *rauni* was not applied. In different environments, all the genotypes were planted in the last week of November in a randomized block design with three replications in 4 m long three-row plots following standard agronomic practices. The data, using five competitive plants, were recorded on five characters, viz., plant height (cm), fruiting branches and pods plant⁻¹, 100-seed weight (g) and seed yield plant⁻¹ (g). The data on days to 50% flowering were recorded on plot basis. The phenotypic and genotypic correlation coefficients among different traits were calculated as per the procedure suggested by Searle (1961). The genotypic correlation coefficients of different characters with seed yield were further partitioned into direct and indirect effects following Dewey and Lu (1959).

A wide range of variability was observed for all important yield traits in all the environments. The E₁ was adjudged as the best environment because of higher fruiting branches, pods and seed yield plant⁻¹ and less time taken for days to 50% flowering (earliness desirable), whereas E₃ was the poorest among all the environments (Table 1). The highest and the lowest estimates of GCV and PCV in all the environments were observed for 100-seed weight and days to 50% flowering, respectively. The estimates of phenotypic coefficient of variation (PCV) were higher than their respective genotypic coefficient of variation (GCV) (Solanki and Singh, 2000).

The highest estimates of heritability in broad sense (h^2) and genetic advance (GA) as per cent of mean were observed for 100-seed weight, whereas the lowest were observed for fruiting branches and days to 50% flowering, respectively, in all the environments. For majority of the characters, the highest estimates of h^2 and GA were observed in E₃. Higher h^2 and GA values for 100-seed weight suggest that additive gene action was more important and improvement of this character is possible through simple selection. In contrast, where either the heritability is

Table 1. ANOVA, estimates of coefficient of variation, heritability and genetic advance for different traits under rainfed environments in lentil

Character	Environment	MS	Range	Mean	SE	GCV (%)	PCV (%)	h^2 (%)	GA (% of mean)
Days to 50% flowering	E ₁	3.57**	77.00-81.00	79.26	0.60	1.41	1.57	80.54	2.60
	E ₂	7.76**	76.67-81.33	79.27	0.52	1.98	2.13	85.91	3.77
	E ₃	53.53**	78.00-93.33	89.20	0.59	4.47	4.78	87.50	8.62
Plant height (cm)	E ₁	22.45**	32.33-44.00	38.03	1.87	6.30	8.71	52.40	9.40
	E ₂	32.85**	29.00-45.00	36.31	2.30	7.90	11.15	50.30	5.61
	E ₃	93.05**	35.00-60.67	43.49	1.50	10.56	13.24	63.60	17.34
Fruiting branches plant ⁻¹	E ₁	7.78***	6.57-14.77	8.75	0.96	11.50	21.41	28.89	12.74
	E ₂	3.81**	5.43-9.47	7.43	0.75	8.86	18.25	23.58	8.86
	E ₃	3.91**	5.70-9.80	7.68	0.35	9.21	15.58	35.04	11.23
Fruiting pods plant ⁻¹	E ₁	478.39**	56.67-106.00	77.42	9.40	10.52	20.30	26.87	11.23
	E ₂	468.36**	34.67-88.33	64.25	7.50	13.62	22.72	35.94	16.82
	E ₃	308.25**	35.67-70.67	57.47	3.68	12.24	18.76	42.57	16.45
100-seed weight (g)	E ₁	0.72**	1.43-2.77	1.98	0.09	23.14	25.05	85.47	44.10
	E ₂	0.68**	1.43-2.73	1.92	0.08	23.35	25.14	86.41	44.75
	E ₃	0.58**	1.50-2.83	2.02	0.06	20.47	43.41	86.89	39.29
Seed yield plant ⁻¹ (g)	E ₁	0.67**	1.50-2.63	2.23	0.25	11.86	24.07	24.47	12.13
	E ₂	0.82**	1.10-3.47	1.95	0.23	16.70	29.28	32.46	19.58
	E ₃	0.69**	0.90-3.10	1.75	0.08	16.95	27.76	37.36	21.36

**Significant at 1% level; MS = Mean sum of squares; SE = Standard error of differences; GCV = Genotypic coefficient of variation; PCV = Phenotypic coefficient of variation; h^2 = Heritability in broad sense; GA = Genetic advance; E₁ = 1997-98; E₂ = 1998-99; E₃ = 1999-2000.

higher and GA is lower or vice-versa and where both are lower, as observed in the present study, these traits were under the control of non-additive gene action. Similar results for plant height, fruiting branches and pods plant⁻¹ in lentil have been reported by Solanki and Singh (2000).

Plant height was significantly associated with 100-seed weight in E₁ (0.45) and E₂ (0.45) and E₂ (0.47); fruiting branches with fruiting pods in E₂ (0.57) and fruiting pods with 100-seed weight in E₃ (0.41). Seed yield plant⁻¹ recorded significant correlation with fruiting pods plant⁻¹ [0.45 (E₁), 0.66 (E₂) and 0.68 (E₃)] and 100-seed weight [0.56 (E₁), 0.54 (E₂) and 0.73 (E₃)] in

all the environments and with plant height in E₂ (0.49). Significant associations between pods and seed yield plant⁻¹ and between 100-seed weight and seed yield plant⁻¹ have been reported by Solanki (1999) and Rajora and Yadav (1999), respectively.

In two environments (E₂ and E₃), fruiting pods and in one (E₁), 100-seed weight contributed maximum to seed yield directly (Table 2). Hence, direct selection for these traits would be effective. High positive direct effect of pods plant⁻¹ (Kumar and Bajpai, 1992) and 100-seed weight (Rajora and Yadav, 1999) on grain yield has been reported earlier. The 100-seed weight (except in E₁) and pods plant⁻¹ depicted

Table 2. Direct (bold) and indirect effects of various traits on seed yield under rainfed environments in lentil

Character	Environment	Days to 50% flowering	Plant height (cm)	Fruiting branches plant ⁻¹	Fruiting pods plant ⁻¹	100-seed weight (g)	Genotypic correlation with seed yield
Days to 50% flowering	E ₁	-0.031	0.033	0.005	-0.073	0.010	-0.055
	E ₂	0.172	-0.034	0.000	0.155	-0.118	0.175
	E ₃	-0.018	0.001	-0.053	-0.051	-0.126	-0.248
Plant height (cm)	E ₁	0.007	-0.155	0.023	-0.025	0.482	0.332
	E ₂	-0.062	0.095	-0.030	0.247	0.350	0.600*
	E ₃	-0.002	0.009	0.004	0.050	0.105	0.167
Fruiting branches plant ⁻¹	E ₁	-0.002	-0.040	0.090	0.028	0.295	0.371
	E ₂	-0.000	0.023	-0.126	0.364	0.076	0.337
	E ₃	0.004	0.000	0.220	-0.007	0.084	0.302
Fruiting pods plant ⁻¹	E ₁	0.007	0.012	0.007	0.338	-0.073	0.291
	E ₂	0.044	0.039	-0.076	0.602	0.083	0.692**
	E ₃	0.002	0.001	-0.003	0.515	0.215	0.729**
100-seed weight (g)	E ₁	-0.001	-0.098	0.035	-0.033	0.762	0.666**
	E ₂	-0.038	0.062	-0.018	0.094	0.531	0.631**
	E ₃	0.005	0.002	0.041	0.245	0.451	0.745**

**Significant at 1% level; Residual effects, E₁ = 0.410; E₂ = 0.204; E₃ = 0.216.

maximum contribution to seed yield plant⁻¹ via each other. Except days to 50% flowering, all other traits also contributed maximum via 100-seed weight and pods plant⁻¹ in all the environments.

These results indicate that the impact of different environments on genetic relationships was almost negligible, and for obtaining higher seed yield, selection should be based on a plant type having higher number of fruiting pods and branches plant⁻¹ and greater plant height, in addition to higher test weight.

References

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