International Journal of Bio-resource and Stress Management

https://ojs.pphouse.org/index.php/IJBSM

Crossref

IJBSM November 2025, 16(11): 01-08

Article AR6542

Rsearch Article

Natural Resource Management

DOI: HTTPS://DOI.ORG/10.23910/1.2025.6542

Performance of Chilli Varieties under Diverse Nutrient Management of Different Farming Systems

Anjali Kumari Jha, Prince Kumar, J. C. Jana, R. Chatterjee and R. K. Sarkar

Dept. of Vegetable and Spice Crops, Uttar Banga Krishi Viswavidyalaya, Pundibari, Cooch Behar, West Bengal (736 165), India

Open Access

Corresponding anjalikjha.7@gmail.com

0009-0009-8111-7369

ABSTRACT

The experiment was conducted during November to April of 2024–25 at the Horticulture Instructional Farm of the Faculty of Horticulture, Uttar Banga Krishi Viswavidyalaya, Pundibari, Coochbehar, to evaluate the performance of chillies under diverse nutrient management of different farming systems. The main plot treatments consisted of four nutrient management practices, *viz.*, farmer's practice (FP), integrated nutrient management (INM), organic farming (OF) and natural farming (NF) and three varieties of chillies, viz., Kashi Abha (V_1), Pusa Sadabahar (V_2) and Kashi Anmol (V_3), were described in subplots. Results of the experiment revealed that the integrated nutrient management (INM) recorded significantly higher plant height (67.21 cm), minimum days to 50% flowering (56.07 days), maximum days to last picking (172.94 days), maximum number of pickings (5.36), maximum number of green fruits per plant (99.83), fruit weight (4.25 g), green fruit yield plant^{-1} (431.21 g) and green fruit yield ha^{-1} (24.95 t) whereas NF took maximum days to 50% flowering as compared to other farming practices. Among the varieties, Pusa Sadabahar gave maximum plant height, days to 50% flowering, number of pickings, and number of green fruits per plant, and Kashi Anmol gave maximum days to last picking, average fruit weight, green fruit yield per plant, and green fruit yield per hectare. Despite a minimum number of green fruits per plant (81.65), fruit weight (3.75 g), green fruit yield plant^{-1} (291.03 g), and green fruit yield ha^{-1} (16.17 t), the highest benefit-cost ratio of 2.88 was obtained in the NF treatment.

KEYWORDS: Farming, nutrient, chilli, natural, organic, pickings, weight, yield

***Citation* (VANCOUVER):** Jha et al., Performance of Chilli Varieties under Diverse Nutrient Management of Different Farming Systems. *International Journal of Bio-resource and Stress Management,* 2025; 16(11), 01-08. HTTPS://DOI.ORG/10.23910/1.2025.6542.

Data Availability Statement: Legal restrictions are imposed on the public sharing of raw data. However, authors have full right to transfer or share the data in raw form upon request subject to either meeting the conditions of the original consents and the original research study. Further, access of data needs to meet whether the user complies with the ethical and legal obligations as data controllers to allow for secondary use of the data outside of the original study.

Conflict of interests: The authors have declared that no conflict of interest exists.

RECEIVED on 12th July 2025 RECEIVED in revised form on 23rd October 2025 ACCEPTED in final form on 10th November 2025 PUBLISHED on 22nd November 2025

1. INTRODUCTION

Chilli (*Capsicum annum* var. *annum* L.) is one of the most important solanaceous vegetable crops used both as a vegetable and a spice throughout the world for its pungent green and red ripe fruits with several nutritional benefits (El-Ghorab et al., 2013). It can be grown throughout the year, either sole crop or as an intercrop with other crops. It can be easily fitted into the cropping sequence of different agro-climatic regions to increase its production and productivity. India is the largest producer, consumer, and exporter of chilli, which contributes to 25% of total world's total production. In India, the major chilli-growing states are Karnataka, Tamil Nadu, Odisha, Maharashtra, Rajasthan, and West Bengal (Anonymous, 2022). Chilli production in India is estimated at 19.14 lakh tonnes cultivated over an area of 7.43 lakh hectares, with Uttar Pradesh contributing 14.92 thousand metric tonnes to the total (Anonymous, 2023). Nowadays, farming largely relies on the application of chemical fertilizers, pesticides, and growth regulators to enhance crop productivity (Tripathi et al., 2023). However, the excessive use of chemical fertilizers, while improving soil fertility and yield in the short term, has adversely impacted the intricate balance of biogeochemical cycles (Chandel et al., 2022). Balanced fertilization, integrating both organic and inorganic sources, is crucial for maximizing the crop's productivity potential (Mallika et al., 2022). Indiscriminate use of inorganic fertilizers in conventional agriculture results in a decrease in soil fertility and an increase in soil acidity, with depletion of organic humus content in addition to poor crop quality (Mallika et al., 2017). Conversely, organic farming excludes synthetic inputs and aims to maintain ecological harmony and improve soil fertility, though it may present yield limitations depending on crop variety and management approaches (Reganold and Wachter, 2016). In addition to supplying essential nutrients and minerals, organic manures enhance various soil properties and overall soil health, thereby supporting sustainable crop production (Chitla et al., 2024). Integrated nutrient management (INM) represents a holistic strategy that emphasizes the efficient and judicious utilization of organic, inorganic, and biological sources of plant nutrients. Its primary objective is to optimize economic yields while simultaneously sustaining or enhancing the physicochemical and biological properties of the soil (Yadav et al., 2025). The combined application of organic manures with inorganic fertilizers in an integrated manner has been demonstrated to be the most effective approach (Egbe et al., 2022). Similarly, natural farming encourages the proliferation of beneficial soil microorganisms and earthworm activity, thereby improving nutrient availability, enhancing plant resilience, and contributing to increased productivity (Ray et al., 2020). Moreover, it improves soil properties, biodiversity, and enzyme activity within different agroecosystems and also carbon sequestration and enhances soil structure, thereby serving as a vital strategy for ensuring long-term agricultural sustainability (Lio et al., 2019). Evaluating chilli varieties across diverse farming systems is essential to identify genotypes with superior performance, resilience, and economic viability in context-specific conditions. Nowadays, it has become necessary to compare and analyze diverse nutrient management through different sources in different farming systems and varieties to increase their productivity and sustain agro-ecological health (Sharma et al., 2023). For the rapid depletion of non-renewable sources of energy and the increase in pollution from synthetic fertilizers, it is necessitated the development of alternate ways of nutrient management (Kumar et al., 2021) for different varieties as they respond differently to varying nutrient management practices. This study aims to assess the performance of three chilli varieties under diverse nutrient management of different sources of different farming systems.

2. MATERIALS AND METHODS

The present study was carried out at the Horticulture Instructional Farm of the Faculty of Horticulture, Uttar Banga Krishi Viswavidyalaya, Pundibari, Cooch Behar ($26^0$19´86´´N latitude, $89^0$23´53´´E longitude and 43m altitude above the mean sea level) during November to April of 2024–25. The experiment was laid out in a split-plot design (SPD) in three replications with twelve treatments. The main plot treatments were consisted of four nutrient management practices viz., farmer's practice (FP) of half of the nutrient sources in integrated nutrient management (50% of recommended manures and fertilizers i.e.,12.5 t ha^{-1} FYM and 60:30:30 kg ha^{-1} NPK); integrated nutrient management (INM) with full dose of the recommended doses of manures and fertilizers i.e., 25t ha^{-1} FYM+120:60:60 kg ha^{-1} NPK; organic farming (OF) with 25 t ha^{-1} FYM+13 t ha^{-1} vermicompost+2500 l ha^{-1} cow urine+seed treatment with *Azotobactor* and PSB @ 200 g each per kg seeds and natural farming (NF) using seed treatment with Beejamrit 100ml kg^{-1} of seeds+soil application of Ghanjeevamrit @ 1000kg ha^{-1} before transplanting+mulch 6t ha^{-1} at 15 days after transplanting+application of Jeevamrit at 10% soil drenching starting from 15 days after transplanting at 15 days interval for 6 times (Table 1) and three varieties of chillies *viz*., Kashi Abha (V_1), Pusa Sadabahar (V_2) and Kashi Anmol (V_3) in the sub plots.

Seeds were sown in nursery beds in early October, 2024, and healthy seedlings were transplanted four weeks after sowing in 36 plots with inter and intra-row spacing of 60 and 30cm, respectively.

The observations were recorded on randomly selected 10 plants of each variety in each replication from different

Table 1: Details of diverse nutrient management practices of chilli

Treatments	Different nutrient applications in different farming systems
Farmers practice (FP)	1. Application of FYM @ 12.5 t ha^{-1} during land preparation 2. Application of half of the RDF (120:60:60 kg ha^{-1}) as basal and top dressing
Integrated nutrient management (INM)	1. Application of FYM @ 25 t ha^{-1} during land preparation 2. Application of the recommended dose of fertilizers RDF(120:60:60 kg ha^{-1}) as basal and topdressing
Organic farming (OF)	1. Application of FYM @ 25 t ha^{-1} during land preparation 2. Application of vermicompost @ 13 t ha^{-1} during transplanting 1. Application of cow urine @ 2500 l ha^{-1} from 15 days after transplanting at -day intervals (6 times) 3. Seed treatment with Azotobacter and PSB @ 200 g each kg^{-1} seeds
Natural farming (NF)	2. Application of Ghanjeevamrit @ 1000 kg ha^{-1} during transplanting 3. Seed treatment with Beejamrit @ 100 ml kg^{-1} of seeds 4. Application of Jeevamrit at 10% soil drenching starting from 15 days after transplanting at day intervals for 6 times 5. Mulching with paddy straws 6 t ha^{-1} at 15 days after transplanting

farming practices, followed by computing their means for different growth and yield traits of chilli under different farming practices. Soil samples were taken from 10-15 cm depth before sowing of the crop to examine the physicochemical properties and available nutrients in soil. Soil samples were examined for the estimation of soil texture, available nitrogen, available phosphorous, available potassium, organic carbon, pH and EC. Data on the initial soil nutrient status of the field are mentioned in the Table 2. The data obtained in various parameters in the present study were subjected to statistical analysis using a split-plot design of experimentation as per the procedure suggested by Panse and Sukhatme (2000). The treatment effects were compared at 5% level of significance, where the effects exhibited significance at 5% probability.

3. RESULTS AND DISCUSSION

The results for the mean performance of three varieties grown under different farming practices are presented under the following headings:

Table 2: Initial soil nutrient status of the experimental field

Parameters	Value (%)
Soil texture	Sandy loam
Physical properties	
Sand	63.2
Silt	20.2
Clay	26.6
pH	5.93
Chemical properties	
Organic carbon (%)	0.77
Available N (kg ha^{-1})	203.53
Available P (kg ha^{-1})	35.84
Available K (kg ha^{-1})	176.06
EC (ds m^{-1})	0.11

3.1. Growth parameters

3.1.1. Plant height at final harvest

Different nutrient management practices and varieties solely showed a significant difference in plant height of chillies at final harvest. Among the nutrient management treatments, integrated nutrient management resulted in the tallest plants (67.23 cm), whereas natural farming produced the shortest (55.45 cm). Regarding varietal performance, Pusa Sadabahar attained the greatest height (73.45 cm), while Kashi Anmol had the lowest (40.36 cm). The interaction effect revealed that the combination of INM with Pusa Sadabahar ($INMV_2$) achieved the highest plant height (78.71 cm), in contrast to the lowest value (34.53 cm) recorded under the NFV_3 treatment (Kashi Anmol with natural farming). The enhanced plant height of chilli under integrated nutrient management might be due to the consistent and regulated release of nutrients from organic sources, coupled with the immediate availability of essential nutrients, particularly nitrogen, from inorganic fertilizers. This synergistic effect may have fostered optimal conditions for robust plant growth and development. These findings align with previous research conducted by Kumar et al. (2020) and Mukhi et al. (2025), who reported increased plant height in chilli due to combined application of organic and inorganic fertilizers .

3.1.2. Days to 50% flowering

Among the different treatments, integrated nutrient management resulted in the earliest 50% flowering (57.00 days), which was statistically superior to other nutrient management practices. In contrast, the longest duration to reach 50% flowering (69.63 days) was recorded under natural farming. Considering varietal performance, Kashi Anmol exhibited the earliest flowering (57.62 days), significantly earlier than the other varieties, whereas Pusa Sadabahar showed the latest flowering (70.36 days). In terms of interaction effects, the combination of INM with Kashi Anmol (INMV$_3$) recorded the shortest time to 50% flowering (49.60 days), while the maximum duration (72.13 days) was observed in the NFV$_2$ combination (Pusa Sadabahar under natural farming). The observed earlier flowering can be attributed to enhanced plant growth and an improved source-to-sink ratio, which contributes to sustained soil fertility and allows the crop to reach its full potential (Pawar et al., 2017). The rapid development of vegetative growth (buds) and the accumulation of sufficient reserved food materials for the differentiation of buds into flower buds are believed to contribute to this earlier flowering and subsequent harvesting process (Saboor et al., 2021). These findings are consistent with observations reported by Noori et al. (2023), who reported minimum days to 50% flowering under treatment of 75% NPK in chilli.

3.1.3. Days to last green fruit picking

Among the various nutrient management treatments, maximum days to last green fruit picking (172.94 days) was recorded under the integrated nutrient management, which was markedly delayed over other treatments, while the minimum days to last green fruit picking (167.08 days) was observed under farmers' practice. Among the different varieties, Pusa Sadabahar (V$_2$) recorded prolonged green fruit picking (172.25 days), whereas Kashi Abha (V$_1$) resulted in the minimum days to last green fruit picking (167.68 days). (Table 3). The interaction effect between four nutrient management practices and three varieties was found to be markedly different. The treatment combination of INMV$_2$ had the maximum days to last green fruit picking (174.90 days). However, the minimum days to last green fruit picking (160.03 days) was recorded in FPV$_1$. The extended picking period observed under INM might be due to the synergistic effect of combining organic and inorganic nutrient sources. This approach ensured a balanced and sustained release of essential nutrients throughout the crop's growth cycle, thereby supporting prolonged fruit development and harvesting. The findings by Madavi et al. (2024) reported that treatment with 50% RDF+50% vermicompost has maximum days from sowing to last harvest than all treatments in chilli and the result is consistent with this observation.

3.1.4. Number of pickings

The number of chilli fruit pickings varied significantly across treatments. The highest number of pickings (5.38) was recorded under integrated nutrient management, which was significantly greater than all other treatments, whereas the lowest (4.97) was observed under farmers' practice. Among the varieties, Pusa Sadabahar recorded the highest number of pickings (5.46), significantly outperforming the other varieties, while Kashi Abha showed the lowest (4.98).

Table 3. Mean performance of diverse nutrient management through different sources on growth and yield parameters in chilli

Treatment	Plant height at last harvest (cm)	Days to 50% flowering	Days to last picking	No. of pickings	No. of green fruits plant^{-1}	Average fruit weight (g)	Green fruit yield plant^{-1} (g)	Green fruit yield ha^{-1} (t)	B:C ratio
Nutrient management practices (F)									
FP	59.54	58.49	167.08	4.97	90.68	3.94	315.90	17.55	2.13
INM	67.23	57.00	172.94	5.38	106.47	4.25	437.21	24.29	2.28
OF	62.51	67.42	170.76	5.26	93.76	4.08	369.54	20.53	1.42
NF	55.45	69.63	170.53	5.14	82.34	3.74	297.00	16.50	2.88
SEm±	1.15	0.23	0.28	0.06	0.51	0.33	2.99	0.33	
CD (*p*=0.05)	4.21	0.81	0.95	0.22	1.77	0.11	10.35	1.15	
Kashi Abha	69.73	61.45	167.68	4.98	67.05	4.50	308.87	17.16	1.80
Pusa Sadabahar	73.45	70.36	172.25	5.46	120.16	2.78	337.98	18.78	2.02
Kashi Anmol	40.36	57.62	171.06	5.13	92.74	4.74	417.86	23.24	2.72
SEm±	0.93	0.33	0.26	0.04	0.52	0.03	2.43	0.19	
CD (p=0.05)	2.78	0.99	0.76	0.13	1.56	0.09	7.29	0.57	
Interaction effect (F×V)									
SEm±	1.85	0.66	0.51	0.08	1.04	0.06	4.86	0.38	
CD (*p*=0.05)	5.55	1.99	1.53	0.25	3.11	0.18	14.58	1.14	

Regarding interaction effects, the $INMV_2$ combination (Pusa Sadabahar under INM) recorded the maximum number of pickings (5.67), whereas the minimum (4.73) was observed in the FPV_1 combination (Kashi Abha under farmers' practice). This variation might be attributed to the balanced and sustained nutrient availability ensured by integrated nutrient management practices, which enhance both vegetative and reproductive growth. INM facilitates a synchronized and steady supply of macro and micronutrients through the combined application of organic manures and judicious doses of chemical fertilizers, thereby extending the productive phase of the crop and increasing the frequency of harvests. Similar findings were reported by Rani et al. (2015) in chilli and Sharma et al. (2023) in capsicum, who reported maximum number of pickings was observed in treatment combination (50% RDF through inorganic fertilizer+25% through FYM+25% through vermicompost).

3.2. Yield parameters

3.2.1. Number of green fruits plant^{-1}

Among the various treatments, integrated nutrient management resulted in the highest number of green fruits plant^{-1} (106.47), which was statistically superior to the other nutrient management practices. In contrast, the lowest number (82.34) was recorded under natural farming. Regarding varietal performance, Pusa Sadabahar produced the highest number of green fruits plant^{-1} (120.16), whereas Kashi Abha recorded the lowest (67.05). The interaction between nutrient management practices and varieties revealed that the $INMV_2$ combination (Pusa Sadabahar under INM) achieved the maximum fruit count (131.93), while the minimum (60.10) was noted in the NFV_1 combination (Kashi Abha under natural farming). This increase in the number of green fruits per plant might be due to the use of organic manures in combination with inorganic fertilizers under INM, which supply essential micronutrients such as zinc (Zn), copper (Cu), iron (Fe), manganese (Mn), and magnesium (Mg) in optimal quantities. Zinc is vital for the biochemical synthesis of the phytohormone indole-3-acetic acid (IAA) via the tryptophan to IAA conversion pathway. Iron is crucial for chlorophyll biosynthesis, while copper and manganese serve as important coenzymes in various respiratory processes. Magnesium is also involved in chlorophyll formation, thereby enhancing photosynthetic efficiency (Premsekhar and Rajashree, 2009). The resultant increase in chlorophyll content improves carbohydrate synthesis and promotes new cell formation, which collectively contribute to a higher fruit count. The present findings are in close agreement with the results reported by Rani et al. (2015), who found maximum number of fruits plant^{-1} under 75% Organic+75% Inorganic nutrient in chilli and Yugvinder et al. (2021) also reported rise in the number of fruits plant^{-1} in chilli due to application of recommended NPK+vermicompost @ 2 t ha^{-1}+Azotobacter.

3.2.2. Fruit weight

Significant variations in fruit weight were observed across different nutrient management practices and chilli varieties. Among the treatments, the highest fruit weight (4.25 g) was recorded under integrated nutrient management, which was statistically superior to all other treatments, whereas the lowest (3.74 g) was noted under natural farming. Amongst varieties, Kashi Anmol resulted in the maximum fruit weight of 4.74 g, which was statistically superior to other varieties, while the minimum fruit weight (2.78 g) was reported in Pusa Sadabahar. The interaction between nutrient management practices and varieties revealed that the $INMV_3$ combination (Kashi Anmol under INM) resulted in the maximum fruit weight (4.91 g), whereas the minimum (2.48 g) was observed in the NFV_2 combination (Pusa Sadabahar under natural farming). This enhancement in fruit weight might be attributed to the adequate and balanced supply of nitrogen, phosphorus, and potassium at the recommended levels, which contributed to the formation of a nutrient-rich soil solution. The availability of these nutrients at the critical growth stages promoted early crop establishment, vigorous vegetative growth, and optimal fruit development, resulting in longer and broader fruits. The increased fruit weight may also be due to improved translocation of photo-assimilates from source to sink organs. These findings are in agreement with Ranjitha et al. (2018); Yugvinder et al. (2021) and Madavi et al. (2023), who reported maximum fruit weightin chilli with the application of 50% RDF+50% vermicompost.

3.2.3. Green fruit yield plant^{-1} (g)

Green fruit yield plant^{-1} was significantly influenced by both nutrient management practices and varieties. Among the different treatments, the highest green fruit yield per plant (437.21 g) was obtained in integrated nutrient management. Natural farming had the lowest green fruit yield (297.00 g). With respect to varieties, Kashi Anmol produced the highest green fruit yield (417.86 g) statistically outperforming other varieties, while the lowest green fruit yield per plant (308.87 g) was recorded in Kashi Abha. The interaction among nutrient management practices and varieties resulted in maximum green fruit yield plant^{-1} (507.96 g) in $INMV_3$ combination (Kashi Anmol grown under integrated nutrient management), while the minimum green fruit yield plant^{-1} (266.40 g) was recorded in NFV_1 (Kashi Abha under natural farming). This improvement in yield may be attributed to enhanced physiological conditions and an increased population of beneficial microflora under INM, which improves nutrient availability through enhanced mineralization. The consistent supply of nutrients likely promoted better vegetative growth, resulting in an expanded photosynthetic area and increased synthesis and allocation of dry matter to the fruits. These results are supported by the findings of Ranjitha et al. (2018) and Ujjwal et al. (2023), who reported maximum fruit yield plant^{-1} with combined application of organic and inorganic fertilizers in chilli.

3.2.4. Green fruit yield ha^{-1} (t)

Among the various treatments, integrated nutrient management resulted in the highest green fruit yield ha^{-1} (24.29 t), which was statistically significant over all other treatments, while natural farming recorded the lowest yield (16.50 t ha^{-1}). Among the varieties, Kashi Anmol exhibited the highest green fruit yield ha^{-1} (23.24 t), statistically superior to the other varieties, whereas the lowest yield (17.16 t ha^{-1}) was recorded in Kashi Abha. The interaction among nutrient management practices with varieties showed that maximum green fruit yield per hectare (28.22 t) was obtained in $INMV_3$, i.e., Kashi Anmol, grown under integrated nutrient management, while the lowest yield (14.80 t) was observed in NFV_1, i.e., Kashi Abha, under natural farming. The observed increase in yield under integrated nutrient management might be due to improved early-stage growth and morphological traits, which reflect the plant's efficiency in intercepting and utilizing available solar radiation. This increased radiation use efficiency likely boosted the synthesis of assimilates that contributed to enhanced fruit formation and number. Additionally, the improved fruit weight and size in chilli under INM could be linked to a balanced (C:N) ratio, increased organic matter decomposition and mineralization, and greater availability and solubilization of both native and applied macro- and micronutrients. Furthermore, the use of organic manures may have enhanced physiological activity, resulting in the accumulation of food reserves in developing sink organs and improved assimilate partitioning towards fruit development. These results were in line with the findings of Mallika et al. (2022), who reported the maximum fruit yield of chilli was obtained in (75% RDF+25% vermicompost+VAM), Aslam et al. (2022) also reported in chilli, maximum yield was obtained under the treatment of 25% chemical fertilizers+25% vermicompost+25% cow dung+25% vermi-tea; and Sharma et al. (2023) in sweet pepper recorded highest fruit yield ha^{-1} under treatment combination (50% RDF through inorganic fertilizer+25% through FYM+25% through vermicompost) .

3.3. Economics

Despite its low input costs, NF exhibited promising profitability due to favorable marketable yields, particularly when combined with high-performing varieties (Table 1). The benefit-cost ratio, a key indicator of economic efficiency, varied significantly across treatments. The highest B:C ratio was recorded under NFV_3 (3.54), followed by $INMV_3$ (2.82), FPV_3 (2.46), and OFV_3 (2.06). The average B:C ratio across varieties revealed that NF had the most favorable return on investment (2.88), indicating that low-input systems can also be economically viable, especially when paired with responsive genotypes like Kashi Anmol (V_3). This aligns with previous studies of Mahantesh et al. (2023) in okra, emphasizing the potential of low-input sustainable systems for improving farm profitability in vegetable crops.

4. CONCLUSION

The different nutrient management practices and varieties separately and in combination markedly influenced their growth, yield, and quality parameters. Integrated nutrient management was found to be best in terms of growth and yield attributes and also net profit in chilli as compared to other farming practices. Natural farming practice resulted in minimum growth and yield attributes; however, it gave the highest benefit-cost ratio for Kashi Anmol for its yield with the lowest cost of cultivation.

5. REFERENCE

Anonymous, 2022. Agricultural Market Intelligence Centre, PJTSAU. Chilli Outlook - August 2022. Retrieved from http://www.agriwatch.com. Accessed on 19th August, 2025.

Anonymous, 2023. Horticultural Statistics at a Glance. Ministry of Agriculture & Farmers Welfare, Government of India. Retrieved from http://nhb.gov.in/. Accessed on 19th August, 2025.

Aslam, Z., Ahmad, A., Bashir, S., Hussain, S., Bellitürk, K., Ahmad, J.N., Ullah, E., Tanvir, S., Abbas, T., 2022. Effect of integrated nutrient management practices on physiological, morphological and yield parameters of chilli (*Capsicum annuum* L.). Pakistan Journal of Botany 54(6), 2143–2150. http://dx.doi.org/10.30848/PJB2022-6(40).

Chandel, A., Sharma, A., Sharma, P., Manuja, S., Rana, R.S., Rana, S.S., 2022. Influence of seeding time, fertility level and genotype influence on productivity, quality and profitability of garden pea (*Pisum sativum* L.). Indian Journal of Agronomy 67(1), 30–37. DOI: 10.59797/ija.v67i1.81.

Chitla, S.R., Dayal, A., Dileep, R., 2024. Impact of organic manures and inorganic fertilizers on growth, yield and its attributing traits of chilli (*Capsicum annum* L.). International Journal of Plant and Soil Science 36(4), 118–122. DOI: 10.9734/ijpss/2024/v36i44460.

Egbe, E., Soupi, N., Awow, M., Besong, G., 2022. Effects of green manure and inorganic fertilizers on the growth, yield, and yield components of soybean (*Glycine max* l.) Merr.) in the Mount Cameroon region. American

Journal of Plant Sciences 13, 702–721. https://doi.org/10.4236/ajps.2022.135047.

El-Ghorab, A.H., Javed, Q., Anjum, F.M., Hamed, S.F., Shaaban, H.A., 2013. Pakistani bell pepper (*Capsicum annum* L.): chemical compositions and its antioxidant activity. International Journal of Food Properties 16(1), 18–32. https://doi.org/10.1080/10942912.2010.513616

Kumar, H., Kumari, P., Ravinder, Hemlata, 2023. Comparative efficacy of natural farming, organic farming and inorganic systems of nutrition in transplanted rice. Biological Forum- An International Journal 15(11), 210–213. ISSN No. (Print): 0975-1130 ISSN No. (Online): 2249-3239.

Kumar, V., Kumar, A., Kumar, M., Kumar, M., 2020. Growth and yield of chilli (*Capsicum annuum* L.) as affected by different NADEP compost and chemical fertilizers. Biotech Today 10, 57–59. http://dx.doi.org/10.5958/2322-0996.2020.00009.5.

Kumar, C.P., 2021. Trends and status of zero budget natural farming in Andhra Pradesh, ZBNF impact in the District of Visakhapatnam. Indian Journal of Pure Applied Bioscience 9(4), 54–60. https://doi.org/10.18782/2582-2845.8738.

Liao, J., Xu, Q., Xu, H., Huang, D., 2019. Natural farming improves soil quality and alters microbial diversity in a cabbage field in Japan. Sustainability 11(11), 3131. https://doi.org/10.3390/su11113131.

Madavi, K.B., Chaudhari, V.T., Gajbhiye, M.D., Rathod, A.V., Ghodake, B.D., 2024. Integrated nutrient management studies on flowering and fruit quality in chilli type Keshori local. International Journal of Research in Agronomy 7(12), 373–375. https://doi.org/10.33545/2618060X.2024.v7.i12e.2169.

Mahantesh, P.S., Kamath, K.V.S., Lakshmana, 2021. Influence of organic, natural farming and recommended package of practices on growth, yield, and economics of okra. The Pharma Innovation Journal SP-10(10): 103-106. E-ISSN Number: 2277-7695P-ISSN Number: 2349-8242.

Mallika, A., Kumar, D., Singh, N., Gangwar, V., Veersain, Pal, O., Rawat, M., 2022. Integrated nutrient management on physiological, yield, and quality parameters of chilli (*Capsicum annuum* L.) genotypes. Biological Forum – An International Journal 14(3), 1506–1511. https://www.researchtrend.net/bfij/bfij.php.

Mukhi, S.K., Sardar, S.S., Bar, N., Mishra, P.J., 2025. Influence of integrated nutrient management on growth, yield and economics of chilli (*Capsicum annuum* L.) in Kandhamal, Odisha, India. Journal of Experimental Agriculture International 47(8), 98–105. DOI: https://doi.org/10.9734/jeai/2025/v47i83652.

Noori, R., Sharma, A., Rana, S.S., Lata, H., Shilpa, Sharma, P., Rana, R.S., 2023. Differential response of nutrient management practices on different varieties in chilli-garden pea cropping system. Himachal Journal of Agricultural Research 49(1), 84–92. https://hjar.org/index.php/hjar/article/view/172440.

Panse, V.G., Sukhatme, P.V., 2000. Statistical methods for agricultural workers. ICAR, New Delhi, 359p. https://www.cabidigitallibrary.org/doi/full/10.5555/19561604178.

Pawar, Y., Varma, L.R., Verma, P., Joshi, H.N., More, S.G., Dabhi, J.S., 2017. Influences of integrated use of organic and inorganic sources of nutrients on growth, flowering and yield of garden pea (*Pisum sativum* L.) cv. Bonneville. Legume Research 40, 117–124. http://dx.doi.org/10.18805/lr.v0i0.6840.

Premsekhar, M., Rajashree, V., 2009. Influence of organic manures on growth, yield, and quality of okra. American-Eurasian Journal of Sustainable Agriculture 3(1), 6–8. https://www.aensiweb.net/AENSIWEB/aejsa/aejsa/2009/6-8.pdf.

Rani, P.L., Balaswamy, K., Rao, A.R., Masthan, S.C., 2015. Evaluation of integrated nutrient management practices on growth, yield and economics of green chilli cv Pusa Jwala (*Capsicum annuum* L.). International Journal of Bio-resource and Stress Management 6(1), 076–080. http://dx.doi.org/10.5958/0976-4038.2015.00007.X.

Ranjitha, B.M., Allolli, T.B., Jhanavi, D.R., Kavyashree, N., Gururaj, S., Ashwini, B.K., 2018. Yield and economics of chilli hybrid Sitara with the use of different nutrient management practices and organic amendments. Agricultural Science Digest 38(1), 44–47. https://doi.org/10.18805/ag.D-4688.

Ray, P., Lakshmanan, V., Labbé, J.L., Craven, K.D., 2020. Microbe to microbiome: A paradigm shift in the application of microorganisms for sustainable agriculture. Frontiers in Microbiology 11, 622926. https://doi.org/10.3389/fmicb.2020.622926.

Reganold, J.P., Wachter, J.M., 2016. Organic agriculture in the twenty-first century. Nature Plants 2, 15221. http://dx.doi.org/10.1038/nplants.2015.221.

Saboor, A.M.A., Ali, S., Hussain, H.A.E., Enshasy, S., Hussain, N., Ahmed, A., Gafur, R.Z., Sayyed, S., Fahad, S., Danish, Datta, R., 2021. Zinc nutrition and arbuscular mycorrhizal symbiosis effects on maize (*Zea mays* L.) growth and productivity. Journal of the Saudi Society of Agricultural Sciences 28(11), 6339–6351. https://doi.org/10.1016/j.sjbs.2021.06.096.

Sharma, A., Sharma, G.D., Kumar, R., Sankhyan, N.K., Manuja, S., 2023. Effect of farming practices and varieties on growth, phenology and yield of okra

(*Abelmoschus esculentus* L.) Moench). Himachal Journal of Agricultural Research 49(2), 248–252. https://hjar.org/index.php/hjar/article/view/172494.

Sharma, N., Kumar, S., Yadav, D., Kumar, R., Kumar, A., 2023. Effect of integrated nutrient management (INM) practices on growth, yield, economics and soil properties of sweet pepper under open conditions at mid-hill of Himachal Pradesh, India. International Journal of Plant & Soil Science 35(19), 773–782. https://doi.org/10.9734/ijpss/2023/v35i193610

Tripathi, A., Singh, J.K., Mourya, P.K., Chaudhary, P., Chaudhary, A.K., Kannaujiya, A.K., 2023. Effect of different sources of organic manure on the growth and yield of chilli. Biological Forum–An International Journal 15(11), 355–360.

Ujjwal, D., Lakhawat, S.S., Chhipa, B.G., Lakhawat, S., Upadhyay, B., Saharan, V., 2023. Effect of organic manures and liquid formulations on growth, yield and quality of chilli (*Capsicum annuum* L.). Biological Forum–An International Journal 15(8), 141–147. https://www.researchtrend.net/bfij/current_issue_bfij.php?taxonomy-id=162.

Yadav, P., Kumar, J., Singh, H.S., Silas, V.J., 2025. Impact of integrated nutrient management on growth and yield of capsicum (*Capsicum annuum* L. var. *Grossum*). Journal of Experimental Agriculture International 47(7), 407–412. https://doi.org/10.9734/jeai/2025/v47i73580.

Yugvinder, Kumar, K., Kumar, N., Gill, V., Yadav, M., Singh, S., 2021. Effect of integrated nutrient management on quality of chilli (*Capsicum annuum* L.). The Pharma Innovation Journal 10(10), 645–648. https://www.thepharmajournal.com/archives/2021/vol10issue10/PartJ/10-9-350-182.pdf.