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Effect of Bio-Fertilizer and Kitchen Waste Manure on Growth of Chilli cv. Pusa Jwala

Vinit Kumar Meena*, Sutanu Maji, Rakesh Kumar Meena and Batti Lal Meena

Department of Horticulture, Babasaheb Bhimrao Ambedkar University, Vidya-Vihar, Rae Bareli Road, Lucknow-226025, India

**Corresponding author*

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A B S T R A C T

An experiment was carried out at the Horticulture Research Farm, Department of Applied Plant Science (Horticulture) Babasaheb Bhimrao Ambedkar University (A Central University), Lucknow to Effect of bio-fertilizer and kitchen waste manure on vegetative growth of chilli cv. Pusa Jwala. The results revealed that the that application of treatment T_{10} [RDF 50% + kitchen waste manure (25 and 50 days after transplanting)] was found to be the best treatment in respect of betterment of vegetative growth except treatment T_7(RDF 50% + kitchen waste manure) showed the early flowering to harvesting (23.67 days).

Introduction

Pepper (*Capsicum* sp.) is an economically important vegetable crop belonging to the family solanaceae having chromosome number n = 12 (Thambhuraj and Singh, 2015). It originated from South and Central America where it is still under cultivation (Pickersgill, 1997). Pepper was introduced into Europe by Columbus and other early new explorers in the sixteenth century and cultivation spread throughout the world (Greenleaf,1986). Chilli (*Capsicum annum* var. *frutescence*) is one of the most important vegetable crops grown throughout India. It is grown for export as well as for domestic market. Chilli is a heavy feeder crop so, it needs higher amount of nutrient according to recommended that 150 kg/ha Nitrogen, 75 kg/ha Phosphorus, 75 kg/ha Potassium.

It is used for good growth and yield for production of chilli proper supply sufficient amount of nutrient by inorganic source. But now a days, inorganic or chemical fertilizer can be reduce the soil fertility, plant growth, flowering and yield as well as it affect the quality of chilli. thus I have used to bio-fertilizer like *Azospirillum* in chilli crop because it help to convert the atmospheric

nitrogen in available nitrogen form and increases the growth, no of leaves, flowering, fruiting, yield and biochemical property in fruit as well as in kitchen waste manure good amount of nutrient because it is made by plant origin like leaves, flower, peel, seed etc. kitchen waste manure is not only good amount in nutrient as well as clean area and provide fresh air because disposed the kitchen garbage and it increase the microbial activity, soil porosity, water retention and reducing the pH level. It is used for increase the growth yield and quality of chilli.

Materials and Methods

The experiment was carried out at the Horticulture Research Farm, Department of Applied Plant Science (Horticulture) Babasaheb Bhimrao Ambedkar University (A Central University), Vidya Vihar, Rae Barely Road, Lucknow during October 2016 - May 2017.Geographically, experimental field is situated at an elevation of 123 meter above Mean Sea Level (MSL) in the Sub-tropical Climate of Central Uttar Pradesh at 26^0 $55^/$ North latitude and 80^0 $59^/$ East longitude. The experiment was laid out in Randomized Block Design (RBD) with three replications. Total plot size2.16 m^2, total no. plot 36 along with 30 x 30 cm. The seeds of chilli (*Capsicum annum var. frutescence*) cv. Pusa Jwala were obtained from the Indian Agricultural Research Institute, Pusa, New Delhi.

Before the seed sowing, the nursery field was ploughed, harrowed and the soil was brought to a fine tilth. Raised nursery beds were prepared at a height of 15cm with 1m width and 2m length. Well-decomposed compost at 2 kg per meter cube and NPK complex fertilizer was applied 15 days before sowing. Seeds of chilli variety Pusa Jwala sown after treating the seeds with 0.2 percent captan. Seeds of chilli were sown in rows and after sowing the lines were covered with fine FYM. Healthy seedling of 35 days old with 4-6 true leaves were transplanted in main field.

Well-rotted Farmyard manure applied as per the treatments one month prior to transplanting. The other inorganic sources of nitrogen, phosphorous and potassium were applied in the form of urea, di ammonium phosphate and muriate of potash respectively at recommended dose. Full dose of phosphorous and potassium and half dose of nitrogen was applied to the treatments receiving Farmyard manure and *Azospirillum* inoculation, while the remaining treatments received full dose of recommended dose of nitrogen (RDN) 150 kg N/ha in two splits doses and 50 % RDN (in two splits) as per treatment specifications at the time of transplanting. The roots of chilli seedlings were dipped in solution containing *Azospirillum* inoculation and left for 15 minutes before transplanting as per the treatment specifications. The solution was made by adding juggary in sterile distilled water.

Results and Discussion

It revealed (Table 1) that application of 50% Recommended dose of fertilizers (RDF) and kitchen waste manure applied at 25 and 50 days after transplanting (T_{10} treatment) increased the plant height at maximum ratei.e. 66.83 cm at 120 days after transplanting, respectively followed by T_4 (50% RDF + *Azospirillum* application at the time of transplanting) and T_9 (50% RDF +Kitchen waste manure at 25 days of transplanting while, the minimum height was recorded under control plant (T_0). Similarly, Natarajan (1990) also observed that chilli cultivars Local and CA- 42 when inoculated with *Azospirillum* in combination with 75 % of recommended nitrogen produced higher plant height (56.13 cm and 57.86cm, respectively). It was also observed that T_{10} i.e. treatment

with 50% RDF and kitchen waste manure applied at showed the maximum number of branches per plant at 120 days after transplanting 27.81, respectively) followed by T_4 (50% RDF + *Azospirillum* at the time transplanting) as similar trend observed in case of plant height. Seedling treatment with *Azospirillum* and 50% RDF application (T_3) also had a better result to increase the number of branches

The maximum number of leaves were counted under treatment T_{10}(50% RDF and kitchen waste manure 186.50but, there was a negligible statisitical difference among most of the treatments (Table 1). In general, all the treatments increase the number of leaves as compared to the control plants and some of the treatment effect (except T_7) were better than the 100% RDF treatment (T_1).

To find out T_{10} treatment (50% RDF and kitchen waste manure showed the maximum average spreading of plant (39.20cm, respectively) at 120 days after transplanting followed by T_4 (50% RDF + *Azospirillum* at the time transplanting) while the minimum average spreading of per plant was recorded under control plant (T_0). Siddesh (2006) also observed that application of *Azospirillum* to chilli plants with 70 kg N per ha produced the higher branches (11.2/plant) respectively. The observation on flowering revealed that early flowering was initiated by the application of 50% RDF and kitchen waste manure showed (79.30 days from transplanting) followed by 82.30 days in T_4 i.e. 50% RDF + *Azospirillum* at the time transplanting and 84.3 days at T_9 (50% RDF + *Azospirillum*; soil application at transplanting*)* while the late flowering was recorded under control plant (T_0). Deshpande *et al.,* (2010) also examined and found that the treatment N 125 kg / ha + FYM @ 10 t/ha + *Azospirillum* reported more plant height, number of braches per plant, days to first 50 % flowering, days to first harvest, number of fruits per plant, weight of individual fruit, fruit length, fruit diameter, yield of fresh red fruits, while least values for all above characters were recorded in control (N 150 kg/ha + FYM @ 10 t/ha).

The early flowering (Table-2) also caused early harvesting of green chilli fruits. Plants under T_{10} showed the early harvesting from transplanting (107.67 days) followed by 109.00 days from transplanting date under T_4(RDF 50% + *Azospirillum* at the time transplanting). Late flowering in control plants lead to late harvesting from transplanting. However, Jeevansab (2000)reported that *Azospirillum* + RDF (150:75:50) took more number of days (37.81 days) to 50 per cent flowering as compared to RDF (36.6) alone in capsicum. But, Sutagundi (2000) reported early flowering (43.66 days) in plants when treated with FYM (10 t/ha) as compared to 100:50:50 kg NPK per ha (43.75 days) in chilli.

Maximum fruit set (96.07%) was recorded under treatment T_{10} followed by T_4. The significant fruit se increase was observed in all the treated plants a compared to control plants. This increase also reflected in case of number of fruits per plants after 10 harvesting. Control plants showed minimum fruit numbers than the other treatments, Sajan *et al.,* (2002) studied the effect of bio-fertilizers combined with different N, P and K fertilizer rates on the growth and yield of chilli cv. Byadagi Dabba. They showed that plants inoculated with *Azotobacter*, *Azospirillum*, PSB and VAM in combination with 75% NPK+100% K recorded 36% more fruits per plant (111.38) and 45% more dry fruit yield (2.27 t/ha) compared to the control (81.68 and 1.56 t/ha, respectively).

Table.1 Five different Vegetative growth parameters in chilli

Treatment	Vegetative growth parameters				
	Plant height (cm)	**Number of branches**	**Number of leaves**	**Average Spreading of plant (cm)**	**Days required for first flowering after transplanting**
T_0 – Control	51.91	16.67	129.39	27.17	94.7
T_1 - 100% RDF (NPK)	56.02	23.42	167.00	34.77	90.0
T_2 - RDF 50% + *Azospirillum* (soil application before transplanting)	62.75	24.83	171.67	35.43	86.3
T_3 - RDF 50% + *Azospirillum* (Seedling treatment)	64.33	26.16	176.92	35.90	86.0
T_4 - RDF 50% + *Azospirillum* (soil application at transplanting treatment)	64.92	26.79	178.83	38.20	82.3
T_5 - RDF 50% + *Azospirillum* (at 25 days after transplanting)	58.75	23.63	153.67	34.93	87.3
T_6 - RDF50 % +*Azospirillum* (at 25 and 50 days after transplanting)	61.25	24.70	158.25	34.00	88.3
T_7 - RDF 50% + kitchen waste manure (soil application before transplanting)	59.08	23.80	153.50	34.83	89.0
T_8 - RDF 50% + kitchen waste manure (at the time of transplanting)	63.00	25.90	174.50	34.40	85.7
T_9 - RDF 50% + kitchen waste manure (25 days after transplanting)	64.00	26.38	174.58	35.60	84.3
T_{10} - RDF 50% + kitchen waste manure (25 and 50 days after transplanting)	66.83	27.81	186.50	39.20	79.3
T_{11} - 100% kitchen waste manure (at the time of transplanting)	59.42	23.50	156.08	35.30	86.7
SEm (±)	0.986	0.491	5.417	0.324	1.486
CD (P=0.05)	2.709	1.449	15.990	15.990	4.388

Table.2 Five different Vegetative growth parameters in chilli

Treatment	Vegetative growth parameters				
	Days to first harvesting after transplanting in chilli	**Fruit set %**	**Individual average fruit weight (g)**	**Thickness of pericarp (mm)**	**Days from flowering to harvesting**
T_0 – Control	120.67	80.67	2.11	0.75	26.00
T_1 - 100% RDF (NPK)	118.00	84.12	2.58	0.82	28.00
T_2 - RDF 50% + *Azospirillum* (soil application before transplanting)	115.33	85.42	2.85	0.93	29.00
T_3 - RDF 50% + *Azospirillum* (Seedling treatment)	113.33	91.83	2.93	1.17	27.33
T_4 - RDF 50% + *Azospirillum* (soil application at transplanting treatment)	109.00	92.92	3.18	1.20	26.67
T_5 - RDF 50% + *Azospirillum* (at 25 days after transplanting)	116.33	84.92	2.81	0.96	29.00
T_6 - RDF50 % +*Azospirillum* (at 25 and 50 days after transplanting)	114.67	87.49	2.77	1.02	26.33
T_7 - RDF 50% + kitchen waste manure (soil application before transplanting)	112.67	86.16	2.77	1.05	23.67
T_8 - RDF 50% + kitchen waste manure (at the time of transplanting)	115.00	86.69	2.94	1.05	29.33
T_9 - RDF 50% + kitchen waste manure (25 days after transplanting)	112.00	89.92	2.88	1..06	27.67
T_{10} - RDF 50% + kitchen waste manure (25 and 50 days after transplanting)	107.67	96.07	3.35	1.37	28.33
T_{11} - 100% kitchen waste manure (at the time of transplanting)	112.33	88.46	2.79	0.88	25.67
SEm (±)	1.038	0.738	0.036	0.020	1.572
CD (P=0.05)	3.065	2.179	0.107	0.060	N/A

Similarly, a significant increase on average fruit weight was also observed of physic-chemical qualities of fruits. The application of RDF 50% and kitchen waste manure at 25 and 50 days after transplanting produced fruits with the highest average fruit weight of 3.35g followed by application of RDF 50% and *Azospirillum* as soil application during transplanting (T_4) as well as seedling transplanting (T_3).

Mishra and Singh (2005) also noticed that NPK and *Azotobactor* significantly increase in okra, number of fruits, fruit length, fruit width, fruit size, average fruit weight and finally the yield was noted maximum under the treatment (Sewage Sludge @ 2.5 t + ¾ NPK + *Azotobactor*).

Maximum fruit thickness of pericarp(1.37 mm) was recorded under treatment T_{10} followed by T_4. The significant fruit thickness of pericarp increase was observed in all the treated plants a compared to control plants. According to the study by Gosavi *et al.*, (2010) fruit quality parameter of tomato such as pericarp thickness found to be better in the treatment with organic fertilizers in combination bio-fertilizer.

The days from flowering to harvesting of green chilli fruits under T_7(RDF 50% + kitchen waste manure) showed the early from flowering to harvesting (23.67 days) followed by 25.67 days from flowering to harvesting and maximum days from flowering to harvesting of green chilli fruits 29.33 days under T_8(RDF 50% + kitchen waste manure at the time of transplanting).

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