

## Influence of different dates of sowing on incidence of virus diseases of French bean

S.M. PRASAD, M.K. BARNWAL, R.B. SHARMA and N. PRASAD

Department of Plant Pathology, Birsa Agricultural University, Kanke, Ranchi 834006

**SUMMARY:** French bean crop sown on 5<sup>th</sup> Sept. recorded lowest *Bean common mosaic virus* (BCMV) and *Bean yellow mosaic virus* (BYMV) disease incidences of 5.4 and 27.93 per cent, respectively. A relatively higher disease incidence of BCMV (7.3 %) and BYMV (28.57 %) was recorded in the crop sown on 20<sup>th</sup> Sept. The initial disease symptoms of BCMV and BYMV were observed within 7 and 28 days after sowing, respectively, under all the six sowing dates starting from 5<sup>th</sup> to 19<sup>th</sup> Nov. Aphid vector population build up in the crop sown early *i.e.*, 5<sup>th</sup> Sept. was rather slow and maximum population of aphid (3.2) was recorded after 70 days when the crop reached almost maturity stage. As the sowing was delayed beyond 5<sup>th</sup> Sept. population build up was very rapid. Aphid vector population was found to be negatively correlated with maximum temperature when the crop was sown on 5<sup>th</sup> Sept. Also, aphid vector population was found to be negatively correlated with minimum temperature when the crop was sown on 20<sup>th</sup> Sept., 5<sup>th</sup>, 20<sup>th</sup> Oct 4<sup>th</sup>, 19<sup>th</sup> Nov. Correlation between incidence of BCMV and BYMV diseases with aphid vector population was found to be positively correlated for all six dates of sowing.

**Key words:** *Phaseolus vulgaris*, *Bean common mosaic virus*, *Bean yellow mosaic virus*, sowing dates, weather parameters, correlation

French bean (*Phaseolus vulgaris* L.) is an important leguminous vegetable crop cultivated extensively in Jharkhand State for its edible green pods. *Bean common mosaic virus* (BCMV) and *Bean yellow mosaic virus* (BYMV) are important virus diseases of the crop in the State. High incidences of virus diseases have been recorded in Ranchi and other French bean growing area of the State. BCMV is efficiently transmitted through infected bean seeds (93%) and is subsequently spread by several aphid species, while BYMV is transmitted mainly by *Aphis craccivora*. Both viruses are transmitted through aphids in a non-persistent manner (Borges and Sequeira, 1988; Schmidt, 1991). BCMV inflicts considerable loss in yield of French bean in Himachal Pradesh (Dhanju *et al.*, 1995). The present paper deals with influence of different date of sowing on incidence of virus diseases of French bean.

Field trials were conducted during *Rabi*, 2002-2003 and 2003-2004 crop seasons at the Research Farm of Birsa Agricultural University, Kanke, Ranchi. The treatments comprised of six sowing dates at 15 days intervals beginning from Sept., 5 up to Nov., 19. French bean cultivar, Selection-9 was sown in 3 x 1.5 m<sup>2</sup> sized plots. The experiment was laid out in RBD with three replications. FYM @ 20 ton/ha and NPK @ 15:75:75 kg/ ha, respectively, were applied. Plots were irrigated when required. Disease incidences were recorded at 7 days intervals up to 70 days after sowing (DAS) under natural epiphytotics *i.e.* Sept., 5<sup>th</sup> up to Nov., 19<sup>th</sup> including the normal sowing date *i.e.*, 20<sup>th</sup>

Oct. (Control). Aphid vector population was recorded for each sowing date at 7 days intervals. Aphid population per plant up to 70 days was recorded by observing the top 20 cm. of the plant of each sampling unit (Nath and Nag, 1996). Correlation between aphid vector population at different date of sowing with weather parameters and disease incidence was also determined.

BCMV incidence on French bean was least (5.4%) in the crop sown on 5<sup>th</sup> Sept. and comparatively higher (7.3% and 9.8%) for 20<sup>th</sup> Sept. and 5<sup>th</sup> Oct. sown crops, respectively, while maximum (25.4%) BCMV incidence was recorded in the crop sown on 19<sup>th</sup> Nov. The final disease incidence (*i.e.*, at 70 DAS) increased gradually in the plots sown from 20<sup>th</sup> Oct. up to 19<sup>th</sup> Nov. The initial disease symptoms of BCMV were observed within 7 days under all the six sowing dates starting from 5<sup>th</sup> to 19<sup>th</sup> Nov. (Table 1).

BYMV incidence on French bean was minimum (27.93%) in the crop sown on 5<sup>th</sup> Sept. with higher infection percentages (28.57% and 35.87%) for 20<sup>th</sup> Sept. and 5<sup>th</sup> Oct. sown crops, respectively, Highest BYMV incidence (44.12%) was recorded in the crop sown on 19<sup>th</sup> Nov. The final disease incidence (*i.e.*, at 70 DAS) increased gradually in the plots sown from 20<sup>th</sup> Oct. up to 19<sup>th</sup> Nov. The crop was apparently free from the disease up to 21 DAS under all the six sowing dates beginning 5<sup>th</sup> Sept. to 19<sup>th</sup> Nov. However, the initial disease symptoms were observed 28 DAS on wards in all dates of sowing (Table 2).

**Table 1. Effect of date of sowing on incidence of *Bean common mosaic virus* disease in French bean**

Date of sowing	Percent infection days after sowing (2002-03 and 2003-04)									
	7	14	21	28	35	42	49	56	63	70
<b>5<sup>th</sup> Sept.</b>	1.26 (6.37)	1.58 (17.14)	1.9 (7.92)	2.53 (9.13)	3.13 (10.17)	3.46 (10.82)	4.13 (11.83)	4.46 (12.25)	4.46 (12.25)	5.4 (13.29)
<b>20<sup>th</sup> Sept.</b>	1.58 (7.14)	1.9 (7.92)	2.21 (8.49)	3.13 (10.17)	3.80 (11.24)	4.13 (11.71)	5.1 (12.97)	5.7 (13.60)	6.66 (14.87)	7.30 (15.67)
<b>5<sup>th</sup> Oct.</b>	0.95 (5.59)	1.26 (6.37)	2.21 (8.49)	3.13 (10.17)	3.46 (10.70)	4.13 (11.71)	4.46 (12.91)	6.66 (14.87)	7.6 (14.87)	9.8 (15.67)
<b>20<sup>th</sup> Oct.</b>	2.21 (8.49)	2.85 (9.60)	3.16 (10.17)	6.66 (14.89)	7.30 (15.67)	8.56 (17.00)	8.90 (17.35)	9.52 (17.62)	10.46 (18.86)	12.13 (20.38)
<b>4<sup>th</sup> Nov.</b>	7.29 (13.75)	7.61 (16.02)	8.25 (16.70)	11.43 (19.75)	11.73 (20.03)	13.93 (21.91)	14.90 (21.91)	16.80 (23.21)	17.76 (24.20)	20.33 (26.78)
<b>19<sup>th</sup> Nov.</b>	11.42 (19.73)	12.37 (20.58)	13.64 (21.67)	16.50 (23.96)	16.80 (22.86)	17.76 (24.93)	19.03 (25.85)	20.9 (27.20)	21.26 (27.96)	25.4 (30.29)
<b>SEm (±)</b>	0.43	0.66	0.27	0.64	0.62	0.52	0.41	0.51	0.48	0.39
<b>CD at 5%</b>	1.35	2.07	0.85	2.00	1.96	1.60	1.29	1.61	1.51	1.24

· Figures in parentheses are arc sine transformed values

**Table 2. Effect of date of sowing on incidence of *Bean yellow mosaic virus* disease in French bean**

Date of sowing	Percent infection days after sowing (2002-03 and 2003-04) *						
	28	35	42	49	56	63	70
<b>5<sup>th</sup> Sept.</b>	10.15 (18.59)	11.10 (19.46)	12.69 (20.80)	15.55 (23.10)	19.68 (26.31)	25.39 (30.28)	27.93 (31.91)
<b>20<sup>th</sup> Sept.</b>	7.29 (15.67)	8.25 (16.70)	12.69 (20.81)	16.50 (23.95)	20.63 (26.99)	25.39 (30.28)	28.57 (32.33)
<b>5<sup>th</sup> Oct.</b>	10.78 (19.18)	12.08 (20.32)	19.14 (25.85)	25.39 (30.28)	27.93 (31.92)	33.96 (35.58)	35.87 (36.79)
<b>20<sup>th</sup> Oct.</b>	9.20 (17.65)	10.47 (18.91)	15.55 (23.21)	20.95 (27.20)	26.02 (30.74)	35.23 (36.41)	38.84 (38.57)
<b>4<sup>th</sup> Nov.</b>	15.55 (23.21)	16.50 (23.75)	19.04 (25.85)	23.49 (28.93)	25.39 (30.24)	33.96 (35.62)	39.36 (38.84)
<b>19<sup>th</sup> Nov.</b>	17.45 (24.70)	18.09 (24.70)	21.58 (27.67)	27.29 (31.52)	34.91 (36.21)	39.99 (39.21)	44.12 (41.63)
<b>SEm (+_)</b>	0.36	0.43	0.74	0.50	0.43	0.38	0.19
<b>CD at 5%</b>	1.13	1.37	2.32	1.58	1.35	1.19	0.61

· Initial disease symptoms were observed 28 days after sowing onwards; · Figures in parentheses are arc sine transformed values

Aphid vector population build up in the crop sown early *i.e.*, 5<sup>th</sup> Sept. was rather slow and maximum population of aphid (3.2) was recorded after 70 days when the crop reached almost maturity stage. As the sowing was delayed beyond 5<sup>th</sup> Sept. population build up was very rapid. In 20<sup>th</sup> Sept. 5<sup>th</sup>, 20<sup>th</sup> Oct., 4<sup>th</sup> and 19<sup>th</sup> Nov. sown crops the aphid population counts being 2.13, 3.20, 2.60, 6.27 and 12.07, respectively, after 14 DAS itself. Maximum mean aphid population of 12.73, 22.33, 28.80, 30.20, and 32.53, respectively, were recorded after 70 DAS (Table 3).

Aphid vector population was found to be negatively correlated with maximum temperature when the crop was sown on 5<sup>th</sup> Sept. Also, aphid vector population was

found to be negatively correlated with minimum temperature when the crop was sown on 20<sup>th</sup> Sept., 5<sup>th</sup>, 20<sup>th</sup> Oct, 4<sup>th</sup>, 19<sup>th</sup> Nov. Maximum relative humidity (RH), minimum RH, rainfall and sun shine hour did not reveal relationship with aphid vector population. (Table 4 and 5).

Ghosh (1970) reported maximum aphid population in French bean during March to April and Nov. to early January. According to Chhabra and Kaur (1994) manipulation of date of sowing was effective in reducing the population of various aphid species. Permey *et al.* (1997) reported lowest disease incidence of 26.04 per cent in the crop sown on 15<sup>th</sup> Sept. and highest disease incidence of 74.5 per cent in 15<sup>th</sup> Nov. sown crop.

**Table 3. Aphid vector populations build up in different date of sowing and crop growth stages**

Date of sowing	Percent infection days after sowing (2002-03 and 2003-04)									
	7	14	21	28	35	42	49	56	63	70
5 <sup>th</sup> Sept.	-	1.80	2.07	1.20	1.47	2.00	2.33	2.47	2.67	3.20
20 <sup>th</sup> Sept.	-	2.13	2.33	2.40	2.60	3.20	4.27	4.53	7.80	12.73
5 <sup>th</sup> Oct.	-	3.20	4.27	4.53	6.27	8.13	15.60	16.27	18.53	22.33
20 <sup>th</sup> Oct.	-	2.60	2.20	3.93	9.87	15.60	16.27	22.40	23.60	25.80
4 <sup>th</sup> Nov.	-	6.27	12.73	18.53	20.27	26.93	27.47	28.07	29.00	30.20
19 <sup>th</sup> Nov.	-	12.07	20.73	21.07	23.47	25.33	27.87	28.47	30.27	32.53
SEm (+_)		0.40	1.17	0.80	1.08	0.75	0.59	0.91	0.95	1.35
CD at 5%		1.26	3.68	2.51	3.41	2.35	1.86	2.88	2.98	4.25

**Table 4. Correlation between Aphid vector populations of different date of sowing with weather parameters**

Weather parameters	Different date of sowing (2002-04 and 2003-04)					
	5 <sup>th</sup> Sept.	20 <sup>th</sup> Sept.	5 <sup>th</sup> Oct.	20 <sup>th</sup> Oct.	4 <sup>th</sup> Nov.	19 <sup>th</sup> Nov.
Maximum Temp. (°C)	-0.9486 **	-0.6724	-0.6574	-0.6523	-0.4463	-0.2900
Minimum Temp. (°C)	-0.7559	-0.8260 *	-0.8346 *	-0.9334 **	-0.8348 *	-0.4460
Mean Temp. (°C)	-0.8574 **	-0.7990	-0.8198 *	-0.7925	-0.7291	-0.7440
Maximum RH (%)	-0.3661	-0.3157	0.5843	-0.5597	-0.2360	0.3457
Minimum RH (%)	-0.7088	-0.7018	0.2442	-0.4007	-0.1594	0.2412
Mean RH (%)	-0.6996	-0.6906	0.3417	-0.4313	-0.1616	0.2728
Rainfall (cm)	-0.3779	-0.3485	0.3632	0.2668	0.5961	0.4848
Sun shine hour	0.1109	0.4024	0.3305	0.2305	0.6276	0.1638

\* at 5% level of significance; \*\* at 1% level of significance

**Table 5. Correlation between Aphid vector populations of different date of sowing with disease incidence**

Date	Correlation with aphid vector populations (2002-04, 2003-04)	
	BCMV	BYMV
5 <sup>th</sup> Sept.	0.829 *	0.667
20 <sup>th</sup> Sept.	0.814 *	0.775
5 <sup>th</sup> Oct.	0.965 **	0.894 *
20 <sup>th</sup> Oct.	0.926 **	0.952 **
4 <sup>th</sup> Nov.	0.957 **	0.939 **
19 <sup>th</sup> Nov.	0.898 *	0.859 *

\* at 5% level of significance; \*\* at 1% level of significance

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