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Barot DC
College of Horticulture,
S.D. Agricultural University,
Jagudan, Gujarat, India

Yogesh Pawar
Krishi Vigyan Kendra,
S. D. Agricultural University,
Deesa, Gujarat, India

Nadoda Nisha A
College of Horticulture,
S.D. Agricultural University,
Jagudan, Gujarat, India

Chaudhari Vishal M
Aspee College of Horticulture,
Navsari Agricultural University,
Navsari, Gujarat, India

Corresponding Author:
Yogesh Pawar
Krishi Vigyan Kendra,
S. D. Agricultural University,
Deesa, Gujarat, India

Response of bottle gourd (*Lagenaria siceraria* (Mol.) Standl.) to foliar application of plant growth regulators

Barot DC, Yogesh Pawar, Nadoda Nisha A and Chaudhari Vishal M

Abstract
The present investigation entitled "Response of bottle gourd (*Lagenaria siceraria* (Mol.) Standl.) to foliar application of plant growth regulators" was carried out at College Farm, College of Horticulture, Sardarkrushinagar Dantiwada Agricultural University, Jagudan during Summer- 2020. Experiment was laid out in randomized block design with three replications. Total ten treatments were evaluated in the present study *viz.* T_1: Control (Water spray), T_2: NAA @ 50 ppm, T_3: NAA @ 75 ppm, T_4: NAA @ 100 ppm, T_5: GA_3 @ 20 ppm, T_6: GA_3 @ 40 ppm, T_7: GA_3 @ 60 ppm, T_8: Ethrel @ 100 ppm, T_9: Ethrel @ 200 ppm and T_{10}: Ethrel @ 300 ppm. The results of the present study revealed that, significantly highest number of fruits per vine (11.70), number of pickings (8.37), fruit yield per vine (4.94 kg), fruit yield per plot (57.17 kg), fruit yield per ha (439.02 q) recorded with treatment T_{10} (Ethrel @ 300 ppm). In light of the results obtained in the present investigation, it is concluded that foliar application of Ethrel @ 300 ppm at 2-4 leaf stage was found best for getting higher yield with better quality and maximum net return of bottle gourd.

Keywords: Ethrel, GA, NAA, PGR, bottle gourd

Introduction
Vegetable growing is the most remunerative enterprise as it is adopted on small and marginal holding with high production in short duration. Being a source of farm income, it creates impact on the agricultural development and economy of country. Vegetables are cheaper source of minerals, vitamins and with high caloric values. There is an increasing demand of vegetables both for domestic as well as for export, which can valuable foreign exchanges for India.

A Cucurbitaceous vegetable is one of the largest group in vegetable kingdom consisting of large edible species. Among gourds, bottle gourd [*Lagenaria siceraria* (Mol.) Standl. 2n = 2x = 22] commonly known as lauki, kadu, ghiya or doodhi is grown extensively in India which might have originated in Tropical Africa. It is a photo-insensitive crop but sensitive to thermoperiodism. The name bottle gourd is due to bottle like shape of fruit and its use as a container in the past. Fruits at tender stage are used as a cooked vegetable and for preparation of sweets and pickles. Hard shells of mature fruits are used as water jugs, domestic utensils, floats for fishing nets, musical instruments *etc.* Bottle gourd is a vegetable high on water and is a rich source of vitamin C, K and Calcium. It helps in maintaining a healthy heart and brings down bad cholesterol levels. The juice is also beneficial for diabetic patients as it stabilizes the blood sugar level and maintains blood pressure.

The yield of cucurbits depends to a great extent on sex expression and sex ratio. Early nodes bear male flowers with higher number, where pistillate flowers are found in later nodes. These mechanisms are responsible for delayed harvesting as well as yield reduction. The problem can be overcome by exogenous application of PGRs. It directly affects male and female flower ratio, fruit set, fruit drop and ultimately yield. Therefore, the use of PGRs like NAA, Ethrel and GA_3 in bottle gourd may become an important tool for yield increment as well as timely harvest (Kumari *et al.*, 2019) [6].

Plant growth regulators has important role in various physiological and biochemical process in plant is well known to have an effect on producing of early flowering, yield, ratio of male: female flower, fruit setting and weight of fruits. Initiation of flower bud, development of flower and fruits are controlled by physiological process. In many agricultural plants, these processes can often be used to alter by proper application of plant growth substances. Exogenous application of growth regulators has shifted the sex expression by increasing the production of female flower and suppressing that of male flower in cucurbits (Farhana, 2015)

[4]. In view of that, present investigation entitled "Response of bottle gourd (*Lagenaria siceraria* (Mol.) Standl.) to foliar application of plant growth regulators" was planned and carried out during Summer-2020.

Material and Methods

A field experiment was conducted during the summer season of 2020 under field condition at College farm, College of Horticulture, Sardarkrushinagar Dantiwada Agricultural University, Jagudan, Dist. Mehsana, Gujarat, India. The present investigation was carried out with popular and high yielding variety of bottle gourd cv. "Anand Bottle Gourd 1" released by Anand Agricultural University, Anand during the year of 2005. This variety fruits are long, tender, attractive light green in colour. The fruits are slightly rounded at stem as well as blossom end with fine luster. Experiment was laid out in Randomized Block Design with three replications. The recommended dose of fertilizers were applied @100:50:50 N:P:K kg/ha. The inter row spacing of 1.5 m and intra row spacing of 0.75 m were maintained.

Three PGRs *viz*., GA_3 (Gibberellic acid), NAA (Naphthalene acetic acid) and ethrel (2-chloroethyl phosphoric acid) were used for study. Sprays of each PGR at 2-4 true leaf stages with the Altogether 10 treatment made for the field trial. Total ten treatments were evaluated in the present study *viz*. T_1: Control (Water spray), T_2: NAA @ 50 ppm, T_3: NAA @ 75 ppm, T_4: NAA @ 100 ppm, T_5: GA_3 @ 20 ppm, T_6: GA_3 @ 40 ppm, T_7: GA_3 @ 60 ppm, T_8: Ethrel @ 100 ppm, T_9: Ethrel @ 200 ppm and T_{10}: Ethrel @ 300 ppm.

The plants were trained upward so that the main stem was allowed to climb to the overhead wire. Wires were fixed 1-2 feet above the ground up to the height of 5-6 feet with horizontal wires. Various cultural operations right from the beginning till the end of experimentation have been performed successfully as per recommendations. Randomly selected and labeled plants in each treatment were used for recording observations with respect to growth, flowering, yield and quality attributes. The data were analyzed statistically by adopting the standard procedures described by Panse and Sukhatme (1985) [9].

Results and Discussion

Yield and yield attributes:

The close evaluation of Table 1 revealed that significantly maximum number of fruits per vine (11.70) was observed with treatment T_{10} (Ethrel @ 300 ppm). This may be due to the fact that Ethrel suppressed the number of male flowers, promoted number of female flower and increase fruit set percent thereby, increased number of fruit per vine. The findings are in accordance with the findings of Mehdi *et al.* (2012) [7] and Nayak *et al.* (2018) [8] in cucumber.

Significantly maximum number of pickings obtained with application of Ethrel @ 300 ppm (T_{10}) *i.e.* 8.37. The maximum fruit yield per vine was recorded in treatment T_{10} (Ethrel @ 300 ppm) *i.e.* 4.94 kg. Probably the yield contributed by Ethrel might be due to an increased rate of photosynthetic activity, accelerated transport and efficient utilizing photosynthetic products (Das and Das, 1996) [3]. These findings corroborated the earlier reports of Ansari and Chaudhary (2018) [1] in bottle gourd and Jyoti *et al.* (2016) [5] in ridge gourd.

Maximum yield per plot was recorded with application of Ethrel @ 300 ppm (T_{10}) *i.e.* 57.17 kg. These results are in line with the findings of Ansari and Chaudhary (2018) [1] and Kumari *et al.* (2019) [6] in bottle gourd. The maximum fruit yield per hectare was recorded with treatment of Ethrel @ 300 ppm (T_{10}) *i.e.* 439.02 q ha^{-1}. The probable reason for increased fruit yield by Ethrel treatment may be due to increased fruit set percent, fruit weight, length and diameter of fruits ultimately produced the highest yield. Similar findings were obtained by Chaurasiya *et al.* (2016) [2] in muskmelon, Jyoti *et al.* (2016) [5] in ridge gourd, Nayak *et al.* (2018) [8] in cucumber, Ansari and Chaudhary (2018) [1] and Kumari *et al.* (2019) [6] in bottle gourd.

Quality parameters

The table 2 showed that the effect of PGRs on length of fruit, diameter of fruit, chlorophyll content a, b and total, TSS was found statistically non-significant but the numerically maximum length and diameter of fruit (cm) was recorded with application of Ethrel @ 300 ppm (T_{10}) *i.e.* 32.13 cm and 5.90 cm, respectively. The highest chlorophyll content (a, b and total) found with application of GA_3 @ 60 ppm (T_7) *i.e.* 92.35, 63.99 and 154.77 mg / 100 g, respectively. Ethrel @ 300 ppm (T_{10}) showed maximum total soluble solid in fruit (4.77).

Economics

Influence of plant growth regulators on net realization and benefit cost ratio for different treatments have been calculated and presented in Table 3 and they revealed that maximum gross return (₹ 4,39,020 ha^{-1}), net return (₹ 3,56,919 ha^{-1}) and BCR (5.34) was found under treatment T_{10} (Ethrel @ 300 ppm), whereas the minimum gross return (₹ 2,28,490 ha^{-1}), net return (₹ 1,47,012 ha^{-1}) and BCR (2.80) was found in Control (T_1).

Table 1: Effect of plant growth regulators on yield and yield attributes of bottle gourd

Treat. no.	Treatments	Number of fruits per vine	Number of pickings	Fruit yield per vine (kg)	Fruit yield per plot (kg)	Fruit yield (q ha^{-1})
T_1	Control (Water spray)	6.17	6.83	2.57	28.83	228.50
T_2	NAA @ 50 ppm	7.63	7.20	2.97	33.43	263.71
T_3	NAA @ 75 ppm	7.19	7.13	3.01	34.07	267.70
T_4	NAA @ 100 ppm	8.67	8.31	3.55	40.39	315.47
T_5	GA_3 @ 20 ppm	7.46	7.20	3.79	43.52	337.24
T_6	GA_3 @ 40 ppm	8.31	7.30	4.46	51.46	396.30
T_7	GA_3 @ 60 ppm	8.83	6.97	2.68	30.16	238.49
T_8	Ethrel @ 100 ppm	9.68	7.47	4.09	46.87	363.49
T_9	Ethrel @ 200 ppm	10.37	8.20	4.43	51.03	393.39
T_{10}	Ethrel @ 300 ppm	11.70	8.37	4.94	57.17	439.02
S.Em.±		0.62	0.29	0.24	2.89	21.45
C.D. at 5%		1.84	0.86	0.72	8.60	63.75
C.V.%		12.48	6.72	11.46	12.02	11.46

Table 2: Effect of plant growth regulators on quality parameters of bottle gourd

Treat. no.	Treatments	Length of fruit (cm)	Diameter of fruit (cm)	Chlorophyll a	Chlorophyll b	Total chlorophyll	TSS (°Brix)
T_1	Control (Water spray)	25.73	4.63	82.48	59.58	138.80	4.31
T_2	NAA @ 50 ppm	28.50	5.24	82.78	63.14	147.07	4.41
T_3	NAA @ 75 ppm	26.67	4.89	84.35	59.20	143.53	4.33
T_4	NAA @ 100 ppm	28.76	5.11	85.94	60.11	147.93	4.35
T_5	GA_3 @ 20 ppm	28.03	5.12	89.59	61.39	150.43	4.09
T_6	GA_3 @ 40 ppm	29.67	5.53	89.69	62.84	154.43	4.24
T_7	GA_3 @ 60 ppm	27.53	4.66	92.35	63.99	154.77	4.38
T_8	Ethrel @ 100 ppm	27.90	5.40	86.54	62.10	150.63	4.45
T_9	Ethrel @ 200 ppm	28.97	5.51	88.20	63.07	151.57	4.49
T_{10}	Ethrel @ 300 ppm	32.13	5.90	88.67	63.10	152.33	4.77
S.Em.±		1.18	0.39	2.17	2.02	3.83	0.15
C.D. at 5%		NS	NS	NS	NS	NS	NS
C.V.%		7.17	13.28	4.33	5.66	4.45	5.94

Table 3: Effect of plant growth regulators on economics

Treatment No.	Fruit yield (q ha^{-1})	Gross return ₹ ha^{-1}	Total cost of cultivation ₹ ha^{-1}	Net return ₹ ha^{-1}	Benefit Cost Ratio
T_1	228.50	228450	81438	147012	2.80
T_2	263.71	263710	81541	182169	3.23
T_3	267.70	267700	81593	186107	3.28
T_4	315.47	315470	81644	233826	3.86
T_5	337.24	337240	82014	255226	4.11
T_6	396.30	396300	82590	313710	4.79
T_7	238.49	238490	83166	155324	2.86
T_8	363.49	363490	81659	281831	4.45
T_9	393.39	393390	81880	311510	4.80
T_{10}	439.02	439020	82101	356919	5.34

Selling price of bottle gourd: ₹ 10.00 per kilogram.

Conclusion

In light of the results obtained in the present investigation, it is concluded that foliar application of Ethrel @ 300 ppm at 2-4 leaf stage was found best for getting higher yield with better quality and maximum net return of bottle gourd.

References

1. Ansari AM, Chowdhary BM. Effects of boron and plant growth regulators on bottle gourd (*Lagenaria siceraria* M.). J Pharmaco. Phytochem. 2018;SP1:202-206.
2. Chaurasiya J, Verma RB, Ahmad M, Adarsh A., Kumar R, Pratap T. Influence of plant growth regulators on growth, sex expression, yield and quality of muskmelon (*Cucumis melo* L.). Eco. Env. Conserv. 2016;22:39-43.
3. Das BC, Das TK. Studies on the response of GA_3, NAA and ethrel on vegetative growth and yield of pumpkin. Orissa J Hort. 1996;24(½):74-78.
4. Farhana U. Effect of plant growth regulators on flowering behaviour and of Cucumber. M.Sc. (Agri. Botany), Thesis (Unpublished). Sher- Bangla Agricultural University, Dhaka. 2015.
5. 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) L.]. J Appl. Natural Sci. 2016;8(3):1551-1555.
6. Kumari KK, Kumar R, Singh VK. Effect of plant growth regulators on growth and yield of bottle gourd (*Lagenaria siceraria* L.). Inter. J Current Micro. Appl. Sci. 2019;8(7):1881-1885.
7. Mehdi MN, Ahmed N, Jabeen, Afroza B. Effect of different concentration of ethrel on growth, flowering behaviour and yield of cucumber (*Cucumis sativus* L.) under greenhouse conditions. Asian J Horti. 2012;7(2):579-581.
8. Nayak SR, Parmar VK, Patel AN, Suchismita J, Lathiya JB, Tandel YN. Efficacy of pinching and plant growth regulators in enhancing yield characters of cucumber (*Cucumis sativus* L.). Int. J Chem. Stud. 2018;6(1):1804-1807.
9. Panse VG, Sukhatme PV. Statistical methods for Agricultural workers. Indian Council of Agricultural Research Publication, New Delhi. 1985, 381.
10. Pawar V, Meena MK, Jadia M, Basediya SS. Study of influence of plant growth regulators on yield attributing characters in cucumber. Int. J Pure Appl. Bio. 2019;7(3):318-324.
11. Thappa MS, Kumar, Rafiq R. Influence of plant growth regulators on morphological, floral and yield traits of cucumber (*Cucumis sativus* L.). Kasetsar Journal of Nat. Sci. 2011;45:177-188.