

Effect of Garlic and Licorice Extracts on Vegetative, Root and Floral Trait of *Gazania splendens* L.

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ABSTRACT

A greenhouse experiment was conducted at the Department of Horticulture, College of Agriculture, University of AL-Anbar during 2017 season to investigate effect of spraying extracts of garlic and licorice root on vegetative, root and floral trait of *Gazania splendens* L. Treatments were randomly distributed under RCBD design with three replicates. Each treatment involved six plants. The design included two factors; one represented three concentrations of garlic extract viz. 0, 2 and 4 ml_{Gex}.l⁻¹DH₂O, the second one was four concentrations of licorice root extract viz. 0, 1, 3 and 5 gm_{Lex}. DH₂O. Results revealed that spraying of 2 ml garlic extract per liter causes the highest increase of leaves No., fresh weight, dry weight, root length, the time to flower opening, flowers No. and flower diameter of 59.83 leaf.plant⁻¹, 51.67gm, 10.18gm, 46.70cm, 99.33d, 6.75 flower.plant⁻¹ and 5.458 cm, respectively. Furthermore, licorice extract spraying at 1gm per liter gave significant increase on leaves No., fresh weight, dry weight, time to flower opening, flowers No. and flower diameter at 71.11 leaves.plant⁻¹, 58.86gm, 12.39gm, 98.89d, 7.00 flower.plant⁻¹ and 5.589 cm, respectively. The combinations of 2ml garlic.L⁻¹ + 1gm licorice.l⁻¹ achieved highest average fresh weight, dry weight, and time of flower opening of 74.21gm, 15.47gm and 93.67d, respectively. Thus, it could be concluded that spraying of garlic and licorice extracts were effective and efficient in improvement of vegetative, root and floral trait of *Gazania*.

Keywords: *Gazania*, garlic extracts (gex), licorice root extracts (lex) .

INTRODUCTION

Ornamental plants are considered as natural component, whose big gardening and beauty on human life due to be of various shape, colour, leaves, flowers and scent fragrance. It also possesses primary role on psychological, cultural, healthy and economic aspects that increase intact and creative feeling (Sorensen, 1995, Abo-Dhahab and Tareq, 2008). *Gazania splendens* L. is a member belonging to Asteveaceae family, perennial herb plant that flowers in spring, summer and fall season. It had height fluctuated between 10 and 15cm used as soil mulching. The flowers are opening at day then closed at dark. Furthermore. The plant propagated via off springs. This plant is susceptible to hard frost (Alsultan *et al.*, 1992 and Abdurrahman, 2006). Recently, there is high voices to exploit natural compounds so as to conserve the environment and void the side effects where the specialists focused on plant extracts as alternative materials to industrial chemicals (Sadiq *et al.*, 2002). Plant extracts were registered as effective means to supply plant with necessary nutrients on foliage parts more quickly than via root system (Abou-Dahy and Muayad, 1988). Garlic extract is enriched by nutrients where the bulbs contained 31% carbohydrate, 6.2% proteins, as well as phosphors, Iron, potassium, magnesium and vitamins as thiamine, riboflavin, niacin and Ascorbic acid. The bulb also contained sulphur-contained amino acid as cysteine, and methionine and derivative – cysteine Allicin (Synge, 1971; Saniewska, 1992 and Hassan, 1994). Various scientific articles revealed that garlic extract possessed the importance to stimulate plant to vegetative growth and increase flowering %, leaf area and dry weight, it also possessed medicinal benefits to protect plant against fungi, viral and bacterial diseases (Abou-Hussein *et al.*, 1975a; Helmy, 1992 and Altarya, 2002). Abou-Hussein *et al.* (1975b) and Hussein (2002) pointed that spraying the cucumber with garlic extract was superior on increase plant height, branches No., leaves No., ch1. content, leaf

area and dry weight. Thus, flower No. was increased and reduced the days to flower opening.

Licorice root extract is highly rich in Glycyrrhizin as salts of Calcium and Potassium of Glycyrrhizin acid. furthermore, it contained minerals as magnesium phosphorus, iron, manganese, copper, zinc and cobalt (Musa *et al.*, 2002). Previous studies showed that sprayed licorice extracted caused significant increase in flowering due to being similar behavior of licorice extract to Gibberellin to induce plant flowering there by Mevalonic acid. Moreover, it improved the foliage growth resulted for stimulating enzymes, which necessary to convert complete compounds to simple compounds to exploit for supplying the plant by energetic compounds (Almarsomy, 1999). Sprayed licorice with different levels on onion caused increase of leaves No. The spraying with 3g.l⁻¹ resulted in reduced days to flower opening, while spray with 4g.l⁻¹ increased flower No. (Alalawy, 2003). Alasady (2010) found that sprayed licorice extract on *Mathiola incana* with 2.5 and 5g.l⁻¹ led to significantly increase on plant height, branches No., total leaves No., leaf area fresh and dry weight.

Thus, this study was performed to investigate the effect of garlic and licorice root extracts on vegetative growth, root and floral traits of *Gazania*.

MATERIALS AND METHODS

Trial location: Experiment was laid out at a greenhouse belongs to the Department of Horticulture and Landscape, College of Agriculture University of Anbar during 2017 – season. Where seeds of *Gazania* were sown on 15/2/2017 in wood boxes filled with 2:1 of 2kg loam soil and 1 Kg peatmoss. After germination at 1-2 couple of true leaves, seedlings were divided in plastic pot, (20cm), one plant in each pot. Table 1 illustrates properties of soil.

All Agronomical processes were done as they were necessary. All plants were fertilized via solution

contained 100mg N.l⁻¹ from Urea (N 46%) with amount of 100ml. pot⁻¹. 2 weeks.

Table 1. some chemical and physical properties of soil

Texture	ECds.mu	pH	CaCo ₃ %	OM %	K	P	N
loam	6.10	7.8	32.5	5.81	3.5	16.6	0.32

Investigated factors:

Garlic Extract: there levels of garlic extract were sprayed on foliar system twice up to completely wet.

Licorice root Extract: It was applied as with garlic extract.

Extracts preparation: 250gm of local garlic was taken, after cleaning from imparities was mixed with 250 ml distilled water using electrical blender for 3 min . Then the solution was filtered using filter paper (Whatman 1). The filtrate considered as completely strong solution of 100%. There concentrations were prepared viz.0, 2 and 4ml l⁻¹ dw (Alamery, 2001).

Licorice root Extract: Three weights of licorice root viz.1, 3 and 5gm were soaked in distilled water for 24 hours. Then the extract was filtered using cotton. Then the filtrated was stored in refrigerator until using (Alrubaa, 2003).

At ending of season, readings were registered on plant height, leaves per plant, fresh weight, dry weight, root length, days to flower opening, flower per plant and flower diameter.

Statistical analysis:

Experiment was applied under factorial arrangement using RCBD with three replicates. After readings had been recorded, the means were compared using LSD (p≥ 0.05). Data were analyzed using constant software.

RESULTS AND DISCUSSION

Plant height: Table 2 indicated that treatment of Gazania by spraying of garlic extract hadn't significantly effect on plant height, while licorice root extract (3gm.l⁻¹) possessed significant effect on plant height and gave plant height of 17.87 cm, whereas, spraying licorice with 5gm.l⁻¹ gave lowest plant height 14.74cm.

Interactive combinations of the two extracts caused significant difference, since 3gm licorice l⁻¹ + 2ml.garlic.l⁻¹ resulted in plant height of 20.20cm, while the combination of 5gm licorice l⁻¹ + 2gm garlic l⁻¹ gave the lowest plant height of 11.20 cm .

Leave number (leaf.plant⁻¹): Table 2 illustrated that garlic extract (2ml.l⁻¹) led to significant increase on leaves number per plant and 2ml.l⁻¹of extract gave the heighest leaf No. of 59.83 leaf .plant⁻¹, while control gave the lowest leaf No. of 40.33 leaf plant⁻¹.

Licorice root extract possessed significantly influence on leaf No., where 1gm.l⁻¹ of extract gave the biggest number of leaves of 72.11 leaf .plant-1 followed by 3gm.l⁻¹ of extract, while control resulted in the lowest number at 42-44 leaf , plant⁻¹.

Results from table 2 also referred a significant effect resulted from interactive combinations of 1gm licorice l⁻¹ x 2ml.garlic l⁻¹ and 1gm licorice l⁻¹ x 4ml.l⁻¹ garlic on leaf No., where they gave 81.77 leaf .plant⁻¹ for

each combination. Control gave lowest No. of 20.17 leaf .plant⁻¹.

Fresh weight: Results of effect of licorice root and garlic extract are tabulated in table 2. So, the spray of Gazania foliage with garlic extract gave highly significant differences .Thus 2ml of garlic extract gave the highest fresh weight of 51.67 gm, followed by control, while 4ml.l⁻¹of garlic extract reduced fresh weight to 32.75gm .

It is also observed that licorice extract had significant effect on fresh weight and 1gm.l⁻¹ of licorice extract increased fresh weight (58.86gm), followed by 3gm.l⁻¹, while control decreased fresh weight at 29.27gm.

The interaction of combination also possessed significant effect on fresh weight. The combination of 1gmllicorice l⁻¹ + 2mlgarlic l⁻¹ increased fresh weight (74.21gm) in comparison to control (12.52gm).

Dry weight (gm): Results from table 2 represented that garlic extract sprayed at 2ml.l⁻¹led to significantly increasing of dry weight (10,8mg) for Gazania followed by 4ml.l⁻¹, control decreased dry weight of Gazania (7.0gm).

Licorice extract of root also caused significant effect on dry weight when 1gm.l⁻¹of root extract of licorice significantly increased dry weight to 12.39gm followed by 3gm.l⁻¹ from root extract, control decreased dry weight to 7.28gm.

Farthermore, interaction among levels of two factors possessed significant effect on dry weight. Where 1gm.l⁻¹ + 2ml.l⁻¹ combined of licorice root and garlic extract recorded highest increase of 15.47gm dry weight, while control lowered dry weight to 2.96gm.

Root diameter (cm): Tabulated results revealed that garlic extract achieved clearly effect on root diameter were 3 and 2 ml per liter of garlic extract gave highest root diameter of 47.30 and 46.70 cm , respectively, while control lowered root diameter to 38.77cm.

From table 2, it is observed that 5gm.l⁻¹ from licorice root extract significantly increased root diameter (50.70cm), while 1gm.l⁻¹ caused lowest diameter of root (37.60 cm).

The interaction of 3gm.l⁻¹ of licorice extract by 2ml.l⁻¹ of garlic extract gave highest diameter of root (55.20cm) while, 1gm from licorice by 0 ml of garlic extract caused the lowest diameter of root (30.10cm).

Time of flower opening (days): Results in table 3 revered that 2ml.l⁻¹ from garlic extract significantly decreased time of flower opening (99.33d) followed by 4ml.l⁻¹garlic extract. While, the control increased time of flower opening (106.75d). From the same table, it observed that 1gm.l⁻¹ licorice extract decreased the days to flower opening to 98.89d. While, other root treatments didn't decreased days to flower opening.

The interaction also reduced days to flower opening, which 1gm of licorice root extract by 2ml of garlic extract significantly lowered days to flower opening (93.67d). While, interaction control increased days to flower opening to 115.00d.

Table 2. Effect of garlic and licorice extracts on vegetative and root trait of *Gazania splendens* L.

Treatment		Plant height (cm)	Leave number (leaf.plant ⁻¹)	Fresh weight (gm)	Dry weight (gm)	Root diameter (cm)
Garlic extract	G1	16.01	40.33	35.73	7.00	38.77
	G2	16.47	59.83	51.67	10.18	46.70
	G3	15.87	55.04	32.75	8.66	47.30
LSD _{5%}		NS	1.443	1.576	0.736	0.627
licorice extract	L1	15.03	42.44	29.27	7.28	47.30
	L2	16.82	72.11	58.86	12.39	37.60
	L3	17.87	48.67	40.90	8.47	41.43
	L4	14.74	43.72	31.18	6.32	50.70
LSD _{5%}		1.827	1.667	1.820	0.850	0.724
G1	L1	11.40	20.17	12.52	2.96	41.60
	L2	16.03	54.00	47.16	10.36	30.10
	L3	16.60	52.00	39.12	9.01	32.90
	L4	20.00	35.17	44.14	5.67	50.50
G2	L1	16.07	63.17	52.12	9.44	48.00
	L2	18.40	81.17	74.21	15.47	35.00
	L3	20.20	57.00	62.14	11.16	55.20
	L4	11.20	38.00	18.21	4.64	48.60
G3	L1	17.63	44.00	23.16	9.44	52.30
	L2	16.03	81.17	55.20	11.33	47.70
	L3	16.80	37.00	21.44	5.24	36.20
	L4	13.03	58.00	31.20	8.64	53.00
LSD _{5%}		3.165	2.887	3.153	1.472	1.254

Flower No. (Flower plant⁻¹): Results of flower number are presented in table 3. Foliage feeding of garlic extract by 2ml.l⁻¹ achieved highest number of flower (6.75 flower.plant⁻¹), followed by 4ml.l⁻¹ extract. While, the control lowered flower No. to 4.75 flower.plant⁻¹. Foliar feeding of licorice extract of root also gave the best number of flower (7.00 flower.Plant⁻¹) with 1gm.l⁻¹ superior on other treatments.

Table 3. Effect of garlic and licorice extracts on floral trait of *Gazania splendens* L.

Treatment		Time of flower opening (days)	Flower No. (Flower plant ⁻¹)	Flower diameter (cm)
Garlic extract	G1	106.75	4.75	4.57
	G2	99.33	6.75	5.46
	G3	101.75	5.33	5.01
LSD _{5%}		2.931	0.545	0.40
licorice extract	L1	104.67	5.00	4.62
	L2	98.89	7.00	5.59
	L3	103.33	5.22	4.80
	L4	103.56	5.22	5.03
LSD _{5%}		3.38	0.63	0.46
G1	L1	115.00	2.67	3.80
	L2	102.67	5.33	5.50
	L3	102.67	6.00	4.17
	L4	106.67	5.00	4.80
G2	L1	98.67	8.00	5.53
	L2	93.67	10.00	5.87
	L3	103.33	4.33	5.17
	L4	101.67	4.67	5.27
G3	L1	100.33	4.33	4.53
	L2	100.33	5.67	5.40
	L3	104.00	5.33	5.067
	L4	102.33	6.00	5.033
LSD _{5%}		5.86	1.09	NS

Interaction also had significant effect, which combination of 1mg.l⁻¹ of licorice extract by 2ml of

garlic extract recorded highest number of flower (10.0 flower.plant⁻¹), while control caused lowest number of 2.67 of flower.

Flower diameter (cm): Table 3 involved results of flower diameter which pointed to be significant increase the flower diameter there by 2ml.l⁻¹ of garlic extract (5.46 cm), followed 4ml.l⁻¹ of extract. While control reduced flower diameter to 4.57 cm, moreover 1mg of licorice root extract per liter maximized diameter of flower to 5.59cm. There is no significant effect due to interaction on flower diameter.

CONCLUSION

The exploitation of plant extracts possesses had significant role to improve vegetative and floral traits of *Gazania*. The usefulness of plant extracts had no side effect on environments. Thus, use of safe alternative material to improve and increase yield in most field vegetative and ornamental crops became urgent necessity to avoid the risks of chemical compounds of industries. So, in this study plant extracts were more effective and efficient material to improve growth and derive potent ability of plant to morphologically express per se.

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تأثير الرش بمستخلصي الثوم وجذور عرق السوس في صفات النمو الخضري والجذري والزهري لنبات الكزانيا

Gazania splendens L.

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نفذت التجربة في البيت البلاستيكي التابع لقسم البستنة وهندسة الحدائق/ كلية الزراعة/ جامعة الأنبار للموسم ٢٠١٧ لدراسة تأثير الرش بمستخلصي الثوم وجذور عرق السوس في صفات النمو الخضري والجذري والزهري لنبات الكزانيا *Gazania splendens* L. نفذت التجربة العملية بتصميم القطاعات العشوائية الكاملة RCBD بثلاث مكررات و ست نباتات للمعاملة الواحدة بعاملين الأول تضمن ثلاثة تراكيز من مستخلص الثوم (٠ و ٢ و ٤ مل. لتر^{-١} ماء مقطر) والثاني تضمن أربعة تراكيز من مستخلص جذور عرق السوس (٠ و ١ و ٣ و ٥ غم. لتر^{-١} ماء مقطر) والتداخل بين مستويات العاملین . أظهرت النتائج أن معاملة الرش بمستخلص الثوم بتركيز ٢ مل. لتر^{-١} أعطت زيادة معنوية في صفات عدد الأوراق، الوزن الرطب، الوزن الجاف، طول الجذر، موعد تفتح الأزهار، عدد الأزهار وقطر الأزهار بلغت ٥٩.٨٣ ورقة. نبات^١، ٥١.٦٧ غم، ١٠.١٨ غم، ٤٦.٧٠ سم، ٩٩.٣٣ يوم، ٦.٧٥ زهرة. نبات^١ و ٥.٤٥٨ سم بالتتابع . أما معاملة الرش بمستخلص جذور عرق السوس بتركيز ١ غم. لتر^{-١} فقد أعطت زيادة معنوية في صفات عدد الأوراق والوزن الرطب والوزن الجاف وموعد تفتح الأزهار وعدد الأزهار وقطر الأزهار بلغت ٧١.١١ ورقة. نبات^١ و ٥٨.٨٦ غم و ١٢.٣٩ غم و ٩٨.٨٩ يوم و ٧.٠٠ زهرة. نبات^١ و ٥.٥٨٩ سم بالتتابع . كما أظهرت النتائج أن توليفة التداخل ٢ مل. لتر^{-١} مستخلص الثوم + ١ غم. لتر^{-١} مستخلص جذور عرق السوس أظهرت تفوقاً معنوياً في صفات الوزن الرطب والوزن الجاف وموعد تفتح الأزهار بلغت ٧٤.٢١ غم و ١٥.٤٧ غم و ٩٣.٦٧ يوم بالتتابع . يمكن أن يستنتج أن استخدام مستخلصات الثوم وجذور عرق السوس كانت فعالة في تحسين نمو نبات الكزانيا الخضري والجذري والزهري .

الكلمات المفتاحية : الكزانيا، مستخلص الثوم، مستخلص جذور عرق السوس.