

Effect of INM on Quality and Yield Attributes of Sweet Pepper (*Capsicum Annum L.*) CV. California

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Abstract

The present investigation entitled “Effect of integrated nutrient management on quality & yield attributes of sweet pepper (*Capsicum annum L.*) cv. California.” was conducted at the experimental farm of Faculty of Agricultural Sciences & Allied Industries, Rama University, Mandhna, Kanpur (U.P.) during *Rabi* season 2018-19. The experiment was laid out in randomized complete block design with three replications comprising of 9 treatments combinations. The treatments were T₀ = Control, T₁: 100% RDF Nitrogen + vermicompost, T₂: 100% RDF Nitrogen + FYM, T₃: 100% RDF Zn + Nitrogen, T₄: 100% RDF Phosphorus + FYM, T₅: 100% RDF Potash + Boron, T₆: 100% RDF Nitrogen + Phosphorus + Boron, T₇ : 100% RDF FYM + Vermicompost, T₈: 100% RDF Nitrogen + Zn. Plant height was recorded maximum in T₆ (55.65 cm) and minimum was observed in T₀ (30.75 cm), Number of branches/plant was recorded maximum in T₆ (6.61) and minimum in T₀ (3.40). Plant spread was maximum in T₆ (44.50 cm) through recommended package of fertilization and minimum in T₀ (25.35 cm). Maximum and minimum stalk length were observed in T₇ (42.87 cm) and T₁ (33.16 cm). Application of 100% RDF + Nitrogen+ phosphorus+ Boron in Sweet Pepper var. California proved to be the best treatment which produced superior growth and highest seed yield (686.39 q/ha).

Introduction

Sweet Pepper (*Capsicum annum L.*) is a warm season crop belongs to the family Solanaceae having chromosome number 2n=24. Capsicum is the richest source of vitamin C. Capsicum generally used for salad and pickles etc. Capsicum sp. is an important commercial spice and vegetable crop for small and marginal farmers. in India among the five cultivated species of the genus Capsicum, *Capsicum annum* is the most widely cultivated in India for its pungency (chilli syn. hot pepper). Fruits that are dried for spicy powders, paprika for pickles are non-pungent (*capsicum syn.* bell pepper, sweet pepper, Shimla mirch). Next category is the fruits which are cooked as vegetables or used as stuffing in fast food preparations like pizza and burgers. It is commercially grown in Himachal Pradesh, Jammu and Kashmir, Uttarakhand, Arunachal Pradesh and Darjeeling district of West Bengal during summer months and as an autumn crop in Maharashtra, Karnataka, Tamil Nadu and Bihar. The continuous use of high level of chemical fertilizers leads to decrease the nutrient uptake efficiency of plants, resulting in either stagnation or decrease in yield and also causing environmental pollution (Singh and Kalloo, 2000). In recent times, the concept of integrated nutrient management has been receiving increasing attention worldwide obviously for reasons of minimizing of fertilizer usage, safe guarding and ensuring scientific management of soil health for optimum growth, yield and quality

of crops in an integrated manner in a specific agro-ecological situations, through balanced use of organic and inorganic plant nutrients, so that one can harvest good yield without deteriorating soil health. The two major agro techniques which are largely important in greenhouse crop production are, use of suitable growing media and optimum fertigation schedule. Bell pepper or sweet pepper can be grown on a wide variety of soils, but its shallow and fibrous root system is sensitive to water logging and prone to attack by various soil borne diseases such as fusarium, phytophthora and bacterial wilt. The characteristic of an ideal growing medium are high porosity for better aeration, good drainage and water holding capacity with biological and chemical stability. These features are not common in soil based growing media and the greenhouse vegetable growers are facing problems, however, the research world over shows that sweet pepper can be grown very successfully using different soilless growing media. Similarly, another important component of protected cultivation which influences productivity and quality of produce is application of fertilizers with the irrigation called fertigation. This is a regular and widely accepted practice under protected conditions. Fertigation also provides an opportunity to control the concentrates of individual nutrients in the form of soluble fertilizers to meet the crop need according to its stage of development and greenhouse environment.

Materials and methods

The present investigation was conducted at Agricultural Research Farm, Faculty of Agricultural Sciences & Allied Industries, Rama University, Kanpur (U.P.) during *Rabi* season 2018-19. The experimental farm falls under the Indo-gangetic alluvial tract of Central Uttar Pradesh. The farm was well laid out and irrigated by tube well. Geographically, Kanpur is situated in the central part of U.P. and subtropical tract of North India between latitude ranging from 25° 56' to 28° 58' North and longitude 79° 31' to 80° 34' East and is located at an elevation of about 125.9 meters above mean sea level in gangetic plain. The field experiment was carried out in loamy sand soil, alluvial in origin, light brown in colour, well drained, fairly retentive of moisture, loamy (0.48%) and medium in available phosphorus (30.2 kg ha⁻¹) and available potassium (315 kg ha⁻¹).

Results and discussion

The present field investigation was made mainly to find out the effect of INM on Quality & Yield attributes of sweet pepper.

Plant height (cm)

Maximum plant height was observed under mixtures of Nitrogen+ phosphorus+ Boron 100% RDFT₆(55.65cm) followed by F.Y.M+ vermicompost 100% RDF T₇ (53.25cm). While minimum plant height (cm) were observed under control T₀ (30.75cm) of the sweet pepper crop.. The same finding also reported by Sajjan *et al.*, (2002), Siddesh (2006), Bhattarai (2009), Deshpandey *et al.*, (2010), Lal and Kanaujia (2013).

Number of branches/plant

Maximum number of branches/plant was observed under mixtures of Nitrogen+ phosphorus+ Boron 100% RDF T₆ (06.61) followed by F.Y.M+ vermicompost 100% RDFT₇(06.35/plant) at all growth stage. While minimum number of branches/plant were observed under control T₀ (3.40/plant) of the sweet pepper crop. The same finding also reported by Rani *et al.*, (2015), Gowda *et al.*, (2002), Siddesh (2006).

Number of plant spread (cm)

Maximum number of plant spread (cm) was observed under mixtures of Nitrogen+ phosphorus+ Boron 100% RDFT₆(44.50 cm) followed by F.Y.M+ vermicompost 100% RDF T₇ (42.87cm) at all growth stage. While minimum plant spread (cm) were observed under control T₀ (25.35cm) of the sweet pepper crop. The same finding also reported by Lal and Kanaujia (2013), Tuti *et al.*, (2014), Deshpandey *et al.*, (2010).

Number of fruit/plant

Maximum number of fruit/plant was observed under mixtures of Nitrogen+ phosphorus+ Boron 100% RDF T₆ (19.00/plant) followed by F.Y.M+ vermicompost 100% RDFT₇ (18.75/plant) at all growth stage. While minimum No. of fruit/plant were observed under control T₀(9.95 /plant) of the sweet pepper crop. The same finding also reported by Sangan *et al.*, (2002), Deshpandey *et al.*, (2010), Chetri *et al.*, (2012).

Number of fruit length (cm)

Maximum number of fruit length (cm) was observed under mixtures of Nitrogen+ phosphorus+ Boron 100% RDF T₆ (8.20 cm) followed by F.Y.M+ vermicompost 100% RDFT₇ (8.00cm) at all growth stage. While minimum fruit length (cm) were observed under control T₀ (5.15cm) of the sweet pepper crop. The same finding also reported by Tuti *et al.*, (2014), Lal and Kanaujia (2013), Chetri *et al.*, (2012).

Number of fruit diameter (cm)

Maximum number of fruit diameter (cm) was observed under mixtures of Nitrogen+ phosphorus+ Boron 100% RDFT₆(7.89cm) followed by F.Y.M+ vermicompost 100% RDF T₇ (7.70cm) at all growth stage. While minimum fruit diameter (cm) were observed under control T₀ (4.46cm) of the sweet pepper crop. The same finding also reported by Tuti *et al.*, (2014), Lal and Kanaujia (2013), Rani *et al.*, (2015).

Average weight (g)

Maximum average weight (g) was observed under mixtures of Nitrogen+ phosphorus+ Boron 100% RDF T₆ (93.92cm) followed by F.Y.M+ vermicompost 100% RDF T₇ (93.79cm) at all growth stage. While minimum average weight (g) were observed under control T₀ (58.97gm) of the sweet pepper crop. The same finding also reported by Tuti *et al.*, (2014), Lal and Kanaujia (2013), Deshpandey *et al.*, (2010).

Average fruit (kg/plot),(kg/ha)

Maximum average fruit (kg/plot),(kg/ha) was observed under mixtures of Nitrogen+ phosphorus+ Boron 100% RDF T₆ (37.19 kg/plot),(686.39kg/ha) followed by F.Y.M+ vermicompost 100% RDF T₇(37.06kg/plot),(670.26kg/plot) at all growth stage. While minimum average fruit (kg/plot),(kg/ha) were observed under control T₀ (11.96kg/plot),(221.51kg/ha) of the sweet pepper crop. The same finding also reported by Tuti *et al.*, (2014), Lal and Kanaujia (2013), Deshpandey *et al.*, (2010).

Vitamin C content (mg /100 g)

Maximum vitamin c content (mg /100 g) was observed under mixtures of Nitrogen+ phosphorus+ Boron 100% RDF T_6 (243.34) content followed by F.Y.M+ vermicompost 100% RDF T_7 (225.44) content at all growth stage. While minimum vitamin c content (mg /100 g) were observed under control T_0 (103.80) content of the sweet pepper crop. The same finding also reported by Battari (2009), Jaipaul *et al* (2011), Chetri *et al.*, (2012), Jananthi *et al.*, (2014).

Chlorophyll content (mg/100g)

Maximum Chlorophyll content (mg /100 g) was observed under mixtures of Nitrogen+ phosphorus+ Boron 100% RDF T_6 (732.66) followed by F.Y.M+ vermicompost 100% RDF T_7 (712.69) at all growth stage. While minimum of Chlorophyll content (mg /100g) were observed under control T_0 (407.55)

Dry matter (g)

Maximum and dry matter (g) was observed under mixtures of Nitrogen+ phosphorus+ Boron 100% RDF T_6 (9.93gm) followed by F.Y.M+ vermicompost 100% RDF T_7 (9.57 gm) at all growth stage. While minimum dry matter (g) were observed under control T_0 (5.67gm) of the sweet pepper crop. The same finding also reported by Malik *et al.*, (2011), Gowda *et al.*, (2002), Kondap *et al.*, (2012).

Total number of nitrogen (%) fruit, phosphorus (%) fruit, potash (%) fruit

Maximum number of nitrogen (%) fruit, phosphorus (%) fruit, potash (%) fruit was observed under mixtures of Nitrogen+ phosphorus+ Boron 100% RDF T_6 (4.38), (0.46), (3.55) followed by F.Y.M+ vermicompost 100% RDF T_7 (4.25), (0.43), (3.41) at all growth stage. While minimum nitrogen (%) fruit, phosphorus (%) fruit, potash (%) fruit were observed under control T_0 (1.30), (0.13), (1.12) of the sweet pepper crop. The same finding also reported by Malik *et al.*, (2011), Shiva *et al.*, (2015), Gowda *et al.*, (2002), Raj Narayan *et al.*, (2004).

Conclusion

On the basis of above result and discussion, it may be inferred that the (T_6) 100% RDF nitrogen+ phosphorus+ boron give maximum plant growth and yield in central U.P.

Application of 100% RDF Nitrogen+ phosphorus+ Boron in Sweet Pepper var. California proved the best treatment which produced superior growth and yield attributing characters and gave 686.39 kg/ha more seed yield and Rs. 34319/ha increase in Net Income.

Sr.No	Treatment	Dose	Plant height (cm)		No. of Branches /plant	Plant Spread	No of fruit/p	Fruit length (cm)	Fruit diameter
			Transplant time	Harvest					
T ₀	Control	0	10.30	30.75	3.40	25.35	9.95	5.15	4.46
T ₁	Nitrogen+ vermicompost	(100% RDF)	10.93	42.63	4.70	33.16	14.00	6.00	5.23
T ₂	Nitrogen+ F.Y.M	(100% RDF)	11.03	45.14	7.97	34.45	14.70	6.30	5.43
T ₃	Zn+ nitrogen	(100% RDF)	10.86	46.01	5.29	36.53	16.00	7.00	6.10
T ₄	Phosphorus+ F.Y.M	(100% RDF)	10.18	48.14	5.47	37.81	16.55	7.20	6.50
T ₅	Potash+ Boron	(100% RDF)	10.86	49.79	5.84	39.62	16.78	7.60	6.85
T ₆	Nitrogen+ phosphorus+ Boron	(100% RDF)	10.90	55.65	6.61	44.50	19.00	8.20	7.89
T ₇	F.Y.M+ vermicompost	(100% RDF)	9.89	53.25	6.35	42.87	18.75	8.00	7.70
T ₈	Nitrogen+ Zn	(100% RDF)	11.09	51.44	6.07	41.16	18.50	7.95	7.16
	C.D. (P= 5%)		N.S	4.30	0.70	3.70	1.97	0.99	1.18

Sr.No	Treatment	Dose	Average weight(g)	Average fruit(kg/plot)	Average fruit(kg/ha)	Vitamin c content	Chlorophyll Content	Dry matter(g)	N (%) Fruit	P (%) fruit	K (%) Fruit
T ₀	Control	0	58.97	11.96	221.51	103.80	407.55	5.67	1.30	0.13	1.12
T ₁	Nitrogen+ vermicompost	(100% RDF)	84.07	24.11	446.49	166.13	522.75	7.84	2.97	0.25	2.02
T ₂	Nitrogen+ F.Y.M	(100% RDF)	84.46	25.09	464.76	163.98	538.27	8.13	3.13	0.29	2.10
T ₃	Zn+ nitrogen	(100% RDF)	89.23	29.24	541.63	173.34	612.58	8.60	3.63	0.32	2.45
T ₄	Phosphorus+ F.Y.M	(100% RDF)	89.51	30.03	556.16	180.08	626.50	8.83	3.83	0.35	2.79
T ₅	Potash+ Boron	(100% RDF)	89.73	30.90	572.27	189.42	647.16	9.14	3.99	0.38	2.96
T ₆	Nitrogen+ phosphorus + Boron	(100% RDF)	93.92	37.19	686.39	243.34	732.66	9.93	4.38	0.46	3.55
T ₇	F.Y.M+ vermicompost	(100% RDF)	93.79	37.06	670.26	225.44	712.69	9.57	4.25	0.43	3.41
T ₈	Nitrogen+ Zn	(100% RDF)	93.39	35.41	655.89	210.77	700.33	9.44	4.10	0.40	3.15
	C.D. (P= 5%)		4.32	2.10	45.21	19.75	45.33	1.03	0.45	0.10	0.33

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