The Bioscan 9(4): 1743-1745, 2014 (Supplement on Genetics and Plant Breeding) www.thebioscan.in
AN INTERNATIONAL QUARTERLY JOURNAL OF LIFE SCIENCES

VARIABILITY AND ASSOCIATION OF AGRONOMIC CHARACTERS IN MUNGBEAN

R. S. PAN*, A. K. SINGH AND S. KUMAR
ICAR Research Complex for Eastern Region Research Centre, Plandu,
Namkum, Ranchi - 834010, Jharkhand, INDIA
e-mail: rabispan@rediffmail.com

KEYWORDS
Genetic variability
Correlation
Mungbean

Received on :
13.02.2014

Accepted on :
07.10.2014

***Corresponding author**

ABSTRACT
In nine genotypes of mungbean, the maximum extent of genetic variability was exhibited by100-seed weight followed by number of pods/plant. These two characters indicating the possibility of their improvement through individual plant selection also recorded high heritability coupled with high genetic advance. The grain yield was positively correlated with pod length, number of seeds/pod and number of pods/plant which could be considered as important selection criteria in improvement of grain yield of mungbean. The genotypes K-851 (2.49 t/ha), HARSHA (2.42 t/ha) and VC 6368 (46-40-4)(2.40 t/ha) were found promising in respect of grain yield and could be considered promising for rainy season cultivation in Eastern Plateau and Hill Region of India.

INTRODUCTION

Mungbean (*Vigna radiata* (L.) Wilczek) is an important annual pulse legume of tropical, subtropical and temperate zone of Asia including Bangladesh, India, Pakistan, Myanmar, Indonesia, Philippines, Sri Lanka, Nepal, China, Korea and Japan. It is also cultivated in Australia, East Africa and United States of America. Mungbean is a rich source of protein (22-24%) and essential amino acid lysine. Mungbean is easy to cook and easily digestible. Mungbean sprouts can provide additional iron which is deficient in South Asian diets. Mungbean also improves soil fertility through symbiotic nitrogen (30-74 kg/ha) fixation (Malik, 1994). Raman and Sinhamahapatra (2014) reported that the seeding of closer spacing enhanced seed yield and biological yield in *Vigna mungo*. This short duration crop is grown both as a sole crop and as a component crop in inter and multiple cropping system. Prasad *et al.* (2014) reported that the Mungbean (*V. radiata*) under guava based Agri-Horti System inoculated with *Rhizobium* and standard dose of phosphorus showed positive relationship in the yield of Guava and Mungbean. In Eastern Plateau and Hill Region of India, it is mainly grown as a rainfed crop in monsoon and post-monsoon seasons. The productivity of mungbean in this region is very low (300-400 kg/ha). Concerted breeding efforts made by AVRDC-The World Vegetable Centre resulted in development of Mungbean Yellow Mosaic Virus (MYMV) resistant breeding lines with a yield potential of 2.5 t/ha in about 65-70 days (Anonymous, 2001). For improvement of grain yield of mungbean, it is essential to have knowledge on variability of different characters. The variability of a biological population is an outcome of genetic constitution of individuals making up that population in relation to prevailing environment. A survey of genetic variability with the help of suitable parameters such as genotypic coefficient of variation, heritability and genetic advance are absolutely necessary to start an efficient breeding program. Yield is the end product of interaction of many correlated characters and selection for yield would be effective when based on the characters, which are highly heritable and positively correlated. Keeping the focus on improvement of grain yield of mungbean in Eastern Plateau and Hill Region of India, nine improved lines of mungbean were introduced and evaluated at ICAR RCER Research Centre, Ranchi (Altitude 629 m: longitude of 85º20^ to 85º95^; latitude of 23º15^ to 23º18^^North) to assess the genetic variation in germplasm for grain yield and its components and their association and to identify the suitable genotype for the region.

MATERIALS AND METHODS

The experimental material consisted of nine improved lines of mungbean. Eight lines were introduced from AVRDC-The World Vegetable Centre' s Regional Centre for South Asia, Hyderabad, India and the released variety K-851 was collected from local market. These were evaluated during rainy season (July-September) of 2011 in RBD with three replications. The standard agronomic practices were maintained to raise a good crop. N, P and K fertilizers @ 25-50-25kg/ha were applied. A spacing of 30 cm x 10 cm was maintained. Sixty plants were grown in each replication. Ten randomly selected plants were used for recording pod and grain characters in each replication. Data were recorded on days to 50% flowering, days to 1st dry pod harvest, pod length, number of pods/plant, number of seeds/pod, 100 dry seed weight and grain yield/

Table 1: Performance of 9 mungbean germplasm in respect of yield traits

Lines	Days to 50% flowering	Days to 1st harvest	No. of pods/plant	Pod length (cm)	No. of seeds /pod	100-seed weight (g)	Grain yield/ plant(g)
VC 3890 A	34.00	69.00	10.26	10.26	12.13	5.57	6.94 (2.31 t/ha)
VC 6372(45-8-1)	30.33	56.00	12.60	9.78	12.33	4.33	6.72 (2.23 t/ha)
VC 6368(46-40-4)	30.66	56.00	11.75	9.96	13.60	4.52	7.22 (2.40 t/ha)
NM-92	35.33	58.33	12.09	9.43	12.33	3.76	5.55 (1.84 t/ha)
SML 668	32.33	56.00	12.34	9.75	12.26	4.22	6.38 (2.12 t/ha)
CM 9-5	34.66	69.00	8.51	9.53	11.60	6.18	6.11 (2.03 t/ha)
BARIMUNG-4	39.66	58.00	16.02	7.44	12.13	3.14	6.10 (2.03 t/ha)
HARSHA	36.66	59.00	14.68	9.46	11.86	4.17	7.27 (2.42 t/ha)
K-851	29.66	56.00	14.99	9.76	12.73	3.93	7.50 (2.49 t/ha)
General mean	33.59	59.70	12.58	9.48	12.33	4.42	6.64 (2.21 t/ha)
SEM	0.40	0.34	0.40	0.12	0.24	0.09	0.17
CV (%)	2.09	0.99	5.52	2.34	3.48	3.69	4.66
CD at 5%	1.21	1.03	1.20	0.38	0.74	0.28	0.53
CD at 1%	1.67	1.41	1.65	0.52	1.02	0.38	0.73

Table 2: Mean sum of squares (treatment), mean, parameters of variance, heritability and genetic advance for seven characters in mungbean germplasm

Characters	Mean sum of squares	Mean	Coefficient of variation		Heritability (%)	Genetic advance	Genetic advance as percentage of mean
			Genotypic(%)	Phenotypic(%)	(k = 2.06)		
1.Days to 50% flowering	30.64**	33.59	9.43	9.66	95.30	6.37	18.96
2.Days to 1st harvest	87.37**	59.70	9.02	9.07	98.78	11.02	18.45
3. Number of pods/plant	16.86**	12.58	18.56	19.37	91.85	4.61	36.64
4. Pod length (cm)	1.96**	9.48	8.42	8.74	92.81	1.58	16.66
6. 5. No. of seeds /pod	0.97**	12.33	4.16	5.43	58.87	0.81	6.56
7. 6. 100-seed weight (g)	2.57**	4.42	20.82	21.15	96.94	1.87	42.30
7. Grain yield/ plant (g)	1.27**	6.64	9.41	10.50	80.30	1.15	17.31

** Significant at 1% level

plant. Analysis of variance was calculated (Panse and Sukhatme, 1985). The genotypic coefficient of variation (GCV) and phenotypic coefficient of variation (PCV) were estimated (Burton, 1952). Heritability in a broad sense and genetic advance were computed (Johnson *et al.*, 1955). The correlations were worked out (Al-Jibouri *et al.*, 1958)

RESULTS AND DISCUSSION

Highly significant differences were observed among the nine mungbean genotypes for all the seven quantitative characters (Table 1 and 2). Similar trend of significant differences for pod length, number of pods/plant, number of seeds/pod, 1000-seed weight and total seed yield/plant were observed in estimation of genetic diversity of 20 mungbean genotypes in Malayasian tropical environment (Abna *et al.*, 2012). The degree of variability shown by different characters can be judged by the values of GCV and PCV. The maximum extent of genetic variability was exhibited by 100-seed weight followed by number of pods/plant. Similar results were obtained in variability study of mungbean in Bangladesh (Rahim *et al.*, 2010) and Pakistan (Tabasum *et al.*, 2010). These characters having high GCV values have a better scope of improvement through selection. The differences between GCV and PCV were not of

high magnitude for all the characters, which indicated the minimum influence of environment in expression of these characters. This suggests that selection can be effective on the basis of phenotype alone with equal probability of success.

With the help of GCV alone, it is not possible to determine the extent of variation that is heritable. So, the knowledge of heritability of a character helps the breeder in predicting the genetic advance for any quantitative character and aids in exercising selection pressure. The broad sense heritability was very high for days to 1st harvest, 100-seed weight, days to 50% flowering, pod length, number of pods/plant and grain yield/plant indicating less influence of environment in the expression of these characters.

The heritability estimate along with genetic advance is more useful than the heritability alone in predicting the resultant effect of selecting the best individual genotype as it suggests the presence of additive gene effects (Johnson *et al.*, 1955; Panse, 1957). High heritability along with high genetic advance was recorded in characters viz., 100-seed weight and number of pods/plant. The similar results were obtained in study of variability of mungbean in Bangladesh (Rahim *et al.*, 2010). These characters also recorded high values of GCV and PCV, which indicated that the characters could be improved through individual plant selection.

In correlation studies, grain yield/plant was found to be positively and non-significantly correlated with pod length, number of seeds/pod and number of pods/plant (Table 3). The similar results of positive correlation of grain yield with number of pods/plant and number of seeds/pod were obtained

Table 3: Genotypic (G) and Phenotypic (P) correlation coefficient between 7 characters of 9 mungbean germplasm

Characters		X_1	X_2	X_3	X_4	X_5	X_6	X_7
X_1 Days to 50% flowering	G		0.30	0.19	-0.79*	-0.60	-0.20	-0.60
	P		0.30	0.21	-0.73*	-0.50	-0.19	-0.48
X_2 Days to 1st harvest	G			-0.70*	0.18	-0.62	0.83**	-0.17
	P			-0.66*	0.16	-0.47	0.80**	-0.16
X_3 Number of pods/plant	G				-0.59	0.17	-0.89**	0.23
	P				-0.53	0.13	-0.87**	0.29
X_4 Pod length	G					0.29	0.58	0.44
	P					0.18	0.55	0.40
X_5 Number of seeds/pod	G						-0.29	0.43
	P						-0.27	0.38
X_6 100-seed weight	G							0.07
	P							0.05
X_7 Grain yield/plant	G							
	P							

* Significant at 5% level ** Significant at 1% level

in study of variability of mungbean in Bangladesh (Rahim *et al.*, 2010). So, selection for pod length, number of seeds/pod and number of pods/plant in positive direction could result in substantial improvement in grain yield of mungbean.

On the basis of yield performance (Table 1), the genotypes line K-851 (2.49 t/ha), HARSHA (2.42 t/ha) and VC 6368 (46-40-4) (2.40 t/ha) performed better in respect of grain yield and could be considered promising for rainy season cultivation in Eastern Plateau and Hill Region of India

REFERENCES

Anonymous 2001. DFID Report on Promotion of Mungbean Research Outputs for Farmer Adoption in South Asia.

Al-Jibouri, H. H., Miller, P. A. and Robinson, H. F. 1958. Genotypic and environmental variances and covariances in upland cotton crosses of inter-specific origin, *Agronomy J.* **50:** 633-637.

Abna, F., Golam, F. and Bhassu, S. 2012. Estimation of genetic diversity of mungbean (*Vigna radiata* (L.) Wilczek) in Malayasian tropical environment. *African J. Microbiol. Res.* **6(8):** 1770-1775.

Burton, G. W. 1952. Quantitative inheritance in grasses. *Proc. International Grassland Congress.* **1:** 277-288.

Johnson, H. W., Robinson, H. F. and Comstock, R. E. 1955. Estimates of genetic and environmental variability in soybean. *Agronomy J.* **47:** 314-318.

Malik, B. A. 1994. "Grain legumes". *In*: M.S. Nazir (ed.) *Crop Production,* National Book Foundation, Islamabad, Pakistan. p. 301.

Panse, V. G. and Sukhatme, P. V. 1985. Statistical Methods for Agricultural Workers. *4th Edition, ICAR*, New Delhi.

Panse, V. G. 1957. Genetics of quantitative characters in relation to plant breeding. *Indian J. Genet.* **47:** 318-328.

Prasad, S. K., Singh, M. K. and Jay, S. 2014. Response of *Rhizobium* inoculation and phosphorus levels on Mungbean (*Vigna radiata*) Under Guava-Based Agri-Horti System. *The Bioscan.* **9(2):** 557-560.

Rahim, M. A., Mia, A. A. Mahmud, F., Zeba, N. and Afrin, K. S. 2010. Genetic variability, character association and genetic divergence in Mungbean (*Vigna radiata* L. Wilczek). *Plant Omics J.* **3(1):** 1-6.

Raman, R. B. and Sinhamahapatra, S. P. 2014. A dwarf determinate plant type for achieving higher and stable yield in blackgram (*Vigna mungo* L. Hepper). *The Bioscan.* **9(2):** 497-500.

Tabasum, A., Saleem, M. and Aziz, I. 2010. Genetic variability, trait association and path analysis of yield and yield components in mungbean (*Vigna radiata* (L.) Wilczek). *Pakistan J. Bot.* **42(6):** 3915-3924.