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Ralebhat BN
College of Agriculture Latur, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, Maharashtra, India

RA Patil
Assistant Professor, College of Agriculture Osmanabad, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, Maharashtra, India

TS ghangale
College of Agriculture Latur, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, Maharashtra, India

MR Kharade
College of Agriculture Latur, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, Maharashtra, India

SD Navsupe
College of Agriculture Latur, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, Maharashtra, India

Corresponding Author:
Ralebhat BN
College of Agriculture Latur, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, Maharashtra, India

Effect of different sources of organic fertilizers on nutrient status of soil and incidence of diseases and pests of sweet pepper (*Capsicum annum* L.) under protected condition

Ralebhat BN, RA Patil, TS ghangale, MR Kharade and SD Navsupe

Abstract
Investigation on "Effect of different sources of organic fertilizers on nutrient status of soil and incidence of diseases and pests of sweet pepper (*Capsicum annum* L.) under protected condition" was conducted at "Instructional cum Research Farm, College of Agriculture, Osmanabad" during *rabi* season 2020-21. The experiment was laid out in Randomized Block Design in eleven treatments with three replications. The seedlings were transplanted on 10th Jan., 2020. The plot size was 2. 74 m^2 and a spacing 60 cm × 70 cm were followed. Among the different sources of organic fertilizers, Vermicompost was found to be superior in nutrient status of soil and incidence of pests and diseases. Hence, application of Vermicompost (6 t/ha) for increase the nutrient status of soil and least pests and diseases incidence can be recommended for commercial cultivation.

Keywords: Sweet pepper, Organic Fertilizers, FYM, Vermicompost, Jivamrut, Ghanamrut, nutrient status of soil, diseases and pests)

Introduction
Sweet Pepper (*Capsicum annum* L.) also called as Bell Pepper, Green Pepper and Shimla Mirch is a genus of plant belongs to the family Solanaceae. Most of the species of Sweet Peppers are diploid (2n=2x=24). Sweet Pepper is forecasted to have 34,903 genes, round about the same number as both tomato and potato, two related species within the solanaceae family. Sweet Peppers are said to be originated in the America, but now it is grown all over the world. Sweet Peppers have largely European varieties with large mild fruits. The fruits of Sweet Pepper plant have various names depending on their type and place. The word "Capsicum" is purely used for Sweet Pepper. The name "Pepper" is coming into use because the plants were hot in the same sense as the condiment Black Pepper, but there is no botanical relationship between Sweet Pepper and Black Pepper.

The major countries producing Sweet Pepper are China, Indonesia, Sri Lanka, Pakistan, Turkey, Korea, Hungary, Spain, Bulgaria, Romania, Italy, Yugoslavia, Nigeria, Ghana, Tunisia, Mexico, USA, Central America, Argentina and Peru. Globally, China rank 1st in position in the production of Sweet Pepper with 46 % followed by Mexico with 8.52 % production. India rank 4th in position in the production of Capsicum. In India, total area and production in the year 2019-20 is 34,000 ha and 5,15,000 MT (Anon. 2020) [2]. Sweet Pepper is restricted to cooler regions of the country and the periphery of cities with cooler weather. Sweet Pepper is grown in the cities like Bangalore, Belgaum, Mysore, Pune, Thane, Ranchi, Darjeeling, whole Himachal Pradesh and Jammu & Kashmir and Hills of Uttar Pradesh.

Sweet Pepper can be satisfyingly grown either for fruits or for seed production using ventilated poly house for off season cultivation in the areas where temperature do not exceed 37 ^{0}C -38 ^{0}C using misters or foggers to maintain slightly higher relative humidity and lightly reduced temperature (to an extent of 3-4 ^{0}C). Sweet Pepper is cold season crop but, by using poly house it can be cultivated throughout the year.

Organic manures are the waste of plants and animals that can be used after well decomposition. Nutrient content in concentrated organic manures is higher than bulky organic manure. It can provide almost all the elements that the crop requires. Organic manures compose a reliable source of macro and micro nutrients which are helpful in enhancing physical, chemical and biological health of soil, it reduces the loss of nutrients, increases

nutrient availability and uptake leading to sustainable production without any harmful residues besides, it improves the quality of vegetables (Shinde, 1992) [8]. Organic matter plays important role in improving the soil physical properties (Obi and Ebo, 1995) [6].

Materials and Methods

A field experiment entitled "Effect of different sources of organic fertilizers on nutrient status of soil and incidence of diseases and pests of sweet pepper (*Capsicum annum* L.) under protected condition" was conducted at instructional cum research farm, College of Agriculture, Osmanabad during *rabi* season 2020-21. The details of the materials used and methods acquired during the course of investigation are described in this chapter.

Experimental details

"Effect of different sources of organic fertilizers on nutrient status of soil and incidence of diseases and pests of sweet pepper (*Capsicum annum* L.) under protected condition"

1) Location: Instructional Cum Research Farm, College of Agriculture, Osmanabad
2) Design: Randomized Block Design (RBD)
3) Treatment: 11
4) Replication: 03
5) Spacing: 60 x 70 cm
6) Plot size: 2.74 m^2
7) Total plot: 33
8) Variety: Arka Gaurav
9) Season: *Rabi* 2020-21
10) Date of Transplanting: 10th January 2021.

Treatment details

Table 1: Details of treatments used in experiment

Treatment	Treatment details
T_1	RDF (N: P: K) (200:115:150)
T_2	Vermicompost (6 t/ha)
T_3	FYM (40 t/ha)
T_4	Jivamrut (1,00,000 l/ha)
T_5	Ghanamrut (100 t/ha)
T_6	Vermicompost (50%) + FYM (50%)
T_7	Vermicompost (50%) + Jivamrut (50%)
T_8	Vermicompost (50%) + Ghanamrut (50%)
T_9	FYM (50%) + Jivamrut (50%)
T_{10}	FYM (50%) + Ghanamrut (50%)
T_{11}	Jivamrut (50%) + Ghanamrut (50%)

Manures and fertilizers application

Before the transplanting of plants, Farm yard manure at amount of 40 tons per hectare, Vermicompost at amount of 6 t/ha, and Ghanamrut at amount of 100 t/ha applied in the plots as per their respective treatment at the time of land preparation. Nitrogen, phosphorus and potassium were applied to the respective treatment in the form of urea, single super phosphate and murate of potash, appropriately at amount of 100:50:50 kg NPK per hectare as per the recommendation of Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani. At the time of seedlings transplanting, half dose of nitrogen and full dose of phosphorus and potassium were applied as basal dose and mixed thoroughly in the soil to the respective treatment. The remaining half dose of nitrogen was top dressed, 45 days after transplanting. Jivamrut was applied in four applications at the rate 1, 00,000 lit/ha respectively by drenching at the time of transplanting, 30 DAT, 60 DAT and 90 DAT respectively.

Observations recorded

Nutrient status of experimental soil before experiment

Particulars	Estimate and unit
Organic carbon	1.72 %
Available nitrogen	235.07 kg/ha
Available phosphorus	7.02 kg/ha
Available potassium	285.16 kg/ha
Electrical conductivity (EC)	0.14 (ds/m)
pH	7.05

Incidence of diseases (%)

The total number of plants affected by Anthracnose and Cercospora leaf spot incidence was recorded and expressed as per cent. The per cent Disease Incidence (PDI) was calculated by using following formula.

$$\text{Anthracnose Incidence (\%)} = \frac{\text{No. of infested plants}}{\text{Total no. of plant}} \times 100$$

Incidence of pests (%)

Infestation of thrips and white fly is calculated by using following formula,

$$\text{Thrips Infestation (\%)} = \frac{\text{No. of infested plants}}{\text{Total no. of plant}} \times 100$$

Per cent Disease Incidence	Grade	Reaction
0	0	Immune (I)
1-9%	1	Resistant (R)
10-19%	2	Moderately Resistant (MR)
20-39%	3	Moderately susceptible (MS)
40-69%	4	Susceptible (S)
70-100%	5	Highly Susceptible (HS)

Results and Discussion

Nutrient status of experimental soil after experiment

The data with respect to nutrient status of experimental soil after experiment is presented in Table 1. The effect of different sources of organic fertilizers on nitrogen was recorded maximum (244.13 kg/ha) in T_2 **(**Vermicompost (6 t/ha)) while minimum nitrogen (236.05 kg/ha) was recorded in T_1 (RDF (N: P: K) (200:115:150)). phosphorus was recorded maximum (12.28 kg/ha) in T_2 **(**Vermicompost (6 t/ha)) and minimum phosphorus (8.11 kg/ha) was recorded in T_1 (RDF (N: P: K) (200:115:150)), the maximum K (337.97 kg/ha) was recorded in T_3 (FYM (40 t/ha)) while the minimum potassium (221.79 kg/ha) was recorded in T_2 **(**Vermicompost (6 t/ha)), the maximum pH (7.10) was recorded in T_3 (FYM (40 t/ha)) while the minimum pH (6.70) was recorded in T_7 (Vermicompost (50%) + Jivamrut (50%)), the maximum electric conductivity (0.94 ds/m) was recorded in T_7 (Vermicompost (50%) + Jivamrut (50%)) while the minimum electric conductivity (0.11 ds/m) was recorded in T_3 (FYM (40 t/ha)). The maximum organic carbon (1.71 %) was recorded in T_2 **(**Vermicompost (6 t/ha)) while the minimum organic carbon (0.82 %) was observed in T_{11}(Jivamrut (50%) + Ghanamrut (50%)).

The increase in nutrient status of soil might be due to the application of vermicompost and Jivamrut, which attributed to

the directly addition of NPK as well as release of various organic acids on their decomposition chelating with Fe and Al and helps in solubilization of native phosphorus. Above findings are in conformity with Azarmi *et al*. (2008) [4] who reported increased total N, P and K content from application of vermicompost in tomato, Sharma *et al*. (2009) [7] also observed similar result from application of vermicompost + RDF in okra and onion.

Incidence of diseases

Anthracnose incidence (%)

The data presented in Table No. 2 divulged that the, among the eleven treatments of different sources of organic fertilizers evaluated for reaction to anthracnose incidence under protected condition, four treatments *viz.* T_2 (Vermicompost (6 t/ha)), T_4 (Jivamrut (1,00,000 l/ha)), T_3 (FYM (40 t/ha)), T_7 (Vermicompost (50%) + Jivamrut (50%)) were found moderately resistance (MR) to anthracnose with percent disease infection 16.28 %, 18.40 %, 18.79 % and 18.80 % respectively and other seven treatments were found moderately susceptible (MS) to anthracnose. The minimum percentage of anthracnose infection was recorded in T_2 **(**RDF 100 % through Vermicompost) (16.28 %) while the maximum in T_1 (RDF (N: P: K) (200:115:150)) (24.48 %).

Cercospora leaf spot (%)

The data presented in Table No. 2. The observations was recorded on incidence of cercospora leaf spot (%) divulged that among the eleven treatments of different sources of organic fertilizers, four treatments *viz*. T_2 **(**Vermicompost (6 t/ha)), T_6 (Vermicompost (50%) + FYM (50%)), T_4 **(**Jivamrut (1,00,000 l/ha)), T_7 (Vermicompost (50%) + Jivamrut (50%)) were found moderately resistance (MR) to cercospora leaf spot with percent disease infection 13.49 %, 14.56 %, 15.57 % and 17.67% respectively. Remaining seven treatments were recorded moderately susceptible to cercospora leaf spot. The minimum percentage of cercospora leaf spot infestation (13.49 %) was recorded in T_2 **(**RDF 100 % through Vermicompost) and the maximum percentage of cercospora leaf spot infestation (23.40 %) was recorded in T_1 (RDF (N: P: K) (200:115:150)).

Incidence of pests

Thrips infestation (%)

The data presented in Table No. 2 divulged that, the infestation of thrips was recorded in the range from 18.37 to 25.45 per cent. The minimum thrips infestation (18.37 %) was observed in T_2 **(**Vermicompost (6 t/ha)), which was followed by T_4 (Jivamrut (1, 00,000 l/ha)) (19.57 %), T_8 (Vermicompost (50%) + Ghanamrut (50%))(20.18 %), while the maximum thrips infestation (25.45 %) was recorded in T_1 (RDF (N: P: K) (200:115:150)).

Table 1: Effect of different sources of organic fertilizers on nutrient status of experimental soil after experiment

Treatments	Nitrogen	Phosphorous	Potassium	pH	Electric Conductivity	Organic Carbon
T_1	236.05	10.09	274.60	6.80	0.84	1.23
T_2	244.13	12.28	221.79	7.00	0.12	1.71
T_3	239.16	10.75	337.97	7.10	0.11	1.41
T_4	240.05	7.68	295.72	7.07	0.13	1.46
T_5	239.02	10.09	242.92	7.10	0.50	1.28
T_6	238.40	8.11	232.36	6.98	0.13	1.14
T_7	242.02	9.87	264.04	6.70	0.94	1.56
T_8	239.10	8.11	327.41	6.99	0.15	1.57
T_9	237.20	8.33	295.72	6.98	0.14	1.58
T_{10}	238.14	7.89	316.85	6.98	0.13	1.47
T_{11}	238.09	11.40	316.85	6.95	0.72	0.82

Table 2: Reaction of different sources of organic fertilizers against diseases and pests under protected condition

Treatments	Incidence of Diseases		Incidence of pests	
	Anthracnose	Cercospora leaf spot	Thrips	White fly
T^1	24.48	23.40	25.45	27.40
T^2	16.28	13.49	18.37	19.89
T^3	18.79	20.86	22.80	23.34
T^4	18.40	15.57	19.57	22.46.
T^5	20.19	20.35	21.13	25.39
T^6	20.40	14.56	22.25	23.60
T^7	18.80	17.67	20.77	22.90
T^8	21.67	21.78	21.80	24.00
T^9	22.94	20.34	20.19	22.48
T^{10}	21.50	21.87	23.67	23.69
T^{11}	22.23	20.34	20.18	24.80

White fly infestation (%)

The effect of different sources of organic fertilizers on infestation of white flies was recorded minimum (19.89 %) was observed in T_2 **(**Vermicompost (6 t/ha)) which was followed by T_4 (Jivamrut (1, 00,000 l/ha)) (22.46 %), T_9 (FYM (50%) + Jivamrut (50%)) (22.48 %) and the maximum infestation of white flies (27.40 %) was recorded in T_1 (RDF (N: P: K) (200:115:150)).

It may be possible due to active and rapidly multiplication of bacteria, which creates favourable environment for more nitrogen fixation and availableness of insoluble nutrients, hormone secretion and supply of antifungal and antibacterial compounds with the application of vermicompost and jivamrut. Above result are conformity with Sinha *et al*. (2010) [9] who reported fewer incidence of pests with the application of vermicompost, Am-Euras (2009) [1] reported similar results. Chadha *et al*. (2012) [5] reported efficiency of organic liquid fertilizer i.e. Jivamrut against various plant pathogens.

Conclusions

From the present findings, it was concluded that the plants which treated with vermicompost showed better results in nutrients of soil like nitrogen, phosphorous, calcium, organic carbon, pH and electric conductivity as well as least incidence of diseases like anthracnose and cercospora leaf spot, and the pests like thrips and white fly. Therefore, on the basis of results obtained from the present investigation, application of vermicompost @ 6 t/ha should be used for increase the nutrient status of soil and least diseases and pest incidences and sustainable crop production.

References

1. Am-Euras. Earthworms vermicompost: a powerful crop nutrient over the conventional compost & protective soil conditioner against the destructive chemical fertilizers for food safety and security. Journal of Agriculture & Environmental Sciences 2009;5:01-55
2. Anonymous. Total area and production of horticulture crops 2020. www.NHB.com
3. Atal. Study on effect of organic nutrient sources on bell papper (*Capsicum annum* L.) production. M. Sc. (Hort.) Thesis submitted to UHF, Nauni (HP) 2017. Retrived from http://krishikosh.egranth.ac.in/handle/1/5810028992 Accessed on April 16, 2021.
4. Azarmi R, Giglou MT, Taleshmikail RD. Influence of vermicompost on soil chemical and physical properties in tomato (*Lycopersicum esculentum*) field. African Journal of Biotechnology 2008;7:2397-2401
5. Chadha S, Rameshwar, Ashlesha, Saini JP, Paul YS. Vedic Krishi Sustainable livelihood option for small and marginal farmers. Indian Journal Traditional Knowledge 2012;11:480-486.
6. Obi ME, Ebo PO. The effect of organic and inorganic amendments on soil physical properties and maize production in a severely degraded sandy soil in southern Nigeria. Bioresource Technology 1995;51:117-123.
7. Sharma RP, Datt N, Chander G. Effect of vermicompost, farmyard manure and chemical fertilizers on yield, nutrient uptake and soil fertility in okra (*Abelmoschus esculentus*) onion (*Allium cepa*) sequence in wet temperate zone of Himachal Pradesh. Journal of the Indian Society of Soil Science 2009;57:357-361.
8. Shinde PH, Naik RL, Nazikar RB, Kadam SK, Khaire VM. Evaluation of vermicompost. Proceedings of National Seminar on Organic Farming, MPKV, Pune 1992.
9. Sinha RK, Agarwal S, Chauhan K, Valani D. The wonders of earthworms & its vermicompost in farm production: Charles Darwin's 'friends of farmers', with potential to replace destructive chemical fertilizers from agriculture. Agricultural Sciences 2010;1:76-94.