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Response of Plum Transplants to Spraying with Licorice Root and Ginger Extracts

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ABSTRACT

This study was conducted in private orchard in Baghdad governorate, during 2020 growing season to investigate the influence of licorice root and ginger extracts on growth and leaf mineral content of four year's old trees of "Hollywood" plum transplants. This study included two factors: three levels of licorice root extract spray, 0 (L_0), 4 gm.L^{-1} (L_4) and 8 gm.L^{-1} (L_8) and three levels of ginger extract spray, 0 (G_0) , 4 gm.L^{-1} (G_4) and 8 gm.L^{-1} (G_8) and their interaction. Treatments were replicated three times (two transplants in experimental unit) at factorial experiment in a RCBD. The number of transplants used was 54 transplants. The results showed that, licorice root extract at 8 gm.L^{-1} (L_8) significantly increased in transplant height of 47.30 cm and highest leaf area of 15.78 cm^2 and highest leaf chlorophyll content of 57.55 $mg.g^{-1}$, leaf nitrogen content of 1.35 %, leaf potassium content of 1.72 % and leaf iron content of 184.5 $mg.kg^{-1}$. Results also showed that ginger extract spray at gm.L^{-1} (G_8) gave the highest increased in transplant height of 45.80 cm and highest leaf area of 15.21 cm^2 and highest leaf dry weight of 32.53 % , leaf nitrogen content of 1.29 %, leaf potassium content of 1.63 % and leaf iron content of 182.3 $mg.kg^{-1}$.

Keywords: Plum Transplants, Licorice Root, Ginger Extracts

INTRODUCTION

Plants, especially medicinal ones, have been widely used for thousands of years to treat some medical problems, in addition to using many of them as spices. However, it has recently become common for plant extracts to be used as a supplement or as a substitute for agricultural chemicals, some of which are added to soil and some of which are sprinkled on plants, due to some extracts contain some elements and some alternative substances for growth regulators and some compounds that are used in fight against diseases and insects that infect plants (Pylak et al., 2019). Plant extracts are one of biological preparations is called Biopreparations, where plants produce many chemical compounds with different physiological activities. Plant extracts (PE) are environmentally friendly and biodegradable even can be used in organic farming. Furthermore, they are often cheaper than conventional fungicides (Tiwari et al., 2012).Among the important and modern uses of plant extracts are antioxidants, anti-cancers, insecticides, anti-fungal and bacteria, as well as spraying them on plants.Plant extracts are among materials used recently to stimulate vegetative growth, flowering and yield for many plants as a source of nutrients and natural growth regulators, In addition, they are easy to absorb and contain effective substances and

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natural chemical compounds that differ according to different species and plant parts, which may be stimulating or inhibiting growth (AL Obaidy ,2020) . Among these extracts are licorice root, garlic, onion, ginger, turmeric and moringa extract, as well as algae extract (Bulgari et al., 2019).

Licorice plant is one of plants rich in Glycyrrhizin, whose sweetness exceeds the sweetness of sugar cane by several times. This substance is found in form of calcium and potassium salts of Glycyrrhizic acid. Its roots also contain many mineral elements, most important of which are potassium of 2,913%, magnesium of 1.32%, calcium of 2.14% and nitrogen of 1.5%. It also contains phosphorous, iron, manganese, copper, zinc and cobalt (Vispute and Khopade, 2011). The licorice extract also contains flavonoids, tannins, glycosides, and saponins, and mevalonic acid, which is initiator in gibberellins synthesis in plant (Nomura et al., 2002). Several studies have been conducted to find out licorice roots extract in fruit trees growth, Al-Hadethi et al (2012) in studying the effect of licorice roots extract spraying on growth and leaf chlorophyll and nitrogen content of pear transplants, the experiment included studying effect of spraying with three concentrations of licorice extract (0, 5 and 10 $g.L^{-1}$), it was found that spraying licorice extract at 10 $g.L^{-1}$ was significantly superior to control treatment in growth and leaf chlorophyll and nitrogen content. Al-Hadethi and Al-Kubaisy (2015) showed that spraying "Peento" peach trees with licorice root extract led to an increase in leaf area and leaf dry weight, significantly with an increase in level of licorice root extract sprayed on trees. Al-Rawi et al (2016) conducted a study that included spraying "Aswad Diyala" fig transplants with two concentrations of licorice extract (2 and 4 $g.L^{-1}$) and comparing it with no spraying, and they found that leaves chlorophyll, nitrogen and potassium content increases with the two spraying treatments.

Ginger plant is a perennial herbaceous plant belonging to Zingiberaceae, which includes cardamom and turmeric. It is characterized by its fragrant smell, taste and color, white, yellow or squirrel. It is considered a medicinal herb often used for medicinal purposes. Ginger rhizomes grow below soil surface and contain 9% protein and 50% starch, when delving into nutritional and chemical composition of ginger rhizomes, in addition to the minerals and vitamins they contain, they contain amino acids, tannins, carbohydrates, terpenes, flavonoids, saponins, glycosides and sterols (Shahi and Hussain, 2012 and Al-Asadi, 2018). Given ginger rhizomes contain minerals, vitamins, carbohydrates, amino acids and many other compounds, ginger extract plays a major role in promoting aspects of vegetative growth of fruit trees, according to several studies and research prepared in this regard. Mohamed (2017) found that spraying pear trees (Le-Conte) with plant extracts (hibiscus, cinnamon and ginger) together at a rate of 5 $l.tree^{-1}$ gave the highest leaves micro and macro content.AL-Shujairy and Al-Hadethi (2021) found that ginger extract at 10 and 20 $g.L^{-1}$ caused significant increases in stem diameter, leaves dry weight and leaves mineral content for "Hollywood" plum trees. This study aims to determine effect of

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licorice and gingers extracts spray on growth and leaves mineral content and avoid using chemical fertilizers and use clean agriculture of “Hollywood” plum transplants.

MATERIALS AND METHODS

This study was conducted in private orchard in Baghdad governorate, during 2020 growing season to investigate the influence of licorice root and ginger extracts on growth and leaf mineral content of four year's old trees of “Hollywood” plum transplants. This study included two factors: three levels of licorice root extract spray, 0 (L_0), 4 $gm.L^{-1}$ (L_4) and 8 $gm.L^{-1}$ (L_8) and three levels of ginger extract spray, 0 (G_0) , 4 $gm.L^{-1}$ (G_4) and 8 $gm.L^{-1}$ (G_8) and their interaction. Treatments were replicated three times (two transplants in experimental unit) at factorial experiment in a RCBD. The number of transplants used was 54 transplants. The following parameters were determined in experimental season:

1. Transplant height (cm): Transplant heights were measured by metric tape measure at the beginning and end of the experiment, according to the difference between them and that such an increase in transplant height.

2. Leaf area (cm2): five leaves were taken from the middle position of shoot randomly and measuring leaf area (cm2). Using a Digimizer program Windows 7 operating system.

3. Leaf chlorophyll contents (mg.g-1 fresh weight): Representative fresh leaf sample at middle part of shoots were taken in the first week of June and used for analysis of chlorophyll by calorimetrically method according to mackinny (1941).

4. Leaf dry weight %: Various leaves were taken from the sampling were weighed and then dried. After stability of weight, the percentage of dry matter was calculated by dividing the weight after drying on the weight before drying× 100.

5. Leaf Mineral Content : samples of ten leaves from middle shoots according to Chuntonarb and Cummings,(1981), were selected at random from each replicate (1st week of June) to measure their content of N, P, K according to Wilde et al (1985) on dry weight basis. Iron was determined using atomic absorption as (Black, 1965).

The obtained results were subjected to analysis of variance according to (Elsahookie and Wuhaib, 1990) using L.S.D 0.05 for comparing differences between various treatment means.

RESULTS AND DISCUSSIONS

Effects of Spraying with Licorice Root and Ginger Extracts on Increase in transplant height, Leaf area, Leaf chlorophyll contents and Leaves dry weight: Data concerning effect of treatments on increase in transplant height, leaf area, and leaf chlorophyll contents and leaves dry weight are listed in Table (1). The data

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cleared that, licorice root extract at 8 gm.L^{-1} (L_8) significantly increased in transplant height of 47.30 cm and highest leaf area of 15.78 cm^2 and highest leaf chlorophyll content of 57.55 mg.g^{-1} and highest leaf dry weight of 32.53 %, while lower values of these traits was in control treatment (L_0). Table (1) also shows that ginger extract spray at gm.L^{-1} (G_8) gave the highest increased in transplant height of 45.80 cm and highest leaf area of 15.21 cm^2 and highest leaf chlorophyll content of 48.48 mg.g^{-1} and highest leaf dry weight of 32.53 %.Also, lower values of these traits were in control treatment (G_0). The interactions between licorice root and ginger extracts significantly affected in all studied traits especially the interaction treatment (L_8G_8).

These results may be due to increase carbohydrates amount formed as a result of spraying licorice root extract, which can be used to provide the energy needed for vegetative growth processes, including increase in growths and leaf area as well as leaves number (Chen and Chen, 2004), In addition licorice extract containing mevalonic acid, the initiator in the manufacture of gibberellin, which helps in increasing vegetative growth due to the role of auxin and gibberellin in increasing divisions and thus its reflection on growth, This is explained by Al-Dulaimy (2012), who indicated that foliar spraying of grape plants leads to an increase in leaves gibberellin content, and thus an increase in most of vegetative growth characteristics. These results are in harmony with those obtained by (AL-Dulaimy, 2012) who worked on licorice extract spray in grape, (Al-Hadethi et al., 2012) who worked on licorice extract spray in pear transplants. It is also due to ginger extract containing good amounts of proteins, fats and some necessary nutrients, as proteins and fats are used to provide energy needed for growth, in addition to the many functions of nutrients inside plant, which may contribute to increasing vegetative growth, as well as increasing leaves chlorophyll content, because ginger extract contains good amounts of some micro-nutrients, especially iron, which may increase construction of chlorophyll and reduce its oxidation (Al-Asadi, 2018). These results are in agreement with those obtained by AL-Shujairy and Al-Hadethi (2021) on plum trees; they found a significant increase in vegetative growth when spraying with ginger extract.

Table (1) Effects of Spraying with Licorice Root and Ginger Extracts on Increase in transplant height, Leaf area, Leaf chlorophyll contents and Leaves dry weight of "Hollywood" plum transplants.

Increase in transplant height (cm)					**Leaf area (cm^2)**			
G	**L**				**L**			
	0	**4**	**8**	**Mean**	**0**	**4**	**8**	**mean**
G_0	33.60	36.11	41.39	37.03	11.68	12.67	14.13	12.83
G_4	39.12	41.72	48.40	43.08	11.94	14.39	15.87	14.07
G_8	40.87	44.42	52.12	45.80	12.30	16.00	17.34	15.21
mean	37.86	40.75	47.30		11.97	14.35	15.78	
L.S.D	**G**	**L**	**Int.**		**G**	**L**	**Int.**	
5%	1.23	1.23	2.13		1.04	1.04	1.80	
Leaf chlorophyll contents (mg.g-1 fresh weight)					**Leaf dry weight (%)**			
G_0	37.81	39.85	56.12	44.59	29.33	29.94	30.90	30.06

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G_4	40.16	46.17	56.52	47.62	29.89	31.16	32.88	31.31
G_8	40.66	44.78	60.00	48.48	31.41	32.38	33.80	32.53
mean	39.54	43.60	57.55		30.21	31.16	32.53	
L.S.D	**G**	**L**	**Int.**		**G**	**L**	**Int.**	
5%	2.16	2.16	3.74		0.54	0.54	0.94	

Effects of Spraying with Licorice Root and Ginger Extracts on leaves mineral content: Data concerning the effect of extracts spray on leaves mineral content are listed in Table (2). The data cleared that licorice root extract at 8 $gm.L^{-1}$ (L_8) significantly increased and gave the highest leaf nitrogen, potassium and iron content, while licorice root extract spray did not affect on leaf phosphor content. Table (2) also shows that ginger extract spray at $gm.L^{-1}$ (G_8) significantly superiority of control treatment and gave highest leaf nitrogen, potassium and iron content, while ginger extract spray did not affect on leaf phosphor content. The interaction between treatments especially interaction treatment (L_8G_8) as it gave the highest leaf nitrogen content of 1.42 % , highest leaf potassium content of 1.82 % and highest leaf iron content of 193.1 $mg.kg^{-1}$. This increase may be due to these extracts contain macro nutrients, especially nitrogen and potassium, as well as micro elements, which are directly absorbed when sprayed on leaves, thus increasing their percentage in plant. Also, reason may be attributed to increase in vegetative growth and photosynthesis process efficiency, which leads to absorption of these elements to meet the need of the vegetative growth and strength of tree growth (Taiz and Zeiger, 2010). These results are in agreement with those obtained by Mohammed et al (2016) on almond trees; they found a significant increase in leaves mineral content when spraying with licorice extract, AL-Shujairy and Al-Hadethi (2021) on plum trees; they found a significant increase in leaves mineral when spraying with ginger extract.

Table (2) Effects of Spraying with Licorice Root and Ginger Extracts on leaves mineral content of "Hollywood" plum transplants.

Leaves nitrogen content (%)					**Leaves phosphor content (%)**			
G	**L**				**L**			
	0	**4**	**8**	**Mean**	**0**	**4**	**8**	**mean**
G_0	1.13	1.17	1.27	1.19	0.13	0.14	0.16	0.14
G_4	1.14	1.22	1.36	1.24	0.14	0.15	0.16	0.15
G_8	1.18	1.26	1.42	1.29	0.14	0.16	0.17	0.16
mean	1.15	1.22	1.35		0.14	0.15	0.16	
L.S.D	**G**	**L**	**Int.**		**G**	**L**	**Int.**	
5%	0.04	0.04	0.07		N.S	N.S	N.S	
Leaves potassium content (%)					**Leaves iron content ($mg.kg^{-1}$)**			
G_0	1.36	1.51	1.59	1.49	162.1	169.6	174.0	168.6
G_4	1.43	1.54	1.74	1.57	170.8	178.8	186.4	178.7
G_8	1.45	1.61	1.82	1.63	173.5	180.4	193.1	182.3
mean	1.41	1.55	1.72		168.8	176.3	184.5	
L.S.D	**G**	**L**	**Int.**		**G**	**L**	**Int.**	
5%	0.10	0.10	0.17		3.32	3.32	5.75	

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