



Effect of Ta41 on Growth, Yield and Quality of Cucumber (*Cucumis sativus* L.) Laxmi F1 Hybrid

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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

The present experiment was carried out during 2021-22 in Central Horticulture Research Farm of Department of Horticulture, SHUATS, Prayagraj. The experiment was conducted in Randomized Block Design with 10 treatments replicated thrice. The treatments were T₀ (Without TA41), T₁ (soil drenching of TA41 @10ml/L), T₂ (soil drenching of TA41 @ 10ml/L+ Foliar spray 20ml/spray tank), T₃ (Soil drenching of TA41 @ 15ml/L), T₄ (Soil drenching of TA41@ 15ml/+Foliar spray 30ml/Spray tank), T₅ (Soil drenching of TA41@ 20ml/L), T₆ (Soil drenching of TA41 @ 20ml /L + foliar spray 40ml / spray tank), T₇ (Soil drenching of TA41 @ 25ml /L), T₈ (Soil drenching of TA41 @ 25ml/l + foliar spray 50ml/spray tank) and T₉ (Foliar spray of TA41 @ 30 ml/spray tank). On the basis of our findings it was concluded that the treatment T₄ (Soil drenching of TA41@ 15ml/+Foliar spray 30ml/Spray tank) was found to be best in the terms of vegetative growth, yield and yield parameters, quality parameters, shelf life and benefit cost ratio.

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1. INTRODUCTION

“Vegetables are protective foods. They are rich in vitamins and minerals which are most essential for maintaining good health of human. Among the vitamins, vitamin A, B, C, D and E are important. All vitamins are found in small or large quantities in the common vegetable crops. According to recommendation made by the ICMR (Indian Council of Medical Research, 2016), an average man with vegetarian or non-vegetarian food habit should consume 300 g of vegetables in his daily diet. It recommended that 125 g of these should be green leafy vegetables, 100 g of roots and tubers vegetables and the remaining 75 g of other vegetables. But our present consumption of vegetables is 184 g per day per capita. This means that we need to produce and consume vegetables than we do as present. Cucumber (*Cucumis sativus* L.) is one of the oldest cultivated vegetable crops having its origin probably in India” [1,2,3]. It belongs to family “Cucurbitaceae” genus *Cucumis*. The fruit of cucumber is said to have cooling effect, prevent constipation, checks jaundice and indigestion. Fruit is also used as astringent and antipyretic [1]. “Nutritively 100 g edible portion of cucumber contains 96.3 g moisture, 2.5 g carbohydrates, 0.4 g protein, 0.1 g fat, 0.3 g minerals, 10 mg calcium, 1.5 mg of iron 0.4 g fibre and traces of vitamin C and iron” [1].

“Cucurbitaceous plants have variable range of male and female flowers. The production of male flowers is greater than that of female flowers and ultimately only the female flowers contribute towards yields. Increase in number of female flowers per vine would obviously result into more production of fruits. The expression of different sex forms is influenced by genetic factors, the manifestation of which is influenced by environmental conditions. Besides, exogenous applications of plant hormones play an important role in changing sex tendency in these plants. Subsequently, growth regulating chemicals became important tools in this respect” [4,5,6].

“TA41(*Trichoderma asperelloides*) is a multifunctional organic growth promoter that takes care of viral, fungal, and sucking pests. As a result of this, the quality of crop produce is highly improved and increases the growth and yield of crops by 50%. It can be used for any types of crops. TA41 effectively controls and prevents soft-bodied sucking pests such as

whiteflies, aphids, mites, scale insects, thrips, mealy bugs, and planthoppers. It is very effective & works quickly against sucking pests. TA41 also helps in retaining soil moisture and prevent soil erosion and develops healthy soil for high yield” [7,8-11].

“*Trichoderma* species use different mechanisms for pathogen inhibition, such as myco- parasitism via hydrolytic enzyme secretion, antibiosis via secondary metabolite production, competition for space and nutrients, promoting plant growth, and inducing plant systemic resistance mechanisms. *Trichoderma* spp. are effective biocontrol agents due to the rapid multiplication or the tolerance of harsh conditions” [12-17]. “*Trichoderma* spp. have potent antagonism and mycoparasitic actions on plant pathogens, allowing them to reduce the incidence of plant diseases, and the main mechanism for *Trichoderma* species is hyper-parasitism . Many genes in *Trichoderma* spp. encoding extracellular proteases and oligopeptide transporters are expressed when contacts occur between *Trichoderma* spp. and the host-pathogen” [18,19]. “During the hyper parasitic process, cell wall degrading enzymes (CWDEs), i.e., glucanases, chitinase, and proteinases, can be secreted by *Trichoderma* spp” [20]. “The secreted CWDEs can degrade the plant pathogen’s cell wall. The *Trichoderma* colonization of roots causes root hair growth and triggers defense activities, such as significant changes in a variety of metabolic pathways and the activation of genes involved in plant host defense, primarily through signaling pathways involving jasmonic acid and ethylene. In Arabidopsis, colonization by *Trichoderma* fungus before infection by biotrophic or necrotrophic plant pathogens triggered an oxidizing status that enhanced resistance systemically” [20].

2. MATERIALS AND METHODS

The present investigation entitled “Effect Of TA41 On Growth, Yield And Quality Of Cucumber (*Cucumis Sativus* L.) Laxmi F1 Hybrid.” was conducted at the central research farm of Department of Horticulture, Sam Higginbottom University of Agriculture, Technology and Sciences Prayagraj during 2022.

2.1 Climatic Condition

The area of Prayagraj district comes under subtropical belt in the south east of Uttar

Pradesh, which experience extremely hot summer and fairly cold winter. The maximum temperature of the location reaches up to 46° C-48° C and seldom falls as low as 4°C- 5°C. The relative humidity ranges between 20 to 94 %. The average rainfall in this area is around 1013.4 mm annually. However, occasional precipitation is also not uncommon during winter months.

The experiment was conducted in Randomized Block Design with 10 treatment replicated thrice. The treatments were T₀ (Without TA41), T₁ (soil drenching of TA41 @10ml/L), T₂ (soil drenching of TA41 @ 10ml/L+ Foliar spray 20ml/spray tank), T₃ (Soil drenching of TA41 @ 15ml/L), T₄ (Soil drenching of TA41@ 15ml/+Foliar spray 30ml/Spray tank), T₅ (Soil drenching of TA41@ 20ml/L), T₆ (Soil drenching of TA41 @ 20ml /L + foliar spray 40ml / spray tank), T₇ (Soil drenching of TA41 @ 25ml /L), T₈ (Soil drenching of TA41 @ 25ml/l + foliar spray 50ml/spray tank) and T₉ (Foliar spray of TA41 @ 30 ml/spray tank).

TA41 is a multifunctional organic growth promoter that takes care of viral, fungal, and sucking pests manufactured by Rayan Farming Solution Pvt. Ltd. TA41 effectively controls and prevents soft-bodied sucking pests such as whiteflies, aphids, mites, scale insects, thrips, mealy bugs, and planthoppers. It is very effective & works quickly against sucking pests. TA41 also helps in retaining soil moisture and prevent soil erosion and develops healthy soil for high yield. TA41 contains bacteria (19x10⁸ cfu/ml), Fungi (5x10⁸ cfu/ml) and Actinomycetes (9x10⁸ cfu/ml).

3. RESULTS AND DISCUSSION

“The maximum Vine length was recorded in the Treatment T4 (Soil drenching of TA41@ 15ml/+Foliar spray 30ml/Spray tank) with (131.46) cm, followed by T9 (Foliar spray of TA41 @ 30 ml/spray tank) with (127.95) cm and the minimum was recorded in T0 (Control) with (115.34) cm. This is clearly indicated that integrated use of nutrient helpful in cell elongation of leaves use to development of cell and rapid cell division and cell elongation in meristematic region of plant due to production of plant growth substance and this may be due to abundant supply of plant nutrients and nitrogen

which led in the growth of Cucumber” [21]. Similar findings of in lettuce and [22] in brinjal and radish were also observed.

The maximum number of leaves were recorded in the Treatment T4 (Soil drenching of TA41@ 15ml/+Foliar spray 30ml/Spray tank) with (50.65), followed by T9 (Foliar spray of TA41 @ 30 ml/spray tank) with (49.37) and the minimum was recorded in T0 (Control) with (44.36). This is clearly indicated that integrated use of nutrient helpful in cell elongation of leaves use to development of cell and rapid cell division and cell elongation in meristematic region of plant due to production of plant growth substance and this may be due to abundant supply of plant nutrients and nitrogen which led in the growth of Cucumber. Similar findings of [21] in lettuce and [22] in brinjal and radish were also observed.

The maximum leaf length (cm) were recorded in the Treatment T4 (Soil drenching of TA41@ 15ml/+Foliar spray 30ml/Spray tank) with (17.86) cm, followed by T9 (Foliar spray of TA41 @ 30 ml/spray tank) with (17.05) cm and the minimum was recorded in T0 (Control) with (13.52) cm. This is clearly indicated that integrated use of nutrient helpful in cell elongation of leaves use to development of cell and rapid cell division and cell elongation in meristematic region of plant due to production of plant growth substance and this may be due to abundant supply of plant nutrients and nitrogen which led in the growth of Cucumber. Similar findings of [21] in lettuce and [22] in brinjal and radish were also observed

The maximum leaf area (cm²) were recorded in the Treatment T4 (Soil drenching of TA41@ 15ml/+Foliar spray 30ml/Spray tank) with (293.28) cm², followed by T9 (Foliar spray of TA41 @ 30 ml/spray tank) with (279.59) cm² and the minimum was recorded in T0 (Control) with (258.92) cm². This is clearly indicated that integrated use of nutrient helpful in cell elongation of leaves use to development of cell and rapid cell division and cell elongation in meristematic region of plant due to production of plant growth substance and this may be due to abundant supply of plant nutrients and nitrogen which led in the growth of Cucumber. Similar findings of [21] in lettuce and [22] in brinjal and radish were also observed.

Table 1. Effect of TA41 on vine length (cm), no. of leaves, length of leaves (cm) and Leaf area (cm²) of Cucumber

Treatment	Vine length (cm)			No. of leaves			Length of leaves (cm)			Leaf area (cm ²)		
	30 DAP	60 DAP	90 DAP	30 DAP	60 DAP	90 DAP	30 DAP	60 DAP	90 DAP	30 DAP	60 DAP	90 DAP
T0	55.62	85.64	115.34	9.59	24.35	44.36	5.63	8.28	13.52	132.55	193	258.92
T1	59.67	89.46	119.46	10.25	25.36	45.15	6.63	9.28	14.52	132.98	193.49	259.65
T2	64.59	94.29	124.38	11.36	26.34	46.28	7.45	10.1	15.34	134.25	195.64	261.65
T3	61.49	91.73	121.37	13.25	28.34	48.27	6.97	9.62	14.86	135.48	198.26	249.65
T4	70.34	100.49	131.46	14.26	30.26	50.65	9.97	12.62	17.86	138.65	201.93	293.28
T5	63.12	93.49	123.64	12.65	27.12	47.21	8.46	11.11	16.35	135.89	199.24	268.34
T6	64.38	94.72	125.64	13.45	28.68	48.08	7.93	10.58	15.82	136.59	198.46	276.59
T7	65.27	95.67	126.46	12.92	27.82	47.09	8.9	11.55	16.79	136.73	196.59	270.59
T8	66.45	96.19	125.94	12.43	28.11	48.34	8.2	10.85	16.09	135.98	197.26	273.49
T9	67.19	97.08	127.95	13.86	29.46	49.37	9.16	11.81	17.05	137.25	200.23	279.59
F Test	S	S	S	S	S	S	S	S	S	S	S	S
C.D.@ 5 %	1.56	1.78	2.05	2.35	1.98	1.74	0.49	0.782	1.59	4.35	5.32	6.21
SE.d.	0.78	0.85	1.02	1.1	1.05	0.89	0.24	0.351	0.68	2.31	2.51	3.21

Table 2. Effect of TA41 on days to first flowering & harvesting, no. of flowers/plant, no. of fruits/plant, fruit length, fruit width, fruit weight, fruit yield, TSS, Test weight, shelf life and B:C ratio

Treatment	Days to First Flowering	Days to first Harvesting	Number of flower/Plant	Number of fruit/Pant	Fruit Length (cm)	Fruit width (mm)	Fruit weight (g)	Fruit Yield (q ha ⁻¹)	TSS (⁰ Brix)	Test Weight	Shelf life	B:C Ratio
T0	39.65	55.65	11.53	9.23	14.23	18.56	175.65	161.25	4.21	26.33	4.56	1.89
T1	35.26	54.26	12.78	10.23	14.35	19.65	181.26	165.35	4.35	27.35	4.73	1.91
T2	35.67	54.39	14.56	11.65	14.89	20.35	188.64	166.49	5.12	27.89	5.12	1.92
T3	36.16	53.56	13.72	10.98	15.62	22.46	178.95	167.82	5.09	29.36	5.62	1.94
T4	34.12	52.32	17.22	13.78	18.53	25.62	195.26	171.35	6.02	32.89	6.86	2.37
T5	34.98	54.82	15.42	12.34	16.46	23.65	186.26	168.59	4.64	30.31	6.45	1.92
T6	35.02	53.26	16.18	12.95	16.89	22.89	187.38	169.37	4.82	31.26	6.59	1.93
T7	35.37	53.46	14.97	11.98	15.82	21.65	188.91	168.82	4.18	30.59	5.92	1.96
T8	36.56	54.75	15.8	12.64	17.08	23.46	189.21	167.95	5.36	31.95	6.08	1.95
T9	34.56	52.68	16.40	13.12	17.32	24.35	190.35	170.26	5.56	32.21	6.75	1.99
F Test	S	S	S	S	S	S	S	S	S	S	S	S
C.D.@ 5 %	2.13	4.26	2.34	0.81	1.56	2.86	4.35	6.56	1.55	2.31	0.89	
SE.d.	1.02	2.32	1.11	0.48	0.64	1.42	2.12	3.46	0.61	1.26	0.41	

The minimum days for harvesting were recorded in the Treatment T4 (Soil drenching of TA41@ 15ml/+Foliar spray 30ml/Spray tank) with (52.32), followed by T9 (Foliar spray of TA41 @ 30 ml/spray tank) with (52.68) and the maximum was recorded in T0 (Control) with (258.92). The decreased in the number of days taken for appearance of first flower in best treatment of organic and inorganic fertilizers in Cucumber is due to combined effect of the organic manures and Chemical fertilizers. The Similar results were also obtained by [22] in the cucurbits.

The maximum fruit length were recorded in the Treatment T4 (Soil drenching of TA41@ 15ml/+Foliar spray 30ml/Spray tank) with (18.53) cm, followed by T9 (Foliar spray of TA41 @ 30 ml/spray tank) with (17.32) cm and the minimum was recorded in T0 (Control) with (14.23) cm. The increased number of fruits and flowers in best treatment of organic and inorganic fertilizers in Cucumber is due to combined effect of the organic manures and Chemical fertilizers. The Similar results were also obtained by [22] in the cucurbits.

The maximum fruit width were recorded in the Treatment T4 (Soil drenching of TA41@ 15ml/+Foliar spray 30ml/Spray tank) with (25.628) mm, followed by T9 (Foliar spray of TA41 @ 30 ml/spray tank) with (24.35) mm and the minimum was recorded in T0 (Control) with (18.56) mm. The increased number of fruits and flowers in best treatment of organic and inorganic fertilizers in Cucumber is due to combined effect of the organic manures and Chemical fertilizers. The Similar results were also obtained by [22] in the cucurbits.

The maximum number of fruits were recorded in the Treatment T4 (Soil drenching of TA41@ 15ml/+Foliar spray 30ml/Spray tank) with (13.78), followed by T9 (Foliar spray of TA41 @ 30 ml/spray tank) with (13.12) and the minimum was recorded in T0 (Control) with (9.23). The integrated use of growth regulators along with N.P.K. significantly influenced the length diameter ratio of fruit. The results are conformity with findings of (Abusaleh, 1992) in okra.

The maximum weight of fruit were recorded in the Treatment T4 (Soil drenching of TA41@ 15ml/+Foliar spray 30ml/Spray tank) with (195.26)g, followed by T9 (Foliar spray of TA41 @ 30 ml/spray tank) with (190.35) g and the minimum was recorded in T0 (Control) with

(170.65) g. The integrated use of growth regulators along with N.P.K. significantly influenced the length diameter ratio of fruit. The results are conformity with findings of (Abusaleh, 1992) in okra.

The maximum score for TSS ⁰B were recorded in the Treatment T4 (Soil drenching of TA41@ 15ml/+Foliar spray 30ml/Spray tank) with (6.02) ⁰B, followed by T9 (Foliar spray of TA41 @ 30 ml/spray tank) with (5.56) ⁰B and the minimum was recorded in T0 (Control) with (4.21) ⁰B. Maximum TSS might be due to increased availability of major as well as minor nutrients specially nitrogen and potassium, because they play vital role in enhancing the quality. The minimum TSS in T₀ (Control) might be to lack of availability of nutrients. Similar findings were also reported by Singh *et al.* (2018); Swetha *et al.* [23] and Shnain *et al.* (2021) in field grown tomato.

The maximum test weight of seed were recorded in the Treatment T4 (Soil drenching of TA41@ 15ml/+Foliar spray 30ml/Spray tank) with (32.89), followed by T9 (Foliar spray of TA41 @ 30 ml/spray tank) with (32.21) and the minimum was recorded in T0 (Control) with (26.33). Maximum test weight might be due to increased availability of major as well as minor nutrients specially nitrogen and potassium, because they play vital role in enhancing the quality. The minimum TSS in T₀ (Control) might be to lack of availability of nutrients. Similar findings were also reported by Singh *et al.* (2018); Swetha *et al.* [23] and Shnain *et al.* (2021) in field grown tomato.

The maximum B:C ratio were recorded in the Treatment T4 (Soil drenching of TA41@ 15ml/+Foliar spray 30ml/Spray tank) with (2.37), followed by T9 (Foliar spray of TA41 @ 30 ml/spray tank) with (1.99) and the minimum was recorded in T0 (Control) with (1.89).

4. CONCLUSION

On the basis of our findings it was concluded that the treatment T₄ (Soil drenching of TA41@ 15ml/+Foliar spray 30ml/Spray tank) was found to be best in the terms of Vegetative growth, Yield and Yield parameters, Quality parameters, Shelf life and Benefit cost ratio.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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