

PERFORMANCES OF VEGETABLE FRENCH BEAN AS INFLUENCED BY VARIETIES AND SOWING DATES IN RABI SEASON

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Accepted for publication: October 09, 2007

ABSTRACT

Moniruzzaman, M., Rahman, S.M.L., Kibria, M.G., Rahman, M.A. and Kaisar, M.O. 2007. Performances of Vegetable French Bean as Influenced by Varieties and Sowing Dates in Rabi Season. Int. J. Sustain. Crop Prod. 2(5): 69-73

A field experiment on French bean having three varieties (BARI Jhar Seem-1, BARI Jhar Seem-2 and Local) and six sowing dates at 10 days interval from November 01 to December 20) was conducted at the Agricultural Research Station, Raikhali, Rangamati Hill District during the rabi seasons of 2004-05 and 2005-06 to find out the suitable variety and optimum sowing date for getting higher pod yield. Both the varieties of BARI Jhar Seem-1 and BARI Jhar Seem-2 yielded higher from local variety but the first two varieties were statistically at par in respect of pod yield. November 10 sowing was statistically at par with November 20 sowing gave the highest pod yield of French bean. BARI Jhar Seem -1 and BARI Jhar Seem-2 produced maximum pod yield of French bean when sown on either November 10 or November 20.

Key words: French bean, varieties, sowing dates, pod yield

INTRODUCTION

French bean (*Phaseolus vulgaris* L.) also known as 'Jhar sheem' in Bangladesh, is a dual purpose crop grown as pulse and vegetable crop. Different characters and yield potential of a crop depend on the environmental conditions prevailing during its growth. The positive effect of environmental factors on growth and yield could be harnessed if the information on optimum time of sowing is made available. With the availability of improved varieties the crop is catching in southeastern hilly region of the country in a big way. As the crop, in rabi season experiences cooler phase (end of December to January) during later crop stages, the optimum sowing date plays a decisive role in growth and production of French bean (Singh *et al.*, 1992). However, owing to lack of information with regard to specific agro-climatic requirements, the yield obtained is far below the potential. Hence, the present study was undertaken to find out the suitable variety and optimum date of planting during rabi season under south-eastern hilly region of Bangladesh.

MATERIALS AND METHODS

The field experiments were carried out during the rabi seasons of 2004-05 and 2005-06 at the Agricultural Research station, Raikhali, Rangamati Hill District, with 18 treatment combinations, comprising three varieties (V_1 = BARI Jhar Sheem-1, V_2 = BARI Jhar Sheem-2 and V_3 = Local) and six sowing dates (D_1 = November 01, D_2 = November 10, D_3 = November 20, D_4 = November 30, D_5 = December 10 and D_6 = December 20) in factorial randomized complete block design, replicated thrice. The soil of the experimental plot was sandy clay loam, having pH 5.5, organic matter 0.92%, total nitrogen 0.078%, available phosphorous 8.5 $\mu\text{g/g}$ and available potassium 0.19 meq/100 g soil. The total rainfall during the crop period was 22.83 mm in 2004-05 and 69.55 mm in 2005-06 (Table 1). Sowing was done on scheduled time according to the treatments both in 2004-05 and 2005-06 in rows 30 cm apart, where two seeds were dibbled at 10 cm spacing. Seedlings were thinned 15 days after sowing keeping one seedling per hill. The crop was raised using 120 kg N, 60 kg P_2O_5 and 50 kg K_2O /ha during both the years of experimentation (Anonymous, 2000a). Half dose of the nitrogen and full dose of phosphorous and potash was applied as basal in the form of urea, triple super phosphate (TSP) and muriate of potash (MP), respectively. Remaining nitrogen was applied 30 days after sowing. The field was given one light pre-sowing irrigation in every planting date. The plants were earthed up 35 days after sowing. The plots were kept weed free by manual weeding up to pod initiation stage and another two light irrigations were given 30 and 60 days after sowing. Ten plants were selected randomly in each treatment and all the growth and yield observations were recorded from them. The green pod was harvested four times from all the plots. At first the plot yield was recorded and then it was converted to per hectare yield in tons. The various observations recorded were statistically analyzed and the means were separated by least significant difference test (LSD) following Gomez and Gomez (1984).

Table 1. Ten days interval temperature and rainfall during cropping season

Month	Period (Date)	2004-05			2005-06		
		Temperature ($^{\circ}$ C)		Rainfall (mm)	Temperature ($^{\circ}$ C)		Rainfall (mm)
		Max.	Min.		Max.	Min.	
October	22 - 31	31.2	22.8	11.43	32.0	24.3	18.75
November	01-10	31	21.7	0.0	31.0	23.2	17.78
November	11 -20	29.2	18.5	0.0	30.7	19.3	33.02
November	21 -30	25.5	19.8	0.0	26.9	17.0	0.0
December	01 -10	24.3	15.0	0.0	24.4	14.7	0.0
December	11 -20	23.2	14.3	0.0	34.6	18.6	0.0
December	21-30	24.2	14.4	0.0	32.0	17.9	0.0
January	01 -10	20.3	11.6	0.0	23.8	14.8	0.0
January	11-20	20.3	11.1	0.0	24.4	11.8	0.0
January	21 -30	24.0	10.8	0.0	28.5	12.8	0.0
February	01 - 10	26.0	14.0	0.0	24.9	12.1	0.0
February	11 -20	27.7	16.8	0.0	27.5	13.4	0.0
February	21 -30	29.0	18.9	11.40	26.8	13.6	0.0

Source: Meteorological section, A.R.S, Raikhali, Rangamati

RESULTS AND DISCUSSION

Varietal performance

Varieties showed significant variation in plant height, number of branches per plant and dry weight per plant (Table 2). Variety 'BARI Jhar Seem-2' produced significantly smallest plant in both the years, whereas the plant height was maximum in 'local' variety though at par with 'BARI Jhar Seem-1' during 2005-06. However, branches/plant and dry weight/plant was significantly lowest in 'local' variety compared to 'Bari Jhar Seem-2' and 'Bari Jhar Seem-1' during both the years. 'Bari Jhar Seem-1' significantly produced maximum number of branches/plant closely followed by 'Bari Jhar Seem-2' and highest dry weight/plant in both the years.

Varieties had significant effect on the yield attributes (pod length, pod width, pods/plant and weight of 10 pods) (Table 2) and yield of French bean (Table 3). The variety 'BARI Jhar Seem -2' significantly produced longer pods having lowest diameter during both the years. Local variety significantly gave maximum pod width in both the years, being at par with BARI Jhar Seem -1' in both the years. Number of pods/plant was significantly higher in 'BARI Jhar Seem -1' and 'BARI Jhar Seem -2' compared to 'local' variety during 2004-05 and 2005-06 but the differences between 'BARI Jhar Seem -1' and 'BARI Jhar Seem -2' were not significant. However, weight of 10 pods was significantly highest in 'local' variety whereas, lowest weight of 10 pods was observed in 'BARI Jhar Seem -1' and 'BARI Jhar Seem -2' with no significant difference between them. Varieties had no significant influence on number of pods/m². Significantly maximum pod yield of both per plant and per hectare was obtained from BARI Jhar Seem -1 which was at par with BARI Jhar Seem-2 during 2004-0 and 2005-06 and also when the data was analyzed after pooling, because of higher number of pods per plant. Local cultivar produced significantly lowest pod yield of both per plant and per hectare during both the years and also in pooled analysis because of its lowest number of pods/plant. The variety 'BARI Jhar Seem-1' gave significantly highest straw yield in 2004-05 compared to other two varieties, but in 2005-06 and pooled analysis gave higher straw yield compared to local variety only. The 'local' variety recorded significantly lower harvest index as compared to other two varieties of French bean. BARI Jhar Seem-1 and BARI Jhar SEem-2 gave statistically similar results in respect of harvest index.

Effect of sowing times

The growth attributes viz. plant height, number of branches/plant and dry weight per plant significantly varied due to different dates of sowing (Table 2). The crops sown on November 20 being statistically at par with November 10 in 2004-05 and with November 01 and November 10 in 2005-06 produced significantly tallest plants over the remaining dates of sowing. The crops sown on November 01 to November 30 gave statistically identical number of branches/plant compared to the two sowings of December during both the years. The November 10-sown crops being at par with November 20 gave significantly maximum dry weight per plant compared to other sowings. The lowest dry matter was obtained from December 10 and December 20 sown crops. All the yield attributes and pod yield of French bean were affected significantly by different dates of sowing (Table 2 and Table 3). Significantly maximum pod length was recorded from November 10-sown crops, which was statistically at par with November 20-sown crops in 2004-05 whereas in 2005-06 the crops sown on

November 01 being at par with November 10 and November 20 were significantly superior to all other dates of sowing. Maximum pod width was also obtained from November 10-sown crops in both the years that were statistically similar to those of November 01, November 20, November 30 of 2004-05 and 2005-06. Number of pods/plant and weight of 10 pods in November 10 sowing being at par with that of November 20 sowing were significantly superior to the remaining sowing dates during both the years. Number of plants per square meter was remained unaffected due to different dates of sowing. Significantly higher pod yield of both per plant and hectare was found with November 10 and November 20 sowing dates as compared to later ones and 1st sowing (Nov. 01). However, in pooled data the yield before November 10 sowing and after November 20 sowing dates declined to the tune of 16, 19, 29 and 32% with November 30, December 10 and December 20 sowing dates, respectively. There was no significant difference between November 10 and November 20 sowing dates in respect of pod yield. Superior basic capital in terms of dry matter under November 10 and November 20 sowing dates due to favourable temperature might have contributed to higher yield. Moderate and positive correlation of yield with total biomass of plant has also been advocated by Lawn (1988). Significantly low yield was with December 20 sowing. Better growth parameters, as evidenced from plant height, branches and dry matter have contributed to higher straw yield of French bean in November 10 and November 20 sowing.

The results are in close conformity with Anon. (1993) and Mishra *et al.* (1998) and differed with Anon., (2000). Anon. (1993) obtained the highest pod yield from November 15 sowing in Jessore. Mishra *et al.* (1998) reported that November 9 sowing recorded higher values of yield attributed and higher green pod yield due to favourable temperature and moisture condition in Orissa, India. But Anon. (2000b) reported the highest pod yield from October 30 sowing in Chittagong region.

Maximum harvest index was recorded from November 20 sown crops that was statistically at par with November 01 and November 10 sowing in 2004-05 whereas it was at par with November 01, November 10, and November 30 sowing in 2005-06 and in pooled data and the lowest harvest index was obtained from the December 20 sowing. The reduction in yield under late sown condition could be attributed to poor development of yield attributes i.e. number of pods/plant, pod size (length x width) and pod weight (Table 2 and Table 3) due to low minimum temperature prevailed during reproductive phase of the crop (Table 1). Contrary to this, reduced yield in early sowing of November 01 was because of highest mean temperature during the early stage of crop which resulted in poor growth of plants. The mean temperature requirement for optimum growth of French bean has been reported to be 14 – 24°C (Kay, 1979) and 15-25°C (Rashid, 1999). The reduction in yield of French bean due to delayed planting has also been reported by Singh and Singh (1987) and Ali (1989).

Table 2. Growth and yield attributes of French bean as influenced by varieties and sowing dates

Treatment	Plant height (cm)		Branches /plant (no.)		Dry weight (g/plant)		Pod length (cm)	
	2004-05	2005-06	2004-05	2005-06	2004-05	2005-06	2004-05	2005-06
Variety								
V ₁	40.14	40.62	4.21	4.39	15.78	16.76	11.55	12.19
V ₂	38.16	38.75	4.24	4.40	15.29	16.24	12.11	12.78
V ₃	40.93	41.06	3.46	3.59	13.98	14.65	11.88	12.40
LSD (0.05)	0.68	1.05	0.04	0.05	0.37	0.47	0.13	0.073
Sowing date								
D ₁	44.27	44.98	4.08	4.24	15.13	15.85	11.79	12.58
D ₂	44.86	45.19	4.10	4.26	17.44	18.89	12.06	12.69
D ₃	45.46	45.82	4.09	4.26	17.20	18.24	11.98	12.61
D ₄	36.01	36.30	4.06	4.22	14.12	15.03	11.75	12.54
D ₅	34.50	34.80	3.81	3.96	13.32	13.93	11.72	12.31
D ₆	33.35	33.77	3.69	3.83	12.89	13.56	11.79	12.22
LSD (0.05)	0.96	1.49	0.06	0.07	0.53	0.67	0.18	0.29

Table 2. cont'd.

Treatment	Pod width (cm)		Pods/plant (no.)		Weight of 10 pods(g/plant)		Plants/m ²	
	2004-05	2005-06	2004-05	2005-06	2004-05	2005-06	2004-05	2005-06
Variety								
0.67	0.69	15.92	16.79	32.35	36.38	30.98	30.98	
0.60	0.63	15.78	16.60	32.82	36.78	31.00	31.06	
0.68	0.70	11.35	11.93	35.74	40.15	30.99	30.97	
0.00	0.00	0.30	0.57	0.50	0.64	ns	ns	
Sowing date								
D ₁	0.65	0.67	13.81	14.61	33.68	39.66	30.97	31.18
D ₂	0.66	0.68	15.97	16.82	36.74	41.30	31.02	31.01
D ₃	0.65	0.68	15.85	16.67	36.61	41.10	30.91	30.88
D ₄	0.65	0.68	13.85	14.55	33.17	37.25	31.00	30.91
D ₅	0.64	0.66	13.32	13.99	30.58	34.24	31.05	31.04
D ₆	0.64	0.66	13.32	14.00	29.43	33.06	30.99	31.00
LSD (0.05)	0.009	0.008	0.43	0.81	0.71	0.90	ns	ns

Table 3. Effect of variety and sowing dates on yield, plants/m² and harvest index of French bean

Treatment	Pod yield/plant (g)			Pod yield (t/ha)			Dried straw yield (t/ha)			Harvest index (%)		
	2004-05	2005-06	Pooled	2004-05	2005-06	Pooled	2004-05	2005-06	Pooled	2004-05	2005-06	Pooled
Variety												
V ₁	52.08	54.88	53.48	16.13	17.01	16.57	3.85	4.12	3.98	21.84	21.77	21.81
V ₂	52.04	54.69	53.09	16.09	16.91	16.50	3.72	3.93	3.85	21.09	21.05	21.07
V ₃	40.81	42.90	41.85	12.79	13.45	13.11	3.52	3.65	3.58	18.68	18.82	18.84
LSD (0.05)	0.62	1.04	0.98	0.20	0.22	0.21	0.10	0.21	0.15	0.77	0.74	0.81
Sowing date												
D ₁	48.91	51.75	50.33	15.19	16.07	15.63	3.71	3.84	3.77	20.74	21.31	21.00
D ₂	58.24	61.29	59.22	18.14	19.08	18.61	4.25	4.63	4.34	21.52	20.98	21.25
D ₃	57.65	60.57	59.10	17.77	18.67	18.22	4.19	4.41	4.30	21.54	21.44	21.48
D ₄	45.68	47.99	46.83	14.22	14.95	14.58	3.50	3.66	3.62	20.63	20.57	20.61
D ₅	40.50	42.49	41.49	12.61	13.28	12.93	3.732	3.47	3.40	19.50	19.63	19.78
D ₆	38.87	40.85	39.86	12.09	12.71	12.40	3.22	3.39	3.30	19.29	19.38	19.33
LSD (0.05)	0.88	1.47	1.38	0.40	0.43	0.44	0.15	0.30	0.21	0.87	1.04	0.95

Combined effect of variety and sowing dates

The combined effect of variety and sowing date was significant in pooled data (Table 4). Both the varieties of 'BARI Jhar seem-1' and 'BARI Jhar Seem-2' of French bean out yielded the local variety in all dates of sowing. 'BARI Jhar Seem -1' produced higher but identical yields with BARI 'Jhar Seem-2' in all dates of sowing except November 01 and November 20 sowing dates. 'BARI Jhar Seem -1' gave the highest pod yield in November 10 sowing closely followed by November 20 sowing. 'BARI Jhar Seem-2' in November 10 sowing, being at par with November 20 sowing produced statistically higher results compared to other sowings. However, the yield differences were not significant between 'BARI Jhar Seem-1' and 'BARI Jhar Seem-2' in all dates of sowing.

It could be concluded from the study that during rabi season Variety 'BARI Jhar Seem-1' and 'BARI Jhar Seem -2' sown in the 2nd or 3rd week of November was most suitable for getting higher yields of French bean in eastern hilly areas of Bangladesh (AEZ-29).

Table 4. Combined effect of variety and sowing date on pod yield (t/ha) of French bean (pooled)

Variety	Sowing date					
	Nov. 01	Nov. 10	Nov. 20	Nov. 30	Dec. 10	Dec. 20
BARI Jhar Sheem-1	16.79	19.98	19.44	15.74	13.98	13.50
BARI Jhar Sheem-1	16.81	19.86	19.67	15.55	13.74	13.23
Local	13.28	15.99	15.53	12.46	11.08	10.33
LSD (0.05) = 0.55						

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