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Effect of salicylic acid, 2, 4- dichlorophenoxyacetic acid and Gibberellic acid on yield and economics of Cape gooseberry (*Physalis peruviana* L.)

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Abstract
The present experiment was conducted at the field of Horticulture Research Farm, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, during the period from October 2020 to March 2021. The experiment was laid out in randomized block design and coprised Ten treatment *viz*; Salicylic acid (20, 40 and 60 ppm), 2,4-D (4, 8 and 12 ppm), GA_3 (20, 40 and 60 ppm) and control which were replicated thrice. From the result it was observed that GA_3 @ 60 ppm proved to be most effective treatment to enhance yield parameters like number of fruit per plant (108), average fruit weight with husk and without husk (11.8g and 10.9g) polar diameter with husk and without husk (4 mm and 2.7 mm), radial diameter with husk and without husk (3.53 mm and 2.67 mm), and yield (1274.9g and 123.65 q/ha). The maximum gross return, net return and benefit cost ratio (1: 6.13) also recorded in GA_3 @ 60 ppm under Prayagraj agro-climatic condition.

Keywords: Cape gooseberry, Salicylic acid, 2,4-D, Gibberellic acid

1. Introduction
Cape gooseberry (*Physalis peruviana* L.) belonging to family Solanaceae, is grouped under minor underexploited fruit crops of the world. It is grown very well under temperate, tropical and sub-tropical climatic conditions. Cape gooseberry is known by different name in different parts of world commonly as Poha, Tepari, Golden berry, Husk berry. Amongst all only three spp. namely; *Physalis peruviana* L; *P. pubescens* L. and *Physalis ixocarpa* Brot. have been recognized as eatable fruit bearing species. The *Physalis peruviana* is considered to be the best with respect to taste, precocity and yield (Gupta and Roy, 1980) [2]. Fruits are yellow-orange berries, 1 to 3.5 cm in diameter, very juicy aromatic and with a particular bitter-sweet flavour. They are enclosed by the larger crescent papery epicalyx (Chattopadhyay, 1996), which gives them the shape of a bladder. The cape gooseberry deserves special attention particularly due to its availability in lean period (March- April), wide adaptability, quick growing in nature, high productivity, non-perennial occupation of land and delicious fruit with pleasing acetic taste (Prasad *et al*., 1985) [7]. The fruit is rich in vitamins A (3,000 I.U.), C and B complex namely (thiamine, niacin, and vitamin B 12). It also contains higher amount of vitamin C than orange and is good source of dietary fiber. Many medicinal properties have been attributed to cape gooseberry, including anti asthmatic, antiseptic and strengthener for the optic nerve, treatment of throat infections and elimination of intestinal parasites, amoebas as well as albumin from kidneys. It has an anti-ulcer activity and is effective in reducing cholesterol level (Mayorga *et al.*, 2001) [5].

2. Material and Methods
The details of the materials used, experimental procedures followed and methodology adopted during the course of investigation have been presented below:

2.1 Experimental site
The present research work entitled "Effect of Salicylic acid, 2,4- dichlorophenoxyacetic acid and Gibberellic acid on growth, yield and quality of cape gooseberry (*Physalis peruviana* L.)" was conducted at the field of horticulture Research Farm, Department of horticulture, Naini agricultural institute, Sam Higginbottom University of agriculture, technology and sciences, Prayagraj, during the period from October 2020 to March 2021.

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. The maximum temperature of the location reaches up to 46 ºC – 48 ºC and seldom falls as low as 4 ºC – 5 ºC. The relative humidity ranged between 20 – 94 percent. The average rainfall in this area is around 1013.4 mm annually with maximum concentration during July to September months with occasional showers in winters.

2.2 Treatments details

Treatments	Treatment Combination
T_0	Control (Water spray)
T_1	SA @ 20 ppm
T_2	SA @ 40 ppm
T_3	SA @ 60 ppm
T_4	2,4-D @ 4 ppm
T_5	2,4-D @ 8 ppm
T_6	2,4-D @ 12 ppm
T_7	GA_3 @ 20 ppm
T_8	GA_3 @ 40 ppm
T_9	GA_3 @ 60 ppm

3. Result and Discussion

3.1 Yield parameters

The value revealed that T_9 (GA_3 @ 60 ppm) had recorded significantly higher no of fruit (108) followed by T_8 -GA_3 @ 40 ppm (102.78) as compared to other treatment. Whereas control recorded (93.78) minimum no of fruit per plant. GA_3 showed best result because of it promotes fruit set and less fruit drop. Fruiting in cape gooseberry is maintained by optimum concentration of growth regulators with sufficient carbohydrates reserve and it becomes more active with food reserve resulting increasinged number of fruit. This result was close agreement with Udden *et al*., (2009) [11] on tomato and Kaur *et al*., (2013) [3, 4] on cape gooseberry.

Lowest concentration of 2,4-D @ 4 ppm significantly showed maximum number of fruit than its higher concentrations. 2,4-D has herbicidal effect on plant and its higher concentration caused flower bud abcission which leads flower drop resulting less no of fruit per plant. Tiwari and Singh (2014) [9] and Pundhir and Yadav (2001) [6] on tomato.

The best result pertaining to average fruit weight with husk was observed significantly at T_9 (GA_3 @ 60 ppm) followed by T_8 (GA_3 @ 40 ppm) *viz*., 11.8 g and 11.07 respectively, and for the without husk T_9 (GA_3 @ 60 ppm) was recorded significantly highest average fruit weight (10.9 g) followed by T_8 (10.3 g) as compare to other treatments. The minimum average fruit weight in relation to with husk (7.4) and without husk (6.67) was observed with T_0 (control). The beneficial effect of GA_3 chemical on fruit weight may be explained that sole function of fertilized ovules or seeds in relation to growth of fruits is to synthesis one or more hormones which initiate and maintain a metabolic gradient along which foods can be transported from other parts of the plants towards the fruit. This findings is close confirmly with Kaur *et al*. (2013) [3, 4] and Tohamy *et al*., (2012) [10] on Cape goose berry.

The maximum polar diameter of cape gooseberry fruit with husk was released significantly under T_9 (4.23 cm) followed by T_8 (4 cm) and T_3 (3.9 cm) and the maximum polar diameter of cape gooseberry fruit without husk was released significantly under T_9 (2.4 cm) followed by T_8 (2.27 cm), T_3 (2.2 cm), T_7 (2.1 cm). The minimum polar diameter in relation to with husk (2.77 cm) and without husk (1.6 cm) was observed with T_0 (control).

The maximum radial diameter of cape gooseberry fruit with husk was released significantly under T_9 (3.53 cm) followed by T_8 (3.4 cm) and T_3 (3.33 cm). The maximum diameter of cape gooseberry fruit without husk was released significantly under T_9 (2.67 cm) followed by T_8 (2.5 cm). The minimum polar diameter in relation to with husk (2.33 cm) and without husk (1.87 cm) was observed with T_0 (control). Various concentration of growth regulators presented significantly greater fruit diameter over control.

Larger size of fruits was due to an increase in cell division and cell elongation by vacuoles enlargement, cell loosening and also due to enhanced metabolic activities. GA_3 accumilates carbohydrates reserve which bowing maximum photosynthesis resulting increase in diameter of fruits. Uddain *et al*., (2009) on tomato and Kaur *et al*., (2013) [3, 4].

Result signified that The highest fruit yield (g/plant) was observed in T_9 (1274.9 g) followed by T_8 (1137.63 g) while T_0 (control) reported lowest fruit yield per plant (485.27 g.). 646.99 g/plant fruit yield recorded under T_4 (2,4-D @ 4 ppm) which was maximum over its higher concentration.

Data presented in Table 2. showed that the maximum fruit yield (q/ha) was significantly obtained in T_9 (123.65 q/ha) followed by T_8 (115.91 q/ha), T_7 (103.49 q/ha) and T_3 (100.25 q/ha) over control. whereas minimum yield (51.22) was estimated under T_0 (control). Different concentration of GA_3 greatly influenced fruit yield than other PGRs. on the other hand, lesser yield was expressed under non treated plants of cape gooseberry.

Appropriate reason for maximum yield in higher concentration of GA_3 was due to it leads less flower drop cause maximum number of fruit, average fruit weight and also enhanced fruit size. GA_3 application promotes enlargement of overy and it enhanced translocation and mobilization of photosynthesis which leads food supply for developing fruit from source to sink. And resulted in increased fruit set, which led to higher yield. Uddain *et al*., (2009) on tomato, Singh *et al*., (2018) **[8]**, Kaur *et al*., (2013) [3, 4] and Tohamy *et al*., (2002) [10] on cape gooseberry.

3.2 Economics parameters

Data in respect of cost of cultivation, gross return, net return and B:C ratio of cape goose berry was influenced by plant growth regulators are presented in Table 3. The maximum cost of cultivation with treatment cost (Rs. 80620), Gross return (Rs. 494600), Net return (Rs. 413980) and benefit cost ratio (6.13) is observed in T_9 (GA_3 @ 60 ppm). The minimum gross return, net return and benefit cost ratio was observed under not treated plant (control).

Table 1: Effect of Salicylic acid, 2,4- dichlorophenoxyacetic acid and Gibberellic acid on number of fruit/plant and polar and radial diameter (with husk and without husk in cm) of cape gooseberry

Treatment symbols	Treatments	No of fruit/plant	Polar diameter (mm)		Radial diameter (mm)	
			With husk	Without husk	With husk	Without husk
T_0	Control (Water spray)	65.33	2.77	1.6	2.33	1.86
T_1	SA @ 20 ppm	89	3.23	1.97	2.73	2.23

T_2	SA @ 40 ppm	92.33	3.73	2	3.27	2.36
T_3	SA @ 60 ppm	94	3.9	2.2	3.33	2.57
T_4	2,4-D @ 4 ppm	77.33	3.5	1.9	3.07	2.4
T_5	2,4-D @ 8 ppm	73	3.57	1.97	3.17	2.2
T_6	2,4-D @ 12 ppm	71.44	3	1.8	2.56	2.03
T_7	GA_3 @ 20 ppm	100.22	3.8	2.1	3.3	2.47
T_8	GA_3 @ 40 ppm	102.78	4	2.27	3.4	2.5
T_9	GA_3 @ 60 ppm	108	4.23	2.4	3.53	2.67
F - Test		S	S	S	S	S

Table 2: Effect of Salicylic acid, 2,4- dichlorophenoxyacetic acid and Gibberellic acid on average fruit weight (in gm) and fruit yield (g/plant and q/ha) of cape gooseberry

Treatment symbols	Treatments	Average fruit weight (g)		Fruit yield (g/plant)	Fruit yield (q/ha)
		With husk	Without husk		
T_0	Control (Water spray)	7.4	6.67	485.27	51.22
T_1	SA @ 20 ppm	9.2	8.5	819.09	83.00
T_2	SA @ 40 ppm	9.67	9.03	892.76	91.41
T_3	SA @ 60 ppm	10.6	9.9	996.58	100.25
T_4	2,4-D @ 4 ppm	8.37	7.57	646.99	67.35
T_5	2,4-D @ 8 ppm	8.7	8.13	634.98	65.09
T_6	2,4-D @ 12 ppm	7.93	7.23	567.22	58.34
T_7	GA_3 @ 20 ppm	10.17	9.53	1019.29	103.49
T_8	GA_3 @ 40 ppm	11.07	10.3	1137.63	115.91
T_9	GA_3 @ 60 ppm	11.8	10.9	1274.9	123.65
F – Test		S	S	S	S

Table 3: Effect of Salicylic acid, 2,4- dichlorophenoxyacetic acid and Gibberellic acid on gross return, net return and benefit cost ratio of cape gooseberry

Treatment symbols	Treatments	Gross return (Rs/ha)	Net income (Rs ha^{-1})	B:C ratio
T_0	Control (Water spray)	204880	130740	2.76
T_1	SA @ 20 ppm	332000	255330	4.33
T_2	SA @ 40 ppm	365640	286440	4.62
T_3	SA @ 60 ppm	401000	319260	4.91
T_4	2,4-D @ 4 ppm	269400	194900	3.62
T_5	2,4-D @ 8 ppm	260360	185520	3.48
T_6	2,4-D @ 12 ppm	233360	158140	3.11
T_7	GA_3 @ 20 ppm	413960	337660	5.43
T_8	GA_3 @ 40 ppm	463640	385180	5.90
T_9	GA_3 @ 60 ppm	494600	413980	6.13

4. Conclusion

From the present investigation it is concluded that gibberelic acid effective to increase yield in cape gooseberry. On the basis of above findings GA3 @ 60 ppm improved number of fruit per plant, polar and radial diameter, average fruit weight and yield and was followed by T_8 GA_3 @ 60 ppm. In term of maximum gross return, net return and benefit cost ratio GA_3 @ 60 ppm was found best among all treatments. For qualitative and improved yield GA_3 @ 60 ppm to be optimum recomondation.

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6. Conflict of Interest

As a corresponding Author, I Amit Mishra, confirms that none of the others have any conflicts of interest associated with this publication.

7. References

1. Gelmesa D, Abebie B, Desalegn L. Effects of Gibberellic acid and 2,4-dichlorophenoxyacetic acid spray on fruit yield and quality of tomato (*Lycopersicon esculentum* Mill.). Journal of Plant Breeding and Crop Science 2018;2(10):316-324.
2. Gupta SK, Roy SK. Multipurpose cape gooseberry. Indian J Hort 1980;24(4):11.
3. Kaur, Gurpinder, Kaur, Arvind Preet, Singh, Bikramjit, *et al*. Effect of plant growth regulators on fruit quality of cape gooseberry (*Physalis peruviana* L.) cv. ALIGARH. Internat. J agric. Sci 2013;9(2):633-635.
4. Kaur G, Kaur A. Plant growth and fruit yield attributes of cape gooseberry cv. Aligarh as affected by the use of different growth regulators. Agric. Sci. Digest 2016;36(2):138-141.
5. Mayorga H, Knapp H, Winterhalter P, Duque C. Glycosidically bound flavor compounds of cape gooseberry (*Physalis peruviana* L.). J Agri. Food Chem. 2001;49:1904-1908.
6. Pundir JPS, Yadav PK. Note on effect of GA3 NAA and 2, 4-D on growth, yield and quality of tomato var. Punjab Chhuhara. Current Agri 2001;25:137-138.
7. Prasad ID, Sengupta BN, Singh RK, Singh SP. Haryana journal of Horticultural Sciences 1985;44(3-4):151-155.
8. Singh RK, Bahadur V, Patidar A. Effect of plant growth regulators on growth, yield and quality of cape goose

berry (*Physalis peruviana* L.). International Journal of Chemical Studies 2018;6(4):2033-2036
9. Tiwari AK, Singh DK. Use of Plant Growth Regulators in Tomato (*Solanum lycopersicum* L.) under Tarai Conditions of Uttarakhand. Indian Journal of Hill Farming 2014;27(2):38-40.
10. Tohamy EI, WA HM, El-Abagy, Badr MA, Ghoname AA, Abou-Hussein SD. Improvement of productivity and quality of Cape gooseberry (*Physalis peruviana* L.) by foliar application of some chemical substances. Journal of Applied Science Research 2012;8(4):2366- 2370.
11. Udden J, Hossain KMA, Mostafa MG, Rahman MJ. Effect different plant growth regulators on growth and yield of tomato. International Journal of Sustainable Agriculture 2009;1(3):58-63.