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REGULAR ARTICLE

Effect of spraying with Liquorice Roots Extract and Vitamin C on some vegetative and flowering parameters of Stock plant *Mathiola incana* L.

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ABSTRACT

A field experiment was conducted at the nursery of Agriculture Faculty/ Kufa University during the growing season 2012 – 2013 to study the effect of spraying liquorice (licorice) roots extract *Glyayrrhiza glabra* L. and vitamin C on some vegetative and flowering parameters of Stock plant . The experiment was adopted in Randomized Complete Block Design (R.C.B.D) with two factors in three replicates: First was three concentrations of liquorice roots extract i.e. (0, 3 and 6) ml.L^{-1}, second was three concentrations of vitamin C i.e. (0, 75 and 150) mg.L^{-1} and their interactions. Least significant differences (L.S.D) test was using to compare the means. Results showed that spraying with liquorice extract at a concentration 4 ml.L^{-1} or vitamin C at a concentration 50 mg.L^{-1} increased significantly plant height, number of leaves, shoots dry weight, content of total chlorophyll and total soluble carbohydrates in leaves, number of main roots, roots dry weight, number of inflorescence and floret, diameter of floret and inflorescence dry weight, compared to control treatment which gave the least values. Results also showed that: spraying with liquorice roots extract at a concentration 4 ml.L^{-1} and vitamin C at a concentration 50 mg.L^{-1} increased significantly plant height, number of leaves, shoots dry weight, total content of chlorophyll, soluble carbohydrates, number of main roots and roots dry weight, number of inflorescence per plant and floret per inflorescence to 8.67 and 48.67, inflorescence stalk diameter to 4.07cm and inflorescence dry weight to 2.92gm, compared to control treatment which gave the least values: 3.00 inflorescence. $Plant^{-1}$, 27.00 floret. Inflorescence-1, 1.20cm and 0.22gm respectively.

Keywords: Stock plant Mathiola *incana* L., Floriculture and Liquorice root extract.

INTRODUCTION

Stock plant belongs to Cruciferae family. Stock plants flowers are sited in a spiky inflorescences either single or double with various colors: white, yellow and scarlet. These flowers are considered as cut flowers (Al-Sultan *et. al*, 1992). This plant was first found in the Mediterranean Sea region and the Canary Islands, it blooms during spring and early summer and could be grown successfully in sunny locations, and it is grown dramatically in public and private gardens (Al-Batal, 2005). Growing this plant requires a good fertility soil (Al- Sultan *et. al*, 1992).

Study showed that spraying some natural compounds improvement flower plant, and protect the soil and environment from damages and pollution (Al- Taiy, 2013), like liquorice roots extract *Glyayrrhiza glabra* L. which contains (proteins , oil, reducing sugars and some nutrients(phosphorus, potassium, magnesium, iron, zinc))((Moses *et.al* , 2002). Al-Zurfi (2009) found that a significant increases in the number of leaves, leaf

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area, flower stalk length and flowers diameters when spraying Spanish Iris bulbs *Iris xiphium* L. with liquorice roots extract at a concentration 3 $g.L^{-1}$. Al-Rashedi and Abdullah(2010) referred that spraying gladiolus bulbs *Gladiouls xhortuianus* L. with liquorice root extract gave a significant increasing in plant height, leaf area, total chlorophyll content of leaves , flower stalk length and flower stalk diameter, also Naser (2012) showed that, spraying Geranium plant *Pelargonium zonale* L. with Liquorice root extract at a concentration 3 $g.l^{-1}$ gave a significantly increased in the number of leaves, leaf area, dry weight of shoots, leaf content of total chlorophyll and total soluble carbohydrates, and nitrogen, phosphorus and potassium content in leaves.

Vitamin C is an important amino sugar, chemical structure is $C_6H_{12}O_6$, and do an impotent physiological roles in plant, including stimulating the formation of protein and nucleic acids as well as acting as a coenzyme in several enzymatic reactions for metabolism of carbohydrates and protein in plant. Also it encourage the formation of gibberellins and anthocyanin as well as it regulating cell growth through its role in cell division and elongation (Smirnoff and Wheeler, 2000). Also affects the process of flowering through the effect on phytochrom pigment (Barth *et.al*. 2006). Aziz and Talaat (2007) mentioned that a significant increases in the production of compound flowers when spraying chamomile plant *Martricaraia chamomilla* L. with ascorbic acid at a concentrations 100 and 200 $mg.L^{-1}$. Also Al-Rashedi and Abdullah (2010) indicated that, the length of flowering inflorescence, number of opened florets increased significantly when spraying gladiolus bulbs with vitamin C at a concentration 500 mg. L^{-1}.

For this aimed an experiment was conducted to study the effect of spraying different concentrations of liquorice roots extract and vitamin C on growth parameters of Stock plant .

MATERIALS & METHODS

A field experiments was contented in the nursery of the Faculty of Agriculture / University of Kufa during the growing seasons 2013-2012 to study the effect of spraying liquorice roots extract and vitamin C on the growth parameters of Stock plant cv. Spanish. Seeds produced by Euro Garden Company were planted in 15/9/2012. Seedlings at four true leaves were transplanted in pots 20cm diameter, contained 4 kg salty sand soil (Table 1).

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RESULTS & DISCUSSION

Results in Table (2) showed that spraying plant with liquorice roots extract at a concentration 6 $g.L^{-1}$ gave a significant increasing in plant height, number of total leaves, shoot dry weight, total chlorophyll content of the leaves and total soluble carbohydrates that reaching 24.99cm, 54.00 leaf. $plant^{-1}$, 5.32g , 44.28 mg 100 g fresh $wt.^{-1}$ and 7.38 mg . g dry wt^{-1} compared with control treatment which gave the lowest values (13.38cm, 37.44 leaf $.plant^{-1}$, 2.37g, 40.93 mg 100 g fresh $wt.^{-1}$ and 4.51 mg. g dry wt^{-1}) respectively. This increases because this extract contain some nutrients such as phosphorus, potassium, magnesium, iron and zinc (Moses *et.al*, 2002), and these nutrients play an important role in the activation of various enzymes that increase the activity of photosynthesis, also that extract contain Glyceyrrhizin as material works like gibberellin roles in the plant, and that increased cell division and elongation (Moses *et.al* , 2002). As well as phosphorus plays an important role in all biological processes such as cell division and transfer energy to all parts of the plant, and acts in the formation of the membrane chloroplasts and composition of amino and nucleic acids, potassium courageous the formation of carbohydrates, proteins, and energy components "ATP" which all affect to increase plant growth and its size (AL-Naimi, 1985), also presence of macro nutrients, such as Zinc and magnesium which participates indirectly in the formation of chlorophyll through its direct effect in the formation of amino acids and energy components (Abu- Dahi and AL – Yunes , 1988). Similar results were found by Naser (2012) on geranium plant.

Results in Table (2) showed that significant increases in the plant height, total number of leaves, shoot dry weight, total content of chlorophyll in leaves and total soluble carbohydrates in leaves i.e.

(20.94cm, 48.78 leaf . plant $^{-1}$, 4.31g, 43.44 mg 100 g fresh wt. $^{-1}$ and 6.46 mg .g $^{-1}$ dry weight) when spraying plant with vitamin C at a concentration 150 mg.L^{-1} compared to the control which gave the lowest values i.e. (16.89 cm, 42.67 . leaf . plant^{-1} , 3.38g, 42.24 mg .100g fresh wt.$^{-1}$ and 5.53 mg . g dry weight. $^{-1}$) respectively, these results may be due to the role of vitamin C in increasing plant growth through its physiological effect which works as a coenzyme in enzymatic reactions for the metabolism of carbohydrates , proteins and involveas in the processes photosynthesis (Weaver *et.al* , 1988), in addition to its role in stimulating cell division and increasing the content of carbohydrates, which can be used in the different operations of growth including, increasing the size of the shoot system (Smirnoff and Wheeler, 2000). This result is the same to Aziz and Talaat (2007) on

Table 1: The physical and chemical characteristics of pot soil

	Measurement units		
Soil structure		Clay	4.80
		Silt	18.5
		Sand	76.7
Degree of soil pH		6.35	
Electric conductivity (EC)		2.38	
Ca^{++}	Mmol.l^{-1}	22.8	
K^{+}	Mmol.l^{-1}	1.85	
Mg^{++}	Mmol.l^{-1}	15.8	
N	Mg.g^{-1}	30.2	
Organic matter	g. Kg^{-1}	8.30	

Table 2: effect of spraying the liquorice roots extract and Vitamin C and their interaction on vegetative growth parameters.

Treatments			Plant height (cm)	Number of total leaves (leaf.plant^{-1})	Shoot dry wt. (gm)	Total Chlorophyll (mg.100gm fresh wt.$^{-1}$	Total soluble Carbohydrates (mg . g dry wt^{-1}
Liquorice roots extract ml.l^{-1}	0		13.38	37.44	2.37	40.93	4.51
	3		18.13	44.78	3.90	43.22	5.90
	6		24.99	54.00	5.32	44.28	7.38
L.S.D. 0.05			2.637	3.291	1.067	1.667	1.549
Vitamin C mg.l^{-1}	0		16.89	42.67	3.38	42.24	5.53
	75		18.67	44.78	3.92	42.74	5.80
	150		20.94	48.78	4.31	43.44	6.46
L.S.D. 0.05			2.637	3.291	1.067	1.667	1.549
Liquorice roots extract X Vitamin C	0	0	12.17	35.00	1.90	40.11	4.27
		75	13.20	37.33	2.73	41.08	4.40
		150	14.77	40.00	2.49	41.60	4.87
	3	0	16.60	42.33	3.61	42.62	5.33
		75	17.97	44.33	3.73	43.10	6.07
		150	19.83	47.67	4.38	43.93	6.30
	6	0	21.90	50.67	4.62	44.00	7.00
		75	24.83	52.67	5.29	42.70	6.23
		150	28.23	58.67	6.06	46.13	8.90
L.S.D. 0.05			4.529	5.664	3.264	3.478	3.924

Results of Table (2) showed that an significant increases when spraying the plant with liquorice root extract at a concentration 6 $g.L^{-1}$ and vitamin C at a concentration 150 $mg.L^{-1}$ in plant height, total number of leaves, shoot dry weight, total chlorophyll content in leaves and total soluble carbohydrate in leaves to 28.23cm, 58.67 leaf. $plant^{-1}$, 6.06g , 46.13 mg 100 g fresh $wt.^{-1}$ and 8.90 mg. g dry $wt.^{-1}$ compared to control treatment which gave least vales (12.17cm, 35.00 leaf. $plant^{-1}$, 1.90g, 40.11 mg 100 g. fresh $wt.^{-1}$ and 4.27 mg. g dry wt. $^{-1}$) respectively.n. Resulted in Table (3) showed that spraying liquorice roots extract at a concentration 6 $g.L^{-1}$ had a significant increase in the number of roots per plant and root dry weight (22.26 root. plant $^{-1}$ and 3.28g), compared control (spraying with distilled water only) that gave (15.44 root. Plant $^{-1}$ and 0.78g) respectively, these increases can be attributed to the role of nutrients found in combination of extract including phosphorus and potassium, which increases the growth of root by increasing the growth of the hole plant (Table 2), that phosphorus increased root growth by increasing cell division(13), and potassium promotes maristeamic tissues (Tisdale, *et.al* ,1997).

Results in table (3) showed that a significant increases in root growth parameters when spraying plant with vitamin C at a concentration 150 $mg.L^{-1}$ that gave (20.00 root .$Plant^{-1}$ and 2.49g) as compared with control which gave the lowest values (16.89 root. $plant^{-1}$ and 1.80g) respectively.

Results in Table (3) showed that an significant effect to spraying plant with liquorice root extract at a concentration 6 $g.L^{-1}$ and vitamin C at a concentration 150 $mg.L^{-1}$ which gave the highest number of roots and the beigest dry weight of roots i.e.(25.33 root. $plant^{-1}$ and 3.89g) compared to control which gave the lowest vales (14.67 root. $plant^{-1}$ and 0.33g) respectively.

Table 3: effect of spraying the roots of liquorice extract and Vitamin C and their interaction on Roots growth parameters.

Treatments			Number of roots Root.$plant^{-1}$	Root dry wt. Gm
Liquorice roots extract $ml.l^{-1}$	0		15.44	0.78
	3		17.44	2.09
	6		22.26	3.28
L.S.D. 0.05			2.014	1.094
Vitamin C $mg.l^{-1}$	0		16.89	1.80
	75		18.22	1.86
	150		20.00	2.49
L.S.D. 0.05			2.014	1.094
liquorice roots extract X Vitamin C	0	0	14.67	0.33
		75	15.33	0.76
		150	16.33	1.24
	3	0	16.67	1.87
		75	17.33	2.07
		150	18.33	2.34
	6	0	19.33	3.21
		75	22.00	2.74
		150	25.33	3.89
L.S.D. 0.05			4.556	3.827

Results in table (4) showed that spraying plant with liquorice roots extract at a concentration 6 g.L^{-1} has led to a significant increases in the number of inflorescences and florets, rosette diameter, inflorescence stalk diameter, and dry weight of inflorescence which reached 7.44 inflorescence. plant $^{-1}$, floret 45.44. inflorescence $^{-1}$, 3.50cm , 0.47cm and 2.47g as compared to the control treatment that gave the lowest values (3.44 inflorescence. Plant $^{-1}$, 28.56 floret. inflorescence $^{-1}$, 1.40cm, 0.25cm and 0.33g) respectively, this increases due to the role of the extract in improving vegetative growth (Table 2) which increasing the efficiency of photosynthesis and increases the production of carbohydrates , proteins and transmitted them to the flowers as well as the containment of the extract of the initially acid of gibberellins biosynthesis which works on increasing cell division and elongation and ultimately improve flowering growth(Al-Droush, 1976). Similar results were found in Al-Saad(2010) in gladiolus bulbs. Table (4) showed that positive effect with spraying vitamin C at a concentration 150 mg.L^{-1}. it was a significant increases in the number of inflorescences per plant, number of florets per inflorescence, rosette diameter , inflorescence stalk diameter, and dry weight of inflorescence that reached 6.11 inflorescences. Plant $^{-1}$, 38.89 floret. inflorescence $^{-1}$,2.89 cm , 0.40 cm and 1.55g. as compared to the control treatment that gave the lowest values (4.67 inflorescences. Plant^{-1}, 33.89 floret. inflorescences $^{-1}$, 2.12 cm , 0.33 , and 1.20 g respectively. These results may be due to the role of vitamin C in the biosynthesis of number of plant hormones, including gibbrillin and cytokinin which encourages the flowering process (Weaver *et.al* , 1998). Table (4) showed that an significant increases when spraying liquorice root extract at a concentration

Table 4: effect of spraying the roots of liquorice extract and Vitamin C and their interactions on flowering growth prarmeters

Treatments			Number of inflorescences.Plant^{-1}	Number of (floret. inflorescences $^{-1}$)	Floret diameter (cm)	inflorescences diameter cm	Inflorescences dry weight (gm)
liquorice roots extract ml.l^{-1}		0	3.44	28.56	1.40	0.25	0.33
		3	5.11	34.67	2.47	0.39	1.26
		6	7.44	45.44	3.50	0.47	2.47
L.S.D. 0.05			1.669	2.328	0.628	0.148	1.152
Vitamin C mg.l^{-1}		0	4.67	33.89	2.12	0.33	1.20
		75	5.22	35.89	2.36	0.38	1.32
		150	6.11	38.89	2.89	0.40	1.55
L.S.D. 0.05			1.669	2.328	0.628	0.148	1.152
Liquorice roots extract X Vitamin C	0	0	3.00	27.00	1.20	0.24	0.22
		75	3.33	27.67	1.17	0.27	0.28
		150	4.00	31.00	1.83	0.26	0.50
	3	0	4.67	32.00	2.13	0.36	1.18
		75	5.00	35.00	2.50	0.39	1.37
		150	5.67	37.00	2.77	0.41	1.23
	6	0	6.33	42.67	3.03	0.40	2.21
		75	7.33	45.00	3.40	0.49	2.30
		150	8.67	48.67	4.07	0.53	2.92
L.S.D. 0.05			3.628	4.292	0.954	0.336	3.429

6 g.L^{-1} and vitamin C at a concentration 150 mg.L^{-1} in the number of inflorescences, number of florets, rosette diameter, inflorescence stalk diameter, and dry weight of flowers that gave 8.67 inflorescences. plant $^{-1}$, 48.67 floret. inflorescences $^{-1}$, 4.07cm , 0.53cm and 2.92g compared to control treatment which gave the lowest vales (3.00 inflorescences. Plant $^{-1}$ 27.00 floret. inflorescences 1.20cm , 0.24cm and 0.22g, respectively.

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