**EFFECT OF INM ON GROWTH AND YIELD OF CAPSICUM (*Capsicum annuum* L.) UNDER PROTECTED CULTIVATION**

**ABSTRACT**

The present study investigated the influence of integrated nutrient management on growth and productivity of capsicum grown under protective structure and was conducted at the Horticulture Research Farm, Faculty of Agricultural Sciences and Allied Industries, Rama University, Kanpur (U.P.), Kanpur during the 2024-2025. The experiment had nine treatments replicated thrice in a randomized block design. It was concluded that the application of integrated nutrient management rendered their significant effect on almost all the growth and yield characters as well as quality of capsicum. The result revealed that the maximum plant height (79.84), number of branches per plant (18.13), number of leaves per plant (94.65), leaf area (164.34 cm2), days to 50% flowering (35.38), number of flower per plant (18.37), number of fruit per plant (15.37), fruit length (8.07 cm), fruit diameter (7.09 cm), fruit weight (72.61 g), pericarp thickness (9.17 mm), fruit yield per plant (1.116 kg), fruit yield per plot (16.74 kg), fruit yield (34.87 t ha-1), total soluble solid (6.83%) and ascorbic acid of fruit juice (150.93 mg/100g) were recorded with the T7 (50% FYM + 25% NPK + 25% Vermicompost). Also, in terms of Economics, treatment T7 (50% FYM + 25% NPK + 25% Vermicompost) recorded the highest gross return (Rs. 1569033.3 ha-1), net return (Rs. 1343532.9 ha-1) and benefit cost ratio (5.96:1).

**Key words:-** INM, growth, yield, quality and capsicum

**INTRODUCTION**

India is characterized by a rich diversity of flora, fauna, and various soil and agro-climatic conditions. This diversity enables the cultivation of the highest number of vegetable crops globally, earning it the title of a horticultural paradise (Saravaiya and Patel, 2005). Sweet pepper was introduced to India by British colonists in the 19th century, with the first successful large-scale cultivation occurring in the Shimla hills, which is why it is commonly referred to as 'Shimla Mirch.' It ranks as the second most consumed vegetable crop worldwide. In India, sweet pepper is cultivated over an area of 37 thousand hectares, yielding a production of 586 thousand metric tonnes (Anonymous, 2022). In Himachal Pradesh, sweet pepper is grown as a cash crop in sub-temperate regions, covering an area of 2.85 thousand hectares and producing 48.86 metric tonnes (Anonymous, 2022). The annual, day-neutral sweet pepper (Capsicum annuum L. var. Grossum), belonging to the Solanaceae family, is recognized for its significant nutritional value, flavor, and vibrant color, making it one of the most crucial vegetable crops cultivated globally, including in India (Tiwari et al., 2013). It is also considered one of the primary commercial crops worldwide. India stands as one of the largest producers, consumers, and exporters of chili, attributed to the favorable soil and climatic conditions conducive to chili cultivation (Anonymous, 2021). In terms of area, India ranks first, while it holds the second position in production, following China. The country encompasses an area of 7.43 lakh hectares and achieves a production of 19.14 lakh metric tons, with a productivity rate of 2576 kg per hectare (NHB, 2022). This crop is an excellent source of vitamins A and C. The spiciness of chili is attributed to the alkaloid capsaicin (C9H14O2), which acts as a digestive stimulant. It boasts a high nutritional profile, containing 1.29 mg of protein, 11 mg of calcium, 870 I.U. of vitamin A, 175 mg of ascorbic acid, 0.06 mg of thiamine, riboflavin, 0.55 mg of niacin per 100 g of edible fruit, and 321 mg of vitamin C per 100 g (Agarwal et al., 2007). The yield per unit area can be enhanced alongside quality improvement through the judicious use of both organic and inorganic fertilizers in appropriate combinations. Sweet pepper shows a favorable response to the application of organic manures and inorganic fertilizers. The incorporation of organic manures in integrated nutrient management (INM) aids in alleviating various nutrient deficiencies (Jamir et al., 2017; Kayesh *et al.*, 2023). Organic manures consist of decomposed plant and animal waste. Farmyard manure (FYM) is a mixture of decomposed dung and urine from livestock, along with litter and other materials derived from roughages or fodder provided to cattle. Typically, well-decomposed farmyard manure contains 0.5% nitrogen (N), 0.3% phosphorus pentoxide (P2O5), and 0.5% potassium oxide (K2O). It can supply nearly all essential soil fertility elements required by crops, although not always in sufficient quantities or correct proportions (Jamir et al., 2017).

**MATERIALS AND METHODS**

The present investigation was conducted to study the effect of e**ffect of integrated nutrient management on growth and yield of capsicum (*Capsicum annuum* L.) Under Protected Cultivation at the** Horticulture Research Farm, Rama University Kanpur during rabi season October- 2024 to February 2025. Geographically, this region falls under sub-tropical climate and it is situated at 26047' N latitude, 82012' E longitude and at an indo gangetic alluvial of eastern Uttar Pradesh in India. The annual rainfall of this region is about 1100 mm in which 85 per cent received during mansoon (mid June to end of September).The winter month are cold and dry and occasional frost occuring during the period. The temperature starts during from the month of February onwards and continue to rise up to June. The experimental site for this study is located at the Horticulture Research Farm, Faculty of Agricultural Sciences and Allied Industries, Rama University, Kanpur (U.P.) during the *rabi* season of 2024 Positioned approximately 25 km from the district headquarters of Uttar Pradesh 208024. The farm is situated at 20°16' North latitude and 80°08' East longitude in the southwestern plains of Uttar Pradesh. It sits at an altitude of 180 meters above sea level, falling within the subtropical zone. The field was effectively leveled, equipped with adequate irrigation and drainage facilities. Prior to the current study, any stubble from the previous crop and weeds were manually removed from the field. The soil of experimental site before experimentation was sandy loam in texture with pH of 7.9, E.C of 0.3 dSm-1 and organic carbon of 4.5 %. The available nitrogen, phosphorus and potassium contents were 210, 12.8 and 198 kg ha-1 respectively before the experimentation. The experiment was laid out in randomized block design with three replications comprised of 9 treatment combinations *viz.,* T1:Control, T2:100% FYM, T3:50% FYM + 50% Vermicompost, T4:75% FYM + 25% Vermicompost, T5:50% FYM + 50% NPK, T6:75% FYM + 25% NPK, T7:50% FYM + 25% NPK + 25% Vermicompost, T8:75% FYM + 12.5% NPK + 12.5% Vermicompost and T9:50% Vermicompost + 50% NPK. The 30 days old seedlings was transplanted at spacing of 60cm x 40cm. Different growth, yield and quality parameters like plant height (cm), number of branches per plant, number of leaves per plant, leaf area (cm2), days to 50% flowering, number of flower per plant, number of fruit per plant, fruit length (cm), fruit diameter (cm), fruit weight (g), pericarp thickness, fruit yield per plant (kg-1), fruit yield per plot (kg-1), fruit yield (t ha-1), total soluble solid (0brix) and ascorbic acid (mg/ 100g) of fruit juice were taken during the investigation. The data recorded during the course of investigation were subjected to statistical analysis as per method of analysis of variance (Skeleton). The significance and non- significance of the treatment effect were judged with the help of ‘F’ variance ratio test.

**RESULTS AND DISCUSSION**

The data regarding the integrated nutrient management studies in capsicum are presented in table 1 and 2. Showed that, the effect of integrated nutrient management on growth, yield and quality parameters i e. plant height (cm), number of branches per plant, number of leaves per plant, leaf area (cm2), days to 50% flowering, number of flower per plant, number of fruit per plant, fruit length (cm), fruit diameter (cm), fruit weight (g), pericarp thickness, fruit yield per plant (kg-1), fruit yield per plot (kg-1), fruit yield (t ha-1), total soluble solid (0brix) and ascorbic acid (mg/ 100g) of fruit juice were found significant. The observations for plant height and number of branches per plant and leaf area of capsicum are being presented in the table 1. A perusal of this table reveals that there was a steady increase in the plant height and number of branches per plant from 30, 60 and 90 DAT and leaf area significant influence was observed in plant height (cm) and number of branches per plant and leaf area due to different treatments. At 30, 60 and 90 DAT, there was significant difference between the treatments and maximum plant height (30.27, 48.85 and 79.84) was observed the applications of T750% FYM + 25% NPK + 25% Vermicompost, which was statistically at par with application of T8 75% FYM + 12.5% NPK + 12.5% Vermicompost and T9 50% Vermicompost + 50% NPK. Whereas the lowest value (21.49, 33.40 and 56.34) was observed in treatment T1Control. At 30, 60 and 90 DAT, there was significant difference between the treatments and maximum number of leaves per plant (94.65) was observed the applications of T750% FYM + 25% NPK + 25% Vermicompost followed by T8 75% FYM + 12.5% NPK + 12.5% Vermicompost and T9 50% Vermicompost + 50% NPK. Whereas the lowest value (64.66) was observed in treatment T1Control. At 30, 60 and 90 DAT, there was significant difference between the treatments and maximum number of leaves per plant (35.87, 77.01 and 94.65) was observed the applications of T750% FYM + 25% NPK + 25% Vermicompost followed by T8 75% FYM + 12.5% NPK + 12.5% Vermicompost and T9 50% Vermicompost + 50% NPK. Whereas the lowest value (24.35, 47.68 and 64.66) was observed in treatment T1Control. The soil and foliar application of organic manures had a significant effect for individual as well as interaction effect on plant height of the capsicum crop. **Joshi and Pal Vig (2010), Ramesh *et al.* (2015), Huerta *et al.* (2010), Howlader *et al*. (2019)** all reported findings of a similar nature. The increase in plant height may be attained due to the release of the fixed nitrogen, hence increasing the concentration and availability of nitrogen in the root zone. Plant growth and its development was also obtained by **Fawzy *et al.,*  (2010), Malik *et al.,* (2011), Lal and Kanaujia (2013), Jamir*et al.,*  (2017) and Shilpa *et al.,* (2017).** At 90 DAT, there was significant difference between the treatments and maximum number of branches per plant (2.58, 9.41 and 18.13) was observed the applications of T750% FYM + 25% NPK + 25% Vermicompost followed by T8 75% FYM + 12.5% NPK + 12.5% Vermicompost and T9 50% Vermicompost + 50% NPK. Whereas the lowest value (1.22, 3.99 and 6.30) was observed in treatment T1Control. The reason for the enhancement of branches production might be due to the direct effect of higher amount of inorganic nitrogen, which is a component of protein and chlorophyll molecules which might have increased the foliage of the plants and thus improved photosynthesis. Alike results was observed by **Kumar and Dhar (2010), Malik *et al.,* (2016), Apu *et al*. (2022) and Shilpa *et al.* (2017).** The data presented in table 1 and 2 in respect of fruit yield and quality of capsicum as affected by integrated nutrient management. The data revealed that the maximum leaf area (164.34 cm2) was found in treatment T7 50% FYM + 25% NPK + 25% Vermicompost as found significantly superior over other treatments. Whereas, the minimum leaf area (114.93 cm2) were noted in treatment T1 Control. However, T8 75% FYM + 12.5% NPK + 12.5% Vermicompost and T9 50% (1 t/ha) Vermicompost + 50% NPK are found statistically at par to T7 50% FYM + 25% NPK + 25% Vermicompost. The application of vermicompost to bell pepper also resulted in an increase in leaf area, as observed by **Arancon *et al.* (2005).** The data revealed that the minimum days to 50% flowering (35.38) was found in treatment T7 50% FYM + 25% NPK + 25% Vermicompost as found significantly superior over other treatments. Whereas, the maximum days to 50% flowering (48.49) were noted in treatment T1 Control. However, T8 75% FYM + 12.5% NPK + 12.5% Vermicompost and T9 50% Vermicompost + 50% NPK are found statistically at par to T7 50% FYM + 25% NPK + 25% Vermicompost. It seems that with increase in the levels of nutrient application the number of days taken for 50 per cent flowering showed decreasing trend. Another aspect that could contribute to nutritional integration that results in earlier flowering is quicker photosynthesis and better translocation of photosynthates towards the flowerbud initiation **Naidu *et al.,*  (2002) and Prativa and Bhattarai (2011).** The data revealed that the maximum number of flower per plant (18.37) was found in treatment T7 50% FYM + 25% NPK + 25% Vermicompost as found significantly superior over other treatments followed by T8 75% FYM + 12.5% NPK + 12.5% Vermicompost, T9 50% Vermicompost + 50% NPK and T4 75% FYM + 25% Vermicompost. Whereas, the minimum number of flower per plant (9.7) were noted in treatment T1 Control. The solubilization of plant nutrients caused by the addition of vermicompost leads to increase NPK uptake and resulted in maximum number of flowers per plant in sweet pepper.Alike results was obtained by **Shiva *et al.* (2015), Bhattarai *et al.*(2011) and Chetri *et al.* (2012).** The data revealed that the maximum number of fruit per plant (15.37) was found in treatment T7 50% FYM + 25% NPK + 25% Vermicompost as found significantly superior over other treatments followed by T8 75% FYM + 12.5% NPK + 12.5% Vermicompost. Whereas, the minimum number of fruit per plant (6.33) were noted in treatment T1 Control. The increase in number of fruits per plant asresults of integrated application of organic and inorganic fertilizers may be due to higher organic sources, higher organic matter build up, balanced C:N ratio and availability of nutrients **Malik et al. (2011).** Superiority of vermicompostover other organic sources could be attributed to its nutritional richness which results in better growth, more number of fruits when used in combination with organic or inorganic sources. Similar observations were also made by other workers like **Lal and Kanaujia (2013), Ngupok (2018) and Rahman *et al*. (2023)**. The data revealed that the maximum fruit lengrth (cm) (8.07) was found in treatment T7 50% FYM + 25% NPK + 25% Vermicompost as found significantly superior over other treatments followed by T8 75% FYM + 12.5% NPK + 12.5% Vermicompost, T9 50% Vermicompost + 50% NPK and T4 75% FYM + 25% Vermicompost. Whereas, the minimum fruit length (cm) (5.66) were noted in treatment T1 Control. Sufficient quantity of the fertilizers i.e.nitrogen, phosphorus and specially potassium, fulfilled the need of plants to attain more vigour, flowering and fruit development which produced fruits of high quality and significant size (length) **Dubey *et al.,* (2017).** Similar results were obtained by **Malik*et al.* (2011), Chetri *et al.* (2012) and Lal and Kanaujia (2013).** The data revealed that the maximum fruit diameter (cm) (7.09) was found in treatment T7 50% FYM + 25% NPK + 25% Vermicompost as found significantly superior over other treatments. Whereas, the minimum fruit diameter (cm) (5.05) were noted in treatment T1 Control. However, T8 75% FYM + 12.5% NPK + 12.5% Vermicompost and T9 50% Vermicompost + 50% NPK and 75% FYM + 12.5% NPK + 12.5% Vermicompost are found statistically at par to T7 50% FYM + 25% NPK + 25% Vermicompost. It may be due to improved soil physical, chemical and biological properties and addition of nutrients through vermicompost and chemical fertilizers which in turn enhanced growth and led to the production of blocky fruits in the sweet pepper. Similar are the findings of **Lal and Kanaujia (2013), Malik *et al.* (2011), Dubey *et al.* (2017)and Ngupok (2018).** The data revealed that the maximum fruit weight (g) (72.61) was found in treatment T7 50% FYM + 25% NPK + 25% Vermicompost as found significantly superior over other treatments. Whereas, the minimum fruit weight (g) (35.05) were noted in treatment T1 Control. However, T8 75% FYM + 12.5% NPK + 12.5% Vermicompost are found statistically at par to T7 50% FYM + 25% NPK + 25% Vermicompost. It appears from thefindings of Suthar (2009), that supply of nutrients from conjoint application of organic and inorganic sources i.e.vermicompost and chemical fertilizer improved the partionning of photo-assimilates from source to sink (leaf to fruit) thereby increased fruit weight. Similar results have also been reported by **Chetri *et al.* (2012), Lal and Kanaujia (2013) and Raturi *et al.*(2019).** The data revealed that the maximum pericarp thickness (mm) (9.17) was found in treatment T7 50% FYM + 25% NPK + 25% Vermicompost as found significantly superior over other treatments. Whereas, the minimum pericarp thickness (mm) (5.27) were noted in treatment T1 Control. However, T8 75% FYM + 12.5% NPK + 12.5% Vermicompost and T9 50% Vermicompost + 50% NPK and 75% FYM + 12.5% NPK + 12.5% Vermicompost are found statistically at par to T7 50% FYM + 25% NPK + 25% Vermicompost. The data revealed that the maximum fruit yield per plant (kg-1) (1.116) was found in treatment T7 50% FYM + 25% NPK + 25% Vermicompost as found significantly superior over other treatments. Whereas, the minimum fruit yield per plant (kg-1) (0.222) were noted in treatment T1 Control. However, T8 75% FYM + 12.5% NPK + 12.5% Vermicompost are found statistically at par to T7 50% FYM + 25% NPK + 25% Vermicompost. It is seen that the treatment having plant growth couples with yield contributing parameters like number of fruits per plant, fruit length, fruit diameter and average fruit weight had attained the highest fruit yield. Similar are the findings of **Bhattarai *et al.* (2011), Dubey *et al.* (2017) and Sharma *et al.* (2020).** The data revealed that the maximum fruit yield per plot (kg-1) (16.74) was found in treatment T7 50% FYM + 25% NPK + 25% Vermicompost as found significantly superior over other treatments. Whereas, the minimum fruit yield per plot (kg-1) (3.32) were noted in treatment T1 Control. However, T8 75% FYM + 12.5% NPK + 12.5% Vermicompost are found statistically at par to T7 50% FYM + 25% NPK + 25% Vermicompost. It is seen that the treatment having plant growth couples with yield contributing parameters like number of fruits per plant, fruit length, fruit diameter and average fruit weight had attained the highest fruit yield. Similar are the findings of **Bhattarai *et al.* (2011), Dubey *et al.* (2017) and Sharma *et al.* (2020).** The data revealed that the maximum fruit yield (t ha-1) (34.87) was found in treatment T7 50% FYM + 25% NPK + 25% Vermicompost as found significantly superior over other treatments. Whereas, the minimum fruit yield (t ha-1) (6.92) were noted in treatment T1 Control. However, T8 75% FYM + 12.5% NPK + 12.5% Vermicompost are found statistically at par to T7 50% FYM + 25% NPK + 25% Vermicompost. It is seen that the treatment having plant growth couples with yield contributing parameters like number of fruits per plant, fruit length, fruit diameter and average fruit weight had attained the highest fruit yield. Similar are the findings of **Bhattarai *et al.* (2011), Dubey *et al.* (2017), Sharma *et al.* (2020) and Sultana *et al*. (2022).** The data revealed that the maximum total soluble solid (0Brix) (6.83) was found in treatment T7 50% FYM + 25% NPK + 25% Vermicompost as found significantly superior over other treatments. Whereas, the minimum total soluble solid (0Brix) (4.79) were noted in treatment T1 Control. However, T8 75% FYM + 12.5% NPK + 12.5% Vermicompost and T9 50% Vermicompost + 50% NPK and 75% FYM + 12.5% NPK + 12.5% Vermicompost are found statistically at par to T7 50% FYM + 25% NPK + 25% Vermicompost. The data revealed that the maximum ascorbic acid (mg/ 100g) of fruit juice (150.93) was found in treatment T7 50% FYM + 25% NPK + 25% Vermicompost as found significantly superior over other treatments. Whereas, the minimum ascorbic acid (mg/ 100g) of fruit juice (139.83) were noted in treatment T1 Control. However, T8 75% FYM + 12.5% NPK + 12.5% Vermicompost and T9 50% Vermicompost + 50% NPK and 75% FYM + 12.5% NPK + 12.5% Vermicompost are found statistically at par to T7 50% FYM + 25% NPK + 25% Vermicompost.

**CONCLUSION**

From the present investigation it is concluded that treatment T7 50% FYM + 25% NPK + 25% Vermicompost performed best in terms of Growth parameters, yield and quality viz., plant height (79.84), number of branches per plant (18.13), number of leaves per plant (94.65), leaf area (164.34 cm2), days to 50% flowering (35.38), number of flower per plant (18.37), number of fruit per plant (15.37), fruit lengrth (cm) (8.07), fruit diameter (cm) (7.09), fruit weight (g) (72.61), pericarp thickness (mm) (9.17), fruit yield per plant (kg-1) (1.116), fruit yield per plot (kg-1) (16.74), fruit yield (t ha-1) (34.87), total soluble solid (0Brix) (6.83) and ascorbic acid (mg/ 100g) of fruit juice (150.93) of capsicum.

**REFERENCES**

**Agarwal, N., Sharma, R., Basu, S., Parekh, A., Sarkar, A., Agarwal, V. K. (2007).** Bay of Bengal summer monsoon 10-20 day variability in sea surface temperature using model and observations. *Geophys Res Lett;*. p. 34.

**Anonymous (2020).** Horticulture statistics at a glance. Govt. of India, Ministry of Agriculture and Farmers Welfare, Dept. of Agriculture, Cooperation and Farmers Welfare, Horticulture Statistics Division; c2020-21.

**Anonymous (2022).** Department of Agriculture and Farmers Welfare, horticulture Statistics; 2022. Available: <https://agricoop.nic.in/en/StatHortEst2>.

**Arancon, N.Q., C.A. Edwards, P. Bierman, J.D. Metzger, and C. Lucht. (2005).** Effects of Vermicomposts Produced from Cattle Manure, Food Waste and Paper Waste on the Growth and Yield of Peppers in the Field. *Pedobiologia.* 49: 297-306.

**Apu, S. C., Biswas, M. S., Bhuiyan, M. A. B., Gomasta, J., Easmin, S., & Kayesh, E. (2022).** Effect of organic amendments and arbuscular mycorrhizal fungi on plant growth, yield and quality of strawberry. *Annals of Bangladesh Agriculture*, *26*(2), 71-82.

**Bharathi, S., Kumari, S. S. and Uma. K. J.(2011).** Productivity in chilli (cv. LCA 334) as influenced by organic and inorganic nutrient management in vertisols. *J. Hortl. Sci.* 6**(1)**:62-65, 2011.

**Chetri, D. A., Singh, A. K. and Singh, V. B. (2012).** Effect of integrated nutrient management on yield, quality and nutrient uptake by capsicum (*Capsicum annum*) cv. California wonder. *Journal of Soils and Corporation* 2012;22:44-48.

**Dubey, A. K., Devi, S., Pranjal, S. R., Yogesh, K., Ajay, K. V. and Sandip, K. C. (2017).** Effect of NPK on plant growth, yield and quality of capsicum (*Capsicum annum* L.) under shade net condition. *International Journal of Current Microbiology and Applied Sciences* 6:1085-1091.

**Fawzy, Z.F., Behairy, A.G. and Shehata, S.A. (2010).** Effect of Potassium Fertilizer on Growth and Yield of Sweet pepper plants (*Capsicum annum* L.). *Journal of Agriculture Reserach* 2:599-610.

**Howlader, M. I. A., Gomasta, J., & Rahman, M. M. (2019).** Integrated nutrient Management for Tomato in the southern region of Bangladesh. *International journal of innovative research*, *4*(3), 55-58.

**Huerta, E., Vidal, O., Jarquin, A., Geissen, V., & Gomez, R. (2010).** Effect of vermicompost on the growth and production of amashito pepper, interactions with earthworms and rhizobacteria. *Compost Sci. Util.,* 18(4), 282-288.

**Jamir, Tajungsola, Rajwade, B. V., Prasad V. M. and Lyngdoh Carol. (2017).** Effect of Organic Manures and Chemical Fertilizers on Growth and Yield of Sweet Pepper (*Capsicum annuum* L.) Hybrid Indam Bharath in Shade Net Condition. *Int.J.Curr.Microbiol.App.Sci.* 6(8): 1010-1019.

**Joshi, R., and Vig, A. P. (2010).** Effect of vermicompost on growth, yield and quality of tomato (*Lycopersicum esculentum* L). *African Journal of Basic& Applied Sciences,* 2(3-4), 117-123.

**Kayesh, E., Gomasta, J., Bilkish, N., Koly, K. A., & Mallick, S. R. (2023).** A holistic approach of organic farming in improving the productivity and quality of horticultural crops. In *Organic Fertilizers-New Advances and Applications*. IntechOpen

**Kumar A and Dhar S. (2010)** Evaluation of organic and inorganic sources of nutrients in maize (Zea mays) and their residual effect on wheat (*Triticumaestivum*) under different fertility levels. *Indian Journal of Agriculture Science* 80:364-71.

**Lal, S. and Kanaujia, S. P. (2013).** Integrated nutrient management in capsicum under low cost polyhouse condition. *Annals of Horticulture* 6:170-177.

**Lal, S. and Kanaujia, S. P. (2013).** Integrated nutrient management in capsicum under low cost polyhouse condition. *Annals of Horticulture* 6:170-177.

**Malik, A. A., Chattoo, M. A., Sheemar, G. and Rashid, R. (2011).** Growth, yield and fruit quality of sweet pepper hybrid SH-SP-(*Capsicum annuum* L.) as affected by integration of inorganic fertilizers and organic manures (FYM). *Journal of Agricultural Technology* 7:1037-1048.

**Malik, A. A., Chattoo, M. A., Sheemar, G. and Rashid, R. (2016).** Growth, yield and fruit quality of sweet pepper hybrid SH-SP- (*Capsicum annuum* L.) as affected by integration of inorganic fertilizers and organic manures (FYM). *Journal of Agricultural Technology* 7:1037-1048.

**Naidu, A. K., Kushwah, S. S., Mehta, A. K. and Jain, P. K. (2002).** Study of organic, inorganic and biofertilizers in relation to growth and yield of tomato. *Jawaharlal Nehru Krishi Vishavidalay Research Journal* 35:36-37.

National Horticulture Board. Horticulture Database. Ministry of Agriculture and Farmers Welfare, New Delhi; c2022. p 21.

**Ngupok, O., Warade, S.D., Das, S., and Raghavan M. (2018).** Effect of NPK on Growth, Yield and Quality of Hybrid Capsicum (*Capsicum annuum* L. var. grossum) under Protected Condition. *International Journal of Chemical Studies* 6:451-453.

**Prativa, K.C. and Bhattarai, B. P. (2011).** Effect of integratednutrient management on the growth yield and soil nutrient status in tomato. *Nepal Journal of Science and Technology* 12:23-28.

**Rahman, A., Salma, U., Gomasta, J., Ali, M. K., Bari, A. K. M. A., Alam, M. N., Rahman, M. M., Promi, R. J., & Kayesh, E. (2023).** Degree and frequency of nitrogen amendments influencing the off-season okra production in the semi-arid north-western Bangladesh. *Plant Archives*, *23*(2), 93-103.

**Ramesh, G., Ajithkumar, K., Savitha, A. S., & Patil, S. G. (2015).** Integrated influence of organic manures in addition to inorganic fertilizers on growth, yield parameters and early blight disease of tomato (*Lycopersicon esculentum* L.). *International Journal of Biological and Pharmaceutical Research,* 6**(6)**, 478-483.

**Raturi, H. C., Singh, G. U., Singh, S. K. and Kachwaya, D. S. (2019).** Effect of organic and inorganic nutrient sources on growth, yield and quality of bell pepper (*Capsicum annuum* L.) grown under polyhouse condition. *Journal of Pharmacognosy and Phytochemistry*8(1): 1788-1792

**Sharma, N., Shukla, Y.R., Singh, K. and Mehta, D. K.** **(2020).** Soil fertility, Nutrient uptake and yield of bell pepper as influenced by conjoint application of organic and inorganic fertilizers. *Communications in Soil Science and Plant Analysis* 51:1626-1640.

**Shilpa, A.K., Sharma, T. S. and Sharma, K.** **(2017).** IntegratedNutrient Management of Peppers (*Capsicum annuum* L.) in 21st Century -A Review. *International Journal Current Microbiology Applied Science* 6:227-237. (*Capsicum annuum* L.) *Journal of Spices and Aromatic Crops* 24:92-97.

**Shiva, K.N., Srinivasan, V., Zachariah, T.J. and Leela, N.K. (2015).** Integrated nutrient management on growth, yield and quality of paprika alike chillies (*Capsicum annuum* L.) *Journal of Spices and Aromatic Crops* 24:92-97.

**Sultana, N., Mannan, M. A., Khan, S. A. K. U., Gomasta, J., & Roy, T. (2022).** Effect of different manures on growth, yield and profitability of small scale brinjal (egg-plant) cultivation in gunny bag. *Asian Journal of Agricultural and Horticultural Research*, *9*(1), 52-60.

**Tiwari, S. P., Panigrahi, H. K. and Sharma, D. (2013).** Effect of different fertigation levels on morpho-physiological characters and yield of capsicum under greenhouse condition. *Int J Agric Sci.* 1**(9)**:111-113

**Table 1: Effect of integrated nutrient management on growth, yield and yield of capsicum (*Capsicum annuum* L.) under protected cultivation**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **S.N.** | **No. of Treatments** | **Plant height (cm)**  | **Number of branches per plant** | **Number of leaves per plant** | **Leaf area (cm2) at 90 DAT** |
| **30 DAT** | **60 DAT** | **90 DAT**  | **30 DAT** | **60 DAT** | **90 DAT**  | **30 DAT** | **60 DAT** | **90 DAT**  |
| 1 | T1 | 21.49 | 33.40 | 56.34 | 1.22 | 3.96 | 6.30 | 24.35 | 47.68 | 64.66 | 114.93 |
| 2 | T2 | 24.43 | 39.85 | 65.07 | 2.07 | 7.40 | 9.97 | 29.94 | 67.97 | 87.81 | 144.05 |
| 3 | T3 | 24.12 | 40.72 | 66.28 | 2.14 | 7.33 | 9.47 | 33.17 | 67.86 | 84.00 | 143.50 |
| 4 | T4 | 24.69 | 38.27 | 67.67 | 1.86 | 6.41 | 11.39 | 27.08 | 49.82 | 85.06 | 145.99 |
| 5 | T5 | 24.94 | 41.67 | 71.58 | 1.33 | 7.09 | 12.35 | 26.62 | 65.40 | 76.23 | 141.85 |
| 6 | T6 | 24.26 | 39.24 | 71.35 | 1.32 | 7.31 | 12.30 | 24.82 | 62.08 | 75.57 | 144.20 |
| 7 | T7 | 30.24 | 48.85 | 79.84 | 2.58 | 9.41 | 18.13 | 35.87 | 77.01 | 94.65 | 164.34 |
| 8 | T8 | 28.78 | 46.47 | 77.50 | 2.27 | 9.13 | 15.95 | 33.30 | 75.03 | 93.17 | 159.93 |
| 9 | T9 | 26.98 | 45.20 | 75.85 | 2.22 | 8.19 | 14.10 | 30.75 | 72.27 | 93.68 | 153.26 |
|   | **F-Test** | **S** | **S** | **S** | **S** | **S** | **S** | **S** | **S** | **S** | **S** |
|   | **C.D.at 5%** | **1.28** | **1.94** | **4.75** | **0.22** | **0.87** | **1.56** | **2.70** | **6.20** | **3.47** | **8.17** |
|   | **S.Ed. (+)** | **0.60** | **0.91** | **2.24** | **0.10** | **0.41** | **0.74** | **1.28** | **2.93** | **1.64** | **3.85** |
|   | **S.Em.** | **0.43** | **0.65** | **1.58** | **0.07** | **0.29** | **0.52** | **0.90** | **2.07** | **1.16** | **2.73** |
|   | **CV** | **2.89** | **2.70** | **3.91** | **6.71** | **6.87** | **7.40** | **5.29** | **5.32** | **2.39** | **3.24** |

**Table 2: Effect of integrated nutrient management on growth, yield and yield of capsicum (*Capsicum annuum* L.) under protected cultivation**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S.N.** | **No. of Treatments** | **Days to 50% flowering**  | **Number of flower per plant** | **Number of fruit per plant** | **Fruit length (cm)** | **Fruit diameter (cm)** | **Fruit weight (g)** | **Pericarp thickness (mm)** | **Fruit yield per plant (kg-1)** | **Fruit yield per plot (kg-1)** | **Fruit yield (t ha-1)** | **Total soluble solid (0Brix)** | **Ascorbic acid (mg/ 100g) of fruit juice** |
|
| 1 | T1 | 48.49 | 9.87 | 6.33 | 5.66 | 5.05 | 35.05 | 5.27 | 0.222 | 3.32 | 6.92 | 4.79 | 139.83 |
| 2 | T2 | 38.89 | 14.65 | 10.37 | 7.27 | 5.51 | 59.04 | 6.95 | 0.612 | 9.18 | 19.12 | 3.95 | 144.88 |
| 3 | T3 | 40.93 | 13.47 | 11.73 | 6.66 | 6.07 | 59.10 | 7.15 | 0.693 | 10.40 | 21.66 | 5.53 | 145.40 |
| 4 | T4 | 41.53 | 14.76 | 11.59 | 7.07 | 5.75 | 64.07 | 6.51 | 0.742 | 11.14 | 23.20 | 5.75 | 147.27 |
| 5 | T5 | 41.16 | 13.30 | 9.57 | 7.48 | 6.09 | 61.30 | 7.36 | 0.587 | 8.80 | 18.34 | 5.91 | 144.21 |
| 6 | T6 | 41.93 | 13.62 | 9.41 | 6.42 | 5.62 | 65.72 | 7.41 | 0.618 | 9.26 | 19.30 | 5.41 | 141.49 |
| 7 | T7 | 35.38 | 18.37 | 15.37 | 8.07 | 7.09 | 72.61 | 9.17 | 1.116 | 16.74 | 34.87 | 6.83 | 150.93 |
| 8 | T8 | 36.73 | 16.75 | 13.39 | 7.51 | 6.83 | 70.64 | 8.47 | 0.946 | 14.19 | 29.57 | 6.40 | 149.39 |
| 9 | T9 | 37.38 | 15.72 | 7.97 | 7.21 | 6.34 | 43.63 | 8.09 | 0.348 | 5.22 | 10.87 | 6.12 | 148.34 |
|   | **F-Test** | **S** | **S** | **S** | **S** | **S** | **S** | **S** | **S** | **S** | **S** | **S** | **S** |
|   | **C.D.at 5%** | **0.88** | **0.52** | **0.86** | **0.25** | **0.17** | **4.78** | **0.48** | **0.06** | **0.91** | **1.98** | **0.24** | **2.11** |
|   | **S.Ed. (+)** | **0.41** | **0.24** | **0.41** | **0.12** | **0.08** | **2.26** | **0.23** | **0.03** | **0.43** | **0.94** | **0.11** | **0.99** |
|   | **S.Em.** | **0.29** | **0.17** | **0.29** | **0.08** | **0.06** | **1.60** | **0.16** | **0.02** | **0.30** | **0.66** | **0.08** | **0.70** |
|   | **CV** | **1.26** | **2.06** | **4.66** | **2.07** | **1.60** | **4.68** | **3.77** | **5.61** | **5.37** | **5.61** | **2.36** | **0.84** |