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Response of integrated nutrient management on Chilli (*Capsicum annum* L.) under South Western Rajasthan

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Abstract

A field experiment was conducted at Research Farm of Mewar University, Chittorgarh (Rajasthan) during *rabi* season, 2024-25 on loamy sand soil, which consisted nine treatments *viz.*, T₀: Control, T₁: 100% RDF through chemical fertilizers, T₂: 100% RDF + Vermicompost, T₃: 100% RDF + Poultry manure, T₄: 75% RDF + 25% FYM, T₅: 75% RDF + 25% Vermicompost, T₆: 75% RDF + 25% Poultry manure, T₇: 75% RDF + 25% Poultry manure + Vermicompost, T₈: 75% RDF + FYM + Vermicompost randomized block design (RBD). The Chilli variety “Arka Harita” was used for experiment. Results clearly showed that growth parameters *viz.*, plant height (cm) and number of branches/plant significantly higher recorded under T₇: 75% RDF + 25% Poultry manure + Vermicompost over control and remained at par with T₈: 75% RDF + FYM + Vermicompost. Similarly, maximum yield parameters *viz.* fruit length and yield/ha also recorded under T₇: 75% RDF + 25% Poultry manure + Vermicompost and remained at par with T₈: 75% RDF + FYM + Vermicompost and superior to rest of the treatments.

Keywords: Chilli, FYM, RDF, plant height and yields

Introduction

Vegetable growing in India has assumed greater importance during the last few years. India is second largest producer of vegetables next to china. India has achieved self sufficiency in vegetable and has attained a good degree of stability in food production.

Chilli (*Capsicum annum* L.), a member of the Solanaceae family, is one of the most widely cultivated spice crops globally and holds a prominent place in Indian agriculture. It is considered to be originated in tropical South America (Brazil) where it is still found in wild state and was introduced in India by the Portuguese in the 17th century. Today, India is not only the largest producer but also the leading consumer and exporter of dried chilli in the world (NHB, 2023). Chilli is one of the most important commercially grown vegetable crop throughout the world and valued as spices, condiments, sauces and pickles. Amongst spice group, chilli occupies a predominant place. And it is demanded for its pungency because of alkaloid capsaicin present in the placenta. Spicy taste, besides, the appearing and attractive colour it adds to the food in which it is used. Despite its importance, the productivity of chilli in India often falls below its potential due to challenges such as improper crop management, pest and disease infestation (like thrips, fruit borers, and viral diseases), and climatic stresses. In particular, leaf curl virus, damping-off, and anthracnose are some of the major diseases affecting the crop at various growth stages.

Nutrient management plays an important role in boosting up the yield of vegetable crops. Integrated use of organic manure, inorganic fertilizers and biofertilizers, as a source of plant nutrients helps in building up soil health and productivity of crops. It helps in improving soil physical and biological properties. It supplies the various nutrients required by the plant in a balanced form and avoids ill effects on soil health, those associated with the use of inorganic fertilizers. Thus, this system supplies all the nutrients judiciously to increase yield in a sustainable way. Hence, the integrated approach of plant nutrient supply is indispensable for sustaining the production potential of vegetable crops.

Integrated nutrient management plays a vital role in enhancing the growth, yield, and quality of Chilli by improving soil health and fertility.

Application of organic sources such as FYM, vermicompost, compost, and biofertilizers enriches the soil with essential nutrients and beneficial microbes, leading to better nutrient availability and uptake.

Farmyard manure (FYM) is the traditional organic manure and is most readily available to the farmers. The Vermicompost is a nutritive organic fertilizer enriched microbiologically-active peat-like material and is commonly used for management of organic wastes by decomposition and humification of biodegradable organic wastes carried out by microbes present in the soil and gut of earthworms. Compost is a nutrient-rich organic amendment produced through the aerobic decomposition of organic matter, such as crop residues, kitchen waste, animal manure, and plant biomass, by microorganisms under controlled conditions. Phosphorus Solubilizing Bacteria (PSB) are a group of beneficial soil microorganisms capable of converting insoluble forms of phosphorus (P) into forms available to plants through processes like acidification, chelation, and enzymatic solubilization.

Materials and Methods

The field experiments were carried out during summer season (2025) to study the “Response of Integrated Nutrient Management on Chilli (*Capsicum annum* L.) Under South Western Rajasthan” in randomized block design (RBD) with consisted nine treatments viz., Control, T₁: 100% RDF through chemical fertilizers, T₂: 100% RDF + Vermicompost, T₃: 100% RDF + Poultry manure, T₄: 75% RDF + 25% FYM, T₅: 75% RDF + 25% Vermicompost, T₆: 75% RDF + 25% Poultry manure, T₇: 75% RDF + 25% Poultry manure + Vermicompost, T₈: 75% RDF + FYM + Vermicompost at Research Farm, Mewar University, Chittorgarh (Rajasthan). The experimental farm is geographically located at 075°88'99" E longitude and 26°81'17" N latitude and this region falls under agro-climatic zone IV A of Rajasthan. The experimental fields were clay loam and the soil fertility status contained available nitrogen (137.8 kg ha⁻¹) by Subia and Asija 1996, available phosphorus (16.3 kg ha⁻¹) by Olsen *et al.* 1954 and available potassium (250.12 kg ha⁻¹). The organic carbon content was from 0.34-0.38 percent. The weekly mean maximum and minimum temperatures were of temperature during both summers (40.6° C) and winters (2.7° C). The mean relative humidity fluctuated from 63.50 to 91 percent during the crop season. The average rainfall is 557 mm per annum, which is mostly received during july to September. The sporadic showers during winters are also common, which are probably observed during this period. The observation were recorded at harvest was analysed by statistical methods.

Result and Discussion

It is clear from the result of present study that, integrated nutrient management had significantly affected the growth and yield parameters at harvest of Chilli. Application of T₇: 75% RDF + 25% Poultry manure + Vermicompost recorded the highest growth parameters viz. Plant height (75.28 cm) at harvest and number of branches (36.47) which was superior over control. However; T₈: 75% RDF + FYM + Vermicompost remained statistically at par with each other (Table-1). Plant height and number of branches/plant increased with the application of organic sources of nutrients due to increased cell division and cell elongation at higher level of nutrients. Probably the increase in auxin

supply with higher levels of nitrogen brought about increase in the dry matter and branches per plant.

The observed improvement might be due to an early and plentiful availability of nutrients leading to better nutritional environment in the root zone for growth and development. As nitrogen is one of the major essential plant nutrients required for growth (Budige *et al.*, 2021 and Somvanshi *et al.*, 2024) ^[1, 2]. It is obvious that phosphorus and potassium has long been considered as an essential constituent of all living organism, which plays an important role in conservation and transfer of energy in metabolic reactions of living cells including biological energy transformations. Phosphorus not only plays an important role in root development and proliferation but also improves water uptake by supplying assimilates to the roots. It is the main constituent of co-enzymes, ATP and ADP which act as "energy currency" within plants. Almost every metabolic reaction of any significance proceeds viz., phosphate derivatives. Thus, phosphorus influenced photosynthesis, biosynthesis of protein and phospholipids, nucleic acid synthesis, membrane transport and cytoplasmic streaming. Similar results were reported by Sharma *et al.*, 2014 and Sebastian *et al.*, 2024) ^[4, 7].

Further yield parameters and yields like fruit length (4.92 cm) and yield (13.30 t/ha) presented in table 2, recorded with the application of T₇: 75% RDF + 25% Poultry manure + Vermicompost over control but it was remained statistically at par with T₈: 75% RDF + FYM + Vermicompost. Yield components by enhancing cell division, cell elongation process and photosynthetic activity leading to production and accumulation of more carbohydrates and auxins which favours retention of more flowers ultimately leading to more number of reproductive parts plant⁻¹ (Sinha *et al.*, 2023 and Thakur *et al.* 2024) ^[5, 4].

Table 1: Response of integrated nutrient management on growth parameters of Chilli

Treatment	Plant height (cm)	Number of branches/plant
T ₀	42.39	18.77
T ₁	56.92	25.91
T ₂	64.26	30.62
T ₃	66.55	31.47
T ₄	49.56	21.73
T ₅	50.05	22.08
T ₆	58.24	26.18
T ₇	75.28	36.47
T ₈	73.08	35.07
SEm±	2.10	0.93
CD (P=0.05)	6.29	2.80
CV (%)	6.10	5.87

Table 2: Response of integrated nutrient management on yield parameters and yields of Chilli

Treatment	Fruit length (cm)	Yield (t/ha)
T ₀	3.03	5.10
T ₁	3.76	6.50
T ₂	4.22	8.40
T ₃	4.39	10.10
T ₄	2.98	6.50
T ₅	3.02	6.60
T ₆	3.79	6.70
T ₇	4.92	13.30
T ₈	4.89	11.70
SEm±	0.13	0.37
CD (P=0.05)	0.39	1.12
CV (%)	5.84	7.77

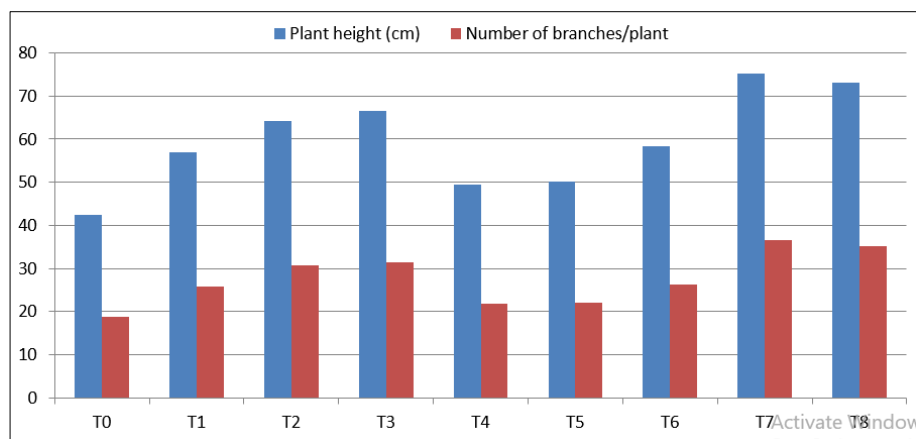


Fig 1: Response of integrated nutrient management on growth parameters of chilli

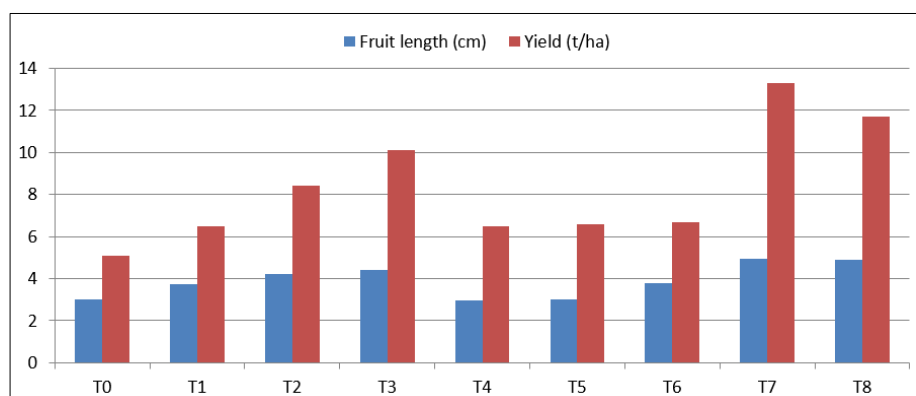


Fig 2: Response of integrated nutrient management on yield parameters and yields of Chilli

Conclusion

Based on the results of one year experimentation, it may be concluded that the Application of T₇: 75% RDF + 25% Poultry manure + Vermicompost found suitable to produce good yield of Chilli.

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