

Effect of TA41 on Growth, Yield and Quality of Bitter Gourd (*Momordica charantia*) cv. Phule Green Gold

ABSTRACT

Water served as the control in nine treatments that included various TA41 properties. After the transplant, 30 and 45 days later, the therapy is administered. The plot size was kept at 2m x 1.5m, and each treatment was reproduced three times in a randomized block design. The best results were achieved with the treatment T6 (foliar spray 40ml/L plus soil drenching of TA41 @ 20ml/L). The maximum plant height (354 cm), number of primary branches (14.66 cm), number of leaves per plant (216 cm), days until first flowering (25), days until first fruit picking (53), number of fruits per plant (38), fruit yield per plant (2.1 kg), average fresh weight of fruit (82.66), yield per hectare (22.75 t/ha), TSS (4.2 Brix), and ascorbic acid per (100.66 mg/100g) are all included in the analysis. The gross return (Rs 341250/ha), net profit (Rs 251021/ha), and B:C ratio (3.78) were all significantly higher than those recorded under.

Keywords: TA41; bitter gourd; biofertilizers; benefit cost ratio.

1. INTRODUCTION

The bitter gourd is a tropical and subtropical vine belonging to the Cucurbitaceae family. It is commonly grown in China, Africa, South and Southeast Asia, and Asia. It is also referred to as balsam pear, bitter cucumber, bitter melon, and karela in Hindi, Gujrati, and Punjabi. Other names for this vegetable crop include pavakai in Tamil and pavakka in Malayalam. It has many medical benefits, particularly the antidiabetic. The fruits are employed as tonics, carminatives, anti-helminthics, anti-inflammatory, febrifuges, antidiabetics, etc. In addition to its several applications, particularly in south, southeast, and east Asia, it is also widely employed in traditional medicine and grown as an ornamental. There are currently roughly 99,000 acres in India that are being used for the cultivation of bitter gourds. It works swiftly and effectively on bugs that sucking. Additionally, TA41 promotes healthy soil development for good production while preventing soil erosion and moisture retention. For greater growth, fruit and seed yield, cucurbitaceous vegetables typically require substantial quantities of secondary nutrients like calcium and sulfur in addition to primary minerals like nitrogen, phosphorus, and potassium. Inorganic fertilizer has skyrocketed in price to the point where small and marginal farmers are no longer able to afford it. It keeps damaging the ecological niche. Therefore, using TA41 in this

circumstance is a suggestion that makes financial sense. A multipurpose organic growth enhancer, TA41 controls sucking, fungal, and viral pests.

2. MATERIALS AND METHODS

2.1 Experimental Site

The Horticulture Research Farm, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology & Sciences, Prayagraj, conducted the study titled "Effect of TA41 On Growth, Yield and Quality of Bitter Gourd (*Momordica charantia*)". The experimental site is located at 25.450 North latitude and 81.840 East longitude, at an elevation of 98 meters above sea mean level (MSL).

2.2 Climate Condition in Experimental Area

The South-East region of Uttar Pradesh has a subtropical climate, with both the winter and summer experiencing temperature extremes. When it's freezing outside, it can get as low as 320 degrees Fahrenheit in December and January, and when it's hot outside, it can get as high as 1150 degrees Fahrenheit in May and June. Frosts occur frequently in winter, and hot, sweltering breezes occur frequently in summer. The amount of rain that falls on average is about

1013.4 millimeters (mm), with the most of it falling from July to September and sporadic showers throughout the winter.

2.3 Experimental Details

An experiment entitled Effect of TA41 On Growth, Yield and Quality of Bitter Gourd (*Momordica charantia*). was conducted at Research Field, Department of Horticulture, Naini Agricultural Institute (NAI), Sam Higginbottom University of Agriculture, Technology and Sciences.

2.4 Treatment Details

Treatment notation	Treatment combination
--------------------	-----------------------

T _{0(control)}	Without any treatment of TA41
T ₁	soil drenching of TA41 @10ml/L
T ₂	soil drenching of TA41 @ 10 ml/L +Foliar spray 20ml/spray tank
T ₃	Soil drenching of TA41 @ 15ml/L
T ₄	Soil drenching of TA41 @ 15ml/+Foliar spray 30ml/Spray tank
T ₅	Soil drenching of TA41 @ 20ml/L
T ₆	Soil drenching of TA41 @ 20ml /L + foliar spray 40ml / spray tank
T ₇	Soil drenching of TA41 @ 25ml /L
T ₈	Soil drenching of TA41 @ 25ml/l + foliar spray 50ml/spray tank

2.5 Observations

Following are the observation that were observed during the experiment-

■ Growth Parameters

1. Vine Length (cm)
2. Number of Leaves
3. Number of Branches

■ Earliness Parameters

1. Days to 1st Flowering
2. Days to 1st Fruit Picking

■ Yield Parameters

1. No. of Fruits per Plant
2. Fruit Weight (g)
3. Fruit Yield/Plant (g)
4. Fruit Yield per Hectare (t/ha)

■ Qualitative Parameters

(a) Physio – chemical properties

1. TSS
2. Vitamin C

■ Economical Parameters

1. Cost of Cultivation (Rs/ha)
2. B.C Ratio

3. RESULTS AND DISCUSSION

The current study, "Effect of TA41 on Growth, Yield and Quality of Bitter Gourd cv. Phule Green Gold," was conducted in the research field from February 2022 to May 2022. India's Sam Higginbottom university of Agriculture, Technology, and Sciences at Prayagraj (U.P.), Naini Agricultural Institute's Department of Horticulture. Nine treatments and three replications were used in the experiment's randomized block design (RBD). The statistical analysis of the mean data for all attributes resulted in the following highlights of the experimental findings:

3.1 Growth Parameters

At 90 days after sowing, T₆ (soil drenching of TA41 @ 20ml /L + foliar spray 40ml /L), followed by T₈ and T₇, which were on par with each other, recorded the maximum Vine Length (cm), and T₀ (without any treatment) recorded the minimum Vine Length (cm), as shown in Table 1. This may be because soil drenching with TA41 at a rate of 20 ml per liter plus foliar application of 40 ml per liter acts as a nutrient link to plants, improves hormonal and nutritional conditions, and significantly increased vine length (cm). The activity of xyloglucan endotransglucosylase, which causes the cell wall to relax and improves cell permeability, can be stimulated by TA41. Similar result was observed by Geeta Biradar, C.M. Nawalagatti, M.II.Doddamani and M.B.Chetti [1].

The treatment T6 (soil drenching of TA41 @ 20ml /L + foliar spray 40ml /L, which is (216.66) was the one with the most plant leaves at 90 days after sowing, followed by T8 and T7, which were on par with one another. The treatment T0 (without any treatment), on the other hand, had the shortest vine length (cm), which was (142.66) as presented Table 1. Dey, S.S, Batters, T.K, Pal, A. and Munshi, A.D), [2].

At 90 days after sowing, T6 (soil soaking with TA41 @ 20 mL/L + foliar spray 40 mL/L, which is (14.66)) recorded the most branches, followed by T8 and T7, which were on par with one another, and T0 (without any treatment), which recorded the least vine length (cm), was recorded at 8.66 as presented Table 1. Geeta, B, Chetti, M.B. and Navalgatti, C.M. [3].

3.2 Earliness Parameters

Table 1's data revealed that Treatment T0, which received no treatment, had the longest Days to First Flowering (35.66 days), followed by

Table 1. Effect of TA41 on Vine Length(cm), no of leaves per plant, no of primary branches, Days to 1st Flowering and Days to 1st Fruit Picking in bitter gourd

Sr. No.	Treatment	Vine Length (cm) 90 Days(cm)	No. of leaves 90 Days	No of primary branches	Days to 1 st Flowering	Days to Fruit Picking
01	T ₀ (control)	291.00	142.66	8.66	35.66	64.33
02	T ₁	299.00	147.00	9.66	32.33	62.33
03	T ₂	309.00	150.00	10.00	32.00	61.00
04	T ₃	319.33	159.00	10.33	32.33	59.00
05	T ₄	326.00	176.33	10.00	31.00	59.33
06	T ₅	331.33	186.33	13.00	30.00	56.00
07	T ₆	354.00	216.66	14.66	25.33	53.00
08	T ₇	348.00	207.66	13.33	27.33	55.66
09	T ₈	343.66	204.00	12.00	27.33	59.66
	F-Test	S	S	S	S	S
	S. Ed.±	1.48	1.73	1.07	1.61	1.61
	CD at 5%	3.14	3.70	2.30	3.45	3.44
	CV	0.55	1.2	11.69	6.51	3.35

3.3 Yield Parameters

The number of fruits per plant with maximum is recorded (38) at T₆ (soil drenching of TA41 @ 20ml /L + foliar spray 40ml /L followed by T₇ and T₈ which is significantly superior over all the treatments. While the minimum control at T0 (26). "The number of fruits per plant is an important determination of yield in bitter gourd due to providing efficiency part and hormonal balance in the plant system. The increase in the number of fruits were associated with increased production of flower, coupled with the reduction in flower and fruit drop that ultimately increased

Treatments T1 and T2, while Treatment T6, which received soil drenching of TA41 at 20 mL/L and foliar sprays at 40 mL/L, had the shortest Days to First Flowering (25.33 days). Improved plant development from the application of seaweed extract or endogenous components, particularly cytokinin, which improve nutrient partitioning in vegetative plant organ and increase in the transfer of assimilates to the growing fruits, were both found to induce more intense flower setting. A similar effect was observed by Arvindkumar, P.R, Vasudevan, S.N. and Patil, M.G. [4].

The data mentioned in Table 1 showed that Days to first fruit picking is recorded maximum in Treatment T₀ without any treatment with (64.33 days) followed by T₁ and T₂ while the minimum is found in T₆ (soil drenching of TA41 @ 20ml /L+ foliar spray 40ml /L which is (53days). Ghani, M.A, Amjad, M, Iqbal, Q. Nawaz, A, Ahmad, T, Hafeez, O. and Abbas, M. [5].

the percentage of fruit set". Hilli, J.S, Vyakarnahal, B.S, Biradar, D.P. and Hunje, R. [6].

The average fresh weight of fruit (g) with maximum is recorded (82.66) at T₆ (soil drenching of TA41 @ 20ml /L + foliar spray 40ml/L and T7 followed by T8 which is significantly superior over all the treatments. While the minimum control at T0 (52.33). The application of TA41 may increase fresh weight of bitter gourd by 1.5 times. It was due to the content level of nitrogen, phosphorus, and potassium in TA41 have higher nutrients than

other treatments. Similar results were reported by Hirpara, Anjita, J, Vaddoria, M.A, Jivani, L.L, Patel, J.B. and Polara, A.M. [7].

“The fruit yield per plant (kg) with maximum is recorded (2.1) at T₆ (soil drenching of TA41 @ 20ml /L + foliar spray 40ml /L followed by T₈ and T₇ (Table 2), which is significantly superior over all the treatments. While the minimum control at T₀ (1.233). The increase in fruit yield might have been due to the better performance of the yield attributes. It may be due to better assimilation of plant nutrients through bio fertilizers”. Hossain, D, Karin, M.A, Pramani, M.H.R. and Rahman, A.A.S. [8].

The yield per hectare (t/ha) are shown in Table 2 with maximum is recorded (22.75) at T₆ (soil drenching of TA41 @ 20ml /L + foliar spray 40ml/L followed by T₈ and T₇ which is significantly superior over all the treatments. “while the minimum control T₀ (13.25) The possible reason for increased fruit yield might be associated to better inorganic nitrogen utilization

in the presence of bio fertilizers, which enhanced biological nitrogen fixation, better development of root system and possible higher synthesis of plant growth hormones”. Anju et al. [9], Jyoti, S, Patel, N.B. and Patel, J.B. [10].

3.4 Qualitative Parameters

3.4.1 Physio – chemical properties

TSS (Total soluble solids)

In terms of Total Soluble Solids (Brix) was recorded maximum in treatments T₆ (soil drenching of TA41 @ 20ml /L+ foliar spray 40ml /L) with (4.2Brix) which is statistically at superior with treatment T₇ and T₈ which is significantly superior over the other treatment. The lowest TSS of fruit was observed in the treatment T₀ (without any treatment of TA41) which is (2.27 brix) as shown in Table 2. Total soluble solids (T.S.S.), quality of solids, dissolved in the liquid

Table 2. Effect of TA41 on no. of fruits per plant, fruit weight (g) fruit yield/plant, fruit yield per hectare (t/ha) TSS and vitamin C in bitter gourd

Sr. No.	Treatment	No. of Fruits per Plant	Fruit Weight (g)	Fruit Yield/Plant	Fruit Yield per Hectare (t/ha)	TSS (°Brix)	Vitamin C
01	T ₀ (control)	26.00	52.33	1.76	13.25	2.27	76.66
02	T ₁	27.33	55.66	1.80	13.50	2.49	79.66
03	T ₂	30.33	57.33	1.90	14.25	2.60	82.00
04	T ₃	31.00	62.66	2.20	16.50	2.79	85.00
05	T ₄	29.66	65.00	2.36	18.50	2.89	91.00
06	T ₅	29.66	68.00	2.20	16.50	3.42	96.66
07	T ₆	38.00	82.66	3.03	22.75	4.20	100.66
08	T ₇	36.00	81.00	2.50	18.75	4.00	100.00
09	T ₈	32.66	72.66	2.46	17.75	3.63	96.00
	F-Test	S	S	S	S	S	S
	S. Ed.±	1.30	1.33	0.07	0.58	0.10	0.80
	CD at 5%	2.78	2.86	0.16	1.24	0.21	1.71
	CV	5.10	2.47	4.21	4.21	3.93	1.09

part of bitter gourd were observed to be increased after treatment with TA41. Total soluble solids (T.S.S.) and the quality of solids dissolved in the liquid part of bitter gourd were found to be higher after Azospirillum treatment. The improved quality caused by the use of bio-fertilizer and nitrogen, phosphorus, and potassium might be linked to increased photosynthetic and metabolic activities, leading to in the synthesis of a greater number of acids, metabolites, and glucose. These reserves eventually contributed to the synthesis of TSS in tomato. These results are in conformity by

Kumar, P.R, Vasudevan, S.N, Patil, M.G. and Rajrajeshwari, C. [11].

3.5 Ascorbic Acid

In terms of ascorbic acid(mg/100g) was recorded maximum in treatments T₆ (soil drenching of TA41 @ 20ml /L+ foliar spray 40ml /L) with (100.66) which is statistically superior with treatment T₇ and T₈ which is significantly superior over the other treatment. The lowest ascorbic acid of fruit was observed in the treatment T₀ (without any treatment of TA41) which is (76.66)

as shown in Table 2. Min, IMA, Islam, MS, Miah, M.V. Das M.I. and Khan, IL. [12].

3.6 Economics

As shown in the table, treatment T6 (soil drenching of TA41 @ 20ml /L + foliar spray 40ml /L) produced the highest gross returns, net returns, and cost benefit ratios, totaling Rs. 341250/ha, Rs. 251021/ha, and (1:3.78), respectively. Treatment T0 (Control) produced the lowest gross returns, net returns, and cost benefit ratios, totaling Rs. 198750/ha, Rs. T6 (soil drenching of TA41 @ 20ml /L + foliar spray 40ml /L) gave the highest gross return, net return, and cost benefit is due to higher productivity and enhanced fruit quality, which increase the market value of the fruit. This is because farmers need to consider the economics when making decisions about the adoption of techniques and scientific knowledge [13].

4. CONCLUSION

The results of the experiment indicate that, in terms of growth, yield, and quality criteria, the treatment Soil drenching of TA41 @ 20ml/foliar spray 40ml/L (T6) performed the best of all combinations, varying levels of TA41. The Soil Drenching of TA41 @ 20ml foliar Spray 40ml/L (T6) treatment had the highest gross return (Rs/ha) (Rs 341250), net profit/ha (Rs 251021), and cost benefit ratio (3.78).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Geeta Biradar CM, Nawalagatti M.II. Doddamani, Chetti MB. Effect of plant growth regulators on morpho-physiological parameters and yield in bittergourd. International Journal of Agricultural Sciences. 2010;6(2):504-507.
2. Dey SS, Batters TK, Pal A, Munshi AD. Correlation and path coefficient analysis in bitter gourd (*Momordica charantia* L.) Vegetable Science. 2005;32:173-176.
3. Geeta B, Chetti MB, Navalgatti CM. Effect of plant growth regulators on leaf biochemical characters and fruit yield components of bitter gourd (*Momordica charantia* L.) cvs. MHBI-15 and Chaman Plus. Journal of Horticultural Sciences. 2014;9(1):43-47.
4. Arvindkumar PR, Vasudevan SN, Patil MG. Effect of NAA, triacontanol and boron on seed viability and vigour in bitter gourd (*Momordica charantia* L.) cv. Pusa visesh. International Journal of Agricultural Science. 2016;12(2):365-369.
5. Ghani MA, Amjad M, Iqbal Q, Nawaz A, Ahmad T, Hafeez O, Abbas M. Efficacy of plant growth regulators on sex expression, earliness and yield components in bitter gourd. Pakistan Journal of Biological Sciences. 2013;11(3):218-224.
6. Hilli JS, Vyakarnahal BS, Biradar DP, Hunje R. Effect of growth regulators and stages of spray on growth, fruit set and seed yield of ridge gourd (*Luffa acutangula* L. Roxb) Karnataka Journal of Agricultural Science. 2010;23(2):239-242.
7. Hirpara Anjita J, Vaddoria MA, Jivani LL, Patel JB, Polara AM. Seed yield and quality as influence by plant growth regulators and stages of spray in bitter gourd (*Momordica charantia* L.). AGRES - An International e-Journal. 2014;3(3): 282-287.
8. Hossain D, Karin MA, Pramani MHR, Rahman AAS. Effect of gibberellic acid (GA3) on flowering and fruit development of bitter gourd. International Journal of Botany. 2006;2:329-332.
9. Anju P, Bahadur V, Topno SE, Paul A. Effects of TA41 on growth, yield and quality of brinjal. International Journal of Plant & Soil Science. 2022;34(22):1162-71.
10. Jyoti S, Patel NB, Patel JB. Effect of growth regulators and stages of spray on seed yield and seed quality parameters of ridge gourd [*Luffa acutangula* (Roxb) LJ. Journal of Applied and Natural Science. 2016;8(3):1551- 1555.
11. Kumar PR, Vasudevan SN, Patil MG, Rajrajeshwari C. Influence of NAA, triacontanol and boron spray on seed yield and quality of bitter gourd (*Momordica charantia*) cv. Pusa visesh, Asian Journal of Horticulture. 7(1): 36-39. L. variety pickling Lam. Seeds and Farms. 2012; 14(1-3):20-24.
12. Min IMA, Islam MS, Miah MV, Das MI, Khan IL. Flower synchrony, growth and yield enlacement of small type Bitter gourd through plant growth regulators and NPK fertilization Pakistan

- Journal of Biological Sciences. 2014;17(3): 408-413.
13. Anonymous. National horticulture board. Department of Agriculture and Farmers Welfare, Government of India, Gurugram, Haryana, India; 2019-20.