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Response of *Syngonium podophyllum* Plant Growth and Chemical Composition to Chlorophyllin Fertilizer

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ABSTRACT

The study investigated the effect of spraying Chlorophyllin, derived from chlorophyll, on *Syngonium podophyum* plant growth and chemical composition. A pot experiment was conducted in a greenhouse in Cairo, Egypt, using three concentrations of Chlorophyllin (0, 100, 200, and 300 ppm) applied three times over 9 months. The results showed that the highest growth parameters (plant height, root length, number of leaves, stem thickness, number of successors, shoot fresh or dry weight, and leaf area) were recorded with Chlorophyllin spray at 100, 200, and 300 ppm. Chlorophyllin application had no significant effect on other parameters such as stem diameter and fresh and dry weight. The study concluded that Chlorophyllin spraying significantly promoted plant growth and could be used as a growth enhancer.

INTRODUCTION

Syngonium podophyllum (Araceae) is a parasitic climber with large leaves that are deeply lobed in adults (Balick, 1998). Podophyllum leaves are used to treat pain, dry skin, fungal infections, itching, rashes, and bruises (Sosa, et al. 2002). The leaves and bark of this plant have traditionally been used in local folk medicine for their wound-healing properties (Kumar, 2014). Microorganisms assembled the system by inoculating the roots with *Aspergillus niger*, an artificially constructed (SPANCS) that had the highest capacity to remove uranium from wastewater with a similar inhibitory effect as biomass (Hu, et al. 2015); evolved into leaves in ornamental plants (Howard, 1996); under different potential stresses (Chauvel, 2010); it cleans the air and acts as a cleansing anti-pollutant by absorbing it in bisected leaves. Given the calcium oxalate contained in the plant sap, it is considered slightly toxic. The leaves can cause mouth irritation, and vomiting is a common side effect.

Some plants need certain nutrients in the soil to thrive. These are known as fertilizer components and usually come from conventional fertilizers. This article deals with the extraction of natural chlorophyll from agricultural waste. As a foliar fertilizer, it can significantly promote plant growth. This new type of fertilizer helps plants grow bigger and produce better yields. We've found that adding powdered green pigment to water makes an excellent fertilizer (El-Tayeb, 2022).

Chlorophyllin is a water-soluble, green pigment derived from chlorophyll and commonly used as a food color additive and dietary supplement. It has a number of potential health benefits including

antioxidant, anti-inflammatory, and antimicrobial effects. It is also used to treat digestive issues and improve the skin's appearance. Chlorophyllin has also been studied for its ability to reduce the odors of certain pollutants, including those associated with urinary incontinence, bad breath, and wound odor. In this article, one more application as a plant growth enhancer will be tested on *Syngoniumpodo phyumplant*.

Materials and Methods

During the 2019 and 2020 seasons, a pot experiment with podophyllum was carried out in the NRC net greenhouse atDokki, Cairo, Egypt. Use a mixture of loam and sandy soil (1:1) by volume. Treatments consisted of three concentrations of Chlorophyllin formula (0, 100, 200, and 300 ppm) (provided by INRAD corp., Egypt) followed by 3 daily sprays (4, 8 and 12 o'clock). Chlorophyllin formula and spray time were taken into account in a completely randomized 5-replicate design. For propagation, homogeneous (10-15 cm) long, 1-month-old plants with 3-4 leaves were transplanted during the first week of July 2019 and 2020. All plants were fertilized in the usual amount at the right time. Pots were watered daily to near-field capacity with tap water for 9 months Representative plant samples were taken randomly from 3 replicates of each treatment, and growth parameters included (plant height, root height, number of leaves, leaf area, number of successors, stem diameter, shoot fresh weight, shoot dry weight, % chlorophyll, carbohydrate compound %, protein %, carotenoid %, Na%, N%, k%, and P%). The following chemical constituents were determined: 1- The pigment content (mg/g FW) of chlorophyll A, B, and carotenoids was determined according to the methods described by (Saric, et al. 1967) and (Lichtenthaler, 1987). 2- Carbohydrate content (mg/g DW) was determined according to the method described by (Dubois, et al., 1956). 3- Elemental content (mg/g DW) of Na %, N %, k %, and P% was determined according to the method described (Black, et al., 1965). Data were collected using a completely randomized design and permutation of factors according to (Snedecer and Cochran, 1982).

RESULTS AND DISCUSSION

Effects of Chlorophyllin Spraying on Growth Characteristics and Chemical Components of *Syngonium podophyllum*.

The data in Tables (1, 2, and 3) show that the highest growth parameters, expressed in terms of plant height, root length, number of leaves, stem thickness, number of successors, shoot fresh or dry weight, and leaf area, were obtained from plants were sprayed with Chlorophyllin 100, 200 and 300 ppm. Spraying 100 ppm of Chlorophyllin significantly increased plant height (cm). When we sprayed 300 ppm of chlorophyllin, root length, number of leaves, number of successors, and leaf area all increased significantly. On the other hand, these treatments had no significant effect on other parameters such as trunk diameter, fresh and dry weight. Regarding the effect of Chlorophyllin foliar sprays (0, 100, 300, and 200ppm) on total chlorophyll and carotenoids, total chlorophyll and carotenoids were increased by the use of Chlorophyllinfoliar sprays, especially at medium doses (200ppm). On the other hand, spraying one treatment (100, 200, and 300 ppm) had no significant beneficial effects on the carbohydrates, proteins, Na, P, K, and N of Synecarpa plants during the growing season.

Data in Tables 4, 5, and 6 suggest that *Syngonium* plants don't experience common significant changes in growth when treated at 4, 8 or 12o'clock. Plants treated at 12 o'clock grew the most branches and leaves; *Syngonium* treated for 8 hours grew the most shoots; and those treated for 4 hours grew the most leaves. Data presented in this table also show that plants treated for 12 hours with *Syngonium* had the highest weight of both leaves and shoots. Treatments showed no significant effect on plants' total chlorophyll, carbohydrates, protein, carotenoids, Na, P, K, or N percentages. Additionally, spraying at 12 o'clock aboveground yielded high levels of all previous minerals in the plant.

Tables 7, 8, and 9 display the results of experiments that show variation in growth parameters depending on spraying intervals and chlorophyllin concentrations. Variable growth effects were not substantial enough to alter any growth parameters. However, higher values of plant height, root length, leaf number, stem diameter, shoot fresh and dry weight, and leaf area were observed when chlorophyllin was sprayed at 300 ppm at 12 o'clock intervals. At8 o'clockwith200ppm spray, protein, carotenoids, and N in chlorophyllin creased; they also increased the amount of chlorophyll in leaves. This can be seen through the effects of interacting with Chlorophyllin foliar sprays. Using Chlorophyllin to

increase the plant's K, P and Na levels by 100 ppm produced the highest results. When compared to other treatments, spraying 300 ppm at 8 hoo'clock increased carbohydrate levels in plants.

Table 1: Effect of Chlorophyllin concentrations on growth parameters of *Syngonium* plants.

Measurements / Treatments	Plant height	Root length	leaves number	Stem diameter	Successors number	Leaf index area	Fresh weight of shoots	Dry weight of shoots
0 ppm Chlorophyllin	34.22	36.22	11.11	0.81	1.11	128.58	45.89	9.44
100 ppm Chlorophyllin	47.28	45.44	13.67	0.75	1.33	193.93	75	12.78
200 ppm Chlorophyllin	39	46.33	15.11	0.71	1.89	182.28	79.33	14.22
300 ppm Chlorophyllin	45	64.54	17.22	0.81	3	241.39	84.56	14.67
L.S.D. 0.05	12.28	25.01	3.72	0.11	0.74	84.98	57.14	7.51

Table 2:. Effect of Chlorophyllin concentrations on chemical constituents and elements % of *Syngonium* plants.

Measurements / Treatments	Total chlorophyll content (mg / g f.w.)	Carbohydrate's content (mg / g d.w.)	Protein %	Carotenoid's content (mg / g f.w.)	Sodium (Na %)	Phosphorus (P %)	Potassium (K %)	Nitrogen (N %)
0 ppm Chlorophyllin	**1.47**	**2.95**	**14.60**	**1.87**	**2.33**	**0.29**	**4.90**	**2.34**
100 ppm Chlorophyllin	**1.47**	**1.90**	**10.61**	**1.94**	**2.38**	**0.33**	**5.63**	**2.27**
200 ppm Chlorophyllin	**1.93**	**2.82**	**13.83**	**2.52**	**1.82**	**0.21**	**3.47**	**2.21**
300 ppm Chlorophyllin	**1.75**	**2.94**	**13.71**	**2.31**	**2.01**	**0.25**	**3.71**	**2.20**
L.S.D. 0.05	**0.29**	**0.31**	**0.62**	**0.39**	**0.19**	**0.03**	**0.31**	**0.10**

Table 3: Effect of spraying times on growth parameters of Syngonium plants.

Measurements / Treatments	Plant height	Root length	leaves number	Stem diameter	Successors number	Leaf index area	Fresh weight of shoots	Dry weight of shoots
8o'clockmorning	39.83	41.25	15.08	0.77	1.75	170.47	55.75	11.67
12 o'clockNoon	43.54	52.83	14.33	0.77	2	204.31	83.17	13.33
4o'clockafter noon	40.75	50.33	13.42	0.77	1.75	184.85	74.67	13.33
L.S.D. 0.05	10.63	21.66	3.22	0.09	0.64	73.59	49.49	6.50

Table (5). Effect of spraying times on chemical constituents and elements % of *Syngonium* plants.

Measurements / Treatments	Total chlorophyll content (mg / g f.w.)	Carbohydrate's content (mg / g d.w.)	Protein %	Carotenoid's content (mg / g f.w.)	Sodium (Na %)	Phosphorus (P %)	Potassium (K %)	Nitrogen (N %)
8o'clock morning	**1.65**	**2.52**	**12.08**	**2.11**	**2.12**	**0.31**	**4.27**	**2.36**
12 o'clockNoon	**1.78**	**2.77**	**14.57**	**2.34**	**2.16**	**0.29**	**4.75**	**2.33**
4 o'clock after noon	**1.54**	**2.67**	**12.91**	**2.04**	**2.13**	**0.21**	**4.26**	**2.07**
L.S.D. 0.05	**0.25**	**0.27**	**0.54**	**0.34**	**0.16**	**0.03**	**0.27**	**0.09**

Table 6. Effect of interaction of Chlorophyllin concentrations and spraying times on growth parameters of *Syngonium* plants.

Measurements / Treatments	Plant height	Root length	leaves number	Stem diameter	Successors number	Leaf index area	Fresh weight of shoots	Dry weight of shoots
8o'clock morning+ 0 ppm	35	30.33	13	0.83	1.33	105.25	50.67	10
8hours8 o'clock morning + 100 ppm	42	38	13.67	0.76	1.67	157.7	57.67	11.33
8 o'clock morning + 200 ppm	35.33	45.67	16.67	0.72	2	177.08	60	15
8 o'clock morning + 300 ppm	47	51	17	0.77	2	241.83	54.67	10.33
12 o'clock Noon + 0 ppm	34.67	48.67	12	0.82	1	158.17	58	10.33
12 o'clock Noon +100 ppm	51.5	40.33	15	0.67	1	194.83	79.67	11.33
12 o'clock Noon +200 ppm	37.67	41.67	13.33	0.72	1.33	196	58.33	10.33
12 o'clock Noon +300 ppm	50.33	80.67	17	0.87	4.67	268.25	136.67	21.33
4 o'clock after noon + 0 ppm	33	29.67	8.33	0.77	1	122.33	29	8
4 o'clock after noon + 100 ppm	48.33	58	12.33	0.82	1.33	229.25	87.67	15.67
4 o'clock after noon + 200 ppm	44	51.67	15.33	0.71	2.33	173.75	119.67	17.33
4 o'clock after noon + 300 ppm	37.67	62	17.67	0.8	2.33	214.08	62.33	12.33
L.S.D. 0.05	21.27	43.32	6.45	0.17	1.29	147.18	98.98	13.01

Table (7). Effect of interaction of Chlorophyllin concentrations and spraying times on chemical constituents and elements %of *Syngonium* plants.

Measurements / Treatments	Total chlorophyll content (mg / g f.w.)	Carbohydrate's content (mg / g d.w.)	Protein content %	Carotenoid's content (mg / g f.w.)	Sodium (Na %)	Phosphorus (P %)	Potassium (K %)	Nitrogen (N %)
8 o'clock morning + 0 ppm	1.55	2.91	15.29	1.85	1.96	0.27	4.19	2.45
8 hours 8 o'clock morning + 100 ppm	1.10	1.27	4.17	1.40	2.73	0.46	6.32	2.38
8 o'clock morning + 200 ppm	2.59	2.43	15.58	3.40	1.82	0.26	3.36	2.49
8 o'clock morning + 300 ppm	1.34	3.46	13.30	1.78	1.96	0.24	3.20	2.13
12 o'clock Noon + 0 ppm	1.97	2.80	14.35	2.51	2.33	0.30	4.75	2.30
12 o'clock Noon + 100 ppm	2.04	2.73	14.70	2.78	2.31	0.34	5.76	2.35
12 o'clock Noon + 200 ppm	1.41	2.40	14	1.79	1.96	0.23	4	2.24
12 o'clock Noon + 300 ppm	1.68	3.15	15.23	2.26	2.03	0.30	4.48	2.44
4 o'clock after noon + 0 ppm	0.88	3.14	14.18	1.23	2.71	0.29	5.76	2.27
4 o'clock after noon + 100 ppm	1.26	1.70	12.95	1.64	2.10	0.20	4.80	2.07
4 o'clock after noon + 200 ppm	1.78	3.64	11.90	2.37	1.68	0.14	3.04	1.90
4 o'clock after noon + 300 ppm	2.24	2.21	12.60	2.90	2.03	0.20	3.44	2.02
L.S.D. 0.05	0.51	0.54	1.07	0.68	0.34	0.05	0.54	0.17

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