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Response of *Chlorophytum* plants to anti-transparent treatments under different water regime

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Abstract

A pot experiment was carried out in the green house of National Research Centre,Giza,Dokki, Egypt during two successive seasons 2020 and 2022 to examine the influence of KCl spraying treatments and duration of irrigation on *Chlorophytum* growth parameters and chemical contents,in three sprays at concentrations (0, 150,200 and 250 ppm) and water regime (4, 7 and 10 days) with the control. However, the highest value of these characters (Plant height, plant volume, cluster number,K %, and carotenoids content) obtained at 4 days intervals while root length, fresh and dry weights of shoots, protein, and N % were showed the highest increments by 7 days irrigation period, as well as carbohydrate % and photosynthetic pigments contents by 10 days with insignificant difference in flowering, and chemical characters. In addition, the KCl treatments showed insignificant effect.It caused an increase in previous vegetative measurements and chemical constituents such as total chlorophyll and mineral elements (Na, N, P and K) analysis at 200 and 250 ppm compared with control. The purpose of study is to know more about the effects of KCl and water periods on plant development and chemical components.

Keywords: Growth stimulant; Anti-transparent; KCl; Water intervals; Ornamental plants; *Chlorophytum*

Introduction

Chlorophytum sp. is a significant genus within the Liliaceae family. More than 200 species make up this genus' global distribution, which is primarily found in the old-world tropics and subtropics, especially in Africa and India (Govaerts et al., 2012). According to research, it contains the greatest concentration of steroidal saponin (Bordia et al., 1995). Owing to its bioactive components, it was widely

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used as an excellent replacement for Viagra, a well-known medication that increases aphrodisiac potential (Kaushik, 2005; Thakur et al., 2009). Furthermore, the resident populations can value these ornamentals for their beneficial effects on the landscape. Some of these species even exhibit the ability to absorb, hold, or translocate particular toxins. It has a number of steroidal bioactive components ,and specifically triterpenoidal saponins (Acharya et al., 2008, 2009). In the relatively confined area of urban green plantings and flowerbeds (Huinink, 1998). Standards for soil quality in urban settings. Selected ornamental plants can provide a transient but aesthetically pleasing decoration in these locations while also contributing significantly to the reduction of pollutants. Plants with highly decorative characteristics, including ornamental flowers, are defined in a number of ways (Li and Zhou, 2005). Phytoextraction is the process of removing heavy metals from soil by using plants. When compared to the control plant, the plant exposed to the KCl source had the longest stem. One potassium source that is essential to plant growth is potassium chloride. and is necessary for their regular metabolic processes and growth. Compared to normal plants, plants that got potassium chloride showed about 65% rise. One of the most crucial nutrients for plants is MSG-pro potassium, and the amount of this mineral in the soil should be regularly checked.

The rate of potassium fertilizer had the biggest impact on above-ground biomass yields (https://1library.net/subject/potassium-chloride-kcl). In the crust of the earth, potassium (K) is the seventh most plentiful element (Liebig, 1841). For agricultural crops, potassium chloride (KCl), sometimes referred to as muriate of potash (MOP), is the most commonly utilized potassium source. The two most significant inorganic ions in charge of neutralizing charges are K and Cl. significant inorganic osmotic active ingredients found in the tissues and cells of plants (Clarkson and Hanson, 1980). Because of the concentrations of chloride both inside and outside the plant, the amount of chloride in plants changes depending on the habitat. For most crops, the ideal concentration range.

The aim of this study is to evaluate the response of *Chlorophytum comosum* to anti-transparent treatments irrigated with different water intervals.Attention has been focused upon the application of anti-transparent on plants subjected to water stress during growth period. The response of some plants grown under dry condition has been discussed by the author. However, water stress it be concluded that in generally reflected by a decrease growth and productivity of plants. The mechanism of stress adaptation by anti-transparent. On the other hand, no attempt has been made to evaluate the effect of KCl on *Chlorophytum comosum* grown under different water regime.

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Material and Methods

The experiment was carried out, during the two successive seasons of 2020 and 2022, at the greenhouse of National Research Centre. Using clay soil sandy 1:1 by volume. The treatments consisted of irrigation intervals 4, 7, and 10 days and 3 concentrations of anti-transparet KCl (0, 150,200 and 250 ppm) in addition to the control. The anti-transparent treatments and irrigation intervals were factorial arranged in complete randomized design with 5 replicates to evaluate the effect of anti-transparent through different irrigation intervals. Thus, the experiments included 12 treatments which are the combination between irrigation intervals and four anti-transparent 0,150,200 and 250 ppm. One-month shoots (10 cm) in length of *Chlorophytum comosum* plants were transplanted in the first week of November 2020 in the pots. All shoots were fertilized by (N – P – K) phosphorus before cultivation as the recommended dose of the Ministry of Agriculture. Pots were irrigated with water and adjusted to reach field capacity. After two months from transplantation the plants were sprayed twice with different concentration of anti-transparent KCl through the first after – days from transplanting and the second is days later different irrigation regime.

Chemical analyses of the soil samples were collected from different locations in the plantation at 0- 30 cm diameter and analyzed for chemical characters according to the standard procedures that mentioned by **Wilde, *et al*., (1985)**in **Table (1)**. Leaves samples were dried in oven dry at 70 ^{o}C to constant weight and ground to fine powder and used for detection of N, P, Ca, Mg and Na by **Cottenie, *et al*., (1982)**.

Chemical constituents:

Pigments contents (chlorophyll a, b and carotenoids (mg / g F.W.).) were determined according to **Metzener,*et al*., (1965)**. Total carbohydrates (% D.W.) will be determined according to the method described by **Herbert,*et al*., (1971)**. Proline content (ug / g) was determined according to the method describe by **Bates, *et al*., (1973)**.Protein content (mg / g F.W.) were determined according to the method described by **Alsmeyer,*et al*., (1974)**. All obtained data were statistically analyzed using the complete randomized design in factorial arrangement, LSD method according to **Snedecor and Cochran (1982)**.

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Results and Discussion

- Effect of irrigation intervals:

Growth characters :

Increasing the irrigation interval from 4 to 9 days resulted in an almost significant drop in practically all of the growth features (plant height, plant volume, cluster number, fresh weight of shoots, and dried weight of shoots) that were evaluated, according to the results shown in Table (1-2). The highest values of these characteristics were found in *chlorophytum* plants, and the highest increments were found in root length and dry weight, as well as in fresh and dried shoots, by 7 days and 4 days irrigation intervals with negligible differences in flowering and chemical parameters. This could be case because to the fact that active solute accumulation of suitable duels, such protein and carbs, is thought to be an efficient stress tolerance strategy during drought stress (Mckersie and Lashem, 1994). Also, Table (2) demonstrates that while the highest protein and N % increased by increasing irrigation period up to 7 days.

Table (1): **Effect of water irrigation intervals on growth parameters of** *Chlorophytum comosum***. (Average of two seasons, 2020-2022).**

Parameters / Treatments	Plant height(cm)	Root length (cm)	Plant volume(cm^3)	Cluster number	Successors number	Root fresh weight (g)	Root dry weight (g)	Shoots fresh weigh(g)	Shoots dry weight(g)
4 Day	39.25	32.67	65736.69	11.33	9.42	51.58	11.92	147.17	20.83
7 Day	36.33	33.42	60638.37	10.92	9.17	62.33	17.83	150.50	24.17
10 Day	34.33	30.33	45236.21	7.17	7.00	67.83	13.42	112.08	14.08
L.S.D. 0.05	2.77	8.31	16166.95	2.85	2.15	29.10	4.53	40.38	5.12

Table (2): **Effect of water regime onsome chemical constituents of** *Chlorophytum comosu*

(Average of two seasons, 2020-2022).

Parameters / Treatments	Carbohydrate. %	Protein %	Carotenoids mg/g/F.W.	Total chlorophyll mg/g/F.W.	Na %	P %	K %	N %
4 Day	3.03	12.16	1.51	0.69	2.10	0.19	2.80	1.95
7 Day	3.13	15.40	0.88	0.73	2.22	0.19	2.26	2.46
10 Day	3.52	10.72	1.26	0.88	1.31	0.08	1.56	1.72
L.S.D. 0.05	7.66	3.63	7.41	6.47	0.007	2.36	0.007	4.23

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Table (3):**Effect of anti-transparent applications on growth parameters of** *Chlorophytum comosum*

(Average of two seasons, 2020-2022).

Parameters / Treatments	Plant height(cm)	Root length (cm)	Plant volume(cm^3)	Cluster number	Successors number	Root fresh weight (g)	Root dry weight (g)	Shoots fresh weight(g)	Shoots dry weight(g)
0 ppm	37.50	30.78	60066.89	10.56	9.11	44.44	12.89	125.33	20.67
150 ppm	36.44	30.67	59895.33	8.44	8.33	62.89	13.44	125.78	20.89
200 ppm	35.67	31.56	52755.72	9.89	8.22	69.78	14.44	132.11	16.78
250 ppm	36.89	35.56	56077.09	10.33	8.44	65.22	16.78	163.11	20.44
L.S.D. 0.05	3.20	9.60	18667.98	3.29	2.49	33.60	5.23	46.63	5.91

As generally in almost cases of vegetative and flowering parameters, the same trend observed on chemical constituents and minerals contents in leaves compared with control plant. Response of growth parameters to anti-transparent, KCl treatments showed insignificant effect on growth parameters with clear difference. In this connection, the positive effect of potassium chloride can be suggested that these adequate amounts of K can enhance the total dry mass accumulation of crop plants under drought stress in comparison to lower K concentrations (Egilla, et al., 2001). This finding might be attributable to stomata regulation by K + and corresponding higher rates of photosynthesis (Marschner, 2012). Taha, et al., (2014) on mango trees potassium increased leaf area, improves leaf mineral content, enhancing yield as well as physical and chemical properties. Moreover, spraying onion plants with potassium markedly increased vegetative growth, yield, bulb quality and bulb chemical composition (Behairy, et al., 2015). Potassium chloride is potassium salt in all treatments, at the same time at the highest results.

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Table (4):**Effect of anti-transparent materialon some chemical constituents of** *Chlorophytum comosum* **(Average of two seasons, 2020-2022).**

Parameters / Treatments	Carbohydrate. %	Protein %	Carotenoids mg/g/F.W.	Total chlorophyll mg/g/F.W.	Na %	P %	K %	N %
0 ppm	3.23	14.12	1.08	0.81	1.77	0.19	2.05	2.26
150 ppm	3.02	11.78	0.80	0.56	1.80	0.13	1.92	1.89
200 ppm	3.71	12.48	1.44	0.94	2.01	0.15	1.97	2.00
250 ppm	2.93	12.66	1.56	0.76	1.94	0.14	2.88	2.03
L.S.D. 0.05	8.84	4.19	8.55	7.47	0.009	2.72	0.009	4.89

Table (5):**Interaction effect between water regime and anti-transparent on growth parameters of** *Chlorophytum comosum* **(Average of two seasons, 2020-2022).**

Parameters / Treatments	Plant height(cm)	Root length (cm)	Plant volume(cm^3)	Cluster number	Successors number	Root fresh weight (g)	Root dry weight (g)	Shoots fresh weight(g)	Shoots dry weight(g)
4 Day + 0 ppm	38.67	36	71284.54	13.67	11.67	49.67	12	136	13.33
4 Day + 150 ppm	39.33	37	64400.35	12.67	8	54	12	137.33	21.33
4 Day + 200 ppm	39	24	67222.17	9	8.33	62.67	12	142.33	21
4 Day + 250 ppm	40	33.67	60039.68	10	9.67	40	11.67	173	27.67
7 Day + 0 ppm	37.67	27.67	60452.33	9	7.33	43.33	14	118.67	28.33
7 Day + 150 ppm	34.33	24	54677.87	6.67	8.67	39.67	11.67	112.33	26.67
7 Day + 200 ppm	35.67	41.33	61460.27	14.33	11.33	77.33	20.67	164.67	19.67
7 Day + 250 ppm	37.67	40.67	65963.03	13.67	9.33	89	25	206.33	22
10 Day + 0 ppm	36.33	28.67	48463.81	9	8.33	40.33	12.67	121.33	20.33
10 Day + 150 ppm	35.67	31	60607.76	6	8.33	95	16.67	127.67	14.67
10 Day + 200 ppm	32.33	29.33	29644.74	6.33	5	69.33	10.67	89.33	9.67
10 Day + 250 ppm	33	32.33	42228.55	7.33	6.33	66.67	13.67	110	11.67
L.S.D. 0.05	5.53	16.63	3.23	5.71	4.31	58.20	9.05	80.76	10.23

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Parameters / Treatments	Carbohydrate. %	Protein %	Carotenoids mg/g/F.W.	Total chlorophyll mg/g/F.W.	Na %	P %	K %	N %
4 Day + 0 ppm	2.80	8.93	0.69	0.62	1.4	0.12	1.92	1.43
4 Day + 150 ppm	3.20	13.13	0.94	0.66	2.38	0.25	2.4	2.1
4 Day + 200 ppm	3.45	14.7	2.43	1.12	2.31	0.23	2.24	2.35
4 Day + 250 ppm	2.67	11.9	2.99	0.39	2.31	0.15	4.64	1.90
7 Day + 0 ppm	3.07	15.93	1.57	1.17	2.1	0.25	2.16	2.55
7 Day + 150 ppm	2.78	10.5	0.23	0.16	1.61	0.13	1.76	1.68
7 Day + 200 ppm	3.87	15.93	0.79	0.93	2.8	0.19	2.4	2.55
7 Day + 250 ppm	2.79	19.25	0.93	0.65	2.38	0.18	2.72	3.08
10 Day + 0 ppm	3.83	17.5	0.97	0.64	1.82	0.20	2.08	2.8
10 Day + 150 ppm	3.09	11.73	1.23	0.88	1.4	0.01	1.6	1.88
10 Day + 200 ppm	3.82	6.83	1.09	0.77	0.91	0.03	1.28	1.09
10 Day + 250 ppm	3.33	6.83	1.75	1.24	1.12	0.09	1.28	1.09
L.S.D. 0.05	4.84	2.29	4.64	4.09	4.68	4.68	4.08	2.71

Table (6):**Interaction effect between water regime and anti-transparent on some chemical constituents of** *Chlorophytum comosum* **(Average of two seasons, 2020-2022).**

Data in **Tables (5, 6)** revealed that, with regard the effect of interaction between water intervals and KCl, generally, there is no significant increased between all treatments in almost cases of morphological and chemical parameters on leaves of Flanjum plants compared with control and other treatments. In this concern, **(Salim,*et al.*, 2011 and 2013; Salim, 2014)** mentioned that K salts are used such as potassium chloride (KCl), caused very good results to improve the growth and yield of plants under stress conditions.

Some field experiment photos

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