

Performance of french bean (*Phaseolus vulgaris* L.) genotypes under different fertility levels

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ABSTRACT

A field experiment was carried out during *rabi* season of 2005-06 at Department of Agronomy farm, MAU, Parbhani to investigate the performance of french bean (*Phaseolus vulgaris* L.) genotypes under different fertility levels. The experiment was laid out in factorial 'Randomized Block Design' with three replications. Each replication consisted of twelve treatment combinations of four varieties *i.e.* Contender, Waghya, HPR-35, Varun and three fertility levels 90:45:45 NPK kg.ha⁻¹, 120:60:60 NPK kg.ha⁻¹, 150:75:75NPK kg.ha⁻¹. Variety HPR 35 recorded significantly higher plant height, branches, total dry matter, seed and straw yield over rest of the varieties. Application of 120:60:60 NPK kg.ha⁻¹ was at par with 150:75:75 NPK kg.ha⁻¹ and recorded significantly higher number of pods per plant, 100 seed weight and seed yield over application of 90:45:45 NPK kg.ha⁻¹

Key words : Frenchbean, Varieties, Fertility level, Grain yield

INTRODUCTION

The ancestor of modern french bean were originated in south and central America. The green pods are mildly diuretic and contain a substance that reduces the blood sugar level. The dried mature pod is used in the treatment of diabetes. Though it is leguminous and short durational crop, it is unable to fix atmospheric nitrogen so nitrogen demand of this crop is much higher. The application of nitrogen induces the flower bud formation and ultimately the pod and finally yield. To increase the per hectare production of this crop, growing high yielding varieties and adopting intensive cultivation practices like use of fertilizers etc. can be adopted. Workers in India and abroad observed positive response of french bean from improved cultivars, major and minor plant nutrients, sowing time, irrigation and *Rhizobium* culture in number of field trials and pot culture experiments. Today, it is the need of the hour to make all possible efforts to utilize various sources for increasing nutrient levels in plant or soil in order to maintain the soil fertility and increase the production of this crop. Nitrogen, phosphorus, and potassium are major essential elements which are generally required in large quantities for growth and higher yields of this crop. Most of the research workers had concentrated their work on phosphorus and potash application. The positive response of nitrogen in combination with potash and phosphorus were reported by Lugo Lopez (1977). Particularly in Marathwada region identification of suitable varieties and optimum fertilizer dose is highly essential. The research work on nutrition and varietal aspects is, therefore, undertaken in consequently.

MATERIALS AND METHODS

The present investigation was carried out at department of Agronomy farm, Marathwada Agricultural University, Parbhani during *rabi* season of 2005-06. The topography of experimental plot was fairly leveled. The soil was about 100 cm deep and clayey loam in texture and moderately fertile being low in organic carbon (0.56 %), high in phosphorus (26.19 kg.ha⁻¹) and very high in potassium (391.12 kg.ha⁻¹). The experiment was laid out in factorial Randomized Block Design with three replications. Each replication consisted of twelve treatment combinations of four varieties (Contender, Waghya, HPR 35 and Varun) and three fertility levels (90:45:45, 120:60:60 and 150:75:75 NPK kg.ha⁻¹). The complete dose of phosphorus and potassium along with half dose of nitrogen per treatment were applied 6 to 10 cm deep in line to side of crop row through fertilizer grade 10:26:26 and urea, remaining half dose of nitrogen was applied 30 days after sowing through urea only. The sowing of crop was done on 21/11/2005 by keeping 45 cm spacing between rows and 10 cm between plants. The harvesting of crop was done at different times *viz.* Varun: 27.2.2006, HPR-35: 2.3.2006, Contender : 2.3.2006 and Waghya : 8.3.2006. All statistical analysis were performed using MAU, STAT statistical package.

RESULTS AND DISCUSSION

Effect of varieties:

All varieties recorded significant response at all growth and yield contributing characters. Variety HPR

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35 was found significantly superior over rest of the varieties (Varun, Waghya and Contendor) with respect to plant height, functional leaves, total dry matter and branches (Table 1). Variety varun was found at par with variety HPR 35 with respect to leaf area (dm²) and pod dry weight. Variety HPR 35 was found significantly superior with respect to 100 seed weight and seed yield

per plant over rest of all varieties while statistically significant number of seeds per pod were recorded with variety Contender. Highest numbers of pods per plant were recorded with variety Varun and HPR 35. Such varietal differences are observed due to genetic makeup of the varieties and such differences in french bean varieties were also observed by earlier research workers

Table 1: Effect of varieties and fertility levels on growth and yield contributing characters of frenchbean

Treatments	Plant height (cm)	Functional leaves at 75 DAS	Leaf area (dm ²) 75 DAS	No. of branches	Pod dry weight (g)	Total dry matter (g)	No. of pods/plant	No. of seeds/pod	Seed yield/plant (g)	100 seed wt. (g)
Varieties (V)										
V ₁ -Contender	20.83	10.26	7.55	3.57	9.38	11.87	6.45	5.33	6.62	27.66
V ₂ - Waghya	23.26	11.33	8.73	3.45	9.64	15.3	6.76	4.1	5.62	23.44
V ₃ - HPR 35	27.2	16.83	14.51	5.3	13.89	20.24	8.97	3.87	7.97	32.66
V ₄ - Varun	21.16	14.06	12.86	4.9	13.32	17.74	9.42	4.18	6.75	26.88
S.E. ±	0.3	0.18	0.71	0.03	0.32	0.69	0.32	0.14	0.26	0.923
C.D. (P=0.05)	0.88	0.34	2.10	0.09	0.94	2.04	0.93	0.41	0.77	1.24
Fertility levels (NPK kg/ha) (F)										
F ₁ - 90:45:45	22.1	10.95	9.32	3.8	10.99	15.98	7.17	4.34	5.91	26.41
F ₂ - 120:60:60	23.35	13.37	11.51	4.45	11.63	15.88	8.18	4.38	6.8	28.00
F ₃ - 150:75:75	23.92	15.05	11.91	4.67	12.05	17	8.35	4.39	7.5	28.58
S.E. ±	0.26	0.1	0.62	0.02	0.28	0.6	0.27	0.12	0.23	0.366
C.D. (P=0.05)	0.76	0.3	1.82	0.08	0.82	N.S	0.81	N.S	0.67	1.24
Interaction (VxF)										
S.E. ±	0.52	0.2	1.24	0.05	0.56	0.12	0.59	0.26	0.46	0.733
C.D. (P=0.05)	N.S	0.6	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S
G.M.	23.12	13.12	10.91	4.3	11.56	16.29	7.9	4.37	6.74	27.66

NS - Non significant

Table 2 : Effect of varieties and fertility levels on yield of frenchbean

Treatments	Seed yield (kg/ha)	Straw yield (kg/ha)	Biological yield (kg/ha)	Shelling percentage	Harvest index (%)
Varieties (V)					
V ₁ -Contender	925	1269	2194	66.36	42.16
V ₂ - Waghya	718	846	1664	65.33	43.15
V ₃ - HPR 35	1480	1852	3332	71.15	44.42
V ₄ - Varun	1335	1647	2982	69.14	44.77
S.E. ±	8.024	21.63	23.7	0.413	0.305
C.D. (P=0.05)	23.5	63.36	69.42	1.211	0.895
Fertility levels (NPK kg/ha) (F)					
F ₁ - 90:45:45	1021	1385	2406	67.62	42.44
F ₂ - 120:60:60	1152	1438	2590	69.57	44.88
F ₃ - 150:75:75	1171	1463	2634	68.44	44.46
S.E. ±	6.949	18.74	20.53	0.358	0.264
C.D. (P=0.05)	20.35	54.87	60.12	N.S	0.775
Interaction (VxF)					
S.E. ±	13.9	37.48	41.06	0.716	0.529
C.D. (P=0.05)	N.S	N.S	N.S	N.S	N.S
G.M.	1078	1392	2470	67.35	43.7

NS- Non significant

(Samal, 1997 and Anonymous, 2005).

Variety HPR 35 recorded significantly superior seed, straw and biological yield (kg/ha) over rest of all varieties (Table 2). Seed yield is a function of yield attributing characters; the significant seed yield resulted due to the increase in the yield attributes viz., number of pods per plant, seed per plant and 100 seed weight. Similar performance of varieties HPR 35 and Varun were observed in this study was reported earlier (Ali, 1989a and Anonymous, 2005).

Effect of fertility levels:

Highest values of plant height, functional leaves, leaf area, number of branches, pod dry weight and total dry matter were recorded with application of fertility level 150:75:75 NPK kg.ha⁻¹ (Table 1). Fertility level 120:60:60 kg.ha⁻¹ was found at par with fertility level 150:75:75 NPK kg.ha⁻¹ with respect to plant height, leaf area and pod dry weight, these reports are in the line to those reported by Ahlawat (1996). Substantial yield increase were noted with the application of higher fertility levels of 150:75:75 NPK kg/ha and 120:60:60 NPK kg/ha. The significant values of number of pods per plant, number of seeds per pod, seed yield per plant, 100 seed weight, seed yield (kg/ha), straw yield (kg/ha), biological yield (kg/ha) and harvest index were recorded at application of fertility level 120:60:60 kg.ha⁻¹. Similar effects of higher fertility level were also reported by Vyas *et al.* (1996) and Singh and Singh (2000).

Effect of interaction:

The interaction V x F was found significant at 75 DAS in influencing mean number of functional leaves per plant (Table 3).

Table 3 : Interaction effect of V x F on mean number of functional leaves for plant at 75 DAS

Treatments	F ₁	F ₂	F ₃	Mean
V ₁ - Contender	8.70	10.30	11.80	9.10
V ₂ - Waghya	9.10	11.16	13.13	11.33
V ₃ - HPR 35	14.90	17.20	18.40	16.83
V ₄ - Varun	11.10	14.40	16.70	14.06
Mean	10.95	13.37	15.05	13.12
S.E. ±	0.20	C.D. (P=0.05)		0.60

Data presented in Table 3 revealed that variety V₃ HPR 35 with the highest level of fertility F₃ recorded the highest value of number of functional leaves per plant (18.40) followed by same variety with F₂ fertility level. The least number of functional leaves per plant was recorded by treatment combination V₁F₁ (8.70). All the varieties produced significantly more number of functional leaves with every increase in fertility level. Under all the levels of fertilizer, variety HPR 35 performed well in leaf number followed by varieties varun, Waghya and the least number of leaves were produced by Contender.

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