Int.J.Curr.Microbiol.App.Sci (2020) *9*(3): 121-126

International Journal of Current Microbiology and Applied Sciences
***ISSN: 2319-7706* Volume 9 Number 3 (2020)**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2020.903.015

Yield and Yield Traits of Cucumber (*Cucumis sativus* L.) as Influenced by Foliar Application of Plant Growth Regulators

Samapika Dalai*, Manoj Kumar Singh and Shweta Soni

Department of Horticulture, Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut (250 110), India

**Corresponding author*

Keywords

Cucumber, Yield traits, GA_3, NAA and Pusa Uday

Article Info

Accepted:
05 February 2020
Available Online:
10 March 2020

A B S T R A C T

A field experiment was conducted to investigate the effect of different levels of GA_3 (10, 20 & 30 ppm), NAA (50, 100 & 150 ppm) and their combined dose (GA_3 20 ppm + NAA 100 ppm) on yield and yield traits of cucumber at experimental plot of Horticultural Research Centre, Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut during the summer season of 2014-15. The experiment was laid out in Randomized Block Design with three replications. The results revealed that combined dose of plant growth regulators (GA_3 20 ppm + NAA 100 ppm) recorded significantly maximum yield and attributing characters such as plant height, number of primary branches, number of female flowers, number of fruits per plant (10.34), fruit length and fruit width at five days, fruit yield per plant (2.27 kg), fruit yield per plot and fruit yield per hectare (173.60 q) with minimum sex ratio (1:65) as compared to individual application of growth regulators. Hence, the combined dose of plant growth regulators (GA_3 20 ppm + NAA 100 ppm) must be suggested for obtaining high yield of cucumber (var. Pusa Uday) under agro-climatic condition of western plain zone of Uttar Pradesh.

Introduction

Cucurbitaceous vegetable crops play a major contribution in vegetables production during all the seasons of growing. In context of cucurbitaceous vegetable, cucumber (*Cucumis sativus* L.) is a nutritious and delicious vegetable belongs to family cucurbitaceae and having chromosome number 2n= 14 (Decandole, 1999). It is the fourth most cultivated vegetable in the world and known to be one of the best foods for human's overall health. It referred as a super food. Cucumber fruits are extremely beneficial especially during the summer due to it has higher water content and important nutrients. However, the major obstacles in production include; sex form (monoecious) of cucumber (Dey *et al.*, 2005). However emergence of new generation agrochemicals such as plant growth regulator

are known to enhance the source-sink relationship and stimulate the translocation of photo- assimilates there by helping better fruit set. Gibberellic acid and NAA are the important growth regulators have many uses to modify the growth, yield and yield attributing characters of plant. Gibberellins mediate many responses in plants i.e., modify the growth, yield and yield contributing characters of plant (Rafeekher *et al*., 2002). Similarly, Auxin (NAA) stimulates cell division and cell elongation in apical region of plant resulting in better plant growth (Pandey and Sinha, 1996). Plant growth regulators such as auxin and gibberellin include many aspects of plant growth and development. Considering the importance of consuming nutritive rich vegetables and fruits in the daily diet, it was thought to investigate the influence of plant growth regulators for enhancing productivity potential in cucumber under agro-climatic condition of western plain zone of Uttar Pradesh.

Materials and Methods

The field experiments were carried out to evaluate the effect of plant growth regulators on yield and yield traits of cucumber at the Horticultural Research Centre, Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut, Uttar Pradesh during the growing period of 2014-15. The experiments were laid out in randomized complete block design with three replications, measuring a net plot size of 7.5 m^2. The healthy and disease free authentic seeds of cucumber variety 'Pusa Uday' were used for conducting experiments. Two seeds per pit were sown in recommended spacing of 1.25×0.60 m. The treatments were consisted of GA_3 (10, 20, 30 ppm), NAA (50, 100, 150 ppm), combined doses (GA3 20 ppm+ NAA 100 ppm) and control (water spray). The solutions were prepared from their respective stock solutions using distilled water. The bio-regulators were sprayed over the crop at two or four leaf stage according to treatments. The recommended dose of manure and fertilizers @ 15 tones FYM + 40: 50: 50 kg NPK/hectare was incorporated in experimental plots. The full dose of FYM was applied at the time of final preparation of field. The half dose of nitrogen, full dose of phosphorous and potash were supplied at the time of seed sowing and remaining half dose of nitrogen was applied before flowering. All other cultural operations were kept normal and uniform for all treatments as per package of practices recommended for this crop during the course of study. The observations were recorded by selecting five plants randomly from each plot. Experimental data was analyzed statistically with the analysis of variance at five percent probability level as per the statistical methods described by Gomez and Gomez (1996).

Results and Discussion

Effect of different levels of GA_3 and NAA on yield and yield attributing parameters in cucumber

The data regarding on yield and yield attributing parameters of cucumber *viz.*, plant height, number of primary branches per plant at final harvest, flowering parameters (number of female flowers and sex ratio) and fruit yield parameters (number of fruits per plant, fruit length and fruit width at five days, fruit yield per plant, fruit yield per plot and fruit yield per hectare) were significantly influenced by individual effect of GA_3, NAA and their combined doses during course of study (Table 1).

The response of different plant growth regulators (GA_3, and NAA) and their combined dose on vine length differed significantly in the experimental year (Table 1). The longest main vine length (155.28) at final harvest stage was recorded with

combined dose of growth regulators (GA_3 20 ppm + NAA 100 ppm) followed by GA_3 30 ppm, (153.02) and GA_3 20 ppm (151.48). Maximum vine length in combined dose of plant growth regulators (GA_3 20 ppm + NAA 100 ppm) might be due to their stimulatory effect on plant height by cell elongation and rapid cell division in apical parts of plant Sargent (2000) and Vadigeri *et al.,* (2001) in cucumber. Similarly, maximum number of primary branches was recorded with the application of GA_3 20 ppm + NAA 100 ppm but it was statistically on par with 30 ppm GA_3 (4.41) whereas, the lowest vine length (138.08) and minimum number of primary branches (2.41) were observed in control during the course of investigation. The significant result might be due to antimitotic action of GA_3 and NAA as a result of more number of primary branches on main branches of cucumber. These findings are in the conformity with the earlier findings of Rafeekher *et al.,* (2001) in cucumber and Chovatia *et al.,* (2010) in bitter gourd.

Flowering parameters such as female flowers per plant and sex ratio are one of the most important factors; decide the net production potential of the crops which were significantly influenced by various doses of GA_3, NAA and their combined application during the course of investigation. Plant growth regulators applied in combined dose (GA_3 20 ppm + NAA 100 ppm) recorded more number of female flowers (27.70) per plant which might be due to the fact that they are known to increase the metabolization and also reduce sugar thereby bringing a change in the membrane permeability. These results are in conformity with Dixit *et al.,* (2001) in watermelon. Similarly, plant growth regulators applied with combined dose (GA_3 20 ppm + NAA 100) had resulted minimum sex ratio (1.65) followed by $GA_3$10 ppm (1.77) and GA_3 20 ppm (1.87) whereas maximum sex ratio was observed in control plants during the course of investigation. The narrower sex ratio by the combined application of NAA and GA_3 is possibly due to the fact that these substances are reported to increase functional female organs and compatibility besides reducing the embryo abortion in plants. Similar results were obtained earlier by Jennifer and Carol, (2007) in long melon.

Number of fruits per plant of cucumber var. 'Pusa Uday' was significantly influenced by foliar application of plant growth regulators and their combined dose during the year of the experiment (Table 1). Overall, increasing trend of NAA doses and decreasing trend of GA_3 doses gave higher number of fruits per plant whereas, highest number of fruits was obtained with their combined doses (GA_3 20 ppm + NAA 100). Among the treatments, the maximum number of fruits per plant (10.34) was recorded with combination (GA_3 20 ppm + NAA 100) followed by GA_3 10 ppm (9.91) and GA_3 20 ppm (8.62) while, the control plants had minimum number of fruits per plant. This might be due to the fact that they increase the metabolic activity of plant, which resulted in enhancement of reproductive phase in cucumber. These results are similar with the findings of Hossain *et al.,* (2006) in bitter gourd.

Fruit length and width at five days recorded in treated plants was significantly affected due to foliar application of plant growth regulators and their combination in comparison to control (Table 1). The increasing trend pertaining to fruit length was recorded with NAA up to 150 ppm, whereas decreasing trend applied to GA_3 and highest fruit length obtained by their combined doses. The plants sprayed with (GA_3 20 ppm + NAA 100) had fruits of maximum length (15.58 cm) and width (5.17 cm) at five days, but fruit width was atpar with GA_3 10 ppm (5.15 cm) whereas, control plants had minimum fruit length and width at five days during the experimentation.

Table.1 Effect of different levels of GA_3 and NAA on yield and yield attributing parameters in cucumber

Treatment	Plant height (cm)	Number of primary branches	Number of female flowers	Sex ratio	Number of fruits	Fruit length (cm) at five days	Fruit width (cm) at five days	Fruit yield per plant (kg)	Fruit yield per plot (kg)	Fruit yield per hectare (q)
GA_3 10 ppm	150.34	3.91	26.59	1:77	9.91	15.47	5.15	2.15	21.53	168.20
GA_3 20 ppm	151.48	4.16	26.26	1:87	8.62	15.35	5.12	1.85	18.50	165.66
GA_3 30 ppm	153.02	4.41	24.21	3:81	6.35	14.97	4.91	1.34	13.40	155.63
NAA 50 ppm	147.94	3.50	25.28	3:06	6.82	15.13	4.95	1.44	14.46	158.70
NAA 100 ppm	146.65	3.25	25.61	2:85	7.14	15.16	5.02	1.52	15.20	161.70
NAA 150 ppm	144.61	3.00	25.85	2:26	7.92	15.28	5.09	1.69	16.93	163.66
GA_3 20 + NAA 100 ppm	155.28	4.66	27.70	1:65	10.34	15.58	5.17	2.27	22.76	173.60
Control	138.08	2.41	19.31	5:49	5.25	14.89	4.58	1.09	10.96	150.53
S.E.m ±	0.36	0.12	0.08	0.04	0.05	0.01	0.01	0.12	0.12	2.17
C.D. 5 %	1.11	0.37	0.26	0.13	0.17	0.05	0.03	0.37	0.38	7.76

The maximum fruit length and width may be owing to the enlargement of cells. The elongation of cells of the fruit by auxins is diametric leading to the simultaneous increase in fruit diameter in bottle gourd. Similar result also observed by Dostogir *et al*., 2006 in bitter gourd.

The effect of various doses of GA_3, NAA and their combination on fruit yield per plant, fruit yield per plot and fruit yield per hectare were recognized significant manner during the course of study (Table 1). Apparently, as the GA_3 doses decreased up to 10 ppm, the weight of fruit decreased. Moreover, the increment of NAA doses up to 150 ppm increased the fruit weight and their optimum doses gave better result in terms of fruit yield of cucumber. The highest fruit yield per plant (2.27 kg) practically examined under the treatment of GA_3 20 ppm + NAA 100 followed by GA_3 10 ppm (2.15 kg) and GA_3 20 ppm (1.85 kg). Similar to fruit yield per plant, the highest fruit yield per plot (22.76 kg) was measured, under the treatment (GA_3 20 ppm + NAA 100 ppm) followed by $GA_3$10 ppm (21.53 kg) and GA_3 20 ppm (18.50 kg). In case of fruit yield per hectare, the admirable increase in yield was noted in lowest dose of GA_3 and each increase in the dose of NAA gave higher yield, whereas, their optimum doses (GA_3 20 ppm + NAA 100) gave a tremendous increase in yield in cucumber followed by $GA_3$10 ppm (168.20 q) and GA_3 20 ppm (165.66 q), whereas control plants gave minimum fruit yield (150.53 q) per hectare during the cropping period. An increase in fruit yield in treated plants may be attributed to the reason that plants remain physiologically more active to build up sufficient source for the developing female flowers and fruits, ultimately leading to higher fruit yield in cucumber. These results confirmed the finding of Imamsaheb and Hanchimani (2014) in bitter gourd.

On the basis of a comprehensive study, it was concluded that the combined dose of plant growth regulators (GA_3 20 ppm+ NAA 100 ppm) was found to be superior in terms of yield and yield attributing characters of cucumber in profitable manner. Therefore, the combined dose of (GA_3 20 ppm+ NAA 100 ppm) was suggested for agro-climatic condition of western plain zone of Uttar Pradesh.

References

Chovatia, R. S., Ahlawat, T. R., Kavathia, Y. A., Jivani, L. L. and Kaila, D. C., 2010. Effect of plant growth regulators on vegetative, flowering and yield of bitter gourd cv. Priya. *Ind. J. Hort*., 67: 254-256.

De Candole, A., 1999. Origin of Cultivated Plants. Hafnar Publishing Co., New York. 264 pp.

Dey, S. S., Batters, T. K., Pal, A. and Munshi, A. D., 2005. Correlation and path coefficient analysis in bitter gourd (*Momordica charantia* L.). *Veg. Sci.*, 32: 173-176.

Dixit, A., Rai, N. and Kumar, V., 2001. Effect of plant growth regulators on growth, earliness and sex ratio in Watermelon under Chhatisgarh region. *Ind. J. Agric. Res*., 35: 173- 176.

Dostogir, H., Karim, A., Habibur, R. M., Pramanik, M. and Syedur, A. A. M., 2006. Effect of gibberellic acid (GA_3) on flowering and fruit development of bitter gourd (*Momordica charantia* L.). *Int. J. Bot.,* 2 (3): 329-332.

Gomez, A. K. and Gomez, A. A., 1996. Statistical procedure for Agriculture Research. John *Willey and sons Pnc*, New York.

Hossain, D., Karin, M. A., Pramani, M. H. R. and Rehman, A. A. S., 2006. Effect of foliar application of IAA and GA_3 on sex expression, yield attributes and

yield of bitter gourd (*Momordica charantia* L.). *The Chittagong University. J. Bio. Sci.*, 5: 55-62.

Imamsaheb, S. J. and Hanchinmani, C. N., 2014. Effect of different levels of fertilizers and growth regulator on growth, yield and economic of bitter gourd under north eastern transition zone. *Plant Archives*, 14(2): 871-874.

Jennifer, J. W. and Carol, G., 2007. Timing of self-compatibility, flower longevity, and potential for male outcross success in Long melon. *East Carolina University, Department of Biology, Greenville, North Carolina* 27858 USA.

Pandey, S. N. and Sinha, B. K., 1996. Plant Physiology. *Vikas Publishing House, New Delhi*. pp: 432-436.

Rafeekher, M., Gondane, S. U., Goramnagar, H. B., Murkute, A. A., Chandhari, D.U. and Patil, R. R., 2001. Hormonal regulation of growth, sex expression and yield of cucumber in Kharif Season. *J. Soils and Crops.* 11 (1): 95-98.

Sargent, J. A., 2000. The penetration of growth regulators into leaves. *Ann. Rev. Pl. Physiol.*, 16: 1-12.

Vedigeri, B. G., Madalgeri, B. B. and Sheelavantar, M. N., 2001. Effect of ethrel and gibberellic acid on yield and quality of two cucumber varieties. *Karnataka J. Agric. Sci.*, 14 (3): 727-730.

How to cite this article:

Samapika Dalai, Manoj Kumar Singh and Shweta Soni. 2020. Yield and Yield Traits of Cucumber (*Cucumis sativus* L.) as Influenced by Foliar Application of Plant Growth Regulators. *Int.J.Curr.Microbiol.App.Sci.* 9(03): 121-126.
doi: https://doi.org/10.20546/ijcmas.2020.903.015