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ROLE OF PLANT GROWTH REGULATORS IN ENHANCING GROWTH PERFORMANCE OF POTTED SYNGONIUM

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ABSTRACT

The present investigation entitled "Role of Plant Growth Regulators in Enhancing Growth Performance of Potted Syngonium" was carried out at PG Research Block, College of Horticulture, Rajendranagar, SKLTGHU during 2023 and 2024. The experiment was laid out in completely randomized design with three replicates, The results showed that during both the years and pooled, the growth parameters *viz*., plant height (cm) (49.11, 50.75, 49.93), number of leaves/plant (31.33, 31.67, 31.50), leaf length (cm) (22.68, 22.48, 22.58), leaf width (cm) (12.42, 12.35, 12.39), plant spread East-West (cm) (38.46, 38.13, 38.30), plant spread North-South (cm) (36.80, 37.27, 37.03) was recorded in T_4: Salicylic acid 200 ppm. The maximum leaf area (cm^2) (1427.33, 1422.33, 1427.83), fresh weight of leaf (g) (2.07, 1.95, 2.01), dry weight of leaf (g) (0.25, 0.23, 0.24), plant biomass (g) (9.51, 9.53, 9.52), root length (cm) (40.21, 39.28, 39.74) and number of roots per plant (22.67, 22.87, 22.77) was recorded in T_4: Salicylic acid 200 ppm.

Key words : Salicylic acid, Benzyladenine, Gibberellic acid.

Introduction

Foliage plants are typically grown for their attractive foliage and used for indoor landscaping of houses, offices, commercial complexes, hotels, malls and other sites for various functions as they enhance the aesthetic view and create a stress-free atmosphere indoors. The demand for indoor plants with air purifying properties had increased, mainly after Covid-19 pandemic. Syngonium (*Syngonium podophyllum* Schott.) is an attractive potted plant adaptable to diverse conditions. This plant belongs to the Araceae family and is native to Africa and South America. It is known for its simple, sagging leaves. The attractive foliage makes it a potential merchandise plant in the international market. Attractive leaves and compact growth habit is the basic requirement of finished ornamental foliage plant for its marketability. Growth regulators can help enhance the appeal and growth of foliage plants.

Materials and Methods

The experiment was conducted to study the influence of plant growth regulators on growth of potted Syngonium and was laid out in completely randomized design with nine treatments and three replicates during 2023 and 2024. The treatment details include T_1: Benzyladenine 150 ppm, T_2: Benzyladenine 250 ppm, T_3: Salicylic acid 100 ppm, T_4: Salicylic acid 200 ppm, T_5: Gibberellic acid (GA_3) 150 ppm, T_6: Gibberellic acid (GA_3) 250 ppm, T_7: Ascorbic acid 100 ppm, T_8: Ascorbic acid 200 ppm, T_9: Water spray (control) and the Spraying of growth regulators was done twice at 45 and 90 days after planting. The Standard media used for the experiment was cocopeat: sand: vermicompost: 2:1:1 V/V. The following observations was recorded.

Plant height (cm)

Plant height was measured at 45, 90 and 135 days

after planting. The readings were taken for five tagged plants per treatment per replication and the mean was calculated. The height was recorded up to the tip of the longest leaf with the help of a standard meter scale and expressed in centimeters.

Number of leaves per plant

The number of leaves were counted at 45, 90 and 135 days after planting. The readings were taken for five tagged plants per treatment per replication and averages were done.

Leaf length (cm)

The length of mature leaf was measured at 45, 90 and 135 days after planting by taking average of five leaves per each plant. The length was recorded from the basal lobe to the tip with the help of standard meter scale and expressed in centimeters.

Leaf width (cm)

The width of mature leaf was measured at 45, 90 and 135 days after planting by taking average of five leaves per each plant. The width of the middle portion of the fully mature leaves was taken with the help of standard meter scale and expressed in centimeters.

Plant spread (cm^2)

Plant spread was measured at 45, 90 and 135 days after planting. The readings were taken for 5 tagged plants per treatment per replication and mean was calculated. It was measured with standard meter scale in East-West and North-South directions, multiplied, averaged and expressed in square centimeters.

Leaf area (cm^2 /plant)

The leaf area was calculated by taking 10 leaves from a plant by random selection and measured with Leaf Area Meter. The mean was calculated and multiplied with the total number of leaves of 5 randomly selected plants.

Fresh weight of leaf (g)

Syngonium plants of each treatment were sampled at 135 days. Three plants in each replication were taken to observe fresh weight of leaf using an electronic balance. The average fresh weight of leaf was calculated and expressed in grams.

Dry weight of leaf (g)

After separating the leaf from the above sampled plants, they were kept in brown paper bag and dried in hot air oven at a temperature of 70 ºC, till constant weight was obtained. Each dried leaf was then weighed on electronic pan balance and average dry weight of leaf was calculated for each plant and was expressed in grams.

Plant Biomass (g)

The total plant dry weight was calculated at the end of the experiment by taking above ground portion of plant followed by washing with water. After the removal of excessive moisture, the plant was dried at of 70°C in hot air oven until there is no change in weight and then final weight was weighed with the help of an electronic balance and averages were worked out and expressed in grams.

Root length (cm)

The root system of the above sampled plants was cleaned to remove adhered soil and media. The length from collar region to the tip of longest root was measured using a measuring scale, average values were worked out and expressed in centimeter.

Number of roots per plant

Number of roots per plant was counted by uprooting three plants per treatment per replication at 135 DAP and washed thoroughly then total number of roots per plant was recorded and average was calculated.

Results and Discussion

Plant height (cm)

The data pertaining to the plant height (cm) as influenced by plant growth regulators during the years 2023, 2024 and pooled is presented in the Table 1. During 2023, Among the treatments significantly maximum plant height (cm) (35.51, 43.03 and 49.11) was recorded in T_4 : Salicylic acid 200 ppm, while the minimum plant height (16.90, 26.56 and 28.46 cm) was noticed in T_9: Water spray (control) during 45, 90 and 135 DAT, respectively.

During 2024, Among the treatments significantly maximum plant height (cm) (34.75, 43.65 and 50.74) was recorded in T_4 : Salicylic acid 200 ppm, while the minimum plant height (17.99, 25.65 and 27.91 cm) was noticed in T_9: Water spray (control) during 45, 90 and 135 DAT, respectively. Similar trend was observed in the pooled data.

It was observed that, the maximum plant height attained in syngonium may be due to the rapid cell elongation, increased cell division and cell enlargement by exogenous application of salicylic acid. It may be possible that salicylic acid could be involved in the regulation of cell enlargement and division in synergy with other substances such as auxin, IAA and phenolic substances which was recognized to regulate cell enlargement and division in root and shoot. Similar results were also reported by Ram *et al.* (2012) on gladiolus and El-Hak *et al.* (2012) on pea.

Table 1 : Effect of different plant growth regulators on plant height (cm) of potted Syngonium (*Syngonium podophyllum*).

Treatment	Plant height (cm) (45 DAP)			Plant height (cm) (90 DAP)			Plant height (cm) (135 DAP)		
	2023	2024	Pooled	2023	2024	Pooled	2023	2024	Pooled
T_1 : Benzyladenine 150 ppm	28.74	28.31	28.52	38.07	37.96	38.01	44.38	45.02	44.70
T_2 : Benzyladenine 250 ppm	26.22	25.28	25.75	34.11	34.11	34.11	41.39	40.99	41.19
T_3 : Salicylic acid 100 ppm	30.96	30.58	30.77	40.92	40.07	40.49	45.91	46.30	46.10
T_4 : Salicylic acid 200 ppm	35.51	34.75	35.13	43.03	43.65	43.34	49.11	50.75	49.93
T_5 : Gibberellic acid (GA_3) 150 ppm	27.69	27.13	27.41	36.25	36.05	36.15	43.25	43.05	43.15
T_6 : Gibberellic acid (GA_3) 250 ppm	31.53	31.64	31.58	41.61	41.69	41.65	47.10	46.50	46.80
T_7 : Ascorbic acid 100 ppm	23.83	23.52	23.68	32.07	31.67	31.87	39.14	38.74	38.94
T_8 : Ascorbic acid 200 ppm	21.66	21.46	21.56	30.03	29.83	29.93	36.74	36.40	36.57
T_9 : Water spray (control)	16.90	17.99	17.45	26.56	25.65	26.11	28.46	27.91	28.18
SEm ±	**0.50**	**0.47**	**0.45**	**0.87**	**0.74**	**0.78**	**1.68**	**1.61**	**1.63**
CD at 5%	**1.49**	**1.38**	**1.32**	**2.59**	**2.20**	**2.32**	**4.98**	**4.79**	**4.83**

Table 2 : Effect of different plant growth regulators on number of leaves of potted Syngonium (*Syngonium podophyllum*).

Treatment	No of leaves (45 DAP)			No of leaves (90 DAP)			No of leaves (135 DAP)		
	2023	2024	Pooled	2023	2024	Pooled	2023	2024	Pooled
T_1 : Benzyladenine 150 ppm	8.40	7.73	8.07	17.76	17.07	17.41	28.01	27.20	27.61
T_2 : Benzyladenine 250 ppm	6.87	6.47	6.67	16.08	15.80	15.94	24.00	23.60	23.80
T_3 : Salicylic acid 100 ppm	9.16	9.13	9.15	20.08	19.47	19.77	28.89	29.07	28.98
T_4 : Salicylic acid 200 ppm	10.87	11.27	11.07	22.25	21.87	22.06	31.33	31.67	31.50
T_5 : Gibberellic acid (GA_3) 150 ppm	7.73	7.53	7.63	17.23	17.27	17.25	25.80	25.60	25.70
T_6 : Gibberellic acid (GA_3) 250 ppm	10.67	9.93	10.30	20.96	20.27	20.61	30.83	30.33	30.58
T_7 : Ascorbic acid 100 ppm	5.80	5.40	5.60	13.53	13.13	13.33	21.93	21.53	21.73
T_8 : Ascorbic acid 200 ppm	4.97	4.80	4.88	13.60	13.40	13.50	19.82	20.13	19.98
T_9 : Water spray (control)	3.07	3.03	3.05	10.02	9.40	9.71	15.23	15.83	15.53
SEm ±	**0.36**	**0.42**	**0.36**	**0.45**	**0.44**	**0.41**	**1.13**	**0.98**	**1.03**
CD at 5%	**1.06**	**1.24**	**1.08**	**1.33**	**1.30**	**1.22**	**3.36**	**2.91**	**3.06**

Number of leaves/ plant

Significant differences in number of leaves per plant were observed due to different plant growth regulators is presented in Table 2. During 2023, Among the treatments, significantly maximum number of leaves per plant (10.87, 22.25 and 31.33) was recorded in T_4 : Salicylic acid 200 ppm, which is on par with T_6: Gibberellic acid (GA3) 250 ppm (10.67, 20.96 and 30.83), while the minimum number of leaves per plant (3.07, 10.02 and 15.23) was noticed in T9: Water spray (control) during 45, 90 and 135 DAT, respectively.

During 2024, Among the treatments, significantly maximum number of leaves per plant (11.27, 21.87 and 31.67) was recorded in T_4: Salicylic acid 200 ppm, while the minimum number of leaves per plant (3.03, 9.40 and 15.83) was noticed in T_9: Water spray (control) during 45, 90 and 135 DAT, respectively. The pooled data showed that among the treatments, T_4: Salicylic acid 200 ppm recorded the highest number of leaves per plant (11.07, 22.06 and 31.50) during 45, 90 and 135 DAT, respectively.

Leaf length (cm)

The data recorded on the leaf length at various stages of plant growth as influenced by different plant growth regulators is presented in Table 3. During 2023, Among the treatments, significantly maximum leaf length (17.09, 21.68 and 22.68 cm) was recorded in T_4: Salicylic acid 200 ppm, while the minimum leaf length (12.38, 14.43 and 15.25 cm) was noticed in T_9: Water spray (control) during 45, 90 and 135 DAT, respectively.

During 2024, Among the treatments, significantly maximum leaf length (17.20, 21.46 and 22.48 cm) was recorded in T_4: Salicylic acid 200 ppm, while the minimum leaf length (12.23, 14.23 and 15.08 cm) was noticed in T_9: Water spray (control) during 45, 90 and 135 DAT, respectively. Similar trend was observed in the pooled data.

Table 3 : Effect of different plant growth regulators on leaf length (cm) of potted Syngonium (*Syngonium podophyllum*).

Treatment	Leaf length (cm) (45 DAP)			Leaf length (cm) (90 DAP)			Leaf length (cm) (135 DAP)		
	2023	2024	Pooled	2023	2024	Pooled	2023	2024	Pooled
T_1 : Benzyladenine 150 ppm	15.67	15.17	15.42	18.26	17.89	18.08	21.23	20.25	20.74
T_2 : Benzyladenine 250 ppm	14.67	14.27	14.47	17.89	17.49	17.69	19.55	19.15	19.35
T_3 : Salicylic acid 100 ppm	15.60	15.33	15.47	20.09	19.97	20.03	21.73	21.25	21.49
T_4 : Salicylic acid 200 ppm	17.09	17.20	17.14	21.68	21.46	21.57	22.68	22.48	22.58
T_5 : Gibberellic acid (GA_3) 150 ppm	15.20	14.86	15.03	19.20	18.86	19.03	20.27	19.93	20.10
T_6 : Gibberellic acid (GA_3) 250 ppm	16.77	16.33	16.55	20.80	20.53	20.67	22.20	21.57	21.88
T_7 : Ascorbic acid 100 ppm	13.91	13.51	13.71	16.30	15.83	16.07	18.67	18.27	18.47
T_8 : Ascorbic acid 200 ppm	13.29	13.16	13.06	16.84	16.92	16.88	17.76	17.78	17.77
T_9 : Water spray (control)	12.38	12.23	12.31	14.43	14.23	14.33	15.25	15.08	15.16
SEm ±	**0.24**	**0.26**	**0.22**	**0.22**	**0.16**	**0.17**	**0.27**	**0.21**	**0.21**
CD at 5%	**0.71**	**0.78**	**0.67**	**0.64**	**0.47**	**0.51**	**0.80**	**0.62**	**0.62**

Table 4 : Effect of different plant growth regulators on leaf width (cm) of potted Syngonium (*Syngonium podophyllum*).

Treatment	Leaf width (cm) (45 DAP)			Leaf width (cm) (90 DAP)			Leaf width (cm) (135 DAP)		
	2023	2024	Pooled	2023	2024	Pooled	2023	2024	Pooled
T_1 : Benzyladenine 150 ppm	8.11	7.91	8.01	9.59	9.40	9.50	11.54	11.52	11.53
T_2 : Benzyladenine 250 ppm	7.47	7.37	7.42	9.09	8.99	9.04	10.83	10.73	10.78
T_3 : Salicylic acid 100 ppm	8.47	8.33	8.40	10.58	10.51	10.55	11.86	11.83	11.84
T_4 : Salicylic acid 200 ppm	9.06	8.97	9.02	11.41	11.29	11.35	12.42	12.35	12.39
T_5 : Gibberellic acid (GA_3) 150 ppm	7.74	7.62	7.68	10.08	9.96	10.02	11.27	11.15	11.21
T_6 : Gibberellic acid (GA_3) 250 ppm	8.82	8.51	8.67	11.13	10.85	10.99	12.36	11.99	12.18
T_7 : Ascorbic acid 100 ppm	7.15	6.97	7.06	8.15	7.97	8.06	10.46	10.28	10.37
T_8 : Ascorbic acid 200 ppm	6.70	6.57	6.63	8.52	8.46	8.49	9.87	9.83	9.85
T_9 : Water spray (control)	6.00	5.85	5.92	7.33	6.95	7.14	8.00	7.41	7.71
SEm ±	**0.10**	**0.08**	**0.09**	**0.13**	**0.13**	**0.12**	**0.33**	**0.34**	**0.31**
CD at 5%	**0.30**	**0.25**	**0.26**	**0.39**	**0.38**	**0.36**	**0.97**	**1.00**	**0.92**

The positive effect of SA on growth and biomass could be its influence on other plant hormones which play a fundamental role in the auxin, cytokinin and ABA balances (Shakirova, 2007).

Leaf width (cm)

The data recorded on the leaf width at various stages of plant growth as influenced by different plant growth regulators is presented in Table 4. During 2023, Among the treatments, significantly maximum leaf width (9.06, 11.41 and 12.42 cm) was recorded in T_4 : Salicylic acid 200 ppm, while the minimum leaf width (6.00, 7.33 and 8.00 cm) was noticed in T_9: Water spray (control) during 45, 90 and 135 DAT, respectively.

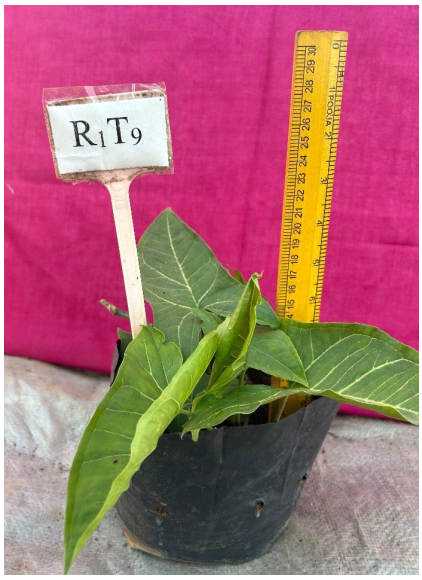
During 2023, Among the treatments, significantly maximum leaf width (8.97, 11.29 and 12.35 cm) was recorded in T_4 : Salicylic acid 200 ppm, while the minimum leaf width (5.85, 6.95 and 7.41 cm) was noticed in T_9: Water spray (control) during 45, 90 and 135 DAT, respectively. Similar trend was observed in the pooled data.

To interpret these results, the effect of SA on plant functions should be understood. SA is involved in regulating plant growth processes as reported by Singh (1993) who demonstrated the effect of SA in stimulating of root formation in young shoots of ornamental plants. This positive effect could be explained upon the effect of SA on increasing CO_2 assimilation and accordingly photosynthetic rate in addition to the increase in mineral uptake (Karlidag *et al*. 2009).

Plant spread (East-West) (cm)

In 2023, among the treatments, significantly maximum Plant spread (E-W) (31.15, 35.97 and 38.46 cm) was recorded in T_4 : Salicylic acid 200 ppm, while the minimum Plant spread (E-W) (17.62, 23.88 and 25.96 cm) was

T_4 : Salicylic acid 200 ppm



T_9 : Water spray (control)

Plate 1 : Plant height as influenced by plant growth regulators on potted Syngonium.

noticed in T_9: Water spray (control) during 45, 90 and 135 DAT, respectively (Table 5).

In 2024, Among the treatments, significantly maximum Plant spread (E-W) (31.40, 35.40 and 38.13 cm) was recorded in T_4: Salicylic acid 200 ppm, while the minimum Plant spread (E-W) (17.20, 23.60 and 25.73 cm) was noticed in T_9: Water spray (control) during 45, 90 and 135 DAT, respectively. Similar trend was observed in the pooled data.

Plant spread (North -South) (cm)

Significant differences in Plant spread (North-South) were observed due to different plant growth regulators and is presented in Table 6. In 2023, among the treatments, maximum Plant spread (N-S) (29.52, 35.10 and 36.80 cm) was recorded in T_4: Salicylic acid 200 ppm, which is on par with T_6: Gibberellic acid (GA_3) 250 ppm (28.40, 34.60 and 36.53) during 45, 90 and 135 DAT, respectively. During 2024, Among the treatments, maximum Plant spread (N-S) (29.13, 34.40 and 37.27 cm) was recorded in T_4: Salicylic acid 200 ppm, which is on par with T_6: Gibberellic acid (GA_3) 250 ppm (28.33, 33.67 and 36.20) during 45, 90 and 135 DAT, respectively. Similar trend was observed in the pooled data.

It is observed that an increase in salicylic acid concentration increased the number of branches. This might be due to enhanced cell division and cell enlargement which ultimately increased the plant spread. The results are in close agreement with the findings of El-Hak *et al.* (2012) in pea and Yeluguri *et al.* (2016) in marigold. Salicylic acid treatments were found to increase cell division by promoting the mitotic system of the apical meristem of roots, resulting in greater plant spread. (Sakhabutdinova *et al*., 2001).

Leaf area (cm^2) (135DAP)

The data recorded on the leaf area at 135 days after planting as influenced by the plant growth regulators is presented in Table 7. Among the treatments, T_4: Salicylic acid 200 ppm recorded the maximum leaf area (1427.33, 1422.33 and 1424.83 cm^2), which is on par with T_6: Gibberellic acid (GA_3) 250 ppm (1403.67, 1406.07 and 1404.87 cm^2), while the minimum leaf area (1217.87, 1232.20 and 1225.03 cm^2) was noticed in T_9: Water spray (control) during 2023, 2024 and pooled, respectively.

This might be due to enhanced cell division and leaf development which ultimately increased net photosynthetic rates as well as the total chlorophyll content in the leaves due to salicylic acid. The results are in close agreement with the findings of El-Yazeid (2011) in sweet pepper, Pacheco *et al*. (2013) in marigold and Abdou *et al.* (2014) in gladiolus.

GA_3 induce plasticity in cell and thus creates water diffusion pressure deficit and result in maximum water uptake and enhances cell division by promoting DNA synthesis in cell elongation. Further GA_3 is also known to increase sink strength of actively growing plant parts. Similar results were reported by Sable *et al.* (2016) in gladiolus, Sajid *et al*. (2016) in chrysanthemum and Gajbhiye *et al.* (2017) in gladiolus.

Fresh weight of leaf (g) (135DAP)

Among the treatments, T_4: Salicylic acid 200 ppm recorded the maximum fresh weight of leaf (2.07, 1.95

Plate 2 : Root length as influenced by plant growth regulators of potted Syngonium.

Table 5 : Effect of different plant growth regulators on plant spread East- West (cm) of potted Syngonium (*Syngonium podophyllum*).

Treatment	Plant spread East-west (45 DAP)			Plant spread East-west (90 DAP)			Plant spread East-west (135 DAP)		
	2023	2024	Pooled	2023	2024	Pooled	2023	2024	Pooled
T_1 : Benzyladenine 150 ppm	27.13	26.53	26.83	31.36	30.47	30.91	35.06	34.47	34.77
T_2 : Benzyladenine 250 ppm	25.40	25.00	25.20	29.47	29.07	29.27	32.00	31.60	31.80
T_3 : Salicylic acid 100 ppm	28.66	28.87	28.77	32.65	32.73	32.69	36.10	36.27	36.18
T_4 : Salicylic acid 200 ppm	31.15	31.40	31.28	35.97	35.40	35.68	38.46	38.13	38.30
T_5 : Gibberellic acid (GA_3) 150 ppm	28.00	27.80	27.90	31.93	31.73	31.83	33.53	33.33	33.43
T_6 : Gibberellic acid (GA_3) 250 ppm	30.61	30.13	30.37	34.57	33.87	34.22	37.32	36.67	37.00
T_7 : Ascorbic acid 100 ppm	22.33	21.93	22.13	26.80	26.40	26.60	30.53	30.13	30.33
T_8 : Ascorbic acid 200 ppm	21.47	21.93	21.70	27.81	28.20	28.01	28.98	29.13	29.06
T_9 : Water spray (control)	17.62	17.20	17.41	23.88	23.60	23.74	25.96	25.73	25.85
SEm ±	**0.59**	**0.44**	**0.48**	**0.43**	**0.50**	**0.43**	**0.66**	**0.52**	**0.57**
CD at 5%	**1.75**	**1.30**	**1.43**	**1.28**	**1.49**	**1.29**	**1.97**	**1.55**	**1.69**

and 2.01 g) which is on par with T_6: Gibberellic acid (GA_3) 250 ppm (1.92, 1.81 and 1.86 g), while the minimum fresh weight of leaf (0.58, 0.60 and 0.59 g) was noticed in T_9: Water spray (control) during 2023, 2024 and pooled respectively (Table 8).

This result is in agreement with that of Gharib (2006) who reported that foliar spray with SA at 0.1mM and 0.01 mM concentrations on *Ocimum basilicum* and *Origanum majorana* plants promoted growth parameters *viz.*, plant height, number of branches, spikes and leaves per plant, leaf area and herbage yield. The plant growth promotion with the application of SA has also been observed in different crops viz., *Helianthus annus* (Dawood *et al.*, 2012), *Vigna radiata* (Linga kumar *et al*, 2015).

Dry weight of leaf (g) (135DAP)

Among the treatments, T_4: Salicylic acid 200 ppm recorded the maximum dry weight of leaf (0.25, 0.23 and 0.24 g), while the minimum dry weight of leaf (0.08, 0.06 and 0.07 g) was noticed in T_9: Water spray (control) during 2023, 2024 and pooled, respectively (Table 8).

Table 6 : Effect of different plant growth regulators on plant spread North – South (cm) of potted Syngonium (*Syngonium podophyllum*).

Treatment	Plant spread North-south (cm) (45 DAP)			Plant spread North-south (cm) (90 DAP)			Plant spread North-south (cm) (135 DAP)		
	2023	2024	Pooled	2023	2024	Pooled	2023	2024	Pooled
T_1 : Benzyladenine 150 ppm	24.67	23.93	24.30	30.87	29.80	30.33	35.00	34.27	34.63
T_2 : Benzyladenine 250 ppm	23.07	22.67	22.87	29.07	28.67	28.87	32.47	32.07	32.27
T_3 : Salicylic acid 100 ppm	26.62	27.00	26.81	32.20	32.33	32.27	35.53	35.67	35.60
T_4: Salicylic acid 200 ppm	29.52	29.13	29.33	35.10	34.40	34.75	36.80	37.27	37.03
T_5 : Gibberellic acid (GA_3) 150 ppm	26.33	26.13	26.23	29.67	29.47	29.57	33.53	33.33	33.43
T_6 : Gibberellic acid (GA_3) 250 ppm	28.40	28.33	28.37	34.60	33.67	34.13	36.53	36.20	36.37
T_7 : Ascorbic acid 100 ppm	20.27	19.87	20.07	26.93	26.53	26.73	30.93	30.53	30.73
T_8 : Ascorbic acid 200 ppm	19.03	19.33	19.18	27.23	27.40	27.32	29.33	29.80	29.57
T_9 : Water spray (control)	16.27	15.73	16.00	24.47	23.53	24.00	26.30	27.07	26.68
SEm ±	**0.51**	**0.39**	**0.41**	**0.96**	**0.71**	**0.80**	**0.45**	**0.53**	**0.41**
CD at 5%	**1.53**	**1.16**	**1.22**	**2.85**	**2.11**	**2.38**	**1.34**	**1.56**	**1.21**

Table 7 : Effect of different plant growth regulators on Leaf area (cm^2) of potted Syngonium (*Syngonium podophyllum*).

Treatment	Leaf area (cm^2) (135 DAP)		
	2023	2024	Pooled
T_1 : Benzyladenine 150 ppm	1380.83	1383.27	1382.05
T_2 : Benzyladenine 250 ppm	1357.33	1353.93	1355.63
T_3 : Salicylic acid 100 ppm	1388.97	1391.87	1390.42
T_4: Salicylic acid 200 ppm	1427.33	1422.33	1424.83
T_5 : Gibberellic acid (GA_3) 150 ppm	1368.87	1367.27	1368.07
T_6 : Gibberellic acid (GA_3) 250 ppm	1403.67	1406.07	1404.87
T_7 : Ascorbic acid 100 ppm	1334.20	1332.60	1333.40
T_8 : Ascorbic acid 200 ppm	1266.07	1264.73	1265.40
T_9 : Water spray (control)	1217.87	1232.20	1225.03
SEm ±	**16.87**	**14.68**	**15.37**
CD at 5%	**50.12**	**43.63**	**45.65**

The enhanced vegetative growth due to salicylic acid could be due to the increasing levels of cytokinins which promote cell division and breaking of capillary sovereignty (Taiz and Zeiger, 1998), increasing the efficiency of photosynthesis by increased absorption of CO_2 in plastids (Khan *et al*., 2003), thus providing the materials needed to build new tissues and increased vegetative growth. According to Shakirova *et al.* (2003) Salicylic acid's positive effect on growth may be due to its influence on other plant hormones. SA caused marked increase in IAA (Indole 3 acetic acid), GA_3 (gibberellic acid), zeatin and zeatin riboside, in the meantime decrease in ABA (abscisic acid) content. The increase in endogenous hormones stimulates cell division and cell enlargement and subsequently growth.

Plant biomass (g) (135DAP)

The data observed on the plant biomass at 135 days after planting as influenced by the plant growth regulators is presented in Table 8. Among the treatments, T_4: Salicylic acid 200 ppm recorded the maximum plant biomass (9.51, 9.53 and 9.52 g), while the minimum plant biomass (6.79, 6.48 and 6.64 g) was noticed in T_9: Water spray (control) during 2023, 2024 and pooled, respectively.

The increase in plant biomass with salicylic acid application might be attributed to more tryptophan production which acts as a precursor of auxin which increases the vegetative growth and leads to production of more food materials which in turn might have altered the biophysical properties of cell wall and also there is a synergistic effect of salicylic acid and auxin which ultimately favoured photosynthesis. The similar results were also reported by Qureshi *et al.* (2015) in sim carnation.

Root length (cm) (135DAP)

The data pertaining to the root length at 135 days after planting as influenced by growth regulators is presented in Table 9. Among the treatments, T_4: Salicylic acid 200 ppm recorded the highest root length (40.21, 39.28 and 39.74 cm) followed by T_6: Gibberellic acid (GA_3) 250 ppm (37.26, 37.63 and 37.45 cm), while the lowest root length (16.01, 15.17 and 15.59 cm) was noticed in T_9: Water spray (control) during 2023, 2024 and pooled respectively.

No of roots per plant (135DAP)

The data pertaining to the number of roots per plant at 135 days after planting as influenced by growth

Table 8 : Effect of different plant growth regulators on fresh weight of leaf (g), dry weight of leaf (g) and plant biomass (g) of potted Syngonium (*Syngonium podophyllum*).

Treatment	Fresh weight of leaf (g) (135 DAP)			Dry weight of leaf (g) (135 DAP)			Plant biomass (g) (135 DAP)		
	2023	2024	Pooled	2023	2024	Pooled	2023	2024	Pooled
T_1 : Benzyladenine 150 ppm	1.72	1.69	1.71	0.20	0.19	0.20	9.11	8.96	9.04
T_2 : Benzyladenine 250 ppm	1.45	1.23	1.34	0.16	0.14	0.15	8.75	8.69	8.72
T_3 : Salicylic acid 100 ppm	1.73	1.67	1.70	0.21	0.19	0.20	9.33	9.10	9.22
T_4 : Salicylic acid 200 ppm	2.07	1.95	2.01	0.25	0.23	0.24	9.51	9.53	9.52
T_5 : Gibberellic acid (GA_3) 150 ppm	1.55	1.31	1.43	0.17	0.15	0.16	8.91	8.59	8.75
T_6 : Gibberellic acid (GA_3) 250 ppm	1.92	1.81	1.86	0.22	0.21	0.22	9.41	9.27	9.34
T_7 : Ascorbic acid 100 ppm	1.15	1.09	1.12	0.13	0.13	0.13	8.47	8.37	8.42
T_8 : Ascorbic acid 200 ppm	0.86	0.63	0.75	0.09	0.08	0.09	8.14	8.09	8.12
T_9 : Water spray (control)	0.58	0.60	0.59	0.08	0.06	0.07	6.79	6.48	6.64
SEm ±	**0.05**	**0.06**	**0.06**	**0.01**	**0.01**	**0.01**	**0.10**	**0.06**	**0.08**
CD at 5%	**0.16**	**0.18**	**0.16**	**0.02**	**0.02**	**0.02**	**0.31**	**0.19**	**0.23**

Table 9 : Effect of different plant growth regulators on Root length (cm) and number of roots per plant of potted Syngonium (*Syngonium podophyllum*).

Treatment	Root length (cm) (135 DAP)			No of roots per plant (135DAP)		
	2023	2024	Pooled	2023	2024	Pooled
T_1 : Benzyladenine 150 ppm	35.34	35.23	35.29	19.85	19.20	19.53
T_2 : Benzyladenine 250 ppm	31.55	31.17	31.36	15.67	15.27	15.47
T_3 : Salicylic acid 100 ppm	36.10	35.74	35.92	20.12	20.27	20.20
T_4 : Salicylic acid 200 ppm	40.21	39.28	39.74	22.67	22.87	22.77
T_5 : Gibberellic acid (GA_3) 150 ppm	32.87	32.67	32.77	17.13	16.93	17.03
T_6 : Gibberellic acid (GA_3) 250 ppm	37.26	37.63	37.45	21.20	21.13	21.17
T_7 : Ascorbic acid 100 ppm	28.04	27.56	27.80	13.47	13.07	13.27
T_8 : Ascorbic acid 200 ppm	24.03	24.67	24.35	11.07	11.80	11.43
T_9 : Water spray (control)	16.01	15.17	15.59	6.07	6.77	6.42
SEm ±	**0.88**	**0.70**	**0.74**	**1.32**	**1.42**	**1.36**
CD at 5%	**2.60**	**2.08**	**2.20**	**3.94**	**4.21**	**4.03**

regulators is presented in Table 9. Among the treatments, T_4: Salicylic acid 200 ppm recorded the highest number of roots per plant (22.67, 22.87 and 22.77) followed by T_6: Gibberellic acid (GA_3) 250 ppm (21.20, 21.13 and 21.17), while the lowest number of roots per plant (6.07, 6.77 and 6.42) was noticed in T_9: Water spray (control) during 2023, 2024 and pooled respectively.

Conclusion

From the present investigation, it is evident that among the various plant growth regulators, T_4: Salicylic acid at 200 ppm exhibited the most significant improvement in vegetative growth parameters of potted Syngonium. The enhanced performance under this treatment may be attributed to the role of salicylic acid in increasing endogenous cytokinin levels, which stimulate cell division and break apical dominance. Additionally, salicylic acid likely improved photosynthetic efficiency by enhancing CO_2 assimilation in plastids, thereby promoting biomass accumulation and vigorous vegetative development.

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