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Podding pattern of Frenchbean (*Phaseolus vulgaris*) as influenced by fertility levels

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ABSTRACT

A field trial was conducted during 1989–90 and 1990–91 to study the effect of fertility levels on podding pattern of Frenchbean (*Phaseolus vulgaris* L.). Nitrogen and phosphorus had a positive effect on number of pods on primary and secondary branches along with total pods/plant in both the years up to 120 kg/ha. Number of pods on tertiary branches were influenced significantly by N in the second year up to 60 kg/ha level only. Potassium significantly influenced the number of pods on secondary branches and total pods/plant in both the years up to 60 kg/ha. Interaction of N and P affected the pods on primary and secondary branches and total pods/plant in both the years and on tertiary branches in the second year only. Interaction effect of N and K on tertiary branches and that of P and K on secondary branches influenced the pods significantly in the first year only. Grains/pod were significantly affected by N, P and K in the first year and by N in the second year. Nitrogen significantly increased the grain yield up to 120 kg/ha and P up to 60 kg/ha being at par with 120 kg P_2O_5/ha. However, K did not affect the yield significantly in any season. It was noticeable that grain yield increased in a linear fashion with the increase in the pods/plant and grains/pod in each year.

Frenchbean (*Phaseolus vulgaris* L.), a new introduction among the winter pulses in northern India, is mainly cropped for seed and green-pod purposes. Being a shy-nodulated crop, its fertilizer requirement particularly of nitrogen is very high. Katare *et al.* (1984) and Singh and Yadav (1986) reported that number of pods/plant and seeds/pod determine the grain yield in pulses to a considerable extent. The present study was therefore undertaken to judge the effect of fertility levels (nitrogen, phosphorus and potassium) on the podding aspect of Frenchbean along with its impact on seed yield as well.

METERIALS AND METHODS

The study was carried out during 1989–90 and 1990–91 at Vegetable Research Farm, Kalyanpur, Kanpur, in a silty loam soil. The soil had 0.27% organic carbon, 13.50 kg/ha phosphorus (average) and 219 kg/ha potassium (average), with 7.2–7.5 pH. Soluble salts were 0.25%. On an average soil was poor to medium in N, medium in P and K. Design choosen was 3^3 confounding replicated 3 times. Treatments comprised N, P and K, each at 3 levels (0, 60 and 120 kg/ha) forming 27 treatments. Frenchbean was planted on 4 November and 26 October during first and second year respectively. Planting was done in 30 cm wide rows. Plant-to-plant distance of 10 cm was maintained about 15 days after sowing by thinning and gap-filling. Half dose of N and full dose of P and K were dressed basal and

Table 1. Number of pods on different branches, seeds/pod and grain yield of Frenchbean

Main effect	Number of pods on (A)				Number of pods on (B)				Grains/pod		Grain yield (q/ha)	
	Primary branches	Secondary branches	Tertiary branches	Plant	Primary branches	Second branches	Tertiary branches	Plant	A	B	A	B
N (kg/ha)												
0	3.60	3.92	1.85	9.38	4.38	3.61	1.41	9.40	5.63	5.43	17.78	21.44
60	5.17	5.35	1.72	12.23	5.48	5.11	1.76	12.30	6.43	6.66	23.23	28.00
120	6.52	6.20	1.90	14.60	6.62	6.26	1.73	14.64	7.21	7.86	26.05	31.51
CD (P = 0.05)	0.22	0.21	NS	0.27	0.16	0.17	0.26	0.16	0.32	0.16	0.96	1.36
P (kg/ha)												
0	4.90	4.62	1.82	11.34	4.99	4.51	1.74	11.21	6.28	6.30	20.55	24.17
60	5.08	5.08	1.92	12.05	5.57	5.12	1.59	12.24	6.39	6.69	22.85	27.74
120	5.32	5.77	1.73	12.82	5.92	5.44	1.56	12.89	6.61	6.96	23.65	29.03
CD (P = 0.05)	0.22	0.21	NS	0.27	0.16	0.17	NS	0.16	NS	0.16	0.96	1.36
K (kg/ha)												
0	5.03	4.89	1.95	11.82	5.38	4.84	1.74	11.93	6.23	6.50	22.34	26.71
60	5.09	5.20	1.82	12.14	5.53	5.01	1.68	12.18	6.62	6.72	22.56	27.17
120	5.16	5.39	1.70	12.25	5.57	5.22	1.48	12.23	6.43	6.72	22.16	27.00
CD (P = 0.05)	NS	0.21	NS	0.27	NS	0.17	NS	0.16	NS	0.16	NS	NS

A, 1989–90; B, 1990–91

the rest N was applied as top-dressing in the standing crop after first irrigation in 2 splits. Besides pre-soaking irrigation, 3–4 irrigations were supplied to the experimental crop. Almost equal precipitation (50 mm) was received as winter rains in 2 years of experimentation. Rest of the parameters showed normal trend in both the years. Essential agronomic and crop-saving practices like disease and insect control were followed as per requirement of the crop. The experimental plot was thus kept as far as possible homogenous in both the years.

RESULTS AND DISCUSSION

Nitrogen

Every increase of 60 kg N/ha increased number of pods on primary and secondary branches and the total pods/plant in both the years, while the pods recorded on tertiary branches with the application of 60 kg N/ha followed by 120 kg N/ha were significantly higher than the control during the second year. A positive response to N may be due to its role in pronounced vegetative growth which resulted in more branching and protein formation in the plants. This resulted in increased number of pods/plant. Seeds/pod were also increased significantly with every dose of N up to the highest level. Similar pattern was noticed in seed yield. Pods/plant and seeds/pod established a linear trend with the seed yield (Table 1). These results confirm the findings of Khurana and Dudeja (1981).

Phosphorus

Pods on primary, secondary and tertiary branches as well as total pods/plant increased up to 120 kg P/ha in both the years. Since P is important in the development of the plant root and in increasing the number and size of grains and also in improving fruiting, the response is expected. A good response to P in Frenchbean was also reported by Ahlawat and Sharma (1989). But phosphorus could not affect the number of pods on tertiary branches significantly. Number of grains/pod was however affected significantly only in the second year, recording maximum grains/pod at higher level. Grain yield was increased up to the highest level of P, though the significant response was up to 60 kg P_2O_5/ha only (Table 1).

Potassium

Potassium incresed the number of pods on secondary branches as well as the total pods/plant during both the years, but significant increase was noticed only up to 60 kg/ha. However, the response was noticed up to 120 kg/ha in number of pods on secondary branches in the second year (Table 1). Like P, K also affected the grains/pod significantly only in the second year, where the response again ceased at 60 kg/ha and recorded 6.72 grains/pod, just equal to the higher dose. Potassium, however, failed to exert any significant influence on grain yield in any season of study and the yield recorded under 3 levels of study was very much comparable to each other (Table 1).

N x P interaction

Number of pods on primary, secondary branches and total pods/plant were affected significantly in both the years by N x P interaction, whereas number of pods on tertiary branches was affected only in the second year. Maximum number of pods on primary branches was recorded under N_{120} + P_{60} dose in both the years. The number of pods was 6.73 and 6.60 during first and second year respectively, whereas pods recorded on secondary branches was

Table 2. Effect of N x P interaction of fertilizers on pod yield of Frenchbean

N (kg/ha)	P (kg/ha)						CD (P = 0.05)	
	0		60		120		A	B
	A	B	A	B	A	B		
	Pods on primary branches							
0	3.20	3.40	3.50	4.47	4.10	5.27		
60	5.30	5.40	5.00	5.63	5.20	5.40		
120	6.19	6.17	6.73	6.60	6.64	2.10	0.39	0.28
	Pods on secondary branches							
0	6.63	3.43	4.06	3.57	4.08	3.83		
60	4.60	4.30	5.51	5.53	5.90	5.50		
120	5.60	5.80	5.67	6.27	7.33	7.00	0.36	0.29
	Pods on tertiary and other branches							
0	1.77	.48	1.93	1.49	1.86	1.27		
60	1.87	2.00	1.64	1.33	1.64	1.93		
120	1.83	1.76	2.18	1.96	1.69	1.47	NS	0.44
	Total pods/plant							
0	8.60	8.30	9.49	9.57	10.04	10.33		
60	11.80	11.70	12.16	12.74	12.83			
120	13.62	13.63	14.51	14.79	15.67	15.50	0.47	0.27

A, 1989–90; B, 1990–91

influenced up to the higher level both of N and P, i.e. $N_{120} + P_{120}$, maximum being 7.33 pods in the first year and 7.00 in the second year. Total pods/plant were also influenced up to the higher level ($N_{120} + P_{120}$) and the maximum were 15.50 and 15.67 during first and second year respectively. Number of pods on tertiary branches was affected significantly only in the second year and maximum pod number (2.00) was recorded under N_{60} compared with control of phosphorus (Table 2).

N x K interaction

The interaction was significant only in the first year for number of pods on tertiary branches (Table 3). However, maximum pods (2.10) were recorded in the control of N and P and the minimum (1.37) under the interaction of 60 kg N/ha and 120 kg P_2O_5/ha. Combination of N_{120} and P_{120} treatment however produced 2.03 pods, which was

Table 3. Effect of N x K interaction on pods/tertiary and other branches (1989–90)

N (kg/ha)	K (kg/ha)			CD (P = 0.05)
	0	60	120	
0	2.10	1.76	1.70	
60	1.90	1.89	1.37	
120	1.86	1.81	2.03	0.37

Table 4. Effect of P x K interaction on number of pods on secondary branches (1989–90)

P (kg/ha)	K (kg/ha)			CD (P = 0.05)
	0	60	120	
0	4.60	4.33	4.93	
60	4.62	5.27	5.34	
120	5.43	6.00	5.88	0.36

significantly superior to the lower level.

P x K interaction

The interaction was observed only for number of pods on secondary branches in the first year only. Application of phosphorus @ 120 kg/ha combined with 60 kg K_2O/ha recorded the maximum pods on secondary branches (6.00), though this was found on a par with P_{120} K_{120} (5.88 pods) and significantly superior to the control of N combined with 60 kg K_2O/ha (4.33) (Table 4).

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