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Effect of Spacing on Growth and Yield of French Bean (*Phaseolus vulgaris* L.) in Red and Lateritic Belt of West Bengal

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Abstract

A field experiment was conducted during *rabi* of 2005-06 and 2006-07 to study the effects of spacing on growth and yield of french bean under nine levels of spacing viz. 10 cm × 10 cm, 15 cm × 10 cm, 15 cm × 15 cm, 20 cm × 15 cm, 20 cm × 20 cm, 25 cm × 20 cm, 25 cm × 25 cm, 30 cm × 25 cm and 40 cm × 20 cm. Different spacing significantly influenced the various growth, yield attributes and ped yield in french bean. Closely spaced plants attained maximum height, but simultaneously recorded minimum number of branches and leaves per plant. Narrow spacing influenced most of the yield attributes positively by recording higher values. Closer spacing accommodated more number of plants per unit area that might contribute towards higher production; 15 × 10 cm spacing was found to be optimum to achieve higher pod yield in French bean under red and lateritic belt of West Bengal.

Key words : French bean, *Phaseolus vulgaris,* Spacing.

French bean (*Phaseolus vulgaris* L.) is an important leguminous vegetable that supplies easily digestible protein for the human diet. It is also rich source of minerals and vitamins (1). This crop is included in the crop rotation to maintain the soil fertility and productivity (2). Despite high yield potential, the actual yield of this crop is low. The role of adequate plant spacing regarded as major factor in determining the production of French bean. Several studies indicated the adequate requirement of spacing for better growth and development (3, 4) and yield attributes and pod yield in French bean (3, 5, 6). In general, french bean performed satisfactorily under red and lateritic belt of West Bengal.However, a location based trial was felt necessary to standardize the proper plant spacing for higher production in this region.

Methods

The experiment was conducted at Horticultural Farm, Institute of Agriculture, Sriniketan, West Bengal, during October 2005 to February 2006 and was again repeated in the next year. The soil was sandy loam in texture, neutral pH, moderate in available nitrogen, phosphorus and potash. The seeds of French bean var selection 9 (from Indo-American Hybrid Seeds, Bangalore) were sown in lines at a depth of 5 cm. The experiment was laid out in a randomized block design with three replications. A general dose of fertilizers in the form of urea, single super phosphate and muriate of potash were applied at 60, 120 and 80 kg N, P_2O_5 and K_2O per hectare, respectively. The treatments comprised nine levels of spacing viz. 10 cm × 10 cm, 15 cm × 10 cm, 15 cm × 15 cm, 20 cm × 15 cm, 20 cm × 20 cm, 25 cm × 20cm, 25 cm × 25 cm, 30 cm × 25 cm and 40 cm × 20 cm. Plant height, branches per plant and total number of leaves per plant were taken at 7-day intervals. Similarly, pods per plant, pod weight, pod length and pod width were recorded during each harvest (thrice in a week) and later added up and averaged.

Results and Discussion

Data on plant height, branches per plant, leaves per plant, pods per plant and average pod weight have been presented in Table 1. In both the year, maximum height was noticed in closely spaced plants;while plants observed shortened as spacing increased. Closer spacing increases the number of plants in a unit area. Crowded plants struggle among themselves for sufficient sunlight and space that re-

Table 1. Some morphological traits in French bean (2005-06 and 2006-07).

Spacing (cm × cm)	Plant height (cm)		Branch per plant		Leaves per plant		Pods per plant		Average pod weight (g)	
	2005-06	2006-07	2005-06	2006-07	2005-06	2006-07	2005-06	2006-07	2005-06	2006-07
10 × 10	30.66	29.27	8.70	8.70	12.20	12.4	7.16	109	14.12	4.81
15 × 10	29.86	30.83	10.40	10.47	13.90	14.5	8.83	13.3	16.01	7.58
15 × 15	30.65	28.13	11.30	11.20	13.53	16.1	7.58	12.5	11.44	6.49
20 × 15	29.06	27.23	10.70	10.43	12.23	19.3	8.33	11.7	11.31	5.89
20 × 20	25.80	26.37	11.26	11.26	14.13	18.3	7.80	10.2	10.6	5.37
25 × 20	23.53	25.10	10.60	10.37	16.40	18.7	9.82	10.2	9.35	6.48
25 × 25	25.73	25.30	12.20	10.60	18.40	14.5	8.24	9.5	9.82	5.33
30 × 25	21.53	21.50	10.53	10.53	19.03	13.2	10.97	9.3	6.68	5.24
40 × 20	22.93	19.60	11.40	11.40	18.83	12.4	11.3	9.1	5.08	5.39
SE (±)	1.41	0.27	0.13	0.18	0.16	0.19	1.59	0.37	0.18	0.21
CD 5%	3.49	0.68	0.33	0.45	0.33	0.46	3.96	0.93	0.44	0.51

sulted taller plants. Mangual-cresso and Torres (7) recorded significantly taller plant in the narrow spacing. On the other hand, branches per plant showed the reverse trend of plant hight. Minimum numbers of branches per plant were observed when plants were spaced 10 × 10 cm in both the year. Maximum number of branches were noted on 25 × 25 cm and 40 × 20 cm spacing during 2005-06 and 2006-07, respectively. It is obvious that wider sowing gave more space to individual plants for branching than closely sown plants. The results corroborate with earlier findings (4). Closely spaced plants also producted minimum number of leaves per plant. In 2005-06, the leaf number per plant increased almost linearly as spacing increased. However, during next year maximum leaves per plant noted on 20 × 15 cm spacing. The result was in line with earlier findings (3). For pod number per plant, no particular trend was noticed. In 2005-06, widest spaced plants (40 × 20 cm) produced maximum number of pods, whereas in next year relatively closely sown crop (15 × 10 cm) recorded highest pod yield. Similar response of various spacing in French bean for this trait was also reported earlier (3,4,6).

Maximum average pod weight was recorded with 15 × 10 cm spacing in both the years. The data on yield attributing traits and yield (Table 2) revealed that relatively closer spacing is useful for increased production in French bean. In general, maximum pod length, pod width and pod yield per plant were recorded in 15 × 10 cm or 15 × 15 cm spacing. Maximum yield per hectare also recorded with 15 × 10 cm spacing during both the years. Most of these traits also showed minimum value on high spacing i.e. 40 × 20 cm.Closer spacing accommodates higher number of plants per unit area. The individual plants might contribute cumulatively towards more yield than more

Table 2. Yield and its attributes in French bean (2005-06 and 2006-07).

Spacing (cm × cm)	Pod length (cm)		Pod width (cm)		Pod yield per plant (g)		Pod yield per hectare (q)	
	2005-06	2006-07	2005-06	2006-07	2005-06	2006-07	2005-06	2006-07
10 × 10	11.54	11.55	0.92	0.92	99.83	89.37	84.62	79.2
15 × 10	12.84	15.09	0.82	0.82	140.9	101.20	137.42	132.03
15 × 15	12.02	10.61	0.97	0.96	77.33	81.70	76.67	86.52
20 × 15	11.50	11.99	0.85	0.94	92.17	79.60	75.07	73.68
20 × 20	11.73	12.27	0.94	0.87	73.17	76.80	83.12	72.67
25 × 20	11.13	11.38	0.94	0.95	90.27	70.70	78.90	67.28
25 × 25	11.12	11.41	0.93	0.94	77.13	62.87	64.12	60.67
30 × 25	11.36	11.91	0.77	0.94	62.00	55.67	54.17	57.65
40 × 20	11.51	11.55	0.74	0.91	49.17	40.43	34.98	32.15
SE (±)	0.28	0.45	0.01	0.01	2.88	0.49	7.45	5.16
CD 5%	0.69	1.13	0.03	0.03	7.12	1.22	18.43	12.79

spaced plants. Earlier workers (5-8) also observed different response of spacing in French bean pod yield per hectare. Thus, it may be concluded that 15 × 10 cm spacing is optimum for French bean cultivation in red and lateritic belt of West Bengal.

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