Original Research Article

EFFECT OF TA41 ON GROWTH, YEILD 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 one. According to **Lomgman (1995)**, 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 **(Heiser, 1979)**. 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

Experimental site

The experiment entitled **"Effect of TA41 On Growth, Yield and Quality of Bitter Gourd (*Momordica charantia*)"** was carried out at the Horticulture Research Farm, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology & Sciences, Prayagraj. The experimental site is situated at an elevation of 98 meters above sea mean level (MSL) at 25.45^0 North latitude and 81.84^0 East longitudes.

CLIMATE CONDITION IN EXPERIMENTAL AREA

This region has a sub-tropical climate prevailing in the South-East part of Uttar Pradesh with both the extremes in temperature, *i.e.*, the winter and the summer. In cold winters, the temperature sometimes is as low as 32^0F in December – January and very hot summer with temperature reaching up to 115^0F in the months of May and June. During winter, frosts and

during summer, hot scorching winds are also common. The average rainfall is around 1013.4 (mm) with maximum concentration during July to September months with occasional showers in winters.

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.

List 1 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

2.4 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 present investigation entitled "effect of TA41 on growth, yield and quality of bitter gourd cv. Phule green gold" was carried during February 2022 to May 2022 in research field. Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom university of Agriculture, Technology and Sciences, Prayagraj (U.P) India. The experiment was conducted in randomized Block Design (RBD) with nine treatments and three replications. The mean data of all the traits were subjected to statistical analysis and salient features of experimental findings are mentioned below

Growth Parameters

At 90 days after sowing the maximum Vine Length (cm) was recorded in T_6 (soil drenching of TA41 @ 20ml /L + foliar spray 40ml /L which is (354cm) followed by T_8 and T_7 which were at par to each other while the minimum Vine Length (cm) was recorded in the treatment T0 (without any treatment) is (291cm) as presented table 1. This might be due to fact that Soil drenching of TA41 @ 20ml /L + foliar spray 40ml /L act as a nutrilink to plants, increases hormonal, nutritional condition and contributed to a considerable extent for better Vine Length (cm). Similar results were also reported by Saptari et al. [22] who reported that TA41 can promote the activity of xyloglucan endotransglucosylase which cause loosening of cell wall and increases cell permeability. Similar result was found in brinjal by **Meena and Dhaka [23].**

At 90 days after sowing the maximum plant leaves was recorded in T_6 (soil drenching of TA41 @ 20ml /L + foliar spray 40ml /L which is (216.66) followed by T_8 and T_7 which were at par to each other while the minimum Vine Length (cm) was recorded in the treatment T_0 (without any treatment) is (142.66) as presented table 1. **Meena *et al.*, (2007)**

At 90 days after sowing the maximum branches was recorded in T_6 (soil drenching of TA41 @ 20ml /L + foliar spray 40ml /L which is (14.66) followed by T_8 and T_7 which were at par to each other while the minimum Vine Length (cm) was recorded in the treatment T_0 (without any treatment) is (8.66) as presented table 1. **(Anju et al., 2020)**

Earliness Parameters

The data mentioned in table 1 showed that Days to first flowering is recorded maximum in Treatment T_0 without any treatment with (35.66 days) followed by T_1 and T_2 while the minimum is found in T_6 (soil drenching of TA41 @ 20ml /L+ foliar spray 40ml /L which is (25.33days). More intensive flower setting was elicited either by improved plant growth through seaweed extract application or by endogenous components, especially cytokinin, which enhance nutrient partitioning in vegetative plant organ and increase in the transport to assimilates to the growing fruits. A similar effect was observed for eggplant treated with seaweed extract by **Abd El-Gawad and Osman [25].**

The data mentioned in table 1 showed that Days to first fruit picking is recorded maximum in Treatment T_0 without any treatment with (64.33 days) followed by T_1 and T_2 while the minimum is found in T_6 (soil drenching of TA41 @ 20ml /L+ foliar spray 40ml /L which is (53days). **Abd El-Gawad and Osman.**

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 1st 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 at5%	**3.14**	**3.70**	**2.30**	**3.45**	**3.44**
	CV	**0.55**	**1.2**	**11.69**	**6.51**	**3.35**

Yield Parameters

The number of fruits per plant with maximum is recorded (38) at T_6 (soil drenching of TA41 @ 20ml /L + foliar spray 40ml /L followed by T_7 and T_8 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 [35]. 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 the percentage of fruit set [36]. Similar results were reported by **Choudhury *et al*., and Akand *et al*.,** in tomato.

The average fresh weight of fruit (g) with maximum is recorded (82.66) at T_6 (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 **Kumaran *et al*., Suryanto and Solanki.**

The fruit yield per plant (kg) with maximum is recorded (2.1) at T_6 (soil drenching of TA41 @ 20ml /L + foliar spray 40ml /L followed by T_8 and T_7 (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 [39].

The yield per hectare (t/ha) are shown in Table 2 with maximum is recorded (22.75) at T_6 (soil drenching of TA41 @ 20ml /L + foliar spray 40ml/L followed by T_8 and T_7 which is significantly superior over all the treatments. while the minimum control T_0 (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 **Gajbhiye *et al*.** Similar trend of work has been noted by **Anburani and Manivannan, Devi et al., and Wange and Kale** in bitter gourd.

Qualitative Parameters

Physio – chemical properties

TSS (Total soluble solids)

In terms of Total Soluble Solids (Brix) was recorded maximum in treatments T_6 (soil drenching of TA41 @ 20ml /L+ foliar spray 40ml /L) with (4.2Brix) which is statistically at superior with treatment T_7 and T_8 which is significantly superior over the other treatment. The lowest TSS of fruit was observed in the treatment T_0 (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 part of bitter gourd were observed to be increased after treatment with TA41. Total soluble solids (T.S.S.), quality of solids, dissolved in the liquid part of bitter gourd were observed to be increased after treatment with Azospirillum. The increased in quality due to application of bio-fertilizer and nitrogen, phosphorus and potassium could be attributed to the enhanced photosynthetic and metabolic activities, which resulted in the synthesis of higher number of acids, metabolites, and glucose. These reserves ultimately contributed synthesis of TSS in tomato. These results are in conformity with **Kamili *et al***., in bitter gourd

Ascorbic acid

In terms of ascorbic acid(mg/100g) was recorded maximum in treatments T_6 (soil drenching of TA41 @ 20ml /L+ foliar spray 40ml /L) with (100.66) which is statistically superior with treatment T_7 and T_8 which is significantly superior over the other treatment. The lowest ascorbic acid of fruit was observed in the treatment T_0 (without any treatment of TA41) which is (76.66) as shown in Table 2. **Meerabai, Jayachandran, B.K. and Asha, K.I.R. (2007)**

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 (^{o}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 at5%	**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**

Economics

Maximum gross returns, Net Return and Cost Benefit Ratio Rs. 341250/ha, Rs. 251021/ha and (1: 3.78) respectively was recorded in treatment T_6 (soil drenching of TA41 @ 20ml /L + foliar spray 40ml /L and the minimum Gross Return, Net Return and Cost Benefit Ratio (Rs. 198750/ha, Rs. 113321/ha and (1:2.32) respectively was recorded in treatment T_0 (Control) as presented in table. As the economics is the need of the farmers while taking decision regarding the adoption of the techniques and scientific knowledge Hence, T_6 (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.

CONCLUSION

From the present investigation it is concluded that, the treatment Soil drenching of TA41 @ 20ml /foliar spray 40ml /L (T_6) was recorded the best among all combinations, different levels of TA41 in term of growth, yield, and quality parameters. Among the different treatments the highest gross return (Rs/ha) (Rs 341250), net profit/ha (Rs 251021), cost benefit ratio (3.78) was obtained in Soil drenching of TA41 @ 20ml foliar spray 40ml/L (T_6)

REFERENCES

1. Anonymous, (2019-20). National Horticulture Board. Department of Agriculture and Farmers Welfare, Government of India, Gurugram, Haryana, India.
2. Anju, P., Bahadur, V., Topno, S. E., & Paul, A. (2022). Effects of TA41 on Growth, Yield and Quality of Brinjal. International Journal of Plant & Soil Science, 34(22).
3. Choudhary. Vegetable. 4th Ed. New Delhi: National Book Trust. 1976;50-8.
4. Barakart MAS, Gabr SM. Effect of different biofertilizer types and nitrogen fertilizer levels on tomato plants. Alexandria J. Agrol Res. 199:43:149-60.
5. Chojnacka K, Michalak I, Dmytryk A, Wilk R, Górecki H. Innovative Natural Plant Growth Bio stimulants. In: Sinha S, Pant KK, editors. Advances in fertilizer technology Vol. 21. Houston: Studium Press LLC; 2014. p. 451-89.
6. Popko M, Michalak I, Wilk R, Gramza M, Chojnacka K, Górecki H. Effect of the new plant growth bio stimulants based on amino acids on yield and grain quality of winter wheat molecules. Molecules.2018;23(2):470.
7. Du J. P. Plant bio stimulants: definition, concept, main categories, and regulation. Sci Hortic. 2015; 196:3-14.
8. Saptari RT, Dewi K. Effect of borax and gibberellic acid on the growth and development of red chilli (*Capsicum annuum* L. 'gelora'). The Third Basic Science International Conference. Vol. B41; 2013. p. 1-3.
9. Meena SS, Dhaka RS. Economics of plant growth regulators in brinjal (*Solanum melogena* L.) under semiarid condition of Rajasthan. Annals Agric Res. 2003;24(2):273-5.
10. Saptari RT, Dewi K. Effect of borax and gibberellic acid on the growth and development of red chilli (*Capsicum annuum* L. 'gelora'). The Third Basic Science International Conference. Vol. B41; 2013. p. 1-3.
11. Gómez-Cadenas A, Pérez-Santamarina R. Ghorbel, R. Effect of a biostimulant product containing macronutrients and a carboxylic on quality parameters of rainfed tomato. S Indian J Hortic. 2001;49 (Special):199-201.
12. Gajbhiye RP, Sharma RR, Tewari RN. Effect of biofertilizers on growth and yield parameters of tomato. Indian J Hortic. 2003;60(4):368-71.
13. M. A. Vahab. 1989. Homeostatic Analysis of Components of Genetic Variance and Inheritance of Fruit Colour, Fruit Shape and Bitterness in Bitter gourd (*Momordica charantia* 1.). Ph.D. Thesis. Kerala Agricultural University, Thrissur, Kerala
14. Momin, M. A., A. J. Islam, A. Hossain and M. M. Rashid (2013). Effect of plant growth regulators and fertilizer management practices on reproductive growth of bitter gourd (*Momordica charantia* L.). Eco-friendly Agril. J., 6(12).
15. Muhammad, Awai, Amjad Ghani Muhammad, Qumer Iqbal, Aamir Nawaz, Tanveer Ahmad, Osama-Bin-bdul Hafeez and Abbas Mazhar (2013). Efficacy of Plant Growth Regulators on Sex Expression, Earliness and Yield Components in Bitter Gourd. Pak. J. Life soc. Sci.
16. Mulani TG, Musmade AM, Kadu PP, Mangave KK. Effect of organic manures and bio fertilizers on growth, yield and quality of bitter gourd (*Momordica charantia* L.) cv. Phule Green Gold. J soils crops. 2007.
17. Mahmood N. Effect of Bio stimulants on growth, yield and quality of bell pepper cv. yolo wonder. pakjas. 2017;54(2):311-7.