Indian J. Genet., **63**(1): 77-78 (2003)

Short Communication

Studies on genetic divergence over stress and non-stress environment in mungbean [*Vigna radiata* (L.) Wilczek]

B. L. Patil[1], V. S. Hegde and P. M. Salimath

University of Agricultural Sciences, Dharwad 580 005

(Received: March 2001; Revised: January 2003; Accepted: January 2003)

Thirty six genotypes of mungbean [*Vigna radiata* (L.) Wilczek] which consisted of both released varieties and advanced lines representing genotypes pre-selected for resistance or tolerance to different stress conditions, maintained at IARI Center for Pulses Improvement, UAS, Dharwad, Karnataka were used for the study. The experiment was carried in three environments involving stress and non-stress conditions to understand the genetic diversity as influenced by the change in environment.

These were grown in three distinct rainfed environments: E_1 (Recommended dose of fertilizers + plant protection chemicals), E_2 (Only recommended dose of fertilizers) and E_3 (Fertilizer and pesticide free conditions) at Agricultural College, Dharwad. The characters studied were plant height (PH), branches per plant (BPP), clusters per plant (CPP), pods per plant (PPP), seeds per pod (S/P), 100 seed weight (100 SW), biological yield (BY), harvest index (HI), days to initiation of flowering (DIF), days to 50% flowering (D50%F), days to initiation of pod maturity (DIPM), days to 75% pod maturity (D75%PM), powdery mildew at 45 (PM45D), 60 days (PM60D) and mung yellow mosaic virus (MYMV)], which were selected because of their association with yield as reported by many authors in their previous studies.

The pathological traits were scored by following th 0-9 disease rating scale by referring to the standard area diagrams [1, 2] and subjected to Arc Sine transformation and then used for statistical analysis. The test of homogeneity of error variances was found significant and hence the Mahalonobis' distance (D^2) were calculated separately for each environment [3]. The simultaneous test for significance based on Wilk's criterion for pooled effect of all the characters in all the test environments showed significant differences among the varieties, thus indicating the presence of considerable amount of genetic variability for different characters.

The genotypes fell into 5 clusters in E_3, 10 in E_2 and 9 in E_1 and the maximum number of genotypes (30) were included in cluster I under stress environment E_3. In contrast, the number of clusters containing single genotype were high in E_2 followed by E_1 and E_3. The variation in the clustering pattern is indicative of high $g \times e$ interaction influencing genotypes mean in different environments, thereby emphasizing importance of multi-environment studies for quantitative assessment of genetic diversity. Variation in clustering pattern was also observed with the change of growing season and fertility levels [4-6].

Under extreme stress conditions (E_3), only 5 clusters were obtained. This shows that such conditions were less efficient in differentiating different genotypes. It is therefore suggested that optimum environmental conditions should be provided to facilitate fullest expression of characters for the best classification of genotypes. It also depends on the breeding objective i.e. in what environmental conditions the varieties to be developed are intended to be released.

The factors responsible for differentiation of intra and inter-cluster levels were different in different environments, as indicated by the cluster means of the various characters (Table 1). In all the three environments, the pathological characters contributed the maximum (Table 2). Based on the *per se* performance, it is very clear that K 851, LM 608 and LM 5-12 are more genetically diverse than the other genotypes in all the three environments.

References

1. **Wheeler B.E.J.** 1969. An Introduction to Plant Diseases, John Wiley and Sons Ltd., London, U.K., p. 301.
2. **Mayee C.D. and Datar V.V.** 1986. Phytopathometry. Marathawada Agricultural University, Parbhani, pp. 33-37.
3. **Mahalanobis P.C.** 1936. On the generalized distance in statistics. *In*: Proceedings of National Academy of Sciences, India, **2**: 49-55.

Table 1. Clusterwise mean of characters important for the selection under favourable and unfavourable environments of mungbean

Character	Environment	Cluster									
		I	II	III	IV	V	VI	VII	VIII	IX	X
PPP	E_1	25.03	27.03	34.40	29.67	26.87	41.13	33.27	36.27	50.27	
	E_2	28.25	40.20	22.93	24.07	36.53	20.67	31.20	24.60	26.73	28.40
	E_3	33.41	17.87	27.53	20.11	22.27					
100SW	E_1	2.68	3.27	3.15	3.25	2.67	3.00	2.39	2.94	3.04	
	E_2	2.98	2.65	2.74	6.35	2.83	2.8	3.14	2.19	2.70	2.86
	E_3	3.05	3.03	2.50	2.67	2.45					
SY	E_1	6.71	7.89	10.77	7.58	7.17	9.90	9.75	7.88	10.21	
	E_2	6.59	8.95	4.92	6.35	4.69	4.20	7.42	5.44	5.07	8.56
	E_3	5.43	2.08	6.42	5.2	4.16					
BY	E_1	22.45	24.15	19.96	27.55	18.13	26.68	24.22	19.14	31.85	
	E_2	19.79	23.74	11.59	18.47	19.95	13.26	15.82	18.57	12.75	20.91
	E_3	15.55	9.42	18.98	16.58	10.10					
HI	E_1	0.29	0.33	0.39	0.34	0.39	0.35	0.40	0.41	0.32	
	E_2	0.33	0.38	0.42	0.34	0.23	0.31	0.47	0.29	0.40	0.41
	E_3	0.36	0.22	0.34	0.32	0.41					
PM (45D)	E_1	3.48	6.97	19.30	0.28	9.92	8.39	0.03	33.35	32.13	
	E_2	19.51	12.37	43.48	5.19	3.88	27.20	19.17	5.15	0.28	0.28
	E_3	24.33	44.18	21.40	4.15	11.88					
PM (60D)	E_1	15.72	22.58	22.56	9.39	25.73	9.60	11.58	42.04	36.35	
	E_2	49.53	30.45	61.20	51.24	31.81	65.66	33.05	25.01	37.39	5.78
	E_3	76.54	99.72	49.90	29.25	25.21					
MYMV	E_1	86.73	9.78	0.79	28.58	25.62	30.36	4.46	0.28	7.97	
	E_2	5.82	22.45	1.40	40.11	0.28	2.30	37.81	29.84	21.13	0.79
	E_3	6.12	0.79	0.28	20.89	6.75					

Table 2. Relative contribution of different characters of mungbean towards divergence in E_1, E_2 and E_3

Source (Character)	Times ranked 1st			Per cent contribution		
	E_1	E_2	E_3	E_1	E_2	E_3
PH	110	94	94	17.46	14.92	14.92
PPP	77	30	39	12.22	4.76	6.19
BY	46	8	6	7.30	1.27	0.95
DIF	2	2	0	0.32	0.32	0.00
DIPM	0	0	1	0.00	0.00	0.16
PM (45D)	65	101	93	10.32	16.03	14.76
PM (60D)	103	219	313	16.35	34.76	49.68
MYMV	227	176	84	36.05	27.94	13.33

Note: The relative contribution of the characters BPP, CPP, PPC, S/P, 100SW, SY, HI, D50%F, D75%PM towards divergence is zero.

4. **del Rio A.H., Bamberg J.B., Huaman Z.** 1997. Assessing changes in the potato gene banks. Theor. Appl. Genet., **95**: 199-204.

5. **Ramana M.V. and Singh D.P.** 1987. Genetic divergence in Mungbean. Crop Improv., **14**: 23-27.

6. **Naidu N.V. and Satyanarayana A.** 1991. Studies on genetic divergence over environment in mungbean. Indian J. Genet., **51**: 454-460.