Effect of biofertilizers on growth of chilli cv Pusa Jwala at different levels of nitrogen and phosphorus

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***Abstract*- The present investigation entitled "Effect of biofertlizers on growth of chilli cv Pusa Jwala at different levels of nitrogen and phosphorus" The experiment was conducted at the Instructional Farm, Department of Horticulture, JNKVV College of Agriculture, Rewa (M.P.) during the year 2016-17. The experiment was laid out in Randomized Block Design with three replications. Among different treatments 75%NP+100%K+Azotobacter+Azospirillum+PSB+VAM was most effective in growth parameters at 15, 45, 75 and 90 DAT the maximum height (22.20cm, 33.20cm. 46.25cm and 46.43 cm, number of primary and secondary branches in per plant (9.85 and 15.33), Stem girth (12.43mm) and Days to flower initiation and days to 50% flowering (42.33 and 52.33), other growth parameters such as Days to maturity (109.67), at "The climate of the region is semi-arid and subtropical having winter and summer'' agro climatic zone of Madhya Pradesh.**

Keywords: **Chilli (capsicum annuum L.), Azotobacter, PSB, VAM, Azospirillum, growth, width, maturity**

INTRODUCTION

Chilli (*Capsicum annuum* L.) is one of the important vegetable-cum-spice crops of India and the most important cash crops belonging to the family Solanaceae. *Capsicum* was domesticated at least five times by prehistoric peoples in different parts of South and Middle America. The substances that responsible for pungency in chili is capsaicin, ($C_{18}H_{37}NO_3$) and several related chemicals, collectively called *capsaicinoids*. Green fruit of chilli and sweet peppers are one of the richest sources of anti- oxidant vitamins such as vitamin A, C and E, these antioxidant in food protect occurrence of cancer. It is used for industrial purpose due to extraction of oleoresin. Hot chilli producing countries are India, China, Indonesia, Korea, Pakistan, Turkey and Sri Lanka. The mild chilli producing countries are Hungary, Spain, Romania and Bulgaria. India is the largest producer, consumer and exporter of chillies in the form of dried whole chillies **(Awasthi and Kumar, 2008).** Being introduced by Portuguese in 17th century in India, especially grown in Andhra Pradesh, Karnataka, Tamil Nadu and Maharashtra, account for 3/4 of the total area besides Madhya Pradesh, West Bengal, Punjab, Bihar and Rajasthan. Chilli occupies an area, production and productivity were estimated to be 9.5 lakh hectare, 10-10.5 lakh tonnes and 8.6 t/ha, respectively. However in Madhya Pradesh chilli is cultivated in 47.091 thousand hectare area with a total annual production of 42.9 thousand tonnes dry chilli. Even though chilli is a high value commodity, which has the potential for improving the income and the livelihood of thousand of small holder farmer.

MATERIALS AND METHODS

Experimental site

The experiment was conducted at the Instructional Farm, Department of Horticulture, JNKVV College of Agriculture, Rewa (M.P.) in the year 2016-17.

Experimental material

The experimental material for this study comprised of variety of Pusa Jwala collected from Indian Institute of Vegetable Research (IIVR) Varanasi (U.P.)

Experimental method

The experiment was conducted in a Randomized block design (RBD) with three replications. Twenty five days old seedlings of Chilli variety was transplanted at the experimental site.

Raising of seedling

The seed beds were prepared by mixing vermi-compost. Seeds are treated with Thiram @ 2g/kg of seeds before sowing and were sown on 17 October 2016 in Separate bed uniformly at a depth of 2-3 cm. A regular watering, weeding and plant protection measures were carried out as and when required.

Fertilizer application

The crop was grown with FYM 50 and 100% recommended of N:P:K (100:60:80 kg/ha) as per treatments. Full dose of phosphorus; potash and half dose of nitrogen were applied as basal dose. At the same time different of FYM and vermicompost were also applied as basal mixed with soil in each plot. The remaining half dose of nitrogen was applied 30 days after transplanting. Biofertilizer was applied in rows according to the treatment.

Gap filling

Gap filling was done to maintain the optimum plant population per plots on 03-12-16. The gap filled plants were then lightly irrigated.

Irrigation's

Light irrigation was applied for establishment of seedlings. After transplanting subsequent irrigations were provided as and when required for growth and development of plants. The irrigation at weekly interval was given as and when required subsequently after one month the irrigation interval was increased to 10 days.

Intercultural operation

The experimental plots were kept free from weeds, by carrying out hand weeding as and when weeds were observed. Light earthing up was given to keep be soil porous and to support the plants.

Observations recorded

Plant height (cm)

Height of 3 randomly selected plants in each plot was measured from the ground level of plant to the tip of the main stem of plant at the time of harvest. The mean height was computed by dividing the summation with three.

Stem girth (mm)

The stem girth of the selected three mature plants was measured by the Vernier calipers in mm taken from each treatment and the average girth of the fruit was calculated.

Primary branches per plant

Number of primary branches plant^{-1} was counted from randomly selected plants at the time of harvest and the average values were estimated.

Secondary branches per plant

Secondary branches were counted along with primary branches at the time of harvest and the average was estimated.

Days to flower initiation

Number of days taken from transplanting to the appearance of first flower on the plant in a plot was recorded. Data was recorded on plot basis.

Days to 50% flowering

The number of days taken to complete 50% plant flowering in a plot from the date of transplant was recorded. Data was recorded on plot basis.

Days to maturity

Number of days from the date of transplanting to the date of physiological maturity of the plant in a plot.

RESULTS AND DISCUSSION

Growth parameter at 15, 45, 75 and 90 days (After transplanting)

Plant height

The results on the plant height are shown in Table 1. the maximum height upto 22.20, 33.20, 46.25 and 46.43 cm was recorded in case of was noted under treatment combination 75%NP+100%K+Azotobacter+ Azospirillum+PSB+VAM. Amirthalingam (1988); Damke (1988); Mallanagouda (1995); Gowda (2002); *Khan et al. (2009).*

Days to flower initiation

The results is regarding days to flower initiation represented in the Table 2. The maximum days to flower initiation was recorded in 42.33 days was noted under treatment combination 75%NP+100%K+Azotobacter+ Azospirillum+PSB+VAM.

Days to 50% flowering

The data regarding Days to 50% flowering is represented in the Table 2. The maximum days to 50% flowering observed in 52.33 days was recorded under treatment combination of 75%NP+100%K+Azotobacter+ Azospirillum+PSB+VAM.

Days to maturity

The results on Days to maturity are represented in the Table 2. The maximum days to maturity recorded by 109.67 days was recorded under treatment combination of 75%NP+100%K+Azotobacter+ Azospirillum+PSB+VAM.

Primary and Secondary branches per plant

The result of primary and secondary branches per plant is given in Table 3. The maximum primary branches 9.85 per plant as well as secondary branches 15.33 per plant was obtained under treatment combination 75%NP+100%K+Azotobacter+ Azospirillum+PSB+VAM.

Stem girth

The data is regarding stem girth in Table 3. The maximum stem girth (12.43 mm) was recorded under treatment combination of 75%NP+100%K+Azotobacter+ Azospirillum+PSB+VAM. Ramakrishnan and Selvakumar (2012); *Singh et al. (2014); Rao MR Krishna. (2015);* and Reddy *et al*. (2017).

Table 1: Plant height of chilli at different growth stages as influenced by different fertility treatments.

Tr. No	Treatments	Plant height (cm)			
		15DAT	45DAT	75DAT	90 DAT
T_1	100% NPK	18.55	30.65	42.17	42.79
T_2	75%NP+100%K	19.55	31.15	43.70	43.79
T_3	75%NP+100%K+Azotobacter	19.65	31.17	44.35	44.57
T_4	75%NP+100%K+Azospirillum	19.95	31.45	44.45	44.65
T_5	75%NP+100%K+PSB	20.15	32.18	44.75	45.07
T_6	75%NP+100%K+VAM	20.20	32.25	45.05	45.25
T_7	75%NP+100%K+Azotobacter + Azospirillum	21.15	33.15	45.18	45.27
T_8	75%NP+100%K+PSB+VAM	21.25	33.20	46.15	46.35
T_9	75%NP+100%K+Azotobacter+ Azospirillum+PSB+VAM	22.20	33.20	46.25	**46.43**
T_{10}	Control	17.60	29.65	40.49	**40.65**
	S.Em±	1.45	2.38	0.89	0.86
	CD at 5%	2.99	4.88	1.84	1.77

Table 2: Days to flower initiation, days to 50% flowering and days to maturity of chilli as influenced by different fertility treatments.

Treatments Details		Days to flower initiation	days to 50% flowering	days to maturity
T_1	100% NPK	31.67	41.67	103.67
T_2	75%NP+100%K	29.77	39.67	102.67
T_3	75%NP+100%K+Azotobacter	30.15	37.67	106.67
T_4	75%NP+100%K+Azospirillum	32.67	44.00	108.33
T_5	75%NP+100%K+PSB	34.33	42.00	104.67
T_6	75%NP+100%K+VAM	34.00	42.67	107.33
T_7	75%NP+100%K+Azotobacter+ Azospirillum	38.00	46.00	109.17
T_8	75%NP+100%K+PSB+VAM	36.00	33.00	107.67
T_9	75%NP+100%K+Azotobacter+ Azospirillum+PSB+VAM	42.33	52.33	109.67
T_{10}	Control	27.83	38.39	102.33
SE(m)±		**0.56**	**33.67**	**41.74**
C.D. at 5%		**1.62**	1.35	5.69

Table 3: Number of primary and secondary branches and stem girth (mm) per plant of chilli as influenced by different fertility treatments.

Treatments Details		Number of primary branches	Number of secondary branches	stem girth (mm)
T_1	100% NPK	7.97	12.44	9.69
T_2	75%NP+100%K	7.95	11.33	10.33
T_3	75%NP+100%K+Azotobacter	8.15	11.67	10.43
T_4	75%NP+100%K+Azospirillum	8.35	13.43	10.74
T_5	75%NP+100%K+PSB	8.27	14.00	10.69
T_6	75%NP+100%K+VAM	8.43	13.67	10.25
T_7	75%NP+100%K+Azotobacter+ Azospirillum	8.67	14.61	11.45
T_8	75%NP+100%K+PSB+VAM	8.79	14.42	12.03
T_9	75%NP+100%K+Azotobacter+ Azospirillum+PSB+VAM	**9.85**	**15.33**	12.43
T_{10}	Control	7.69	10.33	9.40
SE(m)±		0.40	0.75	0.54
C.D. at 5%		0.83	1.54	1.10

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