



Effect of Integrated Nutrient Management on Growth, Yield Attributes and Economics of Spiny Brinjal (*Solanum melongina* L.) Var VRM (Br)-1

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Background: An experiment on "Effect of Integrated Nutrient Management on Growth, Yield Attributes and Economics of Spiny Brinjal (*Solanum melongina* L.) var. VRM (Br)-1" were conducted at Adhiparasakthi Agricultural College farm, Vellore District, Tamil Nadu.

Methods: Eleven treatments of integrated nutrient management viz., T₁-RDF of N:P:K (100:50:30 kg/ha.), T₂- FYM (25 t/ ha.), T₃- Humic acid (20 kg/ha.), T₄- RDF of N:P:K (100:50:30 kg/ha.) +FYM @25 t/ ha, T₅- Humic acid (20 kg/ha.) + RDF of N:P:K (100:50:30 kg/ha.), T₆- *Azospirillum* (2 kg/ha.), T₇- Phosphobacteria (2 kg/ha.), T₈- *Azospirillum* (2 kg/ha.) + Phosphobacteria (2 kg/ha.), T₉ - 75% RDF of N (75 kg/ha.) + 100% RDF of P&K (50:30 kg/ha.) + *Azospirillum* (2 kg/ha.), T₁₀ - 75% RDF of P (37.5 kg/ha.) + 100% RDF of N&K (100:30 kg/ha.) + Phosphobacteria (2 kg/ha.) and T₁₁ - 75% RDF of N & P (75:37.5 kg/ha.) + 100% RDF of K (30 kg/ha.) + *Azospirillum* (2 kg/ha.) + Phosphobacteria (kg/ha.) replicated thrice in Randomised block design.

Results: The various treatments of integrated nutrient management in spiny brinjal clearly showed that growth and yield attributes were high in T₁₁. The economic assessment of different treatments revealed that maximum net profit Rs.2,16,570/ha. with benefit cost ratio (2.60) was also recorded in treatment T₁₁ 75% RDF of N & P (75:37.5 kg/ha.) + 100% RDF of K (30 kg/ha.) + *Azospirillum* (2 kg/ha.) + Phosphobacteria (kg/ha.).

Keywords: Brinjal; economics; growth; yield.

1. INTRODUCTION

The egg plant also known as brinjal (*Solanum melongena* L.) a native of India [1] belongs to family Solanaceae. India is the second largest producer of brinjal in the world after China. Average productivity of brinjal is very low in our country and there exist a good scope to improve its average productivity to fulfil both domestic and national needs [2]. Brinjal consumption could help to meet the mineral requirements of human body. Some medicinal use of brinjal tissues and extract include treatment for diabetes, asthma, cholera, bronchitis and diarrhoea. Its fruits and leaves found to lower certain level of blood cholesterol. It is also used as raw material in pickle making and dehydration industries. Plant nutrition plays an important role in enhancing the yield and quality of brinjal. The present farming is totally dependent on chemical fertilizers, pesticides and growth regulators for enhancing crop productivity. It is well documented fact that increased dependence of agrochemicals including fertilizers has led to several ill effect on the environment.

Generally, solanaceous vegetables require large quantity of major nutrients like nitrogen, phosphorous and potassium in addition to secondary nutrients such as calcium and sulphur for better growth, fruiting and yield [3]. The cost of inorganic fertilizers has been increasing to an extent that they are out of reach of small and marginal farmers. The integrated nutrient management systems approach for crop husbandry is gaining since it is economical cheap, technically sound, practically feasible and paves the way for sustainable agriculture. One part of Integrated Nutrient Management involves the integrated use of mineral fertilizers in combination with organic manures and microbial inoculants to sustain optimum yields to maintain and to improve soil fertility [4-7]. The study was carried out in spiny brinjal (*Solanum melongina* L.) var. VRM (BR)-1. For the first time in India, a unique variety was released in Spiny brinjal (Mullukathiri) as VRM (Br) 1 in 2010 at KVK, Virinjipuram. The average yield is around 40-45 t/ha. Since, it is a ruling variety in Vellore, Thiruvannamalai, Tirupattur and Ranipet districts.

2. MATERIALS AND METHODS

The field experiment was conducted at Adhiparasakthi Agricultural College farm, Vellore

District, Tamil Nadu. The field is situated at 12° 15'N latitude and 78° 20' E longitude. The maximum temperature ranges from 27°C in winter to 42°C in summer, while minimum temperature varies from 19°C in winter to 24.5°C in summer. The mean annual rainfall is 953 mm. The experiment was laid out in randomized block design with 11 treatment combinations and replicated three times with spiny brinjal. Each plot measured 6m×3m with spacing between plant to plant and row to row was 60×75 cm. The raised seed bed of 1.5 m length, 1.0 m width and 15 cm height was prepared.

Eleven treatments of integrated nutrient management viz., T₁- RDF of N: P: K (100:50:30 kg/ha.) (Control), T₂ – FYM (25 t/ ha.), T₃- Humic acid (20 kg/ha.), T₄- RDF of N: P: K (100:50:30 kg/ha.) +FYM (25 t/ ha.), T₅- Humic acid (20 kg/ha.) + RDF of N: P: K (100:50:30 kg/ha.), T₆- *Azospirillum* (2 kg/ha.), T₇- Phosphobacteria (2 kg/ha.), T₈- *Azospirillum* (2 kg/ha.) + Phosphobacteria (2 kg/ha.), T₉ – 75% RDF of N (75 kg/ha.) + 100% RDF of P&K (50:30 kg/ha.) + *Azospirillum* (2 kg/ha), T₁₀ - 75% RDF of P (37.5 kg/ha.) + 100% RDF of N&K (100:30 kg/ha.) + Phosphobacteria (2 kg/ha.) and T₁₁ - 75% RDF of N & P (75:37.5 kg/ha.) + 100% RDF of K (30 kg/ha.) + *Azospirillum* (2 kg/ha.) + Phosphobacteria (kg/ha.) were evaluated in Randomized Block Design with three replications. The observations were recorded viz., plant height (cm), number of leaves per plant, leaf area index, number of primary and secondary branches per plant, stem girth, number of flower per plant, number of fruit per plant, fruit diameter (cm), fruit length(cm), fruit weight (g), fruit volume, fruit yield per plant (g), fruit yield, fruit yield per ha (t) and 100 seed weight(mg).The benefit cost ratio of different treatments were calculated on basis of cost of cultivation, gross and net profit.

3. RESULTS AND DISCUSSION

Integrated nutrient management practices exerted significant effect on growth parameters like number of leaves, leaf are index, plant height (cm), stem girth (cm),number of branches per plant, stem girth and total dry matter productionwere presented in Table 1. Significantly, maximum plant height (99.36 cm), number of primary branches per plant (11.93), number of secondary branches per plant (18.43) and total dry matter production (118.32 g) were

Table 1. Effect of different treatment combinations of INM on growth parameters and total dry matter production of spiny brinjal

Treatment	No. of leaves			Leaf Area Index			Plant height (cm)	Stem girth (cm)	Primary branch (nos)	Secondary branch (nos)	Total Dry matter /plant(g)
	30 (Days)	60 (Days)	90 (Days)	30	60	90					
T ₁	19.93	40.06	79.86	0.601	1.08	2.18	84.77	4.01	4.63	10.99	91.56
T ₂	20.43	39.33	79.43	0.605	1.07	2.18	77.66	3.10	3.86	9.53	90.42
T ₃	20.43	39.76	79.73	0.605	1.07	2.14	87.71	4.12	4.73	11.03	92.03
T ₄	25.23	47.13	87.03	0.695	1.27	2.37	85.88	4.85	5.66	12.86	106.67
T ₅	24.96	46.53	87.39	0.692	1.27	2.36	88.75	4.41	6.29	13.53	109.36
T ₆	20.86	39.96	79.76	0.606	1.14	2.24	84.96	4.37	5.19	10.53	91.68
T ₇	20.13	39.49	79.93	0.631	1.14	2.24	84.87	4.30	5.23	10.23	91.51
T ₈	24.60	44.79	85.46	0.701	1.22	2.31	88.61	6.97	6.59	15.23	97.84
T ₉	27.79	50.03	90.79	0.739	1.32	2.42	91.95	8.35	9.26	16.49	116.58
T ₁₀	27.33	48.23	90.46	0.747	1.32	2.42	91.69	7.30	8.96	16.26	116.28
T ₁₁	30.57	52.17	95.79	0.769	1.36	2.46	99.36	8.02	11.93	18.43	118.32
Mean	23.84	44.31	85.06	0.672	1.20	2.30	87.79	5.43	6.57	13.19	102.02
SE±	0.40	0.91	0.95	0.011	0.017	0.027	0.97	0.11	0.19	0.29	1.41
CD at 5%	0.82	1.84	1.92	0.023	0.034	0.055	1.95	0.23	0.38	0.59	2.84

Table 2. Effect of different treatment combinations of INM on yield and yield attributes of spiny brinjal

Treatment	Yield Attributes								
	No. of flowers/plant	No. of fruits/plant	Fruit weight(g)	Fruit volume(cc)	Fruit length(cm)	Fruit girth(cm)	Yield/plant(g)	Yield (t/ha.)	100 Seed weight(mg)
T ₁	42.33	19.53	78.72	112.84	4.48	12.56	1537.64	34.16	312.5
T ₂	42.03	19.11	78.39	112.51	4.47	12.52	1498.02	33.28	311.0
T ₃	42.43	19.48	79.92	112.89	4.53	12.64	1557.12	34.60	314.0
T ₄	48.03	21.66	85.14	128.75	5.87	17.76	1844.90	40.99	333.0
T ₅	48.06	21.73	85.44	129.04	5.96	17.80	1856.81	41.26	335.0
T ₆	42.29	20.79	81.29	121.06	4.88	14.86	1684.31	37.42	322.5
T ₇	42.29	20.63	81.56	119.44	4.92	14.84	1683.00	37.39	323.0
T ₈	45.33	20.95	82.85	124.84	5.11	16.93	1735.82	38.57	328.5
T ₉	50.20	22.31	83.54	133.53	6.62	18.65	1863.90	41.41	339.0
T ₁₀	50.36	22.28	83.49	133.48	6.46	18.62	1860.28	41.33	338.0
T ₁₁	53.33	23.60	83.87	136.61	6.70	18.68	1979.47	43.98	341.5
Mean	46.06	21.09	82.20	124.09	5.45	15.99	1736.48	38.58	327.0
SE±	0.74	0.223	0.67	2.42	0.09	0.36	24.38	0.54	2.48
CD at 5%	1.49	0.448	1.35	4.86	0.19	0.73	49.00	1.08	4.98

Table 3. Effect of integrated nutrient management on economics of spiny brinjal

Treatment	Fruit yield (t/ha.)	Gross Return (Rs./ha.)	Cost of Cultivation (Rs./ha.)	Net Profit (Rs./ha.)	Benefit and Cost Ratio
T ₁	34.16	2,73,280	1,35,338	1,37,942	2.01
T ₂	33.28	2,66,240	1,46,340	1,19,900	1.81
T ₃	34.60	2,76,800	1,41,840	1,34,960	1.95
T ₄	40.99	3,27,920	1,47,838	1,80,082	2.21
T ₅	41.26	3,30,080	1,43,338	1,86,742	2.30
T ₆	37.42	2,99,360	1,33,920	1,65,440	2.23
T ₇	37.39	2,98,472	1,33,920	1,64,552	2.22
T ₈	38.57	3,08,560	1,34,000	1,74,560	2.30
T ₉	41.41	3,31,280	1,35,280	1,96,000	2.45
T ₁₀	41.33	3,30,640	1,35,328	1,95,312	2.44
T ₁₁	43.98	3,51,840	1,35,270	2,16,570	2.60

recorded in treatment T₁₁[75% RDF of N & P (75:37.5 kg/ha.) + 100% RDF of K (30 kg/ha.) + *Azospirillum* (2 kg/ha.) + Phosphobacteria (kg/ha)] followed by T₉ [75% RDF of N (75 kg/ha.) + 100% RDF of P&K (50:30 kg/ha.) + *Azospirillum* (2 kg/ha.)] Plant height (91.95 cm), number of primary branches per plant (9.26), number of secondary branches per plant (16.49) and total dry matter production (116.58 g) except stem girth. The minimum growth parameters viz., plant height (77.66 cm), stem girth (3.10 cm) number of primary branches per plant (3.86), number of secondary branches per plant (9.53) and total dry matter production (90.42 g) were recorded in treatment T₂ (FYM @25 t/ha.).

Integrated nutrient management showed significant effect on all the yield parameters (Table.2) except for fruit weight of spiny brinjal. Significantly, maximum number of flowers (53.33), number of fruits (23.60), fruit volume (129.04 cc), length (6.70 cm), fruit girth (18.68 cm), yield per plant (1979.47 g), yield per ha. (43.98 t) and 100 seed weight (341.5 mg) was recorded in treatment T₁₁. Increase in yield attributes such as fruit length and fruit girth might be synthesized due to the organic sources of fertilizers and balanced nutrient availability. Similar results were reported in brinjal [8-11].

The economic assessment of different treatments for spiny brinjal cultivation is presented in Table 3. Maximum net profit Rs.2,16,570/ha. with benefit cost ratio (2.60) was observed in treatment T₁₁ [75% RDF of N & P (75:37.5 kg/ha.) + 100% RDF of K (30 kg/ha.) + *Azospirillum* (2 kg/ha.) + Phosphobacteria (kg/ha.)].

4. CONCLUSION

On the basis of results obtained from research experiment, it can be concluded that in spiny brinjal (*Solanum melongena* L.) var. VRM (Br)-1 application of 75% RDF (150: 37.5: 37.5 NPK kg/ha.) through 75% RDF of N & P (75:37.5kg/ha.) +100% RDF of K (30 kg/ha.) + *Azospirillum* (2 kg/ha.) + Phosphobacteria (kg/ha.) consortium was found to be the most effective in increasing plant height, number of branches per plant, fruit length, fruit diameter, fruit weight, number of fruits per plant and fruit yield with maximum net realization and benefit cost ratio.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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