Studies on the Influence of plant growth regulators on physiological traits and quality parameters of potted Syngonium.

Abstract

The present investigation entitled "STUDIES ON THE INFLUENCE OF PLANT GROWTH REGUATORS ON PHYSIOLOGICAL TRAITS AND QUALITY PARAMETERS OF POTTED SYNGONIUM (*Syngonium podophyllum*)" 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 physiological parameters *viz.,* maximum leaf area index (2.28, 2.28, 2.28), specific leaf weight (g/cm^2) (0.005, 0.005, 0.005) was recorded in T_4: Salicylic acid 200 ppm whereas the minimum specific leaf area (cm^2/g) (186.88, 200.05, 192.91) was recorded in T_4: Salicylic acid 200 ppm. In case of quality parameters the highest visual plant grade (4.80, 4.73, 4.77) and visual colour grade (4.60, 4.47, 4.53) was recorded in T_4: Salicylic acid 200 ppm, whereas the highest chlorophyll content (43.33, 42.64, 42.98) was recorded in T_1: Benzyladenine 150 ppm.

Keywords: Salicylic acid, Benzyladenine, Gibberellic acid

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1. Introduction

Potted ornamental foliage plants have increased popularity these days as a result of rapid development and changing lifestyles around the world. They are easy to transport and thus used for instant outdoor landscaping and indoor gardening. The lack of open spaces is another reason why people depend on potted foliage plants for decorating their houses and surroundings. Among the plants which purifies air, Syngonium (*Syngonium podophyllum* Schott.) is an attractive potted plant adaptable to diverse conditions. It is a common houseplant from the Araceae family that is grown around the world due to its appealing ornamental foliage. *Syngonium podophyllum*, also known as ~~african~~ African evergreen, arrowhead plant, nephthytis, and goosefoot plant, is the most widely produced species in the foliage plant industry (Chen *et al.,* 2005). Attractive leaves and compact growth habit is the basic requirement of finished ornamental foliage plant for its marketability. The attractiveness and growth modifications in foliage plants can be achieved by using growth regulators.

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2. Materials and Methods

The experiment was conducted to study the influence of plant growth regulators on physiological traits and quality 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 physiological parameters *viz*., Leaf area index (LAI), Specific leaf area (cm^2/g), Specific leaf weight (g/cm^2) and the quality parameters *viz.,* Chlorophyll content (SPAD meter reading), Plant grade (scale 1-5) and Visual colour grade (scale 1-5) were recorded at 135 Days after planting. A grading system of 1-5 scale as suggested by Poole and Conover (1982) was followed for determining visual plant grade where, 1 = dead, 2 = poor quality, 3 = Fair quality, 4 = Good quality and 5 = Excellent quality. Based on the leaf colour and pigmentation, in the visual colour grade plants were graded as 1 (poor colour), 3 (good, light green) and 5 (excellent dark green & silver contrast).

By Applying the formula proposed by Williams (1946), the leaf area index was determined.

$$LAI = \frac{\text{Leaf area of the entire plant } (cm^2)}{\text{Ground area occupied by the plant } (cm^2)}$$

Specific leaf area was calculated by dividing the leaf area by dry weight of leaf and expressed in centimetre square per gram. Proposed by Kvet *et al.* (1971).

Specific leaf weight (g/cm^2) was suggested by Pearce *et al.* (1968)

$$SLW = \frac{\text{Leaf weight (g)}}{\text{Leaf area } (cm^2)}$$

3. RESULTS AND DISCUSSION

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The results were not discussed and the discussion part need to be more and more improved.

3.1 Physiological parameters

3.1.1 Leaf Area Index (LAI)

The data recorded on the leaf area index as influenced by the plant growth regulators is presented in Table 1. Among the treatments, T_4: Salicylic acid 200 ppm recorded the maximum leaf area index (2.28, 2.28, 2.28) which is on par with T_6: (2.25, 2.25, 2.25), T_3: (2.22, 2.23, 2.22) while the minimum leaf area index (1.95, 1.97, 1.96) was noticed in T_9: Water spray (control) during 2023, 2024 and pooled respectively. SA beneficial effect on leaf area was attributed by activating cell division and organic food biosynthesis (Khan *et al*., 2003). Raskin (1992a) stated that the increasing effect of SA on nutrient availability and movement may result in the stimulation of different nutrients in the leaves. The above results were in support with the findings of Jaya Vasuki Chamarthy (2004) in rice, Mona *et al*., (2012) in sunflower, Sayyari *et al.* (2013) in lettuce.

3.1.2 Specific leaf area (cm^2/g)

The data recorded on specific leaf area as influenced by the plant growth regulators is presented in Table 1. Among the treatments, T_4: Salicylic acid 200 ppm recorded the minimum specific leaf area (cm^2/g) (186.88, 200.05, 192.91) which is on par with T_6: (204.11, 223.06, 213.10), while the maximum leaf area index (1083.29, 1401.14, 1203.09) was noticed in T_9: Water spray (control) during 2023, 2024 and pooled respectively.

3.1.3 Specific leaf weight (g/cm^2)

The data recorded on the Specific leaf weight as influenced by the plant growth regulators is presented in Table 1. Among the treatments, T_4: Salicylic acid 200 ppm recorded the maximum Specific leaf weight (g/cm^2) (0.005, 0.005,0.005) which is on par with T_6: (0.005, 0.005,0.005), while the minimum Specific leaf weight (0.001, 0.001, 0.001) was noticed in T_9: Water spray (control) during 2023, 2024 and pooled respectively.

3.2 Quality parameters

3.2.1 Chlorophyll content (SPAD meter reading)

The data recorded on the chlorophyll content as influenced by the plant growth regulators is presented in Table 2. Among the treatments, T_1: Benzyladenine 150 ppm recorded the maximum chlorophyll content (43.33, 42.64, 42.98) which is on par with T_4: Salicylic acid 200 ppm (42.89, 42.01, 42.45), while the minimum chlorophyll content (27.22, 25.91, 26.56) was noticed in T_9: Water spray (control) during 2023, 2024 and pooled respectively. The beneficial effects of BA on photosynthetic pigments observed in this study could be due to its protecting effect on chlorophyll against photo-oxidation (Petrenko and Biryukova, 1977), retention of chlorophyll and inhibits its degradation (Van Staden and Joughin, 1988), delaying the aging process (Xu *et al.,* 2011), enhancing synthesis of one or more proteins to which chlorophyll binds and becomes stabilized (Salisbury and Ross, 1990) and inhibiting de novo synthesis chlorophyllase enzyme that inhibits chlorophyll degradation (Beyer, 1981). It retains a high protein content by reducing the rate of breakdown than increasing the rate of synthesis (Sacher, 1973) and delays the onset of rising respiration associated with leaf senescence (EL-Shazly 2021).

3.2.2 Visual plant grade

The data pertaining to the visual plant grade as influenced by the plant growth regulators is presented in Table 2. Among the treatments, T_4: Salicylic acid 200 ppm recorded the maximum visual plant grade (4.80, 4.73, 4.77) which is on par with T_6: Gibberellic acid (GA_3) 250 ppm (4.67, 4.60, 4.63), while the minimum visual plant grade (2.07,1.93, 2.00) was noticed in T_9: Water spray (control) during 2023, 2024 and pooled respectively. Angham Talal Mahmoud Al-Chalabi (2020) stated that Gibberellins have an effect on increasing the number of cells in the region directly below the subapical meristem, which leads to increased interstitial cell elongation. Gibberellins stimulate growth by increasing metabolism, which increases soluble carbohydrates through the production of the alpha-amylase enzyme. Gibberellic acid increases the accumulation

of enzymes, which plays a role in promoting the transfer of photosynthesis products from the leaf to the developing top.

3.2.3 Visual colour grade

The data recorded on the visual colour grade as influenced by the plant growth regulators is presented in Table 2. Among the treatments, T_4: Salicylic acid 200 ppm recorded the maximum visual colour grade (4.60, 4.47, 4.53) which is on par with T_1 : Benzyladenine 150 ppm (4.40, 4.33, 4.37), while the minimum colour plant grade (1.97, 1.67, 1.82) was noticed in T_9: Water spray (control) during 2023, 2024 and pooled respectively.

Conclusion

From the studies on different plant growth regulators, the treatment T_4: Salicylic acid 200 ppm recorded best results in terms of physiological and quality parameters. 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.

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Table 1. Effect of different plant growth regulators on leaf area index, specific leaf area (cm^2/g) and Specific leaf weight (g/cm^2) of potted Syngonium

Treatment	Leaf area index (135 DAP)			Specific leaf area (cm^2/g) (135 DAP)			Specific leaf weight (g/cm^2) (135 DAP)		
	2023	**2024**	**Pooled**	**2023**	**2024**	**Pooled**	**2023**	**2024**	**Pooled**
T_1 : Benzyladenine 150 ppm	2.21	2.21	2.21	247.98	267.97	257.38	0.004	0.004	0.004
T_2 : Benzyladenine 250 ppm	2.17	2.17	2.17	346.50	419.25	379.46	0.003	0.002	0.003
T_3 : Salicylic acid 100 ppm	2.22	2.23	2.22	234.55	251.91	242.75	0.004	0.004	0.004
T_4 : Salicylic acid 200 ppm	2.28	2.28	2.28	186.88	200.05	192.91	0.005	0.005	0.005
T_5 : Gibberellic acid (GA_3) 150 ppm	2.19	2.19	2.19	310.40	356.42	331.87	0.003	0.003	0.003
T_6 : Gibberellic acid (GA_3) 250 ppm	2.25	2.25	2.25	204.11	223.06	213.10	0.005	0.005	0.005
T_7 : Ascorbic acid 100 ppm	2.13	2.13	2.13	461.79	492.19	476.60	0.002	0.002	0.002
T_8 : Ascorbic acid 200 ppm	2.03	2.02	2.02	716.79	838.43	759.19	0.001	0.001	0.001
T_9 : Water spray (control)	1.95	1.97	1.96	1083.29	1401.14	1203.09	0.001	0.001	0.001
SEm ±	**0.03**	**0.02**	**0.02**	**77.18**	**27.65**	**48.49**	**0.0003**	**0.0002**	**0.0002**
CD at 5%	**0.08**	**0.07**	**0.07**	**229.33**	**82.16**	**144.06**	**0.001**	**0.001**	**0.001**

Table 2. Effect of different plant growth regulators on chlorophyll content, visual plant grade and visual colour grade of potted Syngonium

Treatment	Chlorophyll content (135 DAP)			Visual plant grade (135 DAP)			Visual colour grade (135 DAP)		
	2023	2024	Pooled	2023	2024	Pooled	2023	2024	Pooled
T_1 : Benzyladenine 150 ppm	43.33	42.64	42.98	4.53	4.33	4.43	4.40	4.33	4.37
T_2 : Benzyladenine 250 ppm	40.54	40.34	40.44	4.07	4.07	4.07	3.87	3.80	3.83
T_3 : Salicylic acid 100 ppm	36.71	36.51	36.61	4.20	4.00	4.10	4.07	3.80	3.93
T_4 : Salicylic acid 200 ppm	42.89	42.01	42.45	4.80	4.73	4.77	4.60	4.47	4.53
T_5 : Gibberellic acid (GA_3) 150 ppm	38.22	38.02	38.12	4.07	4.07	4.07	3.80	3.80	3.80
T_6 : Gibberellic acid (GA_3) 250 ppm	39.14	39.21	39.18	4.67	4.60	4.63	4.33	4.20	4.27
T_7 : Ascorbic acid 100 ppm	34.91	34.51	34.71	3.73	3.73	3.73	3.40	3.40	3.40
T_8 : Ascorbic acid 200 ppm	31.37	32.49	31.93	3.13	3.13	3.13	2.87	2.87	2.87
T_9 : Water spray (control)	27.22	25.91	26.56	2.07	1.93	2.00	1.97	1.67	1.82
SEm ±	**0.52**	**0.60**	**0.48**	**0.16**	**0.15**	**0.14**	**0.18**	**0.18**	**0.17**
CD at 5%	**1.55**	**1.79**	**1.42**	**0.46**	**0.45**	**0.43**	**0.54**	**0.53**	**0.49**