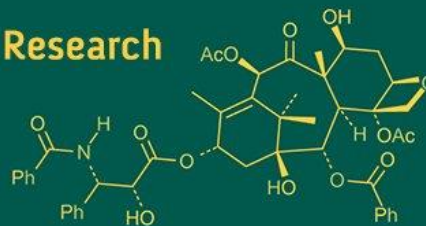


International Journal of Advanced Biochemistry Research



ISSN Print: 2617-4693
ISSN Online: 2617-4707
NAAS Rating (2026): 5.29
IJABR 2026; SP-10(5): 567-570
www.biochemjournal.com
Received: 27-02-2026
Accepted: 30-03-2026

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Effect of Integrated Nutrient Management on Growth, Yield and Quality of Pumpkin (*Cucurbita moschata* Duch ex Poir)

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DOI: <https://www.doi.org/10.33545/26174693.2026.v10.i5Sg.8427>

Abstract

The present investigation was conducted during 2024-25 at the Agricultural Research Farm, School of Agriculture, Suresh Gyan University, Jaipur (Rajasthan) on loamy sand soil. The experiment comprised thirteen treatments viz. T₀: Control, T₁: RDF (100%) (80:40:40 kg N:P:K), T₂: FYM (20 t/ha), T₃: Vermicompost (5 t/ha), T₄: RDF + Azotobacter @ 25 g/kg seed, T₅: FYM + Azotobacter, T₆: Vermicompost + Azotobacter, T₇: RDF + PSB @ 25 g/kg seed, T₈: FYM + PSB, T₉: Vermicompost + PSB, T₁₀: RDF + Azotobacter + PSB, T₁₁: FYM + Azotobacter + PSB and T₁₂: Vermicompost + Azotobacter + PSB were laid out in Randomized Block Design with three replications. The results revealed that integrated nutrient management treatments significantly influenced growth, yield and quality parameters of pumpkin. Among different treatments, application of T₁₀: RDF + Azotobacter + PSB recorded the maximum vine length (459.34 cm), number of branches per plant (13.86), fruit diameter (14.80 cm), fruit weight (1987.45 g), number of fruits per plant (2.50) and yield per plot (4.29 kg). The same treatment also produced superior fruit quality with highest total soluble solids (13.93 °Brix) and ascorbic acid content (9.75 mg/100 g) over rest of the treatments.

Keywords: Azotobacter, Growth, Quality, INM, PSB, Pumpkin and Yield

Introduction

Pumpkin (*Cucurbita moschata* Duch ex Poir.) is one of the most important cucurbitaceous vegetable crops belonging to the family Cucurbitaceae and is widely cultivated in tropical and subtropical regions of the world. It is valued for its high nutritive, medicinal and economic importance. Pumpkin fruits are rich sources of carbohydrates, minerals, dietary fibre, carotenoids, antioxidants and vitamins, especially vitamin A and vitamin C, which play an important role in human nutrition and health. The crop is extensively used for fresh consumption, culinary preparations, processing industries and seed extraction. Owing to its wide adaptability and high productivity, pumpkin occupies an important position among vegetable crops cultivated in India.

India is one of the major producers of pumpkin and the crop is grown successfully under diverse agro-climatic conditions. Pumpkin cultivation is gaining importance due to increasing consumer demand, nutritional awareness and its suitability for commercial cultivation. However, continuous and indiscriminate use of chemical fertilizers alone has adversely affected soil fertility, nutrient balance and crop productivity. Excessive dependence on inorganic fertilizers deteriorates soil health, reduces microbial activity and leads to environmental pollution. Integrated Nutrient Management (INM) has emerged as an efficient and sustainable approach for maintaining soil fertility and enhancing crop productivity. INM involves the judicious and combined use of inorganic fertilizers, organic manures and biofertilizers for balanced nutrient supply to crops. Organic sources such as farmyard manure and vermicompost improve soil structure, water-holding capacity, aeration and microbial activity, while biofertilizers like Azotobacter and phosphate solubilizing bacteria (PSB) enhance nutrient availability and nutrient-use efficiency. Integration of these nutrient sources not only improves crop growth and yield but also enhances quality parameters and maintains long-term soil health. Several studies have indicated that combined application of recommended dose of fertilizers along with organic manures and biofertilizers

significantly improves vegetative growth, flowering, fruit development, yield and quality attributes in cucurbit crops.

Materials and Methods

The present investigation was conducted during 2024-25 at the Agricultural Research Farm, School of Agriculture, Suresh Gyan University, Jaipur (Rajasthan) under semi-arid conditions on loamy sand soil. The experiment comprised thirteen treatments viz. T₀: Control, T₁: RDF (100%) (80:40:40 kg N:P:K), T₂: FYM (20 t/ha), T₃: Vermicompost (5 t/ha), T₄: RDF + Azotobacter @ 25 g/kg seed, T₅: FYM + Azotobacter, T₆: Vermicompost + Azotobacter, T₇: RDF + PSB @ 25 g/kg seed, T₈: FYM + PSB, T₉: Vermicompost + PSB, T₁₀: RDF + Azotobacter + PSB, T₁₁: FYM + Azotobacter + PSB and T₁₂: Vermicompost + Azotobacter + PSB, which were laid out in Randomized Block Design with three replications using pumpkin variety 'Arka Suryamukhi'. Observations on growth, yield and quality parameters were recorded at different growth stages following standard procedures. Total soluble solids (°Brix) were estimated using Erma hand refractometer as per A.O.A.C. (1995) [1], while ascorbic acid content was determined by 2,6-dichlorophenol indophenol dye method suggested by Ruck (1969) [11]. The experimental data were statistically analyzed according to the method described by Fisher (1950) [4].

Results and Discussion

The data presented in table-1 revealed that integrated nutrient management treatments significantly influenced growth parameters of pumpkin. Among all the treatments, T₁₀: RDF + Azotobacter + PSB recorded the maximum vine length (459.34 cm), number of branches per plant (13.86) and fruit diameter (14.80 cm), which were significantly superior over rest of the treatments. Treatments T₁₂: Vermicompost + Azotobacter + PSB and T₁₁: FYM + Azotobacter + PSB were found next best treatments. The minimum values were recorded under control treatment

(T₀). The improvement in growth attributes might be due to balanced nutrient availability, enhanced microbial activity and better nutrient uptake under integrated nutrient management. Similar findings were also reported by Alekar *et al.* (2015) [2], Nath *et al.* (2025) [9], Wang and Xing (2025) [13] and Gurau and Ray (2025) [6].

Perusal of data presented in table 2 indicated that different integrated nutrient management treatments significantly increased yield attributes and yield of pumpkin. Treatment T₁₀: RDF + Azotobacter + PSB recorded the highest fruit weight (1987.45 g), number of fruits per plant (2.50) and yield per plot (4.29 kg), which was significantly superior over other treatments and showed 184.11 per cent higher yield over control. Treatments T₁₂: Vermicompost + Azotobacter + PSB and T₁₁: FYM + Azotobacter + PSB were found statistically at par with T₁₀. The lowest yield parameters were observed under control treatment. Higher yield under integrated nutrient management might be attributed to improved nutrient-use efficiency, better flowering, fruit setting and translocation of photosynthates towards developing fruits. Similar results were reported by Gosai *et al.* (2025) [5], Katta *et al.* (2025) [8], Zhong *et al.* (2026) [14] and Patil and Deshmukh (2026) [10].

The results presented in table-3 showed that integrated nutrient management treatments significantly improved quality parameters of pumpkin. Treatment T₁₀: RDF + Azotobacter + PSB recorded the highest total soluble solids (13.93 °Brix) and ascorbic acid content (9.75 mg/100 g), whereas the lowest values were recorded under control treatment. Treatments T₁₂ and T₁₁ were found next superior treatments for quality improvement. Enhanced quality parameters under integrated nutrient management may be due to improved nutrient availability, higher photosynthetic activity and increased synthesis of sugars and vitamins in fruits. Similar findings were also reported by Isutsa *et al.* (2025) [7], Sharma and Bhadur (2026) [12], Gurau and Ray (2025) [6] and Nath *et al.* (2025) [9].

Table 1: Effect of integrated nutrient management on growth parameters of pumpkin

Treatment	Vine length (cm)	Number of branches/plant	Fruit diameter (cm)
T ₀ : Control	302.98	10.08	10.41
T ₁ : RDF (100%) (80:40:40 kg N:P:K)	357.34	11.43	12.35
T ₂ : FYM (20 t/ha)	321.67	10.52	11.05
T ₃ : Vermicompost (5 t/ha)	339.29	10.98	11.69
T ₄ : RDF + Azotobacter @ 25 g/kg seed	420.54	12.90	13.46
T ₅ : FYM + Azotobacter	380.09	11.93	13.08
T ₆ : Vermicompost + Azotobacter	401.45	12.42	13.75
T ₇ : RDF + PSB @ 25 g/kg seed	418.82	12.86	13.40
T ₈ : FYM + PSB	374.56	11.89	12.10
T ₉ : Vermicompost + PSB	398.84	12.38	13.02
T ₁₀ : RDF+Azotobacter + PSB	459.34	13.86	14.80
T ₁₁ : FYM+Azotobacter + PSB	437.04	13.37	14.10
T ₁₂ : Vermicompost + Azotobacter + PSB	442.56	13.41	14.16
SEm ±	4.96	0.14	0.21
CD (P=0.05)	14.87	0.43	0.62
CV (%)	9.67	8.89	8.67

Table 2: Effect of integrated nutrient management on yields of pumpkin

Treatment	Fruit weight (g)	Number of fruits/plant	Yield/plot (kg)
T ₀ : Control	668.09	1.30	1.51
T ₁ : RDF (100%) (80:40:40 kg N:P:K)	1100.23	1.72	2.44
T ₂ : FYM (20 t/ha)	812.76	1.44	1.75
T ₃ : Vermicompost (5 t/ha)	956.09	1.58	2.09
T ₄ : RDF + Azotobacter @ 25 g/kg seed	1695.09	2.21	3.57
T ₅ : FYM + Azotobacter	1248.09	1.92	2.82
T ₆ : Vermicompost + Azotobacter	1396.13	2.06	3.20
T ₇ : RDF + PSB @ 25 g/kg seed	1689.35	2.19	3.55
T ₈ : FYM + PSB	1245.47	1.85	2.79
T ₉ : Vermicompost + PSB	1391.56	2.04	3.17
T ₁₀ : RDF+Azotobacter + PSB	1987.45	2.50	4.29
T ₁₁ : FYM+Azotobacter + PSB	1839.65	2.37	3.91
T ₁₂ : Vermicompost + Azotobacter + PSB	1845.76	2.35	3.94
SEm ±	46.92	0.04	0.11
CD (P=0.05)	140.76	0.12	0.33
CV (%)	9.79	7.98	7.53

Table 3: Effect of integrated nutrient management on quality parameters of pumpkin

Treatment	Total Soluble Solid (°Brix)	Ascorbic acid content (mg /100 gm)
T ₀ : Control	8.51	7.38
T ₁ : RDF (100%) (80:40:40 kg N:P:K)	10.53	8.25
T ₂ : FYM (20 t/ha)	9.21	7.69
T ₃ : Vermicompost (5 t/ha)	9.89	7.96
T ₄ : RDF + Azotobacter @ 25 g/kg seed	12.59	9.20
T ₅ : FYM + Azotobacter	11.21	8.57
T ₆ : Vermicompost + Azotobacter	11.9	8.87
T ₇ : RDF + PSB @ 25 g/kg seed	12.56	9.15
T ₈ : FYM + PSB	11.19	8.52
T ₉ : Vermicompost + PSB	11.87	8.85
T ₁₀ : RDF+Azotobacter + PSB	13.93	9.75
T ₁₁ : FYM+Azotobacter + PSB	13.25	9.45
T ₁₂ : Vermicompost + Azotobacter + PSB	13.29	9.47
SEm ±	0.15	0.09
CD (P=0.05)	0.44	0.27
CV (%)	3.89	4.54

Conclusion

On the basis of present investigation, it may be concluded that INM significantly improved growth, yield and quality parameters of pumpkin. Among different treatments, T₁₀: RDF + Azotobacter + PSB proved most effective in enhancing vine growth, fruit yield and fruit quality under semi-arid conditions of Rajasthan. Thus, INM along with biofertilizers can be recommended for sustainable and profitable pumpkin production.

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