Performance of pre-*kharif* mungbean genotypes under varying fertility levels in West Bengal

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Mungbean [*Vigna radiata* (L.) Wilczek] is an important pulse crop mainly grown during pre-*kharif* season in West Bengal. Being protein rich crops, pulses require more energy inputs per unit of production as compared to cereals. Despite this fact, these crops are grown on impoverished soils mainly without any external addition of nutrients. Consequently, multi-nutrient deficiencies causing yield reduction are not uncommon (Srinivasarao *et al*., 2003). It is, therefore, imperative to apply fertilizer nutrients in proper quantity and balanced proportion for realizing good yield potentials of improved mungbean genotypes. Keeping these points in view, the present study was undertaken to evaluate the performance of various genotypes of mungbean under different fertilizer management practices.

A field experiment was conducted for two consecutive years of 2005 and 2006 during pre-*kharif* season at the Pulses and Oilseeds Research Sub-station, Beldanga, Murshidabad, West Bengal, situated at 23º55′ N latitude and 88º15′ E longitude. The experimental soil was sandy loam in texture with pH 7.3, EC 0.39 dsm^{-1}, organic carbon 0.20%, available P_2O_5 75 kg ha^{-1}, available K_2O 49 kg ha^{-1} and available SO_4 16.8 kg ha^{-1}. The experiment, consisting of twelve treatment combinations having four different genotypes *viz*. Pusa Vishal, HUM 12, PDM 11 and Pusa 9531, and three fertility levels *viz.* control (no fertilizer), 100% recommended dose (RD) and 100% RD + micronutrients i.e. Zn, B and Mo, was laid out in RBD with factorial arrangement, keeping each treatment in four replications. Individual plot size was 4m x 3m. As per treatment schedule, recommended dose of fertilizers at 20:40:20:20 kg $N:P_2O_5:K_2O:S$ ha^{-1} were applied as basal, whereas micronutients *viz.* Zn, B and Mo were applied at the recommended dose of 15 kg $ZnSO_4$ (21% Zn), 10 kg borax (10.5% B) and 1 kg sodium molybdate (39% Mo) ha^{-1}, respectively. Seeds were inoculated with the culture of *Rhizobium* sp. (cowpea / miscellany group) at the rate of 20 g kg^{-1} seed before sowing. The crop was sown on March 03 and 21 during 2005 and 2006, respectively, at a spacing of 30 cm x 10 cm using a seed rate of 30-40 kg ha^{-1}, depending upon the seed size of individual genotype. The previous crop in the experimental site was yellow sarson and chickpea during *rabi*, 2004-05 and 2005-06, respectively. The crop was raised with recommended package of practices. Harvesting dates of the genotypes along with their maturity period were presented in Table 1. Rainfall received during the crop growth period was 44.9 and 314.8 mm during 2005 and 2006, respectively. Observations on growth, yield attributes and seed yield of mungbean were recorded at harvest.

Effect of genotype

Growth, yield attributes and seed yield of mungbean varied significantly amongst different genotypes under study (Table 2). Amongst the genotypes, PDM 11 exhibited significantly the highest seed yield (1079.42 kg ha^{-1}) during 2005 which was attributed to more number of productive pods $plant^{-1}$ (18.35). This was followed by Pusa Vishal (891.67 kg ha^{-1}), HUM 12 (860.83 kg ha^{-1}) and Pusa 9531 (802.50 kg ha^{-1}) in the first year, whereas in the second year of experimentation, Pusa Vishal produced the highest seed yield (955.42 kg ha^{-1}) owing to maximum weight of thousand seeds (45.60 g), followed by HUM 12 (813.75 kg ha^{-1}), PDM 11 (797.92 kg ha^{-1}) and Pusa 9531 (762.50 kg ha^{-1}). Better yield performance of PDM 11 (938.67 kg ha^{-1}) was attributed to more number of productive pods $plant^{-1}$ as well as longer duration of the genotype for maturity. Bora *et al.* (2006), however, reported the highest grain yield in Pusa 9531(1197 kg ha^{-1}) which remained at par with Pusa Vishal (1125 kg ha^{-1}) and PDM 11 (1189 kg ha^{-1}). All the genotypes excepting PDM 11 matured comparatively earlier (60-63 days), irrespective of fertility levels.

Effect of fertility level

Various levels of fertilizer management had no significant response on growth and yield attributes of mungbean except seed yield (Table 2). Regardless of the genotypes, basal application of full doses of NPKS along with micronutrients significantly

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recorded the highest yield (920.01 kg ha^{-1}) in comparison to the other treatments *viz.* no fertilizer and 100% RD of fertilizers (Table 3). Bhattacharyya (1998) made similar recommendation for mungbean in West Bengal. Ahlawat and Shivakumar (2002) were of the opinion that N, P, K, S, Zn and B were the important nutrients from application point of view to pulse crops, and P, Mo, B, etc. were useful in enhancing N fixation. Negative balance of Zn, B and Mo in soil was reported in considerable parts of West Bengal (Ali, 2005). Bhattacharyya *et al*. (1998) reported significant response of different crops to application of micronutrients (Zn, B and Mo) along with NPK. Ganeshamurthy *et al*. (2004) reported that integrated and balanced fertilization, invariably with micronutrient application, was essential in order to realize the full potential of pulse cultivars.

From the experimental findings, it might be stated that the genotypes PDM 11 and Pusa Vishal were promising as compared with HUM 12 and Pusa 9531 in respect of seed yield. Irrespective of the genotypes, fertilizer management with recommended doses of $N:P_2O_5:K_2O:S$ at 20:40:20:20 kg ha^{-1} along with micronutrients (15 kg $ZnSO_4$, 10 kg borax and 1 kg sodium molybdate ha^{-1}) proved to be the effective.

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Table 1. Harvesting time and maturity period of different mungbean genotypes

Genotype	Harvesting date		Days to maturity		
	2005	2006	2005	2006	Mean
Pusa Vishal	May 05	May 17	63	57	60
HUM 12	May 05	May 23	63	63	63
PDM 11	May 23	May 30	81	70	76
Pusa 9531	May 05	May 18	63	58	61

Table 2. Effect of treatments on crop growth, yield attributes and seed yield of mungbean

Treatments	Plant height (cm)		Branches plant^{-1}		Productive pods plant^{-1}		Seeds pod^{-1}		1000-seed weight (g)		Seed yield (kg ha^{-1})		
	2005	2006	2005	2006	2005	2006	2005	2006	2005	2006	2005	2006	Pooled
Genotype (G)													
Pusa Vishal	40.18	40.03	3.00	3.40	7.03	9.55	9.53	10.28	45.6	49.8	891.67	955.42	923.55
HUM 12	35.67	39.98	3.22	3.91	7.88	11.65	9.02	9.63	41.4	41.3	860.83	813.75	837.29
PDM 11	58.50	67.37	5.36	5.83	18.35	15.00	9.92	9.68	33.4	35.2	1079.42	797.92	938.67
Pusa 9531	45.53	47.40	2.47	4.42	7.93	12.32	9.73	11.05	34.4	39.2	802.50	762.50	782.50
S.E.m(±)	**1.07**	**1.06**	**0.16**	**0.21**	**0.28**	**0.62**	**0.18**	**0.23**	**0.8**	**0.6**	**18.54**	**21.38**	**19.96**
LSD(P=0.05)	**3.07**	**3.05**	**0.45**	**0.60**	**0.80**	**1.79**	**0.52**	**0.66**	**2.2**	**1.7**	**53.31**	**61.47**	**57.38**
Fertility level (F)													
Control	43.08	46.86	3.35	4.11	9.94	11.60	9.25	9.86	37.2	40.5	865.88	786.56	826.22
100% RD	45.66	48.85	3.55	4.40	10.30	11.84	9.64	10.17	38.9	41.2	893.06	837.50	865.28
100% RD + Micronutrients	46.18	50.38	3.63	4.66	10.66	12.95	9.76	10.45	40.1	42.4	966.88	873.13	920.01
S.E.m(±)	**0.93**	**0.92**	**0.14**	**0.18**	**0.24**	**0.54**	**0.16**	**0.20**	**0.7**	**0.5**	**16.06**	**18.52**	**17.29**
LSD(P=0.05)	**NS**	**2.64**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**1.9**	**NS**	**46.17**	**53.23**	**49.70**
Interaction (G x F)													
S.E.m(±)	**1.85**	**1.84**	**0.27**	**0.36**	**0.48**	**1.08**	**0.31**	**0.40**	**1.3**	**1.0**	**32.12**	**37.03**	**34.58**
LSD(P=0.05)	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**
CV (%)	**8.23**	**7.54**	**15.52**	**16.44**	**9.41**	**17.75**	**6.58**	**7.89**	**6.96**	**5.01**	**7.07**	**8.90**	**7.99**

RD: Recommended dose; NS: Not significant