

Original Research Article

Effect of Growth Regulators and Organics on Growth and Yield of Spiny Brinjal Variety VRM (Br) -1

ABSTRACT

Two field experiments were carried out at Horticultural College, Kalavai to study the effect of growth regulators and organics on growth and yield of spiny brinjal (*Solanum melongena*) var.VRM-1. Growth regulators viz., Salicylic acid @ 200 ppm, Brassinosteroids@ 0.1 ppm, Triacntanol @ 5 ppm and NAA @ 40 ppm and organics viz., Seaweed extract @ 1.0%, Humic acid @ 1.0%, Panchagavya @ 5.0% and Vermiwash @ 5.0% were tested and applied as foliar spray in spiny brinjal var VRM-1. Among the treatments tested, Panchagavya treatment recorded maximum value with regard to plant height (85.45 cm), leaf area (131.59 cm), leaf area index (3.66), branches per plant (21.3 Nos) , flowers per plant (55.5 Nos), fruits per plant (20.9 Nos), fruit length (5.8 cm), fruit circumference (14.7 cm) and individual fruit weight (82.1 g). Brassinosteroids treatment found to be effective in increasing root length (22.75 cm).

Key words: *Growth regulators, Organics, Spiny brinjal (VRM 1), Yield parameters*

1.INTRODUCTION

Brinjal or Eggplant (*Solanum melongena* L.) is also known as Aubergine or Guinea squash, an economically important vegetable crop, widely cultivated in the tropics, subtropics and warm temperate regions. It is a versatile crop, adapted to different agro-climatic regions and can be grown throughout the year. It is a perennial, but grown commercially as an annual crop. The fruits are known for being low in calories and having a mineral composition beneficial for human health. It is also a rich source of Potassium, Magnesium, Calcium and Iron [22]. The area under brinjal is estimated around 12,400 hectares with production of 2,03,500 tonnes in Tamil Nadu. The production of brinjal is governed not only by the inherent genetic and yield potential of the cultivars, but also it is greatly influenced by several environmental factors and cultivation practices. The spiny brinjal var. VRM-1 fruits are oval in shape, glossy pink in colour with green tinge in the distal end. The whole plant parts are spines it is a special features in this variety. In India, VRM-1 is the only variety having spines and it also used for medical purpose and gets good profit than any other variety. The production level of brinjal is very low due to poor fruit set, improper fertilization, low yield, physiological and hormonal imbalances in the plants, particularly under unfavourable environments, such as extremes of temperature i.e. too low or high temperature [8]. Plant growth regulators, like promoters, inhibitors or retardants play a key role in controlling the internal mechanisms of plant by interacting with key metabolic processes such as, nucleic acid metabolism and protein synthesis. Use of plant growth regulators (PGRs) might be a useful alternative to increase crop

production. Hence, a study was undertaken to know the effect of growth promoters and organics on the yield attributes of brinjal.

2.MATERIALS AND METHODS

Two field experiments were carried out at Adhiparasakthi Horticultural College, Kalavai during summer and rabi season to study the effect of growth regulators and organics on growth and yield of spiny brinjal (*Solanum melongena*) var.VRM (Br) -1. The raised seed bed of 1.5 m length, 1.0 m width and 15 cm height was prepared. Spiny brinjal seeds of variety VRM (Br) -1 were sown @ 400 g ha.⁻¹ seed rate at one centimeter depth in the rows and covered with thin layer of sand and then covered with dry grass mulch. The seed bed was watered daily during evening hours. A field experiment was laid out using randomized block design (RBD) with nine treatments replicated thrice. The seedlings of 30 days old were transplanted at a spacing of 60 x 60 cm. The gap filling was done on seventh day after planting (DAT) in order to maintain plant population in all the treatments. All the cultural operations recommended in Horticultural Crop Production Guide, Tamil Nadu Agricultural University, Coimbatore were followed uniformly for all the experimental plots. The foliar spray treatments (Table 1) were given on 30 DAT and at 50 per cent flowering. Vermiwash and Panchakavya spray solutions were prepared using standard protocol [11] and [14]. All the treatments were mixed with surfactant @ one ml per litre and Sprayed during the morning hours. The fruits were harvested when they appeared attractive purple-red glossy skin having green calyx at immature stage. Observations on the plant characters viz., plant height (cm), number of leaves, leaf area (cm²), leaf area index (LAI) and root length (cm) at 50 per cent flowering stage and at harvest was taken. Number of branches per plant, days to 50 per cent flowering to harvest, number of flowers per plant, fruit length and fruit circumference (cm), individual fruit weight (g), fruit yield per plant (kg) and fruit yield per hectare (tonnes) were taken. The leaf area and LAI was worked out using the formula

$$\text{Leaf area (cm}^2\text{)} = \frac{\text{Leaf area of model leaf}}{\text{Leaf dry weight of model leaf}} \times \text{Leaf dry weight of all leaves}$$

$$\text{Leaf area index (LAI)} = \frac{\text{Leaf area per plant}}{\text{Leaf area per plant}}$$

The data generated were subjected to statistical scrutiny following the procedure outlined by [9].

3.RESULTS

The effect of growth regulators and organics on the pooled data of two seasons (summer and rabi season 2015) on the plant and yield characters of spiny brinjal VRM (Br) -1 was presented in Tables 1&2. The results showed that the application of Panchagavya @ 5.0% was promising in enhancing the plant height at 50 per cent flowering (51.35 cm) as well as in harvest stage (83.60 cm) followed by Sea-weed extract @ 1.0 % (50.35 & 79.5 cm), respectively. The plants sprayed with water alone (untreated check) reported with 42.25 and 65.00 cm, respectively at 50 per cent flowering and harvest stage. There was also a tremendous growth in the number of leaves when applied with Panchagavya (5.0 %) and Sea-weed extract (1.0%) spray which recorded 85 leaves and was found to be on par with each other. Likewise, the photosynthetic activity was also more in leaves when sprayed with Panchagavya (5.0 %) and Sea-weed extract (1.0%) determined by its leaf area (131.59-129.43 cm²) with LAI of 3.66 and 3.60, respectively at the time of harvest. The root length was also measured in all the treated plots and highest in 22.75 cm root growth in Brassinosteroids 0.1 ppm followed by Panchagavya 5.0% (21.35 cm) and seaweed 1.0% (19.90 cm) sprayed plots, whereas untreated with 18.85 cm root growth.

The plant canopy growth was measured in terms of number of branches per plant and the highest number was recorded in plots sprayed with Panchakavya 5.0 % spray (21.3 Nos) followed by Sea-weed extract 1.0 % (21.1 Nos) with the lowest (18.4 Nos) in water sprayed plots (control). The number of days from flowering to harvest in all the treated plots ranged from 15.1-15.7 days and had no significant difference among the treatments. The number of flowers produced per plant was also high in plots sprayed with Panchakavya 5.0 % spray (55.5 Nos) followed by Sea-weed extract 1.0 % (52.9 Nos) with the lowest (48.9 Nos) in control plots. The highest number of fruits was recorded in Panchakavya 5.0 % spray (20.9 Nos) followed by Napthalene acetic acid (NAA) 40 ppm (20.3 Nos) with the lowest (17.6 Nos) in control plots. There was no significant difference in the fruit length among the treatments which ranged from 5.2-5.8 cm with the lowest in control plots with 4.9 cm. But due to the application of treatments, there was a great variation in the fruit circumference with the highest in Panchakavya 5.0 % spray (14.7 cm) followed by Seaweed extract 1.0 % (14.4 cm) with the lowest (12.6 cm) in control plots which also contributed for individual fruit weight recording 82.1 & 81.9 gram per fruit in Panchakavya 5.0 % and Seaweed extract 1.0 % sprayed plots. The significant growth in Panchakavya 5.0 % and Seaweed extract 1.0 % sprayed plots resulted with the highest fruit yield of 37.8 and 36.5 tonnes per ha.

with highest B: C of 2.32 and 2.22 respectively.

4.DISCUSSION

Use of growth regulators and organics like Panchagavya, Seaweed extract and Vermiwash which help not only in bridging the existing wide gap between the nutrient removal and addition, but it also ensures balanced nutrient supply thereby enhancing nutrient response efficiency and crop productivity of desired quantity [16].

Similar enhancement of plant characters as in spiny brinjal was also supported by [3] in brinjal and [12] in tomato. Main reasons for increasing in plant height by the Panchagavya treatment is, it contain micronutrients like auxin, IAA which is responsible for the cell division and cell elongation by enhancing auxin hypothesis in these treatments [13]. Brassinosteroids and Panchagavya treatments favoured increased root length in this study, whereas Vermiwash treatment failed to promote root length. Superiority of Brassinosteroids in favouring root length was in confirmative with the results of [19] in tomato and [21] in radish. It is well known fact that the leaves are the major site of photosynthesis and act as major 'source' for the 'sink'. The leaf production in general is determined by environment and nutrition. Nitrogen plays an important role in leaf production and it is a main constituent of protein. It might have enhanced the chlorophyll content of leaves and cell division, thus resulting more number of leaves [6].

In general, the yield of the crop is the function of leaf area index [15] and the dependence on photosynthetic efficiency as reported by [6]. For many crops, the optimum Leaf area index has been fixed at fifth leaf stage at peak growth stage. Though no treatment had increased leaf area index above the optimum leaf area index, Panchagavya, Seaweed extract and NAA treatments were effective in increasing leaf area index among the treatments. Panchagavya treatment produced maximum leaf area index is due to increased photosynthetic efficiency because of nitrogen content.

High fruit yield is the ultimate aim for brinjal growers in order to realize maximum economic return. Higher yield is the result of better fruit set and development and finally maturity of individual fruit. This is achieved not only by increased fruit set but also by the lesser fruit drop. In general, the most pronounced effects of growth regulators and organics application to brinjal plants which enhanced higher yields due to cytokinin synthesized and translocated to auxillary buds converting most of them into reproductive growth, which was very well obvious from the data on the total number of fruits.

In the present observation, number of fruits per plant was also high in Panchagavya treatment and NAA treatment. Similar findings were reported by [3] in tomato, [20] in okra, [1] in *capsicum frutescens* and [17] in tomato. This might be due to an increased allocation of photosynthates towards economic part due to increased

leaf area. The increased leaf area may increase the synthesis of cytokinin and its accumulation in the active sinks which could have caused increased number of fruits as reported by [10] in brinjal.

Fruit circumference was high in Panchagavya treatment followed by Seaweed extract treatment and NAA. This finding was reported by [5]. Individual fruit weight was also high in Panchagavya treatment followed by Seaweed extract treatment. This might be due to physiological activities like photosynthesis and plant nutrition provision and these could be the reasons for increasing fruit weight as supported by [2] in chillies.

The enhancement of yield by the application of growth regulators might be due to better utilization of nutrients and photosynthates for the development of fruits as a result of reduction of excessive vegetative growth in tomato. The total yield per plot was increased by application of Panchagavya at 5% which would have brought about by increased fruit set and better fruit weight through better canopy establishment, better interception of light through significant reduction in interplant competition for photosynthesis and translocation of assimilates to the points of fruit set. Panchagavya would also have increased yield through enhanced availability of cytokinins, auxin and micro and macro trace elements accumulated of which in lateral buds would have made them effective sink in the diversion [17].

REFERENCES

1. Ali, M.N., S. Ghatak and T. Ragul. 2011. Biochemical analysis of Panchagavya and Sanjibani and their effect in crop yield and soil health. **J. Crop and Weed 7(2):** 84-86.
2. Al – Saaberi M.R.S. 2005. Effect of Some Agricultural Treatments on Growth, Yield of Lettuce *Lactuca sativa* L. M.Sc. Thesis Horticulture Sciences University of Mosul College of Agriculture and Forestry.
3. Anburani. 2008. Effect of certain organics and pressmud on growth and yield characters of tomato (*Lycopersicon esculentum* Mill). **Asian J.Hort., 3(2):**273-276.
4. Anburani, A. and Manivannan K. 2002. Effect of growth regulators and nutrient management on growth in brinjal (*Solanum melongena* L.). **South Indian Horticulture 50(4-6):** 377-386.
5. Arthur, G.D., W.A. Stirk and J. Van Staden. 2003. Effect of a seaweed concentrate on the growth and yield of three varieties of *Capsicum annuum*. **South African J.Bot., 69:** 207-211.
6. Balasubramani. P. 1989. Studies on the effect of organics on growth and yield of bhendi. **South Indian Horti., 36 (4):** 214
7. Barooah, S. and A.Z. Ahmond. 1983. Effect of organic fertilizers on growth Development and yield of tomato. **Proc. Nat.Sem.Prod.Tech of Tomato and chillies, Cbe,pp.** 54- 56
8. Erickson, A.N. and A.H. Markhart. 2001. Flower production, fruit set and physiology of brinjal during elevated temperature and vapor pressure deficit. **J. American Soc.Hort.Sci.126 (6):**697-702.

9. Gomez, A. and A. Gomez. 1984. Statistical procedures for agricultural research. John Wiley and Sons, New York.
10. Harish, D.K. 2009. Studies on organic brinjal production (*Solanum melongena* L.). M.Sc. (Hort.) Thesis, University of Agricultural Sciences, Dharwad.
11. Ismail, S.A. 1997. Vermicology: The Biology of Earthworms. Orient Longman Press, Hyderabad, pp: 92.
12. Kumar, S. and Sharma S.K. 2007. Effect of integrated nutrient strategies in tomato Production. **Ind. J. Hort** **64(4)**: 96-97
13. Perumal, K., K. Praveena, V. Stalin and B. Janarthanam. 2006. Assessment of selected organic manures as plant growth hormones and their impact on the growth attributes of *Allium cepa* L. **Curr. Sci.**, **8**: 46-51.
14. Raghavendra, K.V., R. Gowthami, R. Shashank and S. Harish Kumar. 2014. Panchagavya inorganic Crop Production. pp.2014
15. Randhawa, G.S., R.K. Mahey and S.R.S. Gills. 1985. Leaf area measurement in Turmeric. **J. Res. Punjab Agric. Univ.**, **22(1)**: 163-166
16. Singh, K. 2014. Use of Plant Growth Regulators in Tomato (*Solanum lycopersicum* L.) under Tarai Conditions of Uttarkhand. **Indian J. Hill Farming.**, **27(2)**: 38-40
17. Singh, K.P. and G. Kalloo. 2000. Nutrient management in vegetable crops. Fertilizer News. **45 (4)**: 77-81
18. Singh, D.K. and G. Lal. 2002. Effect of plant bio-regulators on the growth and yield of tomato (*Lycopersicum esculentum* Mill.). **Prog. Hort.**, **33(1)**: 60- 64
19. Vardhini, B. V. and S. S. R. Rao. 2003. Influence of brassinosteroids on growth, yield, metabolite content and enzyme activities of tomato (*Lycopersicon esculentum* Mill). **Proc. National Acad. Sci.**, **73**: 307-315.
20. Vennila, C. and C. Jayanthi. 2008. Effect of integrated nutrient management on yield and quality of Okra. **Res. on Crops**, **9 (1)**: 75-75.
21. Vidyavardhini and Seetaramrao. 2012. Studies on the Effect of Brassinosteroids on the qualitative changes in the storage roots of radish. **Bulg. J. Agric. Sci.**, **18**: 63-69.
22. Zenia, M. and B. Halin. 2008. Content of micro elements in Egg plant fruits depending on Nitrogen fertilization and plant training method. **J. Elementol.**, **13(2)**: 269-275

Table 1. Effect of Growth Regulators and Organics on vegetative Growth of VRM-1 Brinjal

S.No.	At 50% Flowering						At Harvest				
	Treatments	Plant height (cm)	Root length (cm)	Number of leaves	Leaf area (cm ²)	Leaf area index	Plant height (cm)	Root length (cm)	Number of leaves	Leaf area (cm ²)	Leaf area index
1.	Salicylic acid 200ppm	48.00	19.05	56.65	52.10	1.45	75.80	28.45	84.15	124.13	3.45
2.	Brassinosteroids 0.1ppm	43.75	22.75	52.80	44.30	1.23	67.60	29.55	77.95	113.19	3.14
3.	Triacantanol 1.0 ppm	46.45	19.70	55.90	50.80	1.41	73.90	28.50	80.35	119.27	3.31
4.	NAA 40 ppm	48.80	19.10	58.05	52.95	1.47	77.15	27.70	84.85	128.13	3.56
5.	Seaweed extract 1.0%	50.35	19.90	58.80	55.65	1.55	79.85	28.90	85.05	129.43	3.60
6.	Humic acid 1.0%	45.95	18.60	54.35	48.65	1.35	69.50	27.45	78.95	117.59	3.27
7.	Panchagavya 5.0%	51.35	21.35	59.35	57.60	1.60	83.60	29.00	85.45	131.59	3.66
8.	Vermiwash 5.0%	44.35	17.35	53.40	45.65	1.27	69.40	27.05	78.65	116.35	3.23
9.	Control (Water spray)	42.25	18.85	51.75	43.15	1.20	65.00	27.10	77.15	112.78	3.13
	S Ed	1.03	0.95	1.10	0.91	0.12	1.19	1.48	1.05	1.08	0.11
	CD (5.0%)	2.19	1.97	2.345	1.92	0.26	2.53	-	2.24	2.29	0.23

Table 2. Effect of Growth Regulators and Organics on yield attributes of VRM (Br) - 1 Brinjal

S.No	Treatments	Branches / plant (No.)	Flowering to harvest (days)	Flowers / Plant (No.)	Fruits / Plant (No.)	Fruit Length (cm)	Fruit circumference (cm)	Individual fruit weight (g)	Fruit yield / plant (kg)	Fruit yield/ha	B:C
1.	Salicylic acid 200ppm	20.5	15.1	51.3	19.5	5.4	13.8	80.6	1.57	34.6	2.09
2.	Brassinosteroids 0.1ppm	20.8	15.1	52.2	19.2	5.0	13.3	79.5	1.52	33.5	2.05
3.	Triacantanol 1.0 ppm	20.2	15.1	52.5	19.4	5.2	13.5	80.5	1.56	34.4	2.07
4.	NAA 40 ppm	20.9	15.3	53.2	20.3	5.5	14.0	81.7	1.66	35.2	2.14
5.	Seaweed extract 1.0%	21.1	15.7	52.9	19.6	5.6	14.4	81.9	1.60	36.5	2.22
6.	Humic acid 1.0%	20.5	15.2	52.1	18.8	5.2	13.2	78.5	1.48	32.5	1.97
7.	Panchagavya 5.0%	21.3	15.7	55.5	20.9	5.8	14.7	82.1	1.71	37.8	2.32
8.	Vermiwash 5.0%	19.8	15.3	51.5	18.6	5.2	12.9	78.3	1.46	32.1	1.95
9.	Control (Water spray)	18.4	15.3	48.9	17.6	4.9	12.6	78.1	1.37	30.2	1.86
	S Ed	0.54	0.28	0.89	0.57	0.2	0.24	1.15	1.57	0.93	
	CD (5.0%)	1.14	0.62	1.89	1.22	0.44	0.52	2.43	3.32	1.91	