

Characterization and Evaluation of Horsegram (*Macrotyloma uniflorum* Roxb.) Germplasm from Himachal Pradesh

RK Chahota¹, TR Sharma², KC Dhiman³ and Naval Kishore¹

¹ Department of Plant Breeding & Genetics

² Advanced Centre of Hill Bio-resources and Biotechnology

³ Seed Production Unit, CSK Himachal Pradesh Krishi Vishwavidyalaya Palampur-176 062 (Himachal Pradesh)

Sixty three landraces collected from different parts of Himachal Pradesh were evaluated in an Augmented Block Design having four checks at experimental farm of Department of Plant Breeding & Genetics, CSK HPKV, Palampur (Himachal Pradesh). The variability was assessed on the basis of 12 morpho-agronomical characters. It was observed that sufficient genetic diversity was present for days to maturity, plant height and number of pods/plant. Among the qualitative traits maximum diversity was observed for leaf colour. Disease reaction against *Colletotrichum truncatum* under field conditions revealed that most of the lines were found resistant to bean anthracnose. On the basis of evaluation data lines namely HPKC-1, HPKC-6, HPKC-7, HPKC-9, HPKM-51 and DMK-12 were found to be potential lines which can be exploited as a variety or can be used in future hybridization programme.

Key words: Horsegram, *Macrotyloma uniflorum*, Evaluation, Characterization, Germplasm

Horsegram (*Macrotyloma uniflorum* Roxb.) is an important pulse crop suitable for cultivation in many dry and marginal lands of North-western Himalayan regions comprising states of Himachal Pradesh, Jammu & Kashmir and Uttarakhand. Being a pulse crop it helps in improving the fertility status of the soil. Moreover, it can survive on drought like situations. Owing to its various medicinal uses such as horsegram lipids were shown to be protective and promote healing effects on acute gastric ulceration produced by alcohol (Jayaraj *et al.*, 2000). Besides, it is also known to dissolve and dislocate the kidney stones in human beings. Over the years, the production and area under this crop has been decreasing tremendously. One of the major reasons is the non-availability of high yielding and well-adapted genotypes, which can perform better under higher input conditions as this crop is mostly cultivated as inter crop with maize. The high yielding varieties/lines developed and grown in other parts of the country were unable to perform better when grown in Northern Hill Zones due to photo-period sensitive nature of the crop. Moreover, even within the state, the landraces being cultivated by farmers are adapted to very specific environment. Extensive screening of germplasm collected from different parts of the state is required to identify the potential lines which can either be used as improved variety or can be used in hybridization programme for introgression of desirable genes to well adapted local variety. Therefore, an attempt has been made to evaluate horsegram germplasm available in Himachal Pradesh to assess the magnitude of variability

and to identify promising accessions. The characterization of these landraces will also help the breeder to envisage an objective based breeding programme.

Materials and Methods

Sixty three lines of horsegram were collected from different parts of Himachal Pradesh ranging from 432 to 1500 m amsl (Figure 1). These lines were evaluated in augmented block design having four checks namely, HPK-4, HPKM-149, AK-21 and VLG-1 at the experimental farm of the Department of Plant Breeding & Genetics, CSK HPKV, Palampur, situated at 1290 m amsl. The experiment was conducted in *kharif*, 2003 and each entry was consisted of four rows each of 3 m length. The

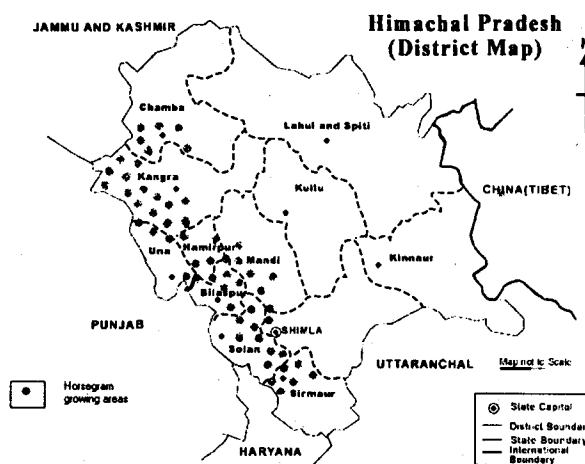


Fig. 1: Area of collection of horsegram

data were recorded on various qualitative traits namely, plant vigour, stem colour, flower colour, leaf colour, and quantitative characters such as seed yield/plant, days to maturity, days to flowering, number of pods /plant, plant height, 100-seed weight and branches/plant. Frequency distribution of various qualitative and quantitative characters was computed. Range, mean and standard deviation were calculated for quantitative characters by following standard statistical procedures.

Results and Discussion

The 63 accessions of horsegram were characterized on the basis of distinguishable phenological and agromorphological characters. Early plant vigour of most of the lines was good, while all the lines were of trailing type and were having the pubescent on leaf surface. The leaf colour of 41 lines were green 12 lines were pale green and 10 lines were dark green. Of the total lines, 35 lines had green stem and 28 lines light yellow, whereas 40 lines had pale yellow flower colour and 23 lines had yellow flower colour. The analysis of variance for quantitative traits revealed that sufficient genetic diversity was present for days to maturity, plant height and number of pods/plant (Table 1). Venkateswarlu (2000) and Tripathi (1999) have reported similar results while studying the genetic diversity in horsegram using 20 and 26 lines, respectively. The quantitative characters were

Table 1. Analysis of variance of different traits of horsegram

Source	d.f.	Mean sum of squares				
		Seed yield / plant	Days to maturity	Plant height (cm)	No. of pods/ plant	No. of branches plant
Blocks(a)	3	1.322	134.687*	680.528*	35.423*	6.890*
Blocks (b)	3	1.198	52.1667	137.035	6.251*	0.285
Entries (a)	67	1.617	70.285*	156.424	29.319*	0.744*
Entries(b)	67	1.623	73.980*	180.760*	30.626*	1.040*
Checks	3	9.961*	200.167*	126.304	30.416*	2.055*
Progenies	63	1.224	66.567*	186.201*	28.655*	0.996
Checks v/s progenies		1.692	162.4375*	1.3516	155.377*	0.800
Error	9	1.409	21.444	79.663	4.951	0.468

Table 2. Variability in quantitative characters

Quantitative trait	Range	Mean	SE of progenies in the same block	SE of progenies in the different block
Seed yield/plant	0.4-4.7	1.95	1.67	1.87
Days to maturity	92.0-120.0	117	6.55	7.32
Plant height (cm)	57.6-111.8	85.37	12.62	14.11
No. of pods/ plant	2.1-26.6	7.31	3.15	3.52
Branches/ plant	1.1-5.4	2.87	0.97	1.08

Table 3. Promising horsegram lines

Character	Line
Seed yield/plant	HPKC-6,HPKC-51, DMK-12
Days to maturity	HPKC-12, HPKM2, HPKM-16, HPKM-116
Plant height (cm)	HPKC-9, HPKC-8, HPKC-4
No. of pods/ plant	HPKC-33, HPKC-50,HPKC-17,HPKC-34, DMK-12, HPKM-51
Branches/ plant	HPKC-43

Table 4. Quantification of quantitative characters

Class	Characters				
	Seed yield/ plant (g)	Days to maturity	Plant height (cm)	No. of pods /plant	No. of branches /plant
1	0-1g	<90	>50	<5	<2
2	1-2g	91-100	50-75	5-10	2-3
3	2-3g	101-110	75-100	10-15	3-4
4	3-4g	111-120	100-125	15-20	4-5
5	>4 g	>120	>125	>20	>5

quantified into discrete classes by using different scales (Table 4). For seed yield 13 lines had the seed yield/plant less than 1g, whereas only 3 lines namely, HPKC-6, HPKM-51 and DMK-12 had seed yield/plant more than 4g. For days to maturity, it was observed that all the lines matured within 91 to 120 days and were uniformly distributed in all the three classes. Medium plant height was observed for 41 lines (65%) ranging from 75-100cm, whereas, 7 lines were having the plant height from 50-75cm. None of the lines had plant height less than 50 cm or more than 125 cm. For plant 20 and 24 lines pods per plant were between 5-10 and 10-15 respectively. Six lines namely, HPKC-33, HPKC-50, HPKC-17, HPKC-34, DMK-12 and HPKM-51 have produced more than 20 pods/plant. Thirty one lines had 2-3 branches/plant, whereas only one line, namely HPKC-43 had more than 5 branches. On the basis of evaluation of germplasm for various traits the lines namely, HPKC-1, HPKC-6, HPKC-7, HPKC-9, HPKM-51 and DMK-12 were found to be potential lines, which need to be evaluated further in multilocation trials. These lines were also evaluated for disease resistance under natural conditions by following the standard scale. Bean anthracnose (*Colletotrichum truncatum*) is an important disease appeared at early stage of growth, which causes heavy losses when appeared in epidemic (Sharma *et al.*, 1999). Data recorded for bean anthracnose with respect to disease incidence and disease severity revealed that most of the lines were moderately resistant. Whereas only three lines namely, HPKC-39, HPKC-57 and HPKC-33 were free from this disease.

Acknowledgements

The authors are grateful to Dr JC Rana, Senior Scientist, NBPGR, Shimla for supplying the seed of some of the lines included in the trial.

References

Jayaraj AP, FI Toverly, MR Lewin and CG Clarck (2000) Duodenal ulcer prevalence: Experimental evidence for the possible role of dietary lipids. *J. Gastroenterology and Hepatology* **15**: 610-616.

Rajan Sharma, RP Kaushal and R Sharma (1999) Characterization of pathogenic variability in *Colletotrichum truncatum* in Himachal Pradesh. *Indian Phytopathology* **52**: 389-392.

Venkateswarlu O (2000) Genetic variability in horsegram. *Agri. Sci. Digest* **20**: 64-65.

Tripathi AK (1999) Variability in horsegram. *Annals of Agri. Res.* **20**: 382-383.