—Effect of foliar application of plant growth regulators on Growth, Fruits Quality and Yield ~~and Quality~~ of Watermelon (*Citrullus lanatus* Thunb.)

ABSTRACT

The present investigation entitled **"Effect of Plant Growth Regulators on Growth, Yield and Quality of Watermelon (*Citrullus lanatus* T.)"** was conducted at Horticulture Research farm, Department of Horticulture, Sam Higginbottom University of Agriculture Technology and Sciences, Prayagraj during *Zaid season* 2020-2021.The experiment was laid out in Factorial Randomized Block Design (FRBD) consisting of 10 treatments with 3 replications. The results concluded that the Germination parameters viz., Days to germination (6-7 days) Survival percentage(99.5%) .Growth parameters viz., Vine length(5.77m), Days to appearance of first pistillate flower in 50% plants(44.7days), Days to first harvest(93.73days), and Yield parameters viz., Fruit size in longitudinal shape(28.6cm), Maximum fruit weight(2.26kg), Number of marketable fruits per plant(2.11fruits), maximum yield per hectare(31.78tons), fruit diameter(30cm) and Quality parameters viz., TSS(10.5 ° Brix)was recorded in variety TMWH-2786 with treatments T_5(GA_3@50ppm).

Comment [u1]: You can fit a factorial experiment into a particular design but not Factoria Randomized Block Design.

Comment [u2]:

Comment [u3R2]: Re-write this section and let summary of your conclusion be part of it.

Key words: *(Watermelon, PGR~~-~~s (NAA, GA_3). Growth, Yield, Quality.)*

UNDER PEER REVIEW

Introduction

Watermelon (*Citrullus lanatus* Thunb.), a polar desert fruit in tropics is an important crop throughout India. It is commonly known by various names tarbuj or paniphal, mathan, palampanna and kalingaddi in different parts of country (Mahala 2014). Watermelon is an important annual vegetable crop and belongs to Cucurbitaceae family having 22 chromosome number. It is grown throughout India particularly in hot and dry North-Western parts of the country both under irrigated river beds and rainfed conditions during summer season. It is native to central Africa where it is served as source of water and a staple animal feed. In India watermelon is a major crop of various riverbeds in Uttar Pradesh, Rajasthan, Gujarat, Maharashtra, Karnataka, Tamil Nadu, and Andhra Pradesh. Watermelon is monoecious or andromonoecious annual ~~spawling~~sprawling over the ground.

Watermelon (*Citrullus lanatus* Thunb.), is believed to have originated from Africa and spread to other parts of world (Citation necessary). In India, Uttar Pradesh is first in area and production (Citation). Seeds germinates well and crop thrives best when temperature is 25-30~~–~~°C~~–~~. Fruits mature best at 30°C. Cool weather below 16 °C adversely affects the growth and development of the crop.

Plant growth regulators are known to be modifying growth and sex expression, improve fruit set and ultimately increase yield in a number of cucurbits. Exogenous application of plant growth regulators can alter the sequence of male and female flowers, if applied at 2 or 4 leaf stage~~s~~, the critical stage at which the suppression or promotion of either sexes is possible~~.~~ (Hossain et al., 2006). Hence, by proper manipulation, the sequence of flowering with the application of exogenous plant growth regulators, the yield of cucurbits can be increased. A relationship between growth substances and sex expression probably exists in these plants~~.~~ ~~(~~Paramar ~~(~~2003).

Naphthalene acetic acid (NAA)~~(Naphthalene acetic acid)~~ helps in g~~G~~rowth promot~~ingion~~, stimulates cell division, cell elongation, cell wall plasticity and permeability of cell membranes, RNA synthesis, induction of hydrolytic enzymes and increases plant height, increased mobilization and translocation of reserve food material (Citation)**.**

Gibberellic acid (GA_3) helps in g~~G~~rowth promot~~ingion~~, stimulates cell division, cell elongation, elongation of shoot, photosynthesis, RNA synthesis, membrane permeability to water uptake, prevents abscission of leaves, flowers and fruits~~.~~, ~~E~~enhances leaf area index, leaf chlorophyll content and fruit yield ~~,~~ increased ~~yield of fruit~~ (Citation).

UNDER PEER REVIEW

Materials and methods.

~~The present investigation was carried out to study the "Effect of plant growth regulators on Growth, Yield and Quality of Watermelon (*Citrullus lanatus* T).~~ The experiment was carried out in Research Farm, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom, University of Agriculture, Technology and Sciences, Prayagraj (UP), India during 2021 – 2022. Prayagraj is situated at an elevation of 78 meters above sea level at 25.87° North latitude and 81.15° E longitudes. This region has a sub-tropical climate prevailing in the South-East part of U~~.~~P~~.~~ with both the extremes in temperature, i.e., the winter and the summer. In cold winters, the temperature sometimes is as low as 32°F in December – January and very hot summer with temperature reaching up to 115°F in the months of May and June (Citation). During winter, frosts and during summer, hot scorching winds are also not uncommon. The average rainfall is around

Comment [u4]: Recast

Formatted: Left

Comment [u5]: This is different from what is contained in abstract. Please, reconcile.

Comment [u6]: Not clear.

1013.4 (cm) with maximum concentration during July to September months with occasional showers in winter (Citation).

The experiment was conducted from February to May 2021 and the experiment material consists of hybrid varieties of seeds namely TMWH-2786 and TMWH-704~~–~~. ~~Total ten treatments were tried to including control in FRBD design and replicated thrice.~~ The plant ~~treatments were~~growth regulators consist~~inged~~ of Gibberellic Acid (GA_3) and Naphthalene Acetic Acid (NAA) while water spray served as untreated ~~and~~ control plots~~(water spray)~~. A factorial experiment fitted into Randomized Complete Block Design (RCBD) was laid out with three replications. The treatment details consists of V_1T_0 (TMWH-2786), c~~C~~ontrol, V_1T_1(TMWH2786+NAA, ~~@~~45 ppm),V_1T_2(TMWH2786+NAA~~@~~, 60 ppm), V_1T_3(TMWH-2786+ GA_3~~@~~, 25 ppm), V_1T_4(TMWH2786+ GA_3~~@~~, 50 ppm), V_2T_0(TMWH-704), control, V_2T_1(TMWH-704+NAA~~@~~, 45 ppm),V_2T_2(TMWH-704+NAA, 60 ppm),V_2T_3(TMWH-704+GA_3~~@~~, 25 ppm), V_2T_4(TMWH-704+ GA_3~~@~~, 50 ppm). The solutions were prepared from their respective stock solution using distilled water. ~~These p~~Plant growth regulators ~~are~~were sprayed at 2 and 4 leaf stages. ~~The solutions were prepared from their respective stock solution using distilled water.~~ Five plants were randomly selected for recording observation on germination, growth, yield and quality attributing parameters.

PLOT SIZE?, PLANTING DISTANCE?~~–~~, NUMBERS OF PLANT PER PLOT?, AGRONOMIC PRACTICES? EXPERIMENT: RAINFED OR IRRIGATED? HOW DID YOU ANALYZE YOUR DATA AND WHAT SOFTWARE DID YOU USE? HOW DID YOU SEPARATE MEANS?

Comment [u7]: Please, reconcile all contradictions in your dates.

Comment [u8]: Till run-off or certain quantity per plant?

Comment [u9]: Replace with 'emergence'. You can not see how it germinated in the soil.

Comment [u10]: This section needs full explanation on how you carried out the experiment Parameters on germination, growth , yield and quality should be itemized. How did you measure each parameter?

Formatted: Highlight

Formatted: Highlight

Formatted: Highlight

Results and Discussions:

UNDER PEER REVIEW

Germination parameters

The germination parameters such as days to germination and survival percentage were mentioned in Table.

Effect of plant growth regulators on days to germination of watermelon (*Citrullus lanatus* Thunb.): The changes in the germination parameters of watermelon was not affected by plant growth regulators because the seeds of watermelon hybrid were already treated by seed treatment methods. All the seeds took almost 6-7 days for germination.

Effect of plant growth regulators on survival percentage of watermelon (*Citrullus lanatus* T.)–: Survival percentage among the seeds sown and the seedlings germinated-, the mortality rate of the seedlings rate was very less that may be due to change in climatic conditions. and the survival rate of the seedlings was 99%

Table 1: Effect of plant growth regulators on Growth, Yield and Quality of Watermelon.

Comment [u11]: Replace with 'emergence'.

Comment [u12]: Which Table?

Comment [u13]: 'emergence'

Comment [u14]: See correction above.

UNDER PEER REVIEW

S.no	Treatment details	Days to germination	Survival percentage	Vine length(cm) 60DAS	Appearance of first pistillate flower	Days to first harvest	Fruit size in longitudinal shape (cm)	Fruit weight (kg)	Number of marketable fruits per plant	Fruit diameter (cm)	Yield per hectare (tons)	TSS (°Brix)	Flesh colour	Rind colour
1	V_1T_0 (TMWH-2786) Control	6.22	99.5	3.22	50.0	100	21.9	1.86	1.61	27	19.96	9.56	41	137
2	V_1T_1 (TMWH-2786+NAA@45ppm)	7.22	99.3	3.67	48.7	98.93	22.7	1.98	1.78	28.5	23.49	9.71	42	138
3	V_1T_2(TMWH2786+NAA@60ppm)	6.94	99.3	3.91	47.5	97.93	23.1	2.05	1.89	28.7	25.82	9.79	42	138
4	V_1T_3(TMWH-2786+ GA_3@25ppm)	6.72	99.4	4.85	46.2	95.93	25.2	2.16	2.06	29.2	29.66	10.2	41	138
5	V_1T_4(TMWH2786+ GA_3@50ppm)	7.06	99.2	5.77	44.7	93.73	28.6	2.26	2.11	30	31.78	10.5	43	139
6	V_2T_0(TMWH-704) control	6.39	99.3	3.12	50.1	103	21.7	1.81	1.56	27.7	18.82	9.56	41	137
7	V_2T_1(TMWH-704+NAA@45ppm)	7.28	99.2	3.49	48.2	99.90	22.4	1.94	1.67	28	21.59	9.78	42	138
8	V_2T_2(TMWH-704+NAA60ppm)	6.5	99.4	3.86	47.6	98.46	23.3	2.04	1.83	28.4	24.85	9.88	42	138
9	V_2T_3(TMWH-704+ GA_3@25ppm)	6.78	99.2	4.81	46.3	97.76	24.9	2.13	1.94	29.5	27.54	10.3	42	139
10	V_2T_4(TMWH-704+ GA_3@50ppm)	6.72	99.4	5.73	44.1	94.86	28.1	2.20	2.06	30.1	30.21	10.5	43	139

Table 2: ~~Table 2~~ showing Different growth factor

Factor A	F test	-	-	S?	S	S	S	S	S	S	S	S	S	S
	CD at5%	0.305	0.167	0.153	1.00	0.66	0.429	0.16	0.134	0.566	2.702	0.141	0.722	0.647
	SE(d)±	0.145	0.085	0.052	0.480	0.318	0.204	0.078	0.064	0.265	1.286	0.067	0.344	0.308
Factor B	F test	-	-	S	S	S	S	S	S	S	S	S	S	S
	CD at5%	0.482	0.264	0.243	1.59	1.05	0.679	0.25	0.211	0.879	4.272	0.223	1.411	1.023
	SE(d)±	0.230	0.134	0.116	0.759	0.503	0.323	0.123	0.101	0.419	2.033	0.106	0.543	0.487
Factor A X B	F test	-	-	S	S	S	S	S	S	S	S	S	S	S
	CD at5%	0.082	0.373	0.343	2.25	1.49	0.36	0.36	0.299	1.243	6.041	0.315	1.614	1.447

Comment [u15]: Let only the three major lines in your Tables appear. Ensure that all figures are in 2-decimal place.

Comment [u16]: Make title concise.

Comment [u17]: ?

UNDER PEER REVIEW

	SE(d)±	0.325	0.190	0.163	1.073	0.711	0.174	0.174	0.142	0.592	2.87	0.150	0.768	0.689

Comment [u18]: See comment above on Table 1.

UNDER PEER REVIEW

Effect of plant growth regulators on growth parameters of watermelon

All the growth parameters such as vine length at 20,40 and 60 DAS, appearance of first pistillate flower in 50% plants and days to first harvest. were variably affected by plant growth regulators i.e., GA_3 and NAA were mentioned in Table 2. The experimental results revealed that all the growth parameters were significantly improved by using lower to higher concentrations. GA_3 @50ppm was found to be superior over the control and other treatments during the experimentation.

Vine length:

In reference with the vine length 20,40 DAS. In variety TMWH-2786, The maximum vine length (1.89_m) and (4.25_m) plant^{-1}.was recorded with the application of GA_3@50ppm, and the minimum (1.41_m) and (2.20_m) vine length plant^{-1} was recorded in control. In variety TMWH-704, The maximum vine length (1.9m) and (4.13m) plant^{-1}.was recorded with the application of GA_3@50ppm, and the minimum (1.25_m) and (2.24_m) vine length plant^{-1} was recorded in control. was recorded in control NAA induces cell division and cell growth and also improves synthesis and translocation of photosynthates that enhance the vegetative growth of the plant, hence vine length of the plant also increases. GA_3 also helps in cell enlargement, internodal elongation, synthesis of RNA and proteins. Thus, it leads to growth and development. The observations were similar to that of findings done by Sahil et al., (2016) and Pal et al., (2016)

In reference with the vine length 60DAS. In variety TMWH-2786, the maximum vine length (5.77_m) plant^{-1}.was recorded with the application of GA_3@50ppm, and the minimum (3.22_m) vine length plant^{-1} was recorded in control. In variety TMWH-704, the maximum vine length (5.73_m) plant^{-1}.was recorded with the application of GA_3@50ppm, and the minimum (3.12_m) vine length plant^{-1} was recorded in control. It might be due to their stimulatory effect on plant growth by cell elongation and rapid cell division in apical parts of the plants~~.~~ ~~(~~Chovatia et al., ~~(~~2010).

Appearance of first pistillate flower in 50% plants:

In reference to appearance of first pistillate flower in 50% plants. in variety TMWH-2786, the lesser number of days to appearance of pistillate flower was recorded with spray of gibberellic acid GA_3@50ppm with (44.87 days), and more number of days for appearance of first pistillate flower was recorded in control with (50 days). In reference to appearance of first pistillate flower in 50% plants. in variety TMWH-704, the lesser number of days to appearance of pistillate flower was recorded with spray of gibberellic acid GA_3@50ppm with (44.1 days), and more number of days for appearance of first pistillate flower

Comment [u19]: I could not see these values in Table 2.

Comment [u20]: Where are these in your results?

Comment [u21]: Separate unit from figures.

Comment [u22]: Are these values significantly different?

Comment [u23]: Approximate days to whole number in your Tables and inside the text e. g 44.87 to 45 days.

Comment [u24]: ?

UNDER PEER REVIEW

was recorded in control with (50 .1days). This may be due to Gibberellins induce early flowering when compared to NAA delayed the flowering with lower doses when compared to higher doses of NAA i.e., it enhances the cell division. Similar results were recorded by Vedigeri et al., (2001), Das et.al. (2001), Dalai et al., (2020)

Comment [u25]: Different version of reference styles. Adhere to the Journal's instructions.

Days to first harvest:

In reference to days to first harvest in varietyTMWH-2786, the lesser number of days for first picking was recorded with spray of gibberellic acid GA_3@50 ppm with (93.73days), and more number of days to first picking was recorded at control with (100 days). In reference to days to first harvest in varietyTMWH-704, the lesser number of days for first picking was recorded with spray of gibberellic acid GA_3@50 ppm with (94.86days), and more number of days to first picking was recorded at control with (103days). The treated plants are more physiologically active translocate food to develop fruits which results in early maturity of fruits to harvest. Similar results were recorded by Dinesh et al., (2019).

Comment [u26]: No yardstick for mean separation in your results. Are these values different statistically?

Effect of plant growth regulators on yield parameters of watermelon

The yield parameters such as fruit size in longitudinal shape, fruit weight, number of marketable fruits, fruit diameter and fruit yield ~~was~~were mentioned in Table 1. The experimental results revealed that all the yield parameters were significantly improved by using lower to higher concentrations. GA_3 @50 ppm was found to be superior over the control and other treatments during the experimentation.

Fruit size in longitudinal shape:

In reference to the fruit size in longitudinal shape, in variety TMWH-2786, the highest fruit size in longitudinal shape was found (28.6 cm) with spray of GA_3 @50ppm), and the minimum fruit size was found in control (water spray) with (21.9 cm) In reference to the fruit size in longitudinal shape, in variety TMWH-704, the highest fruit size in longitudinal shape was found (28.1 cm) with spray of GA_3 @50ppm and the minimum fruit size was found in control (water spray) with (21.7 cm). Prabhu and Natarajan (2006)

Fruit weight:

UNDER PEER REVIEW

In reference to fruit weight, in variety TMWH-2786, the highest weight of fruit was found (2.26 kg) with the spray of GA_3 @50 ppm, and the least fruit weight was found in control (water spray) with (1.86 kg). In reference to fruit weight, in variety TMWH-704, the highest weight of fruit was found (2.20 kg) with the spray of GA_3@50ppm and the least fruit weight was found in control (water spray) with (1.81kg) During the early stages of fruit development GA_3 and NAA directly or indirectly influences the cell number, size and density. These may promote cell elongation and cell expansion. There by the mesocarp of the fruit becomes larger, and increases its weight. The results obtained in this investigation is similar to the results of Chaudari et al., (2016). Prasad et al., (2003)

Number of marketable fruits:

In reference to number of marketable fruits per plant , in variety TMWH-2786, highest number of marketable fruits was found (2.11 fruits) with the spray of GA_3 @50 ppm , the least fruit weight was found in control (water spray) with (1.61 fruits).In reference to number of marketable fruits per plant , in variety TMWH-704, highest number of marketable fruits was found (2.06 fruits) with the spray of GA_3 @50ppm , and the least fruit weight was found in control (water spray) with (1.56 fruits). NAA and GA_3 supress the male flower production and increase the female flowers there by resulting in more number of fruits set which also increases more number of fruits. The similar results were also found in accordance with Thappa et al., (2015).

Comment [u27]: Approximate number of fruits to whole number in your Tables and inside the text.

Fruit diameter

In reference to fruit diameter, in variety TMWH-2786, highest fruit diameter was found (30 cm) with the spray of GA_3 @50 ppm, and the least fruit diameter was found in control (water spray) with (27 cm). In reference to fruit diameter, in variety TMWH-704, the highest fruit diameter (30.1 cm) was found with spray of GA_3 @50ppm, least fruit diameter was found in control (water spray) with (27.7 cm) The function of fertilized ovule or the seed in relation to growth of the fruits is to synthesize hormones which initiate to maintain a metabolic gradient along with translocation of food towards fruits. The results were similar to Ingale et al., (2000)

Fruit yield:

In reference to fruit yield in variety TMWH-2786, the highest fruit yield was found (31.78 tons) with the spray of GA_3 @50 ppm, and the least fruit yield was found in control (water spray) with (19.96 tons) In reference to fruit yield in variety TMWH-704., the highest fruit yield was found (30.21 tons) with the spray of GA_3 @50 ppm, and the least fruit yield was found in control (water spray) with(18.82 tons) Sure et al.,(2012)**.**Increasing the yield in treated plants may be

Comment [u28]: Per plot or per hectare?

UNDER PEER REVIEW

attributed to the plants remain physiologically active to build sufficient food for the developing flowers and fruits. Thereby increasing the yield. The results were similar with that of Aisha et al., (2006), Marbhal et al., (2005)

Effect of plant growth regulators on quality parameters of watermelon

The quality parameters such as total soluble solids, flesh colour and rind colour was mentioned in Table 3. The experimental results revealed that all the quality parameters were significantly improved by using lower to higher concentrations. GA_3 @50ppm was found to be superior over the control and other treatments during the experimentation.

Comment [u29]: Where is Table 3?

TSS (Total Soluble Solids):

In reference to the fruit TSS in variety TMWH-2786, the highest fruit TSS was found (10.5°brix) with the spray of GA_3 @50ppm, and the least fruit TSS was found in control (water spray) with (9.56°brix). In reference to the fruit TSS, in variety TMWH-704, The highest fruit TSS was found (10.5°brix) was found with the spray of GA_3 @50ppm, and the least fruit TSS was found in control (water spray) with (9.56°brix) The physiological process affect the absorption of nutrients by the plants from the soil which resulted in maximum TSS in treated fruits than control Sravika et al., (2021)

Flesh colour :

In reference to flesh color, in variety TMWH-2786, with the spray of GA_3@50ppm the dark colour of the flesh was found indicated with number 43 from Royal Horticultural Colour Chart. And the dull colour was found in control(water spray) with number indicated as 41.In reference to flesh color, in variety TMWH-704, with the spray of GA_3@50ppm the dark colour of the flesh was found indicated with number 43 from Royal Horticultural Colour Chart. And the dull colour was found in control (water spray) -with number indicated as 41.

Rind colour:

In reference to rind color, in variety TMWH-2786, with the spray of GA_3@50ppm the dark colour of the rind was found indicated with number 139 from Royal Horticultural Colour Chart. And the dull colour was found in control (water spray) with number indicated as 137.In reference to rind color, in variety TMWH-704, with the spray of GA_3@50ppm the dark colour of the rind was found indicated with number 139 from Royal Horticultural Colour Chart. And the dull colour was found in control (water spray) with number indicated as 137

UNDER PEER REVIEW

Conclusion:

Based on the results of the present investigation it was concluded that variety TMWH - 2786 treatment with application of Gibberellic acid (GA_3) @ 50 ppm at 2,4 leaf stage was found superior in terms of vine length, appearance of first pistillate flower in 50%plants, fruit weight, fruit diameter, fruit size in longitudinal shape, number of marketable fruits, fruit weight, yield, TSS and with highest benefit cost ratio.

Comment [u30]: Did you carry out this?

References

Formatted: Indent: Left: 0"

Aisha , S., & Chaudhary, N.Y., 2006. GA_3 improve flower yield in some cucurbits treated with lead and mercury. *African Journal of Agriculture and Biology*,6(2).396-399

Choudary, D.C., Patel, N.M., and Prajapati, B.H., 2016. Effect of various plant growth substances on Economics of Watermelon (*Citrullus lanatus* Thunb Mansf.) cv. Durgapura Lal, *International Journal of Engineering Sciences and Computing* (RW 177-3)

Choudary, D.C., Patel, N.M., Rathva, V.D., and Nurbhanej, M.H, 2016. Effect of growth substances on growth, flowering and yield and quality attributes of Watermelon (*Citrullus lanatus* Thunb (Mansf.)) cv. Durgapura Lal, *International Journal of Agriculture Sciences* 8,(40),p :1825-1828.

Chovatia , RS., Ahlawat, T.R., Kavathia , Y., A Javani, L.L., and Kalia, D.C., 2010. Effect of plant growth regulators on vegetative growth, flowering and yield of bitter gourd cv. Priya. *Indian Journal of Horticulture*. 67:254-258.

Das, R., Rabha, B.K., and Dey, S.C., 2001. Effect of plant growth regulators on sex expression and fruit yield of cucumber (*Cucumis sativus*. L.) under plastic green house. *Annals of Agricultural Research*.22(3): 312-317.

Das, R. C and Swain, S. C. 2001 Effect of growth substances on growth, quality and yield of cucumber (*Cucumis sativus* L.). *Indian Journal of Horticulture*,34(1): pp.51-53.

Dalai, S., Singh, M.K., and Soni, S., 2020. Yield and yield traits of cucumber (*Cucumis sativus* L.) as influenced by foliar application of plant growth regulators. *International Journal of Current Microbiology and Applied Sciences*, 9(3): 121–126,

UNDER PEER REVIEW

Dinesh , A.P., Prasanth, D., Laxminarayan, K., Nagaraju., and Gouthami, P., 2019. Efficacy of plant growth regulators on growth and flowering of Cucumber (*Cucumis sativus*. L.), cv. Malini under shade net conditions *International Journal of Current Microbiology and Applied Sciences* 8(09):313-317

Hossain, D., Karim, M, A., Rahman, M.H., Pramanik, A.M., and Rahman, S., 2006 Effect of gibberellic acid (GA3) on flowering and fruit Development of Bitter Gourd *(Momordica charantia* L.) *International Journal of Botany* 2(3): pp.329-332

Ingale, V.G., Jadhao, B.J., and Joshi, P.S., 2000. Effect of plant growth regulators on growth, sex ratio and yield of bottle gourd, *Journal of soil and crop* 10(1):101-104

Marbhal, SK., Musmade, AM., Kashi, NV., Kamble, MS., and Kamthe, PV., 2005. Effect of growth regulators and picking sequence on seed yield of bitter gourd, *Haryana Journal of Horticultural Sciences*, 34:323-326

Mahala, P., Choudary, MR., Yadav, TV., Garhwaland, OP., Singh, P., 2014. Effect of plant growth regulators on yield, quality and economics of bottle gourd (*Lagenaria siceraria* (Mol) Standl.). *Annals of Agric-Bio Research*.2014.,19(1):137-139.

Parmar, H.M., 2003. Effect of plant growth regulators on Growth, sex expression and yield of sponge gourd (*Luffa cylindrica* (Linn.) M. Roem,) cv. Pusa chikni M Sc. (Agri.) thesis submitted to Gujarat Agricultural University, Anand.

Prabhu, M., and Natarajan, S., 2006. Effect of growth regulators on fruit characteristics and seediness in ivy gourd (*Coccinea grandis* L.) *Agricultural Sciences Digest,*26:188-190.

Prasad, V. M., Paul, B.B., and Dasrath Yadav., 2003. Effect of plant Harmone (GA_3) on growth and yield of two varieties of cucumber *(Cucumis sativus* L.) Bioved 14(1/2):83-85

Pal, P., Yadav, K., Kumar, K., and Singh, N., 2016. Effect of gibberellic acids and potassium foliar sprays on productivity and physiological and biochemical parameters of parthenocarpic cucumber cv' seven star F1'.*Journal of Horticultural Research*,24(1):93-100.

Sure, S., Oie, H.A., Azizi, M., 2012 Influence of plant growth regulators and planting method on growthy and yield of Oil Pumpkin (*Cucurbita pepo. var. styriaca). Not Sci Big.*, 4 (2):101-107.

UNDER PEER REVIEW

Sravika, B., Kiranpatro, T.S.K.K., Usha kumari, K., Emmanuel, N., and Suneetha, S., 2021. Effect of plant growth regulators on yield and quality parameters of summer squash (*Cucurbita pepo*. L.). *The Pharma Innovation Journal*, 10(8):708-711.

Sahil, A.A.A.L., 2016. Effect of gibberellic acid and salicylic acids pre-soaking on seed germination attributes of cucumber (*Cucumis sativus* L.)under induced salt stress. Cercetari Agronomice in Moldova XLIX(165):99-109.

Thappa, M., Satesh kumar., and Ramisa Rafiq., 2015. Influence of plant growth regulators on morphological, floral and yield traits of cucumber (*Cucumis sativus* L.) *Kesetsart Journal. (Nat. Sci)* 45:177-188.

Vedigeri, B.G., Madalgeri, B.B., and sheelavantar, M.N., 2001. Effect of gibberellic acid on yield and quality of two cucumber varieties. *Karnataka Journal of Agricultural Sciences*,14(3):727-730.

UNDER PEER REVIEW