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ROLES OF SPRAYING AMINO ACIDS AND CHELATED MAGNESIUM ON GROWTH, FLOWERING AND PRODUCTION OF CORMS OF *FRESSIA HYBRIDA*

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Abstract

An experiment was conducted in the nursery of the Faculty of Agriculture, University of Kufa during agricultural seasons 2018-2019 to study the effect of spraying amino acid and chelated magnesium of growth, flowering and production of corms of Fressia. Experiment was adopted in Randomized Completed Block Design (R.C.B.D) with three replicates in two factors. First spraying nutrition solution (Taravert Amifol) at a three concentration (0, 2 and 4 ml. L^{-1}). Second spraying three concentration of chelated magnesium (EDTA) (0, 100 and 200 mg. L^{-1}).
The results show that spraying amino acid at a concentration of 4ml. L^{-1} and chelated magnesium at a concentration 100 mg.L^{-1} increased significantly: number of leaves, shoot dry weight, leaves content of total chlorophyll and total soluble carbohydrates, number of inflorescence, number of floret, floret diameter, inflorescence stalk length and vase life (6.67 leave.plant^{-1}, 2.74 g, 39.40 mg.100 g fresh weight, 9.10 mg. g^{-1}dry weight, 8.00 inflorescence. plant^{-1}, 12.95 floret. inflorescence, 8.16 cm, 39.63 cm and 9.33 days) compared to control treatment which gave the lowest values (3.66 leave.plant^{-1}, 1.49 g, 33.39 mg.100 g fresh weight, 6.12 mg. g^{-1} dry weight, 3.33 inflorescence. plant^{-1}, 5.00 floret. inflorescence, 3.63 cm, 29.77 cm and 4.66 days), respectively.

Key words*: floriculture bulbs, growth stimulated, minerals nutrient.*

INTRODUCTION

Fressia plant (*Fressia hybrida*) belongs to the Iridaceae family which includes many important floriculture plant. This family includes more than 50 plant genera of annual winter which live under Iraqi climatic conditions. It is considered as a one of the important plants in the world because its floral inflorescences are suitable for picking, and for its pleasant aromatic smell when opened, and for the multiplicity of its colors and long visa life (Al-Batal, 2010). Its flowers are ranked sixth in the world among the cut flowers (Armitage & Luashman, 2003).

Amino acids, which are the primary plant units for protein synthesis (Ria, 2002) are one of the stimuli for plant cell growth as they have many physiological effects in plants, especially the free amino acids that are involved in building the enzymes responsible for photosynthesis, as it is a source of carbon and chelating materials for microelements (Goss, 1973). It also stimulates the process of photosynthesis, builds carbohydrates, and increases the effectiveness and activity of anti-oxidant enzymes (Tantawy et al., 2009). It is also characterized by its ease of penetration and absorption, as it affected the permeability of plant membranes and consequently the ease of transporting nutrients within the plant, which ultimately improves plant growth and development (Koksal et al., 1999). Khattab et al. (2016) show that spraying *Gladiolus grandiflorus* L. with amino acids (Glycine and Methionine) resulted in an increased plant height, number of leaves, shoot dry weight, number of inflorescences, floret diameter, its dry weight, number of corms per plant and its dry weight.

Magnesium is also an important and necessary element for plant growth and nutrition, as many carbohydrate enzymes need magnesium as a catalyst for its action, as well as it enters into building the chlorophyll molecule and activates almost all enzymes that participate in the processes of photo phosphorylation (Taiz & Zeiger, 2006). Abdallateef et al. (2017) mentioned that spraying the element magnesium on the plant *Matthiola incana* at a concentration of 6 g^{-1} resulted in a significant

increase in the height of the plant, number of leaves and flower inflorescences, length and diameter of inflorescences' stem.

The fact that bulbs of freesia are suitable for commercial picking in many producing countries for cut flowers (Imanishi, 1993) conducted this research with the aim of studying the effect of spraying the nutrient solution Taravert Amifol and chelated magnesium in several concentrations in order to improve the growth and flowers parameters and flowering visa life of these bulbs suitable for commercial cut flowers. Reducing the time required to flowering of these commercially important bulbs is also studied.

MATERIALS AND METHODS

An experiment was conducted in the nursery of the Faculty of Agriculture, University of Kufa, in a house covered with green saran during the 2018-2019 agricultural season, to study the effect of spraying nutrient solution "Taravert Amifol" and chelated magnesium on the growth, flower and production of freesia corms. The corms planted on 01/10/2018 in plastic pots with a diameter of 20 cm in which they consisted sand and peatmoos in a ratio of 1: 3. Table 1 shows the analysis of the soil of the pots done in the Graduate Studies Laboratory of the Faculty of Agriculture - University of Kufa.

Table 1. The physical and chemical properties of potting soils

pH	EC. $ds.m^{-}$	OM %	N g 100 g^{-1}	P mg. L^{-1}	K mg L^{-1}	Mg^{++} mg. L^{-1}	clay %	Silt %	Sand %	Soil Texture
7.21	.211	0.92	0.62	2.14	14.1	1.50	3.10	5.3	91.6	sandy

A factorial experiment was carried out in Randomized Complete Block Design (R.C.B.D) with two factors. The first one, three concentrations (0, 2 and 4) $ml.L^{-1}$ of nutrient solution "Taravert Amifol" which consists of: total nitrogen 6.5%, organic matter 15%, total amino acids 20% and free amino acids 11% were used. The second factor which consists in spraying chelated magnesium (Mg-EDTA) in three concentrations (0, 100 and 200) mg. L^{-1} was applied twice: the first time after the emergence of 3 real leaves and the second after 21 days from the first spray. Means were compared according to the Least Significant Difference (L.S.D) at a 5% probability (SAS, 2000).

All operations like watering and weeding were done whenever the plant needed it. On 2/2/2019, the following growth parameters were measured: Number of leaves per plant; Shoot dry weight; Leaf content of total chlorophyll (mg.100 g^{-1} fresh weight) measured by acetone in UV-Visible Spectrophotometer and wavelength 663 and 645 nm according to Goodwin (1976); Leaf content of total soluble carbohydrates (mg.g^{-1}dry weight) measured by UV-Visible Spectrophotometer in wavelength 490 nm according to Duboies et al. (1956); Number of corms per plant; Corms diameter; Number of days required for opening the first floret calculated from planting seeds to the appearance of first floret; Number of inflorescences per plant; Number of floret per inflorescences; Floret diameter (cm); Inflorescence stalk length (cm); Vase life (day): inflorescences were harvested early in the morning with a sharp blade when 2-4 florets opened on the inflorescence, then transferred directly to the laboratory and then placed in a one-liter glass bottle containing one liter of water, aspirin tablet and 2 g of sugar, than number of days was calculated until wilting inflorescence (Singh, 2006).

RESULTS

The results in Table 2 showed that spraying nutrient or chelated significantly increased growth parameters. Also spraying nutrient solution at a concentration of 4 $ml.L^{-1}$ and chelated magnesium at 100 mg. L^{-1} significantly increased of: Leaves per plant, Shoot dry weight, Leaf content of total chlorophyll and total soluble carbohydrates, Number of corms per plant and corms diameters (6.67 leaves, 2.74 g, 39.40 mg.100 g^{-1} and 9.16 mg.g^{-1}, 3.66 corm and 1.86 cm) compared to control treatment which gave the lowest values.

Table 2. Effect of spraying nutrient and chelated magnesium on growth parameters

Treatments			Number of Leaves (leaf.plant^{-1})	Shoot dry weight (g)	Leaves content of Total Chlorophyll (mg.100g^{-1})	Leaves content of total soluble carbohydrats (mg. g^{-1})	Number of corms per plant	Corm diameter (cm)
Nutrient Solution		0	4.00	1.60	33.70	6.34	1.22	1.18
		2	5.11	2.02	35.69	7.44	2.44	1.48
		4	6.33	2.53	38.77	8.31	3.22	1.73
L.S.D. 0.05			0.34	0.08	0.42	0.43	0.30	0.08
chelated magnesium (mg.L^{-1})		0	4.77	1.90	35.34	7.13	2.00	1.53
		100	5.22	2.13	36.13	7.56	2.33	1.48
		200	5.44	2.11	36.69	7.39	2.55	1.56
L.S.D. 0.05			0.34	0.08	0.42	0.435	0.30	0.08
Nutrient Solution (mg.L^{-1}) × chelated magnesium (mg.L^{-1})	0	0	3.66	1.49	33.39	6.12	1.00	1.10
	2	100	4.00	1.62	33.62	6.21	1.00	1.20
	4	200	4.33	1.69	34.10	6.71	1.66	1.26
	0	0	4.66	1.87	34.88	7.14	2.00	1.43
	2	100	5.00	2.04	35.63	7.33	2.33	1.46
	4	200	5.66	2.17	36.57	7.84	3.00	1.56
	0	0	6.00	2.36	37.76	8.14	3.00	1.53
	2	100	6.67	2.74	39.40	9.16	3.66	1.86
	4	200	6.33	2.49	39.14	7.64	3.00	1.80
L.S.D. 0.05			0.60	0.15	0.73	0.75	0.52	0.13

Spraying nutrient or chelated significantly increased flowering parameters. Also spraying nutrient solution at a concentration 4 ml.L^{-1} and chelated magnesium at 100 mg. L^{-1} significantly decreased the number of days required for opening the first floret and increased the number of inflorescences per plant, number of floret per inflorescences, floret diameter, inflorescence stalk length and vase life to (129.33, 8.00 inflorescences, 12.95 floret, 8.16 cm, 39.63 cm and 9.33 days) compared to control treatment which gave the lowest values (Table 3).

Table 3. Effect of spraying nutrient and chelated magnesium on growth parameters

Treatments			number of days required for opening the first floret (day)	number of inflorescences per plant	number of floret per inflorescences	floret diameter (cm)	inflorescence stalk length	vase life (day)
Nutrient Solution		0	138.89	3.88	6.00	3.84	30.32	5.22
		2	134.22	5.55	8.66	5.08	34.40	6.88
		4	130.22	7.33	10.00	7.10	38.87	8.00
L.S.D. 0.05			0.73	0.46	0.48	7.10	0.67	0.41
chelated magnesium (mg.L^{-1})		0	135.67	5.00	7.55	0.23	33.38	6.33
		100	134.11	5.77	8.77	4.76	34.51	7.11
		200	133.56	6.00	9.33	5.31	35.70	7.66
L.S.D. 0.05			0.73	0.46	0.48	5.95	0.67	0.41
Nutrient Solution (mg.L^{-1}) × chelated magnesium (mg.L^{-1})	0	0	140.33	3.33	5.00	0.23	29.77	4.66
	2	100	138.67	4.00	6.00	3.63	30.10	5.00
	4	200	137.67	4.33	7.00	3.86	31.10	6.00
	0	0	136.33	5.00	7.00	4.03	32.33	6.00
	2	100	134.33	5.33	7.66	4.56	33.80	7.00
	4	200	132.00	6.33	8.33	5.03	37.07	7.66
	0	0	130.33	6.66	10.26	5.66	38.03	8.33
	2	100	129.33	8.00	12.95	6.10	39.63	9.33
	4	200	131.00	7.33	12.00	8.16	38.93	9.12
L.S.D. 0.05			1.274	0.80	0.84	7.03	1.16	0.72

DISCUSSIONS

The results of Tables 2 and 3 show significant increasing when spraying nutrient solution in the growth and flowering parameters. That may be due to the role of nutrient solution which contain many nutrients necessary for plant growth such as nitrogen and direct or indirect for amino acids that are important in many physiological processes, as well as its role in stimulated photosynthesis, which leads to improvement plant growth by increasing the manufacture of carbohydrates and proteins, finally that lead to the development plant growth parameters (Thomas et al., 2009). Also, amino acids are an important source of nitrogen which stimulate proteins synthesis, formation of nucleic acids (RNA and DNA), essential amino acids especially tryptophan which is the initial starters product of IAA that it necessary to the division and elongation of plant cells and has role in promoting apical dominance (Wona, et al., 2011). This activates the efficacy of the photosynthesis, enzymes and CO_2 assimilation in plant which increase carbohydrates manufacture and soluble amino acids transportation from the sources to corms (Calvo et al., 2014). In addition to that, increasing number of leaves and leaf content in total chlorophyll (Table 2) stimulates photosynthesis and increases the manufacture of carbohydrates (Table 2) which leads to an excess of sugars that are ready and available to enhancement the flowering growth and give the highest number of inflorescences and improvement flowering growth parameters (Al-Said & Kamal, 2008).

Also, it is observed from the results of Tables 2 and 3 a significant increase when spraying magnesium in the growth characteristics, and that may be due to the main role of magnesium is activation of Ribulose 1-5 Bisphosphosphate carboxylase enzyme which is necessary for the stabilize of carbon dioxide in the Calvin Cycle in the dark reactions of photosynthesis, which has a role in increasing nitrogen and it is involved in protein formation (Taiz & Zeiger, 2006), also has an important role in manufacturing chlorophyll molecule (Al-Sahaf, 1989). Finally stimulates the process of photosynthesis and increases the amount of carbohydrates (Table 2), also flowering parameters had increased significantly as a result of spraying magnesium (Table 3), and that may be due to an increases in the available of the elements ready for absorption by the plant, including magnesium, which may lead to an increase in the efficiency of photosynthesis and the manufactured of soluble carbohydrates in the leaves. In addition to that magnesium has a role in the representation of proteins (Al-Sahaf, 1989) and finally ultimately has improved flowering parameters (Mastalers, 1984).

CONCLUSIONS

Through the research results we conclude that spraying nutrient solution "Taravert Amifol" at 4 mg. L^{-1} and chelated magnesium at 100 mg. L^{-1} have improved growth and flowering parameters especially long vase life for cut flower.

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