IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS)
e-ISSN: 2319-2380, p-ISSN: 2319-2372. Volume 8, Issue 5 Ver. I (May. 2015), PP 36-39
www.iosrjournals.org

Effect of Growth Regulators on Growth and Yield of French bean (*Phaseolus vulgaris* L.) Var. Arka Komal.

R.R. Rathod[1], R.V. Gore[2] and Bothikar P. A[3]
Department of Horticulture, College of Agriculture, Latur- 413 512. Marathwada Agricultural University Parbhani, India.

Abstract: *The growth and yield parameters like height of plant, plant spread, number of leaves, number of branches, number of green pods, yield per plant and yield per hectare were influenced significantly due to application of plant growth regulators.*

In French bean, the maximum height of plant (34.53 cm), plant spread (31.46 cm), number of leaves per plant (15.73) and number of branches (7.66) in treatment where GA_3 200 ppm was applied (T_4) while minimum height of plant (25.93 cm), plant spread (24.70 cm), number of leaves per plant (11.66) and number of branches (5.20) per plant respectively observed in the treatment (T_8) in Cycocel 200 ppm. The treatment T_9 (35.93) days to 50 per cent flowering and it was most effective treatment for inducing earlier 50 per cent flowering and significantly superior over rest of the treatments. Longer green pod length (19.50 cm) were harvested from treatment (T_2) GA_3 100 ppm while shortest green pods (18.13 cm) were harvested in treatment (T_8) CCC 200 ppm.

The treatment (T_2) GA_3 100 ppm produced maximum number of green pods (44.57), yield (0.140 kg) per plant and yield (119.70 q) per hectare while lowest number of green pods (37.46), yield (0.095 kg) per plant and yield (81.29 q) per hectare observed in the treatment (T_8) CCC 200 ppm.

Key words: *Growth, Yield, GA_3, CCC, Ppm.*

I. Introduction

The French bean (Syn. Kidney bean, haricot bean, snap bean and heavy bean) is one of the most important leguminous vegetable. It is the world's most important legume food. The French bean green pod is used as green vegetable. It contain protein 22 per cent, lime, iron potash, phosphorus, sulfer, vitamin 'A' in large quantity. Area under vegetables in India is estimated around 6.2 million hectare with an annual production of about 71.66 million tonnes. India is the second largest producer of vegetables with 2.8 per cent total cropped area under vegetables. India contributes about 13.6 per cent to the world's vegetable production (Anonymous, 2003). The French bean growing leading states in India are Maharashtra, Andra Pradesh and Punjab. In Maharashtra the mostly French bean producing districts are Pune, Ahmednagar, Solapur and Nasik. The French bean green stage contain high level of vitamin 'A' which is beneficial for the controlling night blindness in human being (Birajdar , 2006). Gibberellin is a plant growth regulator which promotes the cell elongation and induces the cell division. It plays a great role in retarding the abscission like that of IAA in lower concentrations. Crane (1964) observed that stimulation of fruit development and retardation of abscission in young fruits due to gibberellin. Therefore, a role of gibberellins is strongly implicated in the control of abscission. An investigation was therefore conducted to find out the effect of growth regulators on growth and yield of French bean (*Phaseolus vulgaris* L.) cv. Arka Komal.

II. Materials And Methods

The field experiment was conducted during *Kharif* season 2007-2008 at Horticultural farm, Department of Horticulture, College of Agriculture, Latur. The experiment was laid out in randomized block design with nine treatments viz., T_1- GA_3 50 ppm T_2- GA_3 100 ppm T_3- GA_3 150 ppm T_4- GA_3 200 ppm T_5- CCC 50 ppm T_6- CCC 100 ppm T_7- CCC 150 ppm T_8- CCC 200 ppm and T_9- Control (Water spray). The 50 ppm, 100 ppm, 150 ppm and 200 ppm solutions of plant growth regulators were prepared by dissolving 50 mg, 100 mg, 150 mg and 200 mg is in small quantity of acetone dissolve all granules of PGR in acetone completely. Make final volume of 1 litre by adding double distilled water slowly. Finally the 50 ppm, 100 ppm, 150 ppm and 200 ppm concentrations of plant growth regulator solutions were prepared. Observations were recorded and statistically analyzed as per method given by Panse and Sukhatme (1967).

III. Results And Discussion

Effect on growth parameters

The vegetative growth parameters like height of plant, plant spread, number of leaves per plant and number of branches per plant were significantly influenced by application of plant growth regulators (Table 1).

Plant height

The data presented in Table 1 on plant height was stastically significant. At 30 days after sowing the maximum height of plant (20.46 cm) was recorded in treatment GA_3 200 ppm (T_4) while minimum (16.86 cm) was recorded in treatment CCC 200 ppm (T_8). The data on height of plant 50 days after sowing, showed that the maximum height of plant (33.00 cm) was recorded in GA_3 200 ppm (T_4) this treatment was significant over the rest of all treatments. The lowest height of plant (24.53 cm) was recorded in treatment Cycocel 200 ppm (T_8). Observations recorded at 70 days after sowing, showed that the maximum height of plant (34.53 cm) was recorded in treatment where GA_3 200 ppm (T_4). The treatments T_2, T_3 and T_4 statistically significant over the control. The lowest height of plant (25.93 cm) was observed in treatment (T_8) Cycocel 200 ppm.

Application of plant growth regulators alone influenced the height of plant beneficially during early growth stage. This might be due to presences sufficient amount of available nitrogen in the soil at this stage. However, integration of plant growth regulators showed significant differences and found better in respect of height of plant than water spray alone. Deotale *et al.* (1993a) reported maximum height of french bean.

Plant spread

Data on spread of plant at 30 days after sowing showed that the treatment GA_3 200 ppm (T_4) was recorded maximum plant spread (21.40 cm) while lowest plant spread (17.20 cm) was observed in the treatment CCC 200 ppm (T_8). Data recorded at 50 days after sowing indicated that maximum spread of the plant (30.03 cm) in GA_3 200 ppm (T_4) this treatment was significantly superior over the rest of all treatments. The minimum plant spread was (24.63 cm) recorded in treatment T_8 receiving CCC 200 ppm. Observations recorded at 70 days after sowing on plant spread was significant. The maximum plant spread (31.46 cm) was observed in treatment GA_3 200 ppm (T_4), while lowest plant spread was (24.70 cm) observed in treatment T_8 CCC 200 ppm.

Number of leaves per plant

At 30 days after sowing the treatments T_1, T_2, T_3, T_4 and T_5 these treatments are statistically significant over the control treatment T_9. The maximum number of leaves (8.46) were recorded in treatment T_4 while lowest number of leaves (7.73) observed in the treatment T_8. At 50 days the maximum number of leaves (14.60) recorded in treatment GA_3 200 ppm (T_4). This treatment was significant over the rest of all treatments. The lowest number of leaves per plant (12.80) recorded in treatment (T_8) CCC 200 ppm. At 70 days after sowing the treatments T_1, T_2, T_3, T_4, T_5 and T_6 these treatments are statistically significant over the control treatment T_9 receiving water spray. The maximum number of leaves per plant (15.73) recorded in treatment GA_3 200 ppm (T_4) and minimum number of leaves per plant (11.66) recorded in treatment (T_8) CCC 200 ppm.

Number of branches per plant

At 30 days after sowing the treatments are non-significant. The data on number of branches per plant after 50 days after sowing the treatments T_1, T_2, T_3, T_4 and T_7 these treatments are statistically significant over the control treatment T_9 receiving water spray. The treatment GA_3 200 ppm (T_4) recorded more number of branches (6.46) per plant while the lowest number of branches per plant (4.86) observed in treatment (T_8) CCC 200 ppm. Number of branches recorded at 70 days the more number of branches (7.66) were obtained from the treatment GA_3 200 ppm (T_4). This treatment significant over the rest of all the treatments. The lowest number of branches (5.20) per plant observed in the treatment (T_8) CCC 200 ppm.

Similar results were reported by Deotale *et al.* (1993a), Abda and Fattah (1994) in fababean. Which are in conformity with the result obtained in present investigation.

Cropping period

Data on number of days required from sowing to 50 per cent flowering presented in Table 2. The treatment (T_9) receiving water spray required (35.93) days to 50 per cent flowering and it was most effective treatment for inducing earlier 50 per cent flowering and significantly superior over rest of the treatments under study. The next best treatment was (T_2) which received GA_3 100 ppm. The treatments T_3, T_7 and T_8 statistically similar to each other for days to 50 per cent flowering. The treatment (T_2) GA_3 100 ppm recorded maximum number of days (42.08) to 50 per cent flowering and it was statistically at par with treatments T_3, T_7 and T_8.
Arya *et al.* (1999) in french bean crop which confirm the present findings.

Green pod length

The significant difference were observed among different treatment during investigation. Longer green pod length (19.50 cm) were harvested from treatment (T_2) GA_3 100 ppm. The treatments T_1, T_2, T_3, T_4, T_6 and T_7 these treatments are statistically significant over the control treatment (T_9) receiving water spray. The shortest green pods (18.13 cm) were harvested in treatment (T_8) CCC 200 ppm.
Cross *et al.* (1989) reported the maximum green pod length due to application of GA_3 200 ppm.

Effect on Yield parameters

The various attributes on yield viz., number of green pods per plant, yield per plant and yield per hectare were significantly influenced by application of plant growth regulators applied through individually (Table 2).

Number of green pods per plant

The treatment (T_2) GA_3 100 ppm produced maximum number of green pods (44.57) per plant. The treatments T_1, T_2, T_5, T_6 and T_7 the control. The lowest number of green pods (37.46) per plant observed in the treatment (T_8) CCC 200 ppm.

Highest number of green pods per plant due to the presence of growth promoting substances in PGR as explained by Mishriky *et al.* (1990), they also reported that the maximum number of green pod per plant in pea. These results are in conformity with above findings.

Yield per plant

The treatment T_2 recorded maximum yield (0.140 kg) per plant this treatment was statistically significant over all the rest of treatments. The treatments T_2, T_5, T_6 and T_7 statistically significantly superior over the control while the lowest yield per plant (0.095 kg) observed the treatment (T_8) CCC 200 ppm. The above findings are on similar Chaudhari *et al.* (2001).

Yield per hectare (q)

The treatment (T_2) GA_3 100 ppm recorded maximum yield (119.70 q) per hectare, this treatment statistically significantly superior over all of the treatments. The treatments T_2, T_6 and T_7 these treatments are statistically significant over the control treatment (T_9) receiving water spray. The lowest yield (81.29 q) per hectare found the treatment (T_8) CCC 200 ppm.

The maximum yield in treatment T_2 was due to more number of pods and large sized green pods as well as increased vegetative growth and balanced C/N ratio, which might have increased the synthesis of carbohydrates which ultimately promoted greater growth and yield. It has been also reported that, the secretes of hormones like IAA, cytokinin, auxin and GA which might have been another factor for increasing the yield. The above results corroborates with Brown *et al.* (1993).

Literature Cited

[1]. Abda. and M.A. Fattah, (1994). Effect of phosphorus, boron, GA_3 and their interaction on growth, flowering, pod setting abscission and both green pod and seed yields of broad bean (Vicia faba, L.) plants. Alexandria- Journal of Agricultural Research. 42(3):311-332.

[2]. Anonymous, (2003). State wise area and production of vegetable in India. http://hortibizindia .nic.in/aiaspesy.htm.

[3]. Arya ,P.S. , Sagar, V. and Singh .S.R. (1999). Effect of Growth Regulators on seed of French bean (Phaseolus Vulgaries L.) Var. Contender Scientific Hort .8:137-139.

[4]. Birajdar, A.M. (2006). Report on French bean Shetiwadi- News 2006.

[5]. Brown, J. E., Gillian, C.H. and Shumack R.L. (1993).Commercial snap bean response of Growth Regulators. Hort. Sci. 25: 29-31.

[6]. Chaudhari, C.S., Mendhe, S.N., Pawar, W.S., Ingole A.S. and Nikam,R.R. (2001). Growth Regulator Manegement in french bean J.Hort. Crop 11 (1): 137-139.

[7]. Crane, J.C. (1964). Growth substances in fruit setting and development. Ann. Rev. plant physiol., 15: 303-326.

[8]. Cross F., Falisse, A., and Haquenne, W. (1989). Effect of Gibberellic acid on morphology and production of spring peas. Mede delingen van de Faculteit landluwwetenschappen, Rijksuniversiteit.Gent. 53 (29); 447-454.

[9]. Deotale, R.D., Patil, A.M., Sorte, N.V., Ratnaparakhi,V.P. and Kene, D.R. (1993a). Effect of growth regulators in podding and yield of french bean. Acta Botnica India, 17(1):54-58.

[10]. Mishriky, j.F., Fadaty, K.A. and Badawi, M.A. (1990). Effect of gibberellic acid (GA3) and chlormequat (CCC) on growth, yield and quality of peas. Bulletin of Faculty of Agriculture, University of Cairo, 41(3):785-797.

[11]. Panse, V.G. and P. V. Sukhatme (1967). Statistical methods for Agricultural worker, ICAR, New Delhi.

Table 1: Effect of Growth Regulators on Growth of French Bean (*Phaseolus vulgaris* L.) var. Arka Komal.

Tr. No	Treatment	Plant Height (cm)			Plant Spread (cm)			Number of leaves per plant			Number of branches par plant		
		30	50	70	30	50	70	30	50	70	30	50	70
T_1	GA_3 at 50 ppm	18.73	28.06	30.06	17.43	25.93	27.23	8.66	13.53	14.13	1.66	5.80	6.13
T_2	GA_3 at 100 ppm	18.86	29.60	31.86	19.60	27.26	29.00	7.80	13.80	14.40	1.86	6.20	7.40
T_3	GA_3 at 150 ppm	19.80	31.80	33.33	21.03	28.63	29.60	8.33	14.00	14.40	1.66	5.53	6.46
T_4	GA_3 at 200 ppm	20.46	33.00	34.53	21.40	30.03	31.46	8.46	14.60	15.73	2.06	6.46	7.66
T_5	CCC at 50 ppm	18.73	28.46	29.93	19.33	25.90	27.63	7.73	13.20	14.00	1.73	5.40	6.46
T_6	CCC at 100 ppm	18.73	27.66	29.26	18.06	26.56	28.03	8.53	13.73	13.86	1.53	5.26	6.46
T_7	CCC at 150 ppm	19.20	27.73	28.93	17.80	25.83	27.76	8.06	13.20	13.40	1.73	5.60	5.83
T_8	CCC at 200 ppm	16.86	24.53	25.93	17.20	24.16	24.70	7.73	12.80	11.66	1.33	4.86	5.20
T_9	Control (water spray)	17.58	25.53	27.80	17.73	24.63	26.36	8.06	12.00	13.16	1.86	6.00	7.33
	SE $\pm$	0.589	0.991	1.127	0.90	0.780	0.974	0.330	0.307	0.430	0.292	0.221	0.277
	CD at 5 %	1.763	2.967	3.375	2.704	2.336	2.917	0.989	0.920	1.288	N.S.	0.663	0.831

Table 2: Effect of Growth Regulators on Flowering and Yield of French Bean (*Phaseolus vulgaris* L.) var. Arka Komal.

Tr. No	Treatment	Days to 50 per cent flowering	length of pod (cm)	Number of green pods/ plant	Yield per plant (kg)	Yield per hectare (q)
T_1	GA_3 at 50 ppm	41.15	19.19	41.87	0.109	93.58
T_2	GA_3 at 100 ppm	42.08	19.50	44.57	0.140	119.70
T_3	GA_3 at 150 ppm	38.89	18.70	40.99	0.099	87.12
sT_4	GA_3 at 200 ppm	41.75	19.08	35.78	0.090	77.18
T_5	CCC at 50 ppm	41.75	19.37	42.99	0.124	106.16
T_6	CCC at 100 ppm	42.03	19.16	43.79	0.137	117.09
T_7	CCC at 150 ppm	36.81	18.60	43.80	0.133	114.38
T_8	CCC at 200 ppm	38.32	18.13	37.46	0.095	81.29
T_9	Control (water spray)	35.93	18.21	39.05	0.107	91.56
	SE $\pm$	0.795	0.444	1.097	0.004	1.056
	CD at 5 %	2.379	1.330	3.284	0.014	3.163