

Impact of integrated nutrient management on vegetative parameter and quality in chilli (*Capsicum annuum*.)

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Abstract

A field experiment was conducted to assess the response of nutrient management on growth and flowering Chilli (*Capsicum annuum*) cv. Kaveri during the Rabi season of 2023-24 the experiment comprises treatment combinations of organic and inorganic fertilizers. The treatments combinations were T₁, Control; T₂, 70% RDF+ 30% FYM (25 t/ha); T₃, 40% vermi compost (2.5 t/ha) + 40% Neem cake (250 kg/ha) + 20% FYM(25t/ha); T₄ , 30% FYM (25 t/ha) + 40% Bio fertilizer (10g/kg seeds) + 30% RDF ; T₅ 30% FYM (25 t/ha) + 70% Bio-fertilizer (10g/kg seeds); T₆ , 50% vermi compost (2.5 t/ha) + 50% RDF ; T₇ , 30% Neem Cake (250kg/ha) + 40% FYM (25 t/ha) + 30% RDF; T₈ , 40% Poultry manure (5 t/ha) + 30% Vermi compost (2.5 t/ha) + 30% FYM(25 t/ha). The experiment was outlined in Randomized Block Design with eight treatments and three replications. The data revealed that application of inorganic fertilizer with a combination of organic fertilizer and bio-fertilizer. T₄ (30%FYM + 40% Bio-fertilizer + 30% RDF) increases the growth and flowering attributes of Chilli i.e., Plant height, Number of branches, Canopy diameter, Days to flower initiation, and Days to 50% flowering.

Keywords: Organic manure, inorganic fertilizer, vegetative parameter and chilli

Introduction

Chilli (*Capsicum annuum* L.), belonging to the Solanaceae family, is one of the most commercially important vegetables grown in India. It has a chromosome number of 2n=24 and originates from tropical America, particularly Brazil. Chillies are rich in vitamins A and C, with their pungency attributed to the alkaloid capsaicin and their red color due to the pigment capsanthin. Farm Yard Manure (FYM) is a decomposed mixture of dung and urine from farm animals, combined with bedding materials and leftover fodder. On average, well-rotted FYM contains 0.73% nitrogen (N), 0.18% phosphorus (P₂O₅), and 0.71% potassium (K₂O), with a recommended application of 9 t/ha (Ghosh *et al.*, 2004) [4]. Vermicompost is produced through composting with various worms, such as red wigglers and white worms, to decompose vegetable or food waste. Vermicompost contains 1.6% N, 1.8% P₂O₅, and 0.75% K₂O (Rao *et al.*, 2015) [11]. Mixture of organic manures and inorganic fertilizer gave better results than organic manure alone. The integrated supply and use of plant nutrients from chemical fertilizers and organic manure has shown to produce higher crops yields than when they are applied alone. Judicious use of chemical fertilizers, organic manure, and biofertilizers is essential rather than completely discarding fertilizers. Organic sources of nutrients have been used in agriculture since its inception and continued until 1952 (Gowda and Babu, 1999) [5]. India has vast potential for utilizing manurial resources, with farmyard manure (FYM) and poultry manure being commonly used organic fertilizers. Poultry manure, in particular, is a rich source of nutrients, especially beneficial for vegetable production (Jose *et al.*, 1988) [7].

Materials and Method

A field experiment was conducted at Horticulture Research Farm, Kamla Nehru Institute of Physical and Social

Sciences, Faridipur, Sultanpur Uttar Pradesh, INDIA. The area is situated on the north of Prayagraj on the right bank of Gomti river at Rewa Road at a distance of about 5 km from Sultanpur city. It is situated at 26° 15' N Latitude and 85° 05' E Longitude. This region has sub-tropical climate with extreme of summer and winter the temperature down to as low as 10 - 12°C during winter season especially in the month of December and January. The temperature rises up to 40- 43°C during summer season. The average rainfall in this area is around 800-1200mm annually. The experiment was outlined in a randomized block design with 08 treatments and 03 replications. The different treatments that were used in the experiment are as follows : T₁ – Control, T₂ - 70% RDF+ 30% FYM @ 25t h⁻¹, T₃ - 40% Vermicompost @ 2.5t ha⁻¹ + 40% Neem cake @250kg ha⁻¹ + 20% FYM @ 25T ha⁻¹, T₄ – 30% FYM @ 25t ha⁻¹ + 30% RDF + 40% Bio fertilizer@10g/kg seeds, T₅ – 30% FYM@ 25t ha⁻¹ + 70% Bio fertilizer@10g/kg seeds, T₆ – 50% Vermicompost @ 2.5t ha⁻¹ + 50% RDF, T₇ - 30% Neem cake @ 250 kg ha⁻¹ + 40% FYM@ 25t ha⁻¹ + 30% RDF, T₈ - 40% Poultry manure @ 5t ha⁻¹ + 30% Vermicompost @ 2.5t ha⁻¹ + 30% FYM @ 25t ha⁻¹. Transplanting was done in the month of September. The distance between row to row was 1m and plant to plant was 45cmx45cm. The organic and inorganic fertilizer were applied as per the treatment schedule. Growth parameter and Flowering parameter were recorded after transplanting.

Result and Discussion

Among the various treatments studied on vegetative parameters like plant height (cm), number of branches, days to flower initiation and days to 50% flowering. The maximum plant height 15.23cm, 22.33 cm and 29.00 cm at 30,60 and 90 days after transplanting respectively observed in T₄(30% FYM + 40% Bio-fertilizer +30% RDF) at par 14.86cm in T₅ (30% FYM +70% Bio- fertilizer), 19.66cm in T₆ (50% Vermicompost + 50 RDF) and 23.00 cm in T₃ (40%

Vermi compost + 40% Neem cake + 20% FYM). The minimum value of plant height 10.26 cm was found in T₈ (40% Poultry manure + 30% Vermicompost + 30% FYM), 16.33 cm was found in T₈ (40% Poultry manure + 30% Vermicompost + 30% FYM). and 20.33 was found in T₅ (30% FYM + 70% Bio-fertilizer). The maximum number of branches per plant 12.33 and 21.00 respectively at 60 and 90 days after transplanting recorded in T₄ (30% FYM+ 40% Bio- fertilizer + 30% RDF) at par 05.66 in T₇ (30% Neem cake + 40% FYM + 30% RDF) and 14.66 in T₇ (30% Neem cake + 40% FYM + 30% RDF) respectively. The minimum number of branches per plant 05.66 was found in T₇ (30% Neem cake + 40% FYM + 30% RDF) and 09.00 was found in T₁ (Control) at 60 and 90 days after transplanting respectively. This may be attributed to the addition of organic manures to the soil in combination with inorganic fertilizers, which significantly enhances nutrient availability, resulting in a positive effect on plant height. Similar findings were reported by Damke *et al.* (1988) [3], who observed increased plant height in chili due to the combined application of organic and inorganic fertilizers, which also contributed to improved soil properties. and the increase in growth attributes due to fertilizer application can be attributed to the enhanced availability of essential nutrients such as nitrogen, phosphorus, and potassium. These nutrients play a crucial role in promoting the synthesis of plant metabolites, which contribute to the development and strengthening of plant tissues. (Childer,1996) [2]. Similar result has been also obtained by Janki *et al.*, (2019) [6] in chilli. The maximum canopy diameter 14.00 cm, 25.33 cm and 26.33 cm respectively at 30, 60 and 90 days after transplanting observed in T₄ (30% FYM+ 40% Bio- fertilizer + 30% RDF) at par 10.00 cm in T₂ (70% RDF + 30% FYM), 16.66 cm in T₆ (50% Vermicompost + 50 RDF) and 19.00 in T₆ (50% Vermicompost + 50 RDF).The minimum canopy diameter 06.33 cm was found in T₈ ((40% Poultry manure + 30% Vermicompost + 30% FYM), 11.66 cm was found in T₁ (Control) and 14.00 cm was found in T₁

(Control). The maximum days to flower initiation 33.33 in T₄ (30% FYM+ 40% Bio- fertilizer + 30% RDF) at par 31.66 in T₆ (50% Vermicompost +50% RDF). The minimum days to flower initiation 28.33 was found in T₂ (70% RDF + 30% FYM). The maximum days to 50% flowering 96.00 observed in T₄ (30% FYM+ 40% Bio- fertilizer + 30% RDF) at par 80.00 in T₈ ((40% Poultry manure + 30% Vermicompost + 30% FYM). The minimum days to 50% flowering 69.33 was found in T₁ (Control). This might because it enhances the nutrient levels. Increase nutrient level might have enhanced cell division of canopy as reported by (Ahmed and Tanki 1991) [1] and This might because the application of bio-fertilizer along with inorganic fertilizer might be due to availability of balanced nutrient and released of growth promoting substances which helps to produce early flower initiation the results were similar with (Azad 2000). The data recorded on keeping quality the results revealed that T₄ (30% FYM+ 40% Bio- fertilizer + 30% RDF) exhibit the maximum keeping quality 05.33 days at par 03.66 days in T₃ (40% Vermicompost + 40% Neem cake + 20% FYM). The minimum keeping quality 02.33 days was found in T₁ (Control). The data recorded on under the influence of various nutrient sources and their interaction was displayed in Results revealed that T₄ (30% FYM+ 40% Bio- fertilizer + 30% RDF) found the maximum ascorbic acid content 96.00 mg at par 75.00 mg in T₆ (50% Vermicompost + 50% RDF). The minimum ascorbic acid content 65.00 mg was found in T₁ (Control). Vermicompost enhances microbial activity and increases humic acid content, which may improve nutrient availability through mineralization (Parthasarathi and Ranganatham, 1999; 2000; Parthasarathi *et al.*, 2007; Parthasarathi, 2010) [9, 10]. This process supports higher photosynthesis and the efficient translocation of photosynthates from source to sink (Kodalli, 2006) [8]. Additionally, vermicompost aids in the accumulation of essential substances, ensures nutrient availability over an extended period, and minimizes nutrient loss through leaching (Sekar *et al.*, 2013).

Table 1: Effect of organic and inorganic fertilizers on vegetative parameters

Treatments	Plant height (cm) at 30 DAT	Plant height (cm) at 60 DAT	Plant height (cm) at 90 DAT	Number of branches at 60 DAT	Number of branches at 90 DAT	Canopy diameter (cm) at 30 DAT	Canopy diameter (cm) at 60 DAT	Canopy diameter (cm) at 90 DAT
T ₁	11.66	17.00	21.66	06.66	09.00	06.66	11.66	14.00
T ₂	12.00	19.33	21.66	08.00	11.66	10.00	14.66	14.66
T ₃	12.83	19.66	23.00	09.33	12.66	08.66	14.66	17.00
T ₄	15.23	22.33	29.00	12.33	21.00	14.00	25.33	26.33
T ₅	14.86	18.00	20.33	10.33	13.33	09.66	14.00	16.66
T ₆	16.63	19.66	20.66	11.66	13.66	10.66	16.66	19.00
T ₇	12.83	19.33	21.33	05.66	14.66	07.66	13.00	19.00
T ₈	10.26	16.33	21.66	07.77	12.00	06.33	14.00	18.00
C.D	02.65	02.57	02.34	04.37	01.06	01.56	01.98	02.89
SE(d)	01.22	01.18	01.08	02.02	00.49	00.72	00.91	01.33

Table 2: Effect of organic and inorganic fertilizers on flowering and keeping quality parameters

Treatments	Days to flower initiation	Days to 50% flowering	Keeping quality (days)	Ascorbic acid content (mg)
T ₁	30.00	69.33	02.33	65.00
T ₂	28.33	73.33	03.00	73.33
T ₃	28.66	78.66	03.66	73.33
T ₄	33.33	96.00	05.33	96.00
T ₅	30.00	73.33	03.33	66.66
T ₆	31.66	70.00	03.00	75.00
T ₇	33.33	75.00	02.66	66.66
T ₈	31.66	80.00	03.66	73.33
C.D	NS	10.09	NS	15.90
SE(d)	07.50	04.66	00.90	07.34

Conclusion

The results revealed that the application of T₄ (30% FYM (25t/ha) + 40% Bio- fertilizer + 30% RDF) improved the vegetative parameters of chilli. The maximization of chilli production in this study may be due to combined of application nutrients from different sources which improves the nutrient efficiency. For yield maximization and quality improvement in chilli, the farmers can follow the integrated nutrient management application from different naturally available sources leading to sustainability and profitability.

Reference

1. Ahmed N, Tanki MI. Response of chilli (*Capsicum annum* L.) to nitrogen and phosphorus. *Haryana J Hort Sci*,1991;20(1-2):114-118.
2. Childer NF. Fruit Nutrition. Horticultural publications. Rntgert State University, Nichole Avenue, New Jwersiy. UAS, 1996.
3. Damke MM, Kawarkhe VJ, Patil CO. Effect of phosphorous and potassium on growth and yield of chilli. *Punjab RAOkrishi Vidya peeth Research Journal*,1988;12:110-114.
4. Ghosh PK, Ramesh P, Bandyopadhyay KK, Tripathi AK, Hati KM, Mishra AK, Acharya CL. Comparative effectiveness of cattle manure, poultry manure, phosphocompost and fertilizer - NPK on three cropping systems in vertisols of semi-arid tropics. Crop yields and system performance. *Bioresour Technol*,2004;95:77-83.
5. Gowda A, Babu VS. Recycling of urban garbage for organic farming. *Kisan World*,1999;26(5):32.
6. Janki D, Poorniammal R, Rajangam J. Effect of organic sources of fertilizers along with inorganic on growth, yield and quality of chillies (*Capsicum annum* L.) var PKM. *IJCS*,2019;7(3):2755-2757.
7. Jose D, Shanmugavelu KG, Thamburaj. Studies on the efficiency of inorganic vs organic form of nitrogen in brinjal. *Indian J Hort*,1988;5(102):100-103.
8. Kodalli SH. Studies on integrated nutrient management on seed yield and quality of chilli [MSc thesis]. Dharwad, India: University of Agricultural Sciences, 2006.
9. Parthasarathi K, Ranganatan LS. Longivity of microbial and enzyme activities and their influence on NPK content in pressmud vermicasts. *Eur J Soil Biol*,1999;35:107-113.
10. Parthasarathi K. Earthworms - Life cycle, Compost and Therapy. Lam Lambert Academic Publishing Ag & Co.Kc. Germany, 2010.
11. Rao KMR, Kumar MS, Jha NK. Comparative yield analysis of chilli (*Capsicum annum* L.) by application of vermicompost and Panchagavya. *J Chem Pharm Res*,2015;7(9):319-323.