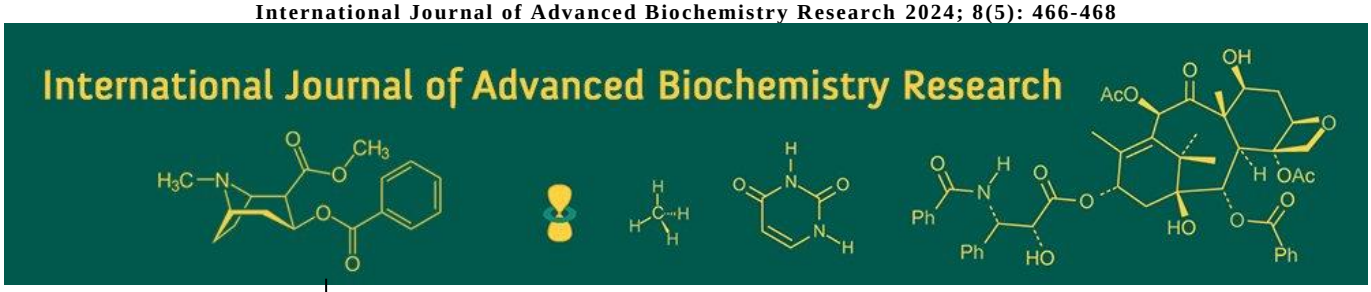

ISSN Print: 2617-4693
ISSN Online: 2617-4707
IJABR 2024; 8(5): 466-468
www.biochemjournal.com
Received: 09-02-2024
Accepted: 13-03-2024

Raji Singh
M.Sc Students Rama University, Mandhana, Kanpur, Uttar Pradesh, India

Jitendra Kumar
Assistant Professor, Rama University, Mandhana, Kanpur, Uttar Pradesh, India

Vinay Joseph Silas
Assistant Professor, Rama University, Mandhana, Kanpur, Uttar Pradesh, India

Syed Mohd Quatadah
Assistant Professor, Rama University, Mandhana, Kanpur, Uttar Pradesh, India

Adarsh Agrahari
M.Sc Students Rama University, Mandhana, Kanpur, Uttar Pradesh, India

Rizwana Khan
M.Sc Students Rama University, Mandhana, Kanpur, Uttar Pradesh, India

Shubham Singh
M.Sc Students Rama University, Mandhana, Kanpur, Uttar Pradesh, India

Shailendra Kumar
M.Sc Students Rama University, Mandhana, Kanpur, Uttar Pradesh, India

Corresponding Author:
Jitendra Kumar
Assistant Professor, Rama University, Mandhana, Kanpur, Uttar Pradesh, India

Impact of NPK, macronutrients and micronutrients on growth and yield parameters of chilli (*Capsicum annuum* L.) Pusa Jwala

Raji Singh, Jitendra Kumar, Vinay Joseph Silas, Syed Mohd Quatadah, Adarsh Agrahari, Rizwana Khan, Shubham Singh and Shailendra Kumar

DOI: https://doi.org/10.33545/26174693.2024.v8.i5f.1106

Abstract
The present investigation during autumn winter season 2022-2023 with the aim of to study the effect of NPK and micronutrients on growth of chilli, to study the effect of NPK and micronutrients on fruit yield of chilli, to study about cost benefit ratio. The experiment was laid out in RBD considering nine treatments with three replications. Different combination of treatment T_1 Control (NPK), T_2 NPK (100:40:40 kg/ha), T_3 NPK (100:40:40 kg/ha) + Calcium (30 kg/ha), T_4 NPK (100:40:40) kg/ha + Sulphur (60 kg/ha), T_5 NPK (100:40:40) kg/ha + Iron (12 kg/ha), T_6 NPK (100:40:40) kg/ha + Calcium (30 kg/ha) + Sulphur (60 kg/ha), T_7 NPK (100:40:40) kg/ha + Sulphur (60 kg/ha) + Iron (12 kg/ha), T_8 NPK (100:40:40) kg/ha + Calcium (30 kg/ha) + Iron (12 kg/ha), T_9 NPK (100:40:40) kg/ha + Calcium (30 kg/ha) + Sulphur (60 kg/ha) + Iron (12 kg/ha). The results showed that application 50% flowering (41.00), no. of primary branches/plant (4.00), no. of secondary branches/plant (7.5), plant height (85.003), Leaves/plant (109.00), leaf area/plant (115.00), Fruit length (9.250), fruit circumference (14.753), pedicle length (3.50), Average fruit weight (45.00), no. of fruit/plant (124.00), total yield/plant (0.400), benefit cost ratio (1.58) was observed with the treatmentT_9 NPK (100:40:40) kg/ha + Calcium (30 kg/ha) + Sulphur (60 kg/ha) + Iron (12 kg/ha).

Keywords: Chilli, NPK, micronutrient, macronutrient, growth and yield parameters

Introduction
Chilli is one of the most important vegetable crops grown almost throughout the country. It belongs to family Solanaceae with chromosome number 2n=24. It is grown for exports as well as for domestic market. Chilli is native to India but it is originated from 'South America" and this was brought to Asia by Portuguese at the end of 15th century. In India subcontinent, chillies are produced throughout the year two crops are produced in *Kharif* and *Rabi* season in the country. Chilli grow best at 20-30 °C and yield suffer when temperatures exceed 30 °C or drops below 15 °C for extended period. The crop can be grown over a wide range of altitudes from sea level upto nearly 2100 meter. In India green chilli is growing in an area of 411 thousand ha with production of 4363 thousand MT and dried chillies (spice) grown an area of 702 thousand ha with production of 2049 thousand MT (Anony., 2020-2021) [2]. Himachal Pradesh, the acreage under chilli and bell pepper is 2072 ha with annual production of 34,132 metric tonnes. Predominantly popular for its green pungent fruits. Pungency is due to the presence of active principal capsaicin (Gokul *et al.*, 2020) [6]. It is an excellent source of Vitamin A, B, C, E and P (Quresh *et al.*, 2015) [10]. It is also a good source of 'oleoresin', which permits better distribution of colour and flavour in foods (Chattopadhyay *et al.*, 2011) [3]. The extensive use of biofertilizers in crop production is the breakthrough as a pollution free low-cost input technology during recent years. Hence biofertilizers and different levels of NPK are the important components of integrated nutrient management. Vegetable inoculated with vesicular arbuscular mycorrhizal (VAM) fungi showed considerable increase in the growth and yield, because of improved uptake of phosphorus and other mineral nutrients particularly in phosphorus deficient soil. However, information on synergistic effect of various biofertilizers is lacking.

Materials and Methods

The present investigation entitled "Impact of NPK, macronutrients and micronutrients on growth and yield parameters of chilli (*Capsicum annum* L.) Pusa Jwala, under Agro climatic conditions of Kanpur" was conducted in the Agriculture Research Farm of Rama University, Mandhana, Kanpur. The experiment was laid out in RBD considering nine treatments with three replications. Different combination of treatment T_1 Control (NPK), T_2 NPK (100:40:40 kg/ha), T_3 NPK (100:40:40 kg/ha) + Calcium (30 kg/ha), T_4 NPK (100:40:40) kg/ha + Sulphur (60 kg/ha), T_5 NPK (100:40:40) kg/ha + Iron (12 kg/ha), T_6 NPK (100:40:40) kg/ha + Calcium (30 kg/ha) + Sulphur (60 kg/ha), T_7 NPK (100:40:40) kg/ha + Sulphur (60 kg/ha) + Iron (12 kg/ha), T_8 NPK (100:40:40) kg/ha + Calcium (30 kg/ha) + Iron (12 kg/ha), T_9 NPK (100:40:40) kg/ha + Calcium (30 kg/ha) + Sulphur (60 kg/ha) + Iron (12 kg/ha). The healthy plant of 'Pusa Jawala' was brought out from Pusa New Delhi and distance between row to row is 60cm and plant to plant 45cm distance with the help of khurpi on 9th oct on 2022-2023 for investigation. After planting we gave light irrigation.Observations were recorded on thirteen characters *viz.*, days to 50% flowering, primary branches per plant, secondary branches per plant, plant height, Leaves/plant, leaf area/plant, Fruit length, fruit circumference, pedicle length, Average fruit weight, no. of fruit/plant, total yield/plant, benefit cost ratio.

Result and Discussion

The results obtained from the investigation described in the proceeding chapter attempts have been made to collaborate the findings reported by the present investigations with those of various worker in the past.

The minimum 50% flowering41 days were recorded in T_9 (NPK (100:40:40) kg/ha + Calcium (30 kg/ha) + Sulphur (60 kg/ha) + Iron (12 kg/ha), followed by 43 days were recorded T_6 (NPK (100:40:40) kg/ha + Calcium (30 kg/ha) + Sulphur (60 kg/ha), whereas the maximum 50% flowering57 days were recorded with control. This result is corroborated with the findings of K. Sha, and P. Karuppaiah (2012) [7].

The maximum No. of primary branches4.00 were recorded in T_9 (NPK (100:40:40) kg/ha + Calcium (30 kg/ha) + Sulphur (60 kg/ha) + Iron (12 kg/ha), followed by 3.80 were recorded T_6 (NPK (100:40:40) kg/ha + Calcium (30 kg/ha) + Sulphur (60 kg/ha), whereas the minimum No. of primary branches 2.44 were recorded with control. This result is corroborated with the findings of Altaf *et al.* (2019) [1], Gokul *et al.* (2020) [6], Aslam *et al.* (2022) [12], Chauhan *et al.* (2023) [4].

The maximum No. of secondary branches 7.500 were recorded in T_9 (NPK (100:40:40) kg/ha + Calcium (30 kg/ha) + Sulphur (60 kg/ha) + Iron (12 kg/ha), followed by 7.200 were recorded T_6(NPK (100:40:40) kg/ha + Calcium (30 kg/ha) + Sulphur (60 kg/ha), whereas the minimum No. of secondary branches 4.767 were recorded with control.This result is corroborated with the findings of Chauhan *et al.* (2023) [4].

The maximum plant heigh$T_8$5.003were recorded in T_9 (NPK (100:40:40) kg/ha + Calcium (30 kg/ha) + Sulphur (60 kg/ha) + Iron (12 kg/ha), followed by 81.000 were recorded T_6 (NPK (100:40:40) kg/ha + Calcium (30 kg/ha) + Sulphur (60 kg/ha), whereas the minimum plant height 63.180 were recorded with control.This result is corroborated with the findings of Chowdhury *et al.* (2020) [5], Chauhan *et al.* (2023) [4].

The Significantly maximum numbers of leaves/Plant 109.000 were recorded in T_9 (NPK (100:40:40) kg/ha + Calcium (30 kg/ha) + Sulphur (60 kg/ha) + Iron (12 kg/ha), followed by 104.000 were recorded T_6(NPK (100:40:40) kg/ha + Calcium (30 kg/ha) + Sulphur (60 kg/ha), whereas the minimum numbers of leaves/plant 87.299 were recorded with control.This result is corroborated with the findings of K. Sha, and P. Karuppaiah (2012) [7], Aslam *et al.* (2022) [12].

The Significantly maximum leaf area/plant 115.000 were recorded in T_9 (NPK (100:40:40) kg/ha + Calcium (30 kg/ha) + Sulphur (60 kg/ha) + Iron (12 kg/ha), followed by 108.000 were recorded T_6 (NPK (100:40:40) kg/ha + Calcium (30 kg/ha) + Sulphur (60 kg/ha), whereas the minimum leaf area/plant 86.299were recorded with control.This result is corroborated with the findings of Gangadhar *et al.* (2019) [8], Ali *et al.* (2020) [11].

The maximum fruit length 9.250 were recorded in T_9 (NPK (100:40:40) kg/ha + Calcium (30 kg/ha) + Sulphur (60 kg/ha) + Iron (12 kg/ha), followed by 8.897were recorded T_6 (NPK (100:40:40) kg/ha + Calcium (30 kg/ha) + Sulphur (60 kg/ha), whereas the minimum fruit length 6.593were recorded with control.This result is corroborated with the findings of Aslam *et al.* (2022) [12] and Chauhan *et al.* (2023) [4].

The maximum fruit circumference 14.753were recorded in T_9 (NPK (100:40:40) kg/ha + Calcium (30 kg/ha) + Sulphur (60 kg/ha) + Iron (12 kg/ha), followed by 13.900 were recorded T_6(NPK (100:40:40) kg/ha + Calcium (30 kg/ha) + Sulphur (60 kg/ha), whereas the minimum fruit circumference 7.987 were recorded with control.This result is corroborated with the findings of Chowdhury *et al.* (2020) [5].

The maximum pedicle length 3.500 were recorded in T_9 (NPK (100:40:40) kg/ha + Calcium (30 kg/ha) + Sulphur (60 kg/ha) + Iron (12 kg/ha), followed by 3.303 were recorded T_6 (NPK (100:40:40) kg/ha + Calcium (30 kg/ha) + Sulphur (60 kg/ha), whereas the minimum pedicle length 2.270 were recorded with control. This result is corroborated with the findings of Aslam *et al.* (2022) [12].

The maximum average fruit weigh$T_4$5.003were recorded in T_9 (NPK (100:40:40) kg/ha + Calcium (30 kg/ha) + Sulphur (60 kg/ha) + Iron (12 kg/ha), followed by 42.003 were recorded T_6 (NPK (100:40:40) kg/ha + Calcium (30 kg/ha) + Sulphur (60 kg/ha), whereas the minimum average fruit weight 28.550 were recorded with control. This result is corroborated with the findings of Muhammad *et al.* (2022) [13].

The maximum no. of fruit/plant 45.003were recorded in T_9 (NPK (100:40:40) kg/ha + Calcium (30 kg/ha) + Sulphur (60 kg/ha) + Iron (12 kg/ha), followed by 42.003 were recorded T_6 (NPK (100:40:40) kg/ha + Calcium (30 kg/ha) + Sulphur (60 kg/ha), whereas the minimum no. of fruit/plant 28.550 were recorded with control.This result is corroborated with the findings of Chowdhury *et al.* (2020) [5], Chauhan *et al.* (2023) [4].

The maximum total fruit yield/plant0.400 were recorded in T_9 (NPK (100:40:40) kg/ha + Calcium (30 kg/ha) + Sulphur (60 kg/ha) + Iron (12 kg/ha), followed by 0.390 were recorded T_6 (NPK (100:40:40) kg/ha + Calcium (30 kg/ha) + Sulphur (60 kg/ha), whereas the minimum total fruit yield/plant 0.283 were recorded with control. This result is corroborated with the findings of Chauhan *et al.* (2023) [4].

The benefit cast ratio recorded significant result with the application different treatment. The highest amount of benefit cast ratio was fetched from the treatment T_3 (1.92) which was significantly superior over all other treatments except treatment T_4 (1.91). The lowest amount of benefit cost ratio was fetched from the treatment T_9 (1.58). Altaf *et al.* (2019) [1], Kurubetta *et al.* (2020) [9]

Table 1.1: Impact of NPK, macronutrients and micronutrients on growth and yield parameters of Chilli (*Capsicum annuum* L.)

S. No.	Days to 50% flowering	Primary branches per plant	Secondary branches per plant	Plant height	No. of leaves/plant	Leaf area/plant	Fruit length	Fruit circumference	Pedicel length	Average fruit weight	No. of fruit/plant	Total fruit yield/plant	Cast benefit ratio
T_1	57.08	2.44	4.767	63.180	87.299	86.299	6.593	7.987	2.270	28.550	116.163	0.283	1.75
T_2	53.00	2.50	5.503	65.000	89.000	89.000	6.800	8.000	2.680	30.000	112.000	0.293	1.82
T_3	51.00	2.90	6.097	68.000	95.000	95.000	7.503	9.800	2.750	33.003	114.000	0.320	1.92
T_4	49.00	2.70	6.500	71.997	95.000	95.000	7.800	10.920	2.800	36.000	115.000	0.350	1.91
T_5	53.00	3.00	5.700	63.000	92.000	92.000	7.000	8.800	2.700	31.000	113.000	0.297	1.83
T_6	43.00	3.80	7.200	81.000	104.000	108.000	8.897	13.900	3.303	42.003	119.997	0.390	1.88
T_7	45.00	3.50	7.000	77.997	101.000	101.000	8.500	12.797	3.100	40.000	117.000	0.373	1.90
T_8	47.00	3.20	6.800	75.003	99.000	99.000	8.100	11.500	2.900	38.000	116.000	0.363	1.66
T_9	41.00	4.00	7.500	85.003	109.000	115.000	9.250	14.753	3.500	45.003	124.000	0.400	1.58
C.D.	6.00	4.53	0.858	8.162	11.244	11.313	0.903	1.222	0.448	4.118	1.225	0.043	0.216
SEm (±)	1.98	1.50	0.284	2.699	3.719	3.741	0.299	0.404	0.148	1.362	4.442	0.014	0.071

Conclusion

Based on the results obtained from the present investigation, it is conducted that the highest growth and yield parameters *viz.*, 50% flowering (41.00), no. of primary branches/plant (4.00), no. of secondary branches/plant (7.5), plant height (85.003), Leaves/plant (109.00), leaf area/plant (115.00), Fruit length (9.250), fruit circumference (14.753), pedicle length (3.50), Average fruit weight (45.00), no. of fruit/plant (124.00), total yield/plant (0.400), benefit cost ratio (1.58) was observed with the treatment T_9 NPK (100:40:40) kg/ha + Calcium (30 kg/ha) + Sulphur (60 kg/ha) + Iron (12 kg/ha). So, we can suggest to farmers for use of NPK, with micronutrients and macronutrients in production of chilli.

Reference

1. Altaf MA, Shahid R, Altaf MA, Ren M, Tan K, Xiang W, *et al.* Effect of NPK, organic manure and their combination on growth, yield and nutrient uptake of chilli (*Capsicum annum* L.). Horticulture International Journal. 2019;3(5):217-222.
2. Anonymous. Database National Horticulture Board. Gurgaon, Haryana, India; c2020-21. p. 85.
3. Chattopadhyay A, Sharangi AB, Dai N, Dutta S. Diversity of genetic resources and genetic association analysis of green and dry chillies of eastern India. Chilean Journal of Agricultural Research. 2011;71:350-356.
4. Chauhan R, Hu D. Effect of Traditional Fertilizer, Nano Fertilizer and Micronutrient on Growth, Yield and Quality of Chilli (*Capsicum annuum* L.). International Journal of Environmental & Climate Change. 2023;13(9):2740-2746.
5. Chowdhury MSN, Sani MNH, Nizam R, Sultana T, Sarkar S, Uddin AFMJ. Foliar Application of Nutrients Solution (Macro and Micro) on Local Chilli (*Capsicum* sp.) Germplasms. Annals of Research and Reviews in Biology. 2020;34(6):1-8.
6. Gokul D, Poonkodi P, Angayarkanni A. Effect of integrated nutrient management on the growth and nutrient content of chilli (*Capsicum annuum* L.). International Journal of Chemical Studies. 2020;8(4):2647-2651.
7. Sha K, Karuppaiah P. Integrated nutrient management on growth, yield and quality of chilli cv K 2. Plant Archives. 2012;10(1):371-374.
8. Gangadhar K, Devakumar N, Vishwajith, Lavanya G. Growth, yield and quality parameters of chilli (*Capsicum annuum* L.) as influenced by application of different organic manures and decomposers. Chemi. 2019;8(1):DOI: https://doi.org/10.22771/chemi.2020.v8.i1g.8299.
9. Kurubetta KD, Kareem A, Mesta RK, Allolli TB, Tatagar MH, Sweta K. Effect of secondary nutrients on yield, quality and economics of dry chilli (*Capsicum annuum* L.). Journal of Pharmacognosy and Phytochemistry. 2020;E-ISSN: 2278-4136, P-ISSN: 2349-8234.
10. Quresh W, Alam M, Ullah H, Jatoi SA, Khan WU. Evaluation and characterization of Chilli (*Capsicum annuum* L.) germplasm for some morphological and yield characters. International Journal of Pure and Applied Bioscience. 2015;4:628-635.
11. Ali U, Ashfaq M, Shafiq M, Ali M, Shaheen S, Mubashar B, *et al.* Effects of Organic and Chemical Fertilizers on Growth and Yield attributes of Chili (*Capsicum annuum* L.). International Journal of Biology and Biotechnology. 2020;17(4):731-738.
12. Aslam Z, Ahmad A, Ashir S, Hussain S, Bellitürk K, Ahmad JN, *et al.* Effect of integrated nutrient management practices on physiological, morphological and yield parameters of chilli (*Capsicum annum* L.). Pakistan Journal of Botany. 2022;54(6):2143-2150.
13. Animasaun IL, Yook SJ, Muhammad T, Mathew A. Dynamics of ternary-hybrid nanofluid subject to magnetic flux density and heat source or sink on a convectively heated surface. Surfaces and Interfaces. 2022 Feb 1;28:101654.