



EFFECT OF ORGANIC FERTIGATION ON GROWTH PARAMETERS OF BELL PEPPER (*CAPSICUM ANNUUM* VAR. *GROSSUM* SENDT.)

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Abstract

Bell pepper (*Capsicum annum var. grossum* Sendt.) is a highly valued vegetable crop grown in India. Use of organic fertilizers enables the production of superior quality produce devoid of toxic residues. With this view, an investigation on "Effect of organic fertigation on growth of bell pepper (*Capsicum annum var. grossum* Sendt.)" was carried out at vegetable unit, Department of Horticulture, Faculty of Agriculture, Annamalai University, Annamalai Nagar, Tamil Nadu, during 2016 - 2017. There were nine treatment combinations including organic manures viz., Farm yard manure, Vermicompost, Bio-stimulants (Humic acid & Sea weed extract) and organic fertigation with Neem cake (two levels viz., 1:20 & 1:40 dilution). Among the nine treatments, the treatment T₇ (Humic acid granules @ 5g plant⁻¹ + Fertigation with Neem cake 1:20) recorded the highest values for plant height, number of leaves, leaf area, leaf area index and dry matter production.

Key words: Bell pepper, Organic fertigation, FYM, Vermicompost, Sea weed extract, Humic acid.

Introduction

Bell pepper (*Capsicum annum var. grossum* Sendt.) is one of the most popular highly valued vegetable crops grown in India. Since it is mostly consumed fresh, its flavor, taste, nutritive value and extended shelf life (Meerabai, 2007) are very important quality characters. Use of organic fertilizers enables the production of superior quality produce devoid of toxic residues. Organic management calls for use of organic supplements to supply the required macro, secondary and micro nutrients and to boost its immunity towards pests. An application of organic nutrients encourages the growth and activity of mycorrhizae and other beneficial organisms in the soil and is helpful in alleviating the increasing incidence or deficiency of secondary and micronutrients and is capable of sustaining high crop productivity and soil health (Nambiar *et al.*, 1992). Among the organic basal supplements, FYM, vermicompost, humic acid and sea weed extracts are easily available in the market. Further, liquid extracts of concentrated cakes like neem, groundnut and gingelly could be used in top dressing and fertigation. However, the significant interaction of media and organic

nutrients calls for development of location specific technology. Hence, the present investigation was undertaken to study the possibilities of increasing the growth of bell pepper through organic fertigation.

Materials and methods

The present study was carried out in the vegetable unit, Department of Horticulture, Faculty of Agriculture, Annamalai University during 2016-2017. Nine treatment combinations including organic manures viz., Farm yard manure (FYM), Vermicompost (VC), Bio-stimulants [Humic acid (HA) & Sea weed extract (SW) and organic fertigation with neem cake (NC) were tried in the present investigation. Fermented neem cake solution was used in fertigation at two levels. All plants were given uniform quantity of water and fertigation was done on every alternate irrigation. The two levels were worked out to supply approximately 200 and 400 ppm N at each fertigation. Treatments include: T₁- Recommended dose of fertilizer (RDF) 250:150:150 kg NPK ha⁻¹, T₂- VC (25 g per plant) + Fertigation with NC 1:40 dilution, T₃- VC (25 g per plant) + Fertigation with NC 1:20 dilution, T₄- SW (5 g per plant) + Fertigation with NC 1:40 dilution, T₅- SW (5 g per plant) + Fertigation with NC

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1:20 dilution, T_6 - HA (5 g per plant) + Fertigation with NC 1:40 dilution, T_7 - HA (5 g per plant) + Fertigation with NC 1:20 dilution, T_8 - FYM (125 g per plant) + Fertigation with NC 1:40 dilution, T_9 - FYM (125 g per plant) + Fertigation with NC 1:20 dilution. The organic manures were applied at basal and the organic fertigation were applied at alternate irrigation. The effect of nine treatments were tried on cv. "Indra" grown in grow bags of 10 kg capacity. The treatments were replicated thrice and the experiment was studied under completely randomized design.

Results and Discussion

Plant height is considered to be an important factor to judge the vigour in bell pepper. The data presented in Table 1 showed significant variations in plant height and number of leaves as influenced by the treatments at three stages of evaluation *viz.*, 45 DAP, 75 DAP and at final harvest. Among the treatments, (T_7) Humic acid @ 5 g

per plant + Fertigation with Neem cake 1:20 recorded showed the maximum plant height (58.82, 76.54 and 108.31cm at 45 DAP, 75 DAP and final harvest respectively) and number of leaves per plant at 45 DAP (47.97), 75 DAP (76.29) and at final harvest (115.33). This was followed by the treatment (T_3) Vermicompost @ 25 g per plant + Fertigation with Neem cake 1:20 which recorded a plant height of 54.82, 70.49 and 103.69 cm at 45 DAP, 75 DAP and final harvest respectively number of leaves of 45.65, 73.75 and 111.39 at 45 DAP, 75 DAP and at final harvest respectively. However, the minimum plant height and number of leaves per plant at 45 DAP, 75 DAP and final harvest was found in (T_8) FYM @ 125 g per plant + fertigation with Neem cake 1:40. It might be attributed to increased plant nutrient balance, fertilizer uptake and root growth. This corroborates the findings of Adani *et al.* (1998) who reported that humic acid naturally activate (or) accelerate enzyme and hormone systems increasing cell

Table 1: Effect of organic fertigation on plant height and number of leaves in bell pepper.

Treatments	Plant height (cm)			Number of leaves		
	45 DAP	75 DAP	Final harvest	45 DAP	75 DAP	Final harvest
T_1 - Recommended dose of fertilizer (RDF) 250:150:150 kg NPK ha ⁻¹	49.85	67.27	98.62	43.18	71.48	108.89
T_2 - Vermicompost (25 g per plant) + Fertigation with Neem cake 1:40	46.19	64.79	91.99	39.26	64.79	101.03
T_3 - Vermicompost (25 g per plant) + Fertigation with Neem cake 1:20	54.82	70.49	103.69	45.65	73.75	111.39
T_4 - Sea weed extract (5 g per plant) + Fertigation with Neem cake -1:40	44.89	61.89	87.88	36.46	61.33	97.38
T_5 - Sea weed extract (5 g per plant) + Fertigation with Neem cake -1:20	53.50	70.18	96.43	43.01	70.69	105.45
T_6 - Humic acid (5 g per plant) + Fertigation with Neem cake 1:40	48.28	65.31	92.33	39.33	65.22	101.09
T_7 - Humic acid (5 g per plant) + Fertigation with Neem cake 1:20	58.82	76.54	108.31	47.97	76.29	115.33
T_8 - FYM (125 g per plant) + Fertigation with Neem cake 1:40	42.69	56.34	82.44	32.17	58.39	90.81
T_9 - FYM (125 g per plant) + Fertigation with Neem cake 1:20	51.22	68.24	95.21	40.19	67.77	104.98
SED	0.57	0.64	0.68	0.52	0.34	0.51
CD (P= 0.05)	1.14	1.28	1.36	1.04	0.68	1.02

Table 2: Effect of organic fertigation on leaf area, LAI and dry matter production in bell pepper

Treatments	Leaf area (cm ²)	Leaf area Index	Dry matter production per plant (g)
T_1 - Recommended dose of fertilizer (RDF) 250:150:150 kg NPK ha ⁻¹	72.68	3.16	21.08
T_2 - Vermicompost (25 g per plant) + Fertigation with Neem cake 1:40	58.39	2.36	18.23
T_3 - Vermicompost (25 g per plant) + Fertigation with Neem cake 1:20	73.94	3.29	21.83
T_4 - Sea weed extract (5 g per plant) + Fertigation with Neem cake -1:40	53.94	2.08	17.31
T_5 - Sea weed extract (5 g per plant) + Fertigation with Neem cake -1:20	68.81	2.90	20.01
T_6 - Humic acid (5 g per plant) + Fertigation with Neem cake 1:40	61.45	2.48	18.76
T_7 - Humic acid (5 g per plant) + Fertigation with Neem cake 1:20	77.83	3.59	22.35
T_8 - FYM (125 g per plant) + Fertigation with Neem cake 1:40	52.31	1.90	16.01
T_9 - FYM (125 g per plant) + Fertigation with Neem cake 1:20	66.99	2.81	19.29
SED	0.64	0.13	0.21
CD (P= 0.05)	1.28	0.26	0.42

communication, coordination, increasing synthesis of energy molecules including cell division or growth. Further, increased natural enzyme activity of the plant and coordinating effect might have resulted in better response in humic acid treatment over control as reported by Khristeva *et al.*, (1953). The increase in plant height due to vermicompost might have resulted from stimulated metabolic process, growth synthesis and application of more metabolites in plant tissues as reported by Kumar and Kohli (2005) in capsicum and in tomato Natarajan (2005). This further goes in the agreement with findings of El- Bassiony *et al.* (2010) who found vermicompost applied plots showed maximum increase in plant height, number of leaves, number of buds. Further the superiority of vermicompost may be attributed to the slower nutrient release rate of vermicompost. Shipitalo and Protz (1989) also opined that due to its structure which is similar to slow release granule having organic matter core and clay casting they exhibit sustained release of nutrients.

The possible reason for increase in plant height might be due to more availability of nutrients in liquid fertigation. However, because no symptoms of any diseases were observed in any treatment neither on root and shoot, this increase is likely linked to a stimulation of general microbial activity including beneficial micro organisms. Increasing microbial activity in the rhizosphere influences plant growth (Jack *et al.*, 2011). Similarly, Kone *et al.* (2010) reported that microbial activity of compost tea is most likely the result of its antagonistic activity against pathogens.

The data on leaf area, leaf area index and dry matter production presented in table 2 revealed significant effect of organic fertigation. The leaf area ranged from 52.31 cm² to 77.83 cm²; leaf area index ranged from 1.90 to 3.59 and dry matter production ranged from 16.01 to 22.35 g per plant. Among the various treatments tested, (T₇) Humic acid @ 5 g per plant + Fertigation with Neem cake 1:20 had recorded the maximum leaf area of 77.83 cm² leaf area index of 3.59 and the highest dry matter production of 22.35 g plant⁻¹. The second best treatment in case of leaf area and dry matter production was (T₃) Vermicompost @ 25 g per plant + Fertigation with Neem cake 1:20 with a value of 73.94 cm² and 21.83 g plant⁻¹ respectively. The treatment T₇ was on par with T₃ in case of leaf area index. The least values for leaf area, leaf area index and dry matter production was recorded in (T₈) FYM @ 125 g per plant + Fertigation with Neem cake 1:40. The present study corroborates the findings of Ghorbani *et al.*, (2010) and Haghigh *et al.*, (2011) who stated that in leguminous plants, humic acid foliar spray had remarkable effects on vegetative growth of

plant and increased photosynthetic activity and leaf area index. The results might be due to the fact that humic acid increases plant growth through chelating different nutrients to overcome the lack of nutrients, and has useful effects on increased growth, production, and quality improvement of agricultural products due to having hormonal compounds (Albayrak and Camas, 2005).

The increase in the dry matter production might be due to the fact that humic acid increased plant water status *viz.*, relative water content, water retention capacity, water saturation deficit and water uptake capacity as well as promotion of photosynthesis and respiration contributed by the protein and quinine groups of the humic acid assimilated in plants improves the growth of crops (Jana Kholova *et al.*, 2010).

The results might be attributed to the fact that organic fertigation with fermented neem cake increased the N uptake of plant, which in turn might have influenced the growth characters. as, N is the chief constituent of protein, essential for the formation of protoplasm, leading to cell division and cell enlargement. The utilization of applied N in protein synthesis stimulates all enzymatic reaction and by this it increased the plant growth was reported by Singh and Mukherjee (2000) and Bharad *et al.* (2007) in chilli.

Conclusion

From the results of the present study it can be concluded that application of Humic acid (5 g per plant)+ Fertigation with Neem cake 1:20 dilution was found to be beneficial in increasing the growth parameters in bell pepper.

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