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Short Note

Variability and correlation studies for some agro-morphological traits in horsegram [*Macrotyloma uniflorum* (Lam.) Verdc.]

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Horsegram (*Macrotyloma uniflorum*) is an important crop suitable for cultivation in many dry and marginal lands of North-western Himalayan region comprising states of Himachal Pradesh & Uttaranchal. Owing to its various medicinal uses, horsegram lipids were shown to be protective and promote healing effects on acute gastric ulceration produced by alcohol (Jayaraj *et al.* 2000). Though, it can survive on drought like situations, the production and area under this crop has decreased tremendously over the years. Being a photosensitive crop, it is sensitive to environmental fluctuations. Considering the scanty information on the extent of its nature and variation among various parameters, the present study on parameters of variability and associations among different traits was undertaken in horsegram in Himachal Pradesh.

The experimental material consisted of 10 diverse horsegram genotypes raised in randomized block design comprising of 3 replications during the *kharif* seasons of 2001-2004 at CSK Himachal Pradesh Krishi Vishvavidyalaya, Palampur (1290m amsl). Each genotype was grown in four rows of three-metre length. Data were recorded on ten randomly taken plants for days to 50% flowering, plant height, days to maturity and 100-seed weight. Seed yield was recorded on plot basis which was converted to kg/ha. Coefficients of variability were estimated as per method given by Johnson *et al.* (1955a). Correlation coefficients were calculated according to Johnson *et al.* (1955b) and path coefficient analysis as per method given by Dewey and Lu (1959).

To initiate a breeding programme in a particular crop, relevant information on the nature and variation, and association among different characters is needed. Analysis of variance showed high variability for all the traits studied as indicated by the significant differences among the horsegram genotypes (Table 1).

In general, magnitude of phenotypic coefficient of variation (PCV) was higher than that of genotypic coefficient of variation (GCV) for all the traits indicating the influence of environmental factors on these traits. The characters days to 50% flowering, days to maturity and 100-seed weight were the least affected by environment as is evident by the minimum differences between the PCV and GCV values. In comparison, these differences were high for plant height and seed yield/ha showing high influence of the environmental factors on these traits. Similar observation for seed yield was also reported by Prakash and Khanure (2000).

Seed yield/ha showed highest PCV and GCV values followed by 100-seed weight and days to 50% flowering, whereas the same were low for plant height and days to maturity.

This suggests that selection based on the former traits would help in the isolation of the desirable genotypes. High PCV and GCV for seed yield and 100-seed weight were also obtained by Tripathi (1999) and Sharma (1995).

According to Johnson *et al.* (1955a), high heritability along with high genetic advance (GA) render the selection effective as these characters are under the control of additive gene action. Seed yield/ha showed highest GA coupled with moderate heritability, whereas for 100-seed weight and days to 50% flowering, the heritability estimates were very high accompanied with moderate GA. High heritability coupled with

Table 1. Variance and parameters of variability for different characters in horsegram

Characters	Variance	Mean±SE_m	Range	PCV (%)	GCV (%)	h^2_{bs}(%)	GA (%)
Days to 50% flowering	251.35*	86.77±1.13	77.42-101.50	12.88	13.07	97.00	27.10
Plant height (cm)	125.41*	81.47±2.33	70.64-93.04	4.42	6.61	44.60	5.87
Days to maturity	272.24*	125.33±1.45	113.00-137.83	7.24	7.45	94.50	14.27
100 seed weight (g)	0.69*	3.06±0.11	2.55-3.57	14.47	14.91	94.30	28.76
Seed yield (q/ha)	8.52*	3.33±0.28	1.96-6.14	40.73	45.86	75.0	72.67

* Significant at 5% level

moderate to high GA for these traits was also reported by Sood *et al.* (1994). The correlation coefficients at genotypic level were generally of higher magnitude than the corresponding phenotypic values as shown in Table 2. Significant and positive association of seed yield/ha with 100-seed weight was observed, a highly desirable aspect in horsegram. Days to 50% flowering, though, was positively correlated with days to maturity, but negatively with 100-seed weight suggesting that late flowering is not necessarily associated with bold seededness. The results are in agreement with the findings of earlier workers (Tripathi, 1999 and Sharma, 1995).

Table 2. Genotypic and phenotypic correlation coefficients among different characters

Characters	Days to 50% flowering	Plant height (cm)	Days to maturity	100 seed weight (g)	Seed yield (q/ha)
Days to 50% flowering		0.19	0.79	-0.74	-0.66
Plant height (cm)	0.19		-0.06	0.23	0.52
Days to maturity	0.76*	-0.04		-0.44	-0.50
100 seed weight (g)	-0.70*	0.11	-0.40		0.86
Seed yield (q/ha)	-0.57	0.35	-0.40	0.77*	

* Significant at 5% level Values below and above the diagonal represent the phenotypic and genotypic coefficients, respectively

The cause and effect relationship as suggested by the path coefficient analysis (Table 3) revealed high and positive direct effects of plant height and 100-seed weight on seed yield but the direct effects of days to 50% flowering on seed yield were highly negative indicating that high seed yield is not necessarily associated with late flowering. The indirect effects of days to 50% flowering and days to maturity via 100-seed weight were negative, whereas that of 100-seed weight via days to 50% flowering were positive, thereby suggesting that for bold seed size early flowering genotypes should be evolved. The results are in conformity with the findings of Prakash and Khanure (2000) and Sharma (1995).

Table 3. Genotypic (G) and phenotypic (P) path coefficient analysis for different traits on seed yield

Characters		Days to 50% flowering	Plant height (cm)	Days to maturity	100 seed weight (g)
Days to 50% flowering	P	**-0.300**	0.066	0.041	-0.381
	G	**-0.980**	0.132	0.298	-0.112
Plant height (cm)	P	-0.058	**0.342**	-0.002	0.062
	G	-0.187	**0.691**	-0.022	0.034
Days to maturity	P	-0.229	-0.012	**0.054**	-0.215
	G	-0.774	-0.039	**0.377**	-0.067
100 seed weight (g)	P	0.211	0.039	-0.021	**0.543**
	G	0.721	0.156	-0.164	**0.152**
Residual effects		Genotypic (G) = 0.053	Phenotypic (P) = 0.313		

Thus from the overall results, it can be inferred that 100-seed weight and plant height are important traits based on which high seed yield can be obtained, flowering genotypes will also be useful in bringing higher although simultaneous selection for early yields in horsegram.

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