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EFFECT OF LICORICE ROOT EXTRACT AND HUMIC ACID ON YIELD CHARACTERS OF SUMMER SQUASH (*Cucurbita pepo* L.)

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ABSTRACT

Field experiment was indicated at the experimental vegetable farms, college of agriculture, Duhok University, Kurdistan region-Iraq during the spring growing season of 2018, to evaluate the impact of licorice root extract (0, 5, 10 g.L^{-1}) and humic acid (0, 2, 4 g.L^{-1}) as foliar exercise on yield traits of summer squash (*Cucurbita pepo* L.) (cv.Naji F1). These experiments were laid out in a factorial arrangement in randomized complete block design (F-RCBD) with three replications. The results of this experiment showed that foliar spray of squash plants with licorice root extract at 10g.L^{-1} recorded highest value in most of yield traits and in terms the early yield (0.389 kg.plant^{-1}) was significantly increased. Moreover, spraying plants with humic acid at level 2g.L^{-1} the yield characters of squash plants was significantly increased in traits of early yield (0.383 kg.plant^{-1}) and marketable yield (34.86 ton.ha^{-1}), while humic acid spray at level 4g.L^{-1} significant affect on fruit number (13.81), fruit length (14.14 cm), fruit diameter (3.65 cm), average fruit weight (123.41gm), total yield (1.707 kg.plant^{-1}) and total yield (39.61 ton.ha^{-1}), except the unmarketable yield (4.656 ton.ha^{-1}) were decreased with increasing the level of humic acid. In addition, the combination treatments between licorice root extract at 10g.L^{-1} and humic acid at 4g.L^{-1} gave the highest value in the most of yield parameters in studied summer squash plants.

KEY WORDS: Foliar spray, Licorice Root Extract, Humic Acid, Yield, Summer Squash.
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INTRODUCTION

Summer squash considered the edible immature fruit of (*cucurbita pepo* L.) a highly different species. This crop belongs to the family cucurbitaceae. Summer squash is a viewed the most popular vegetable crops in Iraq particularly during spring seasons. The cultivated area in Iraq is about (148) thousand hectares and the average rate of production was (15, 472 t/ha.) in 2012 (Annual Statistic Book, 2012), and this amount of yield is excessively low as contrasted with the world production.

One of the approaches to expand productivity is the utilization of modern technologies in agriculture, including modern nutrition and cultivars, which is one of the method of increasing growth and production (Esho and Saeed, 2016). Nowadays, numerous researcher is centered on possibility of utilizing natural plant extracts to increase productivity is the use of licorice extract (*Glycyrrhiza glabrag*) which is a family of Leguminoseae plants (Newall *et al.*, 1996).

Recent studies demonstrated that plant extracts could be utilized as an elective that is safer than chemically synthesized growth regulators and fertilizers. Numerous researches (Al-Ajeeli.,2005) (Moses *et al.*,2002)(Sabry *et al.*,2009) noticed that extract of licorice roots (*Glycyrrhiza glabra*) contain a few compounds, which have comparable impact to that of growth promoters, a wide range of minerals (Ca, K, Mg, Fe, Zn, P), amino acids (alanine, lysine, arginine), vitamins (B1, B2,B6),and furthermore carbohydrate and nitrogen. It likewise contains mevalonic acid utilized in gibberellins blended (AL-Marsoumi.,1999). Hussain,W.A. (2002) noticed that spraying the cucumber plants with licorice root extract at rates of 2.5g.L^{-1} resulted in a significant increased fruit weight and total yield. Al-Sahaaf *et al.*, (2002) reported licorice extract had positive impact in increased the early yield and total yield of tomato plants.

Humic acid (HA) is a promising natural resource that can be utilized as an alternative to synthetic fertilizers to increase crop production

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(Nikbakht *et al.*, 2008). Several researchers have pointed out that humic acid increase fruit yield, fruits number per plant, fruit length of squash (Sensoy *et al* .,2013; El-masry *et al* ., 2014) and of cucumber (Bozorgi *et al.*, 2012; El -Nemr *et al* ., 2012; Sarhan and Yousi f, 2012). Hafez, (2004) mentioned that the application humic acid led to enhanced plant growth, increased plant productivity and enhanced squash plant quality.

Benyamin Esho, K. (2017) established the application of humic acid on summer squash plants increased fruit length, number of fruits.plant^{-1} and total yield.

Thus, the main objective of this study is to investigate the impact of foliar spray of licorice root extract and humic acid with various concentrations on yield characteristic of summer squash plants under climatic condition of duhok provinces, Kurdistan reign, Iraq.

MATERIALS AND METHODS

The experiment was carried out at the experimental vegetable Farm, College of Agriculture, University of Dohuk, Iraqi Kurdistan region, during spring season of 2018, to study the impact of foliar spray of licorice root extract (0, 5, 10 g.L^{-1}) and humic acid (0, 2, 4 g.L^{-1}) on yield traits of summer squash (*Cucurbita pepo* L.) (cv.Naji hybrid). Physical and chemical analysis of the experimental soil assessed according to (Page *et al.* 1982) is shown in Table (1).

Table (1): Some physical and chemical properties of the studied soil in the field

Characteristics	Measuring units	Amount
Volumetric distribution of soil separate		
Sand	Percentage (%)	5.40
Silt	Percentage (%)	29.0
Clay	Percentage (%)	65.6
Soil texture	----	Clay
Available nutrient content		
Total-N	mg/l	70.04
Available phosphorus	mg/l	74.0
Available potassium	mg/l	85
Available calcium	mmol$_c$l^{-1}	2.60
Organic matter(OM)	Percentage (%)	1.89
Soil pH	1:1 in peste	7.69
Electrical Conductivity	dsm^{-1}/cm	0.47

- **Where the soil analysis was carried out at soil and water science laboratory, College of Agriculture, Dohuk University.**
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Preparation and application of licorice root extract

Dried licorice root powder was sifted and weighed according to concentrations required for the study 5 and 10 g.L^{-1} .Then soaked in a liter of distilled water at 50°C for 24 hours and then filtered several times and supplement the final volume to liter. (Elrys & Merwad, 2017).The elements analyses in Licorice roots extract are showed in table (2).

Table (2) : The elements of licorice root extract analyses

Element	Fe^{+3}	Cr^{+3}	Cu^{+2}	Zn^{+2}	Cd^{+2}	Pb^{+2}	Ni^{+2}	Se^{-2}	B^{+1}	Al^{+3}
ppm	741.0	15.0	465.0	145.0	24.0	26.0	1.0	0.0	343.0	0.0

The squash plants were sprayed three times at 10 day intervals with various levels of humic acid at stage after the appearance of 3-4 true leaf on April 22th, with 10 days interval between them, beginning from 21 days after sowing.Moreover, licorice root extract sprayed also three times at stage flowering on April 26th, after 25 days from seed sowing. The summer

squash foliage were completely wetted with licorice root extract and humic acid in order to accomplish faster and more effective absorption of both treatments during late afternoon (Hull *et al.*,1975).

The experiment involved nine treatments (3 levels of licorice root extract x 3 levels of humic acid) were arranged according to a Factorial Randomized Complete Block Design (F-RCBD). Each treatment was replicated three times and each replicate was represented one terrace. Data on yield parameters were statistically analyzed using SAS program (SAS, 2001) and comparison among average was done by utilizing Duncan's Multiple Range test at 5% level to verify the differences between means of treatments (Al-Rawi and Khalaf – Allah., 2000).

Information of data was collected by selected five plants randomly for each experimental unit. For yield characteristics data were collected on early yield (kg.plant^{-1}), total yield (kg.plant^{-1}), total yield (ton.ha^{-1}), marketable yield (ton.ha^{-1}), unmarketable yield (ton.ha^{-1}), fruit length (cm), fruit diameter (cm) and average fruit weight (gm).

RESULTS AND DISCUSSION

Table (3) below illustrated the impact of licorice root extract on fruits number remarked no significant effect among concentration of licorice root extract. While, regarding to the effect of humic acid on fruits number.plant^{-1} had significant increase, the higher fruits number was resulted when spray squash plant with 4 g.L^{-1} humic acid (13.81fruits.plant^{-1}) as contrasted to control treatments (11.97 fruits.plant^{-1}).The combination between humic acid and licorice extract remarked significant influence on fruits number at rate of humic acid 4g.L^{-1} and licorice at rate 10g.L^{-1} (14.80) fruit compared with control (11.23) fruit by increasing 31.78%. This improvement in fruit quality may because of the humic acid activated the biochemical processes in plants (respiration, photosynthesis and chlorophyll content) leading to improved quality (Abolina and Tashkhadzhaev 1968).

Table (3): Effect of licorice root extract, humic acid and their interaction on fruits number.plant^{-1} of summer squash plants.

Cultivar	Humic Acid (g.L^{-1})	Licorice Extract (g.L^{-1})			Humic Effect
		0	5	10	
Humic × Licorice	0	11.23 d	12.36 cd	12.33 cd	11.97 b
	2	13.76 a-c	13.82 ab	13.04 bc	13.54 ab
	4	12.93 bc	13.69 a-c	14.80 a	13.81 a
Licorice effect		12.64 a	13.29 a	13.39 a	

The column, row and their interactions with the same letters are not significantly different from each other according to Duncan's multiple range test at level (α=0.05).

Table (4) showed that treated summer squash with foliar spray of licorice root extract at level 5 g.L^{-1} increased the average of fruit weight (g.plant^{-1}), while humic acid spray significantly affected on the average of fruit weight (g.plant^{-1}) the maximum value (123.41 g.plant^{-1}) observed at rate 4g.L^{-1} of humic acid and the minimum value observed with control treatments (97.63 g.plant^{-1}). This result was in agreement with the El-Aal *et al.*(2010) where the foliar apply of humic acid on squash plant led to an increase in plant growth and gets high yield productivity. The impact of the interaction between humic acid and licorice root extract on the average fruit weight were observed significant difference, humic acid at rate 4g.L^{-1}× 10g.L^{-1}of licorice gave the highest value (126.55 g.plant^{-1}) on fruit weight as compared lowest value (93.53g.plant^{-}

^{1}) at control both application by increasing 35.30%.

The role of licorice root extract as foliar spray may be due to that licorice roots extraction mainly containing glycyrrhizin, flavonoids, reducing and non-reducing sugars, plant gums, resins, essential oils, inorganic salts and low levels of nitrogenous compounds like proteins, individual amino acids and nucleic acids (Isbruker and Burdock, 2006).

Table (4): Effect of licorice root extract, humic acid and its interaction on the average fruit weight (gm).plant^{-1} of summer squash plants.

Cultivar	Humic Acid (g.L^{-1})	Licorice Extract (g.L^{-1})			Humic Effect
		0	5	10	
Humic × Licorice	0	93.53 c	100.58 c	98.78 c	97.63 b
	2	121.90 ab	118.56 ab	114.56 b	118.34 a
	4	121.08 ab	122.58 ab	126.55 a	123.41 a
Licorice effect		112.17 a	113.91 a	113.30 a	

The column, row and their interactions with the same letters are not significantly different from each other according to Duncan's multiple range test at level (α=0.05).

Data presented in Table (5) showed that foliar spray of licorice root extract significantly increased on the early yield, the heights yield observed in 10 g.L^{-1} of licorice (0.389 kg.plant^{-1}) as compared with the other treatments. While treated plants was foliar sprayed with humic acid at rate 2g.L^{-1} significant increased the early yield (kg.plant^{-1}) of summer squash plants. In the same table the effect of the interaction between foliar apply with licorice root extract and humic acid significantly increased early yield (kg.plant^{-1}) the highest value (0.500 kg.plant^{-1}) recorded when plant treats 10 g.L^{-1} of licorice x 4 g.L^{-1} humic acid as contrasted with the lowest value (0.249 kg.plant^{-1}) observed at control treatments, which increased by 50.2%.

This increase may be attributed to the fact that the licorice root extract contains more than 100 various compounds, some of which accumulated in large quantities, the most important compounds are phenolic compounds, mevalonic acid, triterpene sapoins, protein amino acid (asparagin), lignins, vitamins like (B1, B2, B3, B6, E and C), biotin, folic acid, pantothenic acid and polysaccharide (glucose, fructose, sucrose and maltose) all of which play an important role in improving plant growth and thus increasing the production of yield (Rossi, 1999 and Arystanova *et al.*, 2001).

Table (5): Effect of licorice root extract, humic acid and their interaction on the early yield (kg.plant^{-1}) of summer squash plants.

Cultivar	Humic Acid (g.L^{-1})	Licorice Extract (g.L^{-1})			Humic Effect
		0	5	10	
Humic × Licorice	0	0.249 d	0.281 cd	0.330 cd	0.287 b
	2	0.449 ab	0.361 bc	0.338 cd	0.383 a
	4	0.250 d	0.356 bc	0.500 a	0.369 a
Licorice effect		0.316 b	0.333 b	0.389 a	

The column, row and their interactions with the same letters are not significantly different from each other according to Duncan's multiple range test at level (α=0.05).

Table (6) noticed there is no significant increase between licorice root extract and humic acid on the total yield kg.plant^{-1}. According to the effect of interaction between humic acid and licorice extract on the total yield, observed significant increases in yield production and the highest value recorded between 2g.L^{-1}humic acid × 10g.L^{-1} of licorice root extract (1.805 kg. plant^{-1}) compared with the lowest value (1.354 kg.plant^{-1}) of untreated plants with increasing 33.30%. These results may be due to the strongest plant growth that led to hormone-like activities of the humic acid through their involvement in increasing, photosynthesis, protein synthesis, antioxidant and different enzymatic reactions. (Muscolo *et al.*,1993; Zhang and Schmidt, 2000).

Table (6): Effect of licorice root extract, humic acid and their interaction on the total yield (kg.plant^{-1}) of summer squash plants.

Cultivar	Humic Acid (g.L^{-1})	Licorice Extract (g.L^{-1})			Humic Effect
		0	5	10	
Humic × Licorice	0	1.354 b	1.603 ab	1.537 ab	1.498 a
	2	1.537 ab	1.672 a	1.805 a	1.671 a
	4	1.787 a	1.733 a	1.600 ab	1.707 a
Licorice effect		1.560 a	1.669 a	1.647 a	

The column, row and their interactions with the same letters are not significantly different from each other according to Duncan's multiple range test at level (α=0.05).

Licorice root extract spray at rate 10g.L^{-1} on plants increased the total yield ton.ha^{-1} (Table 7), while humic acid apply at level 4g.L^{-1} significantly affected on the total yield ton.ha^{-1} measured (39.61 ton.ha^{-1}). The interaction between humic acid and licorice extract, data shows that humic acid 2g.L^{-1}with 10g.L^{-1} of licorice gave the highest value (42.71 ton.ha^{-1}) as compared with the lowest value (29.65 ton.ha^{-1}) at control interaction, which increased by 44.04% .Increasing the quantitative yield character of summer squash plant could be explained as humic acid is rich in organic and mineral compound which are essential factor to plant growth and increasing the quality and quantity of the crop (Gad El-Hak, *et al.*, 2012).These increments of quantitative yield obtained by (Karakurt *et al.*, 2009; Brownell *et al.*, 1987; Yildirim, 2007) reported that the foliar spray of humic acid promotes plant growth and increase yield and quantity in a number of plant species at least partially by increasing uptake of nutrients.

Table (7): Effect of licorice root extract, humic acid and their interaction on the total yield (ton.ha^{-1}) of summer squash plants.

Cultivar	Humic Acid (g.L^{-1})	Licorice Extract (g.L^{-1})			Humic Effect
		0	5	10	
Humic × Licorice	0	29.65 e	31.68 De	32.30 c-e	31.21 b
	2	36.79 b-d	37.83 a-c	42.71 a	39.11 a
	4	41.74 ab	40.05 ab	37.03 a-d	39.61 a
Licorice effect		36.07 a	36.52 a	37.35 a	

The column, row and their interactions with the same letters are not significantly different from each other according to Duncan's multiple range test at level (α=0.05).

The results presented in Table (8) show there is no significant effect on the marketable yield ton.ha^{-1} when plant treated with licorice root extract treatments. According to the effect of humic acid resulted in significant increase in the marketable yield at level 2g.L^{-1} as compared with other treatments. Relating to the interaction between humic acid and licorice extract observed significant increase when plants treated by 4g.L^{-1} humic acid and 10g.L^{-1} licorice extract with highest value (36.50 ton.ha^{-1}) as compared with control both of foliar application (23.42 ton.ha^{-1}). This result might be due to the comparability of licorice root extract in behavior with gibberellins that improve flowering rates. These ingredients contain mevalonic acid which enhance vegetative growth as a result of the stimulation of enzymes that are important for the change of complex compounds into simple compounds, and energy efficient tretment required for plant growth traits and yield traits (Sahi, 2006; AL-Jebouri *et al.*, 2010; Luyckx *et al.*, 2017 and Cuong *et al.*, 2017).improvement of the quality of marketable yield may be due to the humic acid high content of potassium.

Table (8): Effect of licorice root extract, humic acid and their interaction on the marketable yield (ton.ha^{-1}) of summer squash plants.

Cultivar	Humic Acid (g.L^{-1})	Licorice Extract (g.L^{-1})			Humic Effect
		0	5	10	
Humic × Licorice	0	23.42 c	26.82 c	27.74 bc	25.99 b
	2	36.48 a	35.38 a	32.72 a	34.86 a
	4	31.61 ab	32.95 a	36.50 a	33.69 a
Licorice effect		30.50 a	31.72 a	32.32 a	

The column, row and their interactions with the same letters are not significantly different from each other according to Duncan's multiple range test at level (α=0.05).

Table (9) resulted that there is a decrease in the unmarketable yield (ton.ha^{-1}) when plants treated with foliar spray of licorice root extract at rate 5 g.L^{-1}, while according to the effect of humic acid, untreated treatments recorded the highest unmarketable yield (6.624 ton.ha^{-1}) compared with the other treatments, this means that there is a significant affect when plants sprayed by humic acid at both levels (2 g.L^{-1}, 4 g.L^{-1}) which lead to decrease unmarketable yield. Concerning the effect of both foliar applications (humic acid + licorice extract) on unmarketable yield showed significant differences, the highest unmarketable fruits yield observed with both control of application measured (7.614 ton.ha^{-1}) with lowest production on the unmarketable yield at level 4g.L^{-1}of humic acid and no spray of licorice (3.586 ton.ha^{-1}). Salman *et al.*, (2005) examined that the humic acid applied on watermelon plants promotes to an increase in the overall yield of all hybrids. The increase in yield in summer squash plant may due to the increase in the number of distillate blooms which led to an increase in the number of fruits that affect the yield and total crop. plants^{-1}.

Table (9): Effect of licorice root extract, humic acid and their interaction on the unmarketable yield (ton.ha^{-1}) of summer squash plants.

Cultivar	Humic Acid (g.L^{-1})	Licorice Extract (g.L^{-1})			Humic Effect
		0	5	10	
Humic × Licorice	0	7.614 a	5.570 ab	6.687 ab	6.624 a
	2	5.666 ab	5.019 ab	4.640 ab	5.108 b
	4	3.586 b	4.289 ab	6.093 ab	4.656 b
Licorice effect		5.622 a	4.959 a	5.807 a	

The column, row and their interactions with the same letters are not significantly different from each other according to Duncan's multiple range test at level (α=0.05).

Concerning the effect of spraying with licorice root extract, it increased the fruit length (cm) at concentration 10 g.L^{-1} resulting in (12.69 cm), for the effect of foliar apply of humic acid showed a significant increase in fruit length at level 4g.L^{-1} measured (14.14 cm) contrasted with other treatments (Table 10).

The binary interaction between humic acid and licorice root extract on the fruit length, led to a significant increase that was noticed when plants treated at 4g.L^{-1}of humic acid×10g.L^{-1}of licorice (14.23cm) as compared to the untreated both of application (10.67cm), caused an rising of 33.36%.This increase in fruit length might be due to the activity of hormone like humic acid through their participation in cell respiration, photosynthesis and different enzymatic reaction and increase yield of squash crop (Heli *et al.*, 2005).

Table (10): Effect of licorice root extract, humic acid and their interaction on the fruit length (cm).plant^{-1} of summer squash plants.

Cultivar	Humic Acid (g.L^{-1})	Licorice Extract (g.L^{-1})			Humic Effect
		0	5	10	
Humic × Licorice	0	10.67 c	10.80 c	10.93 c	10.80 c
	2	13.15 b	13.03 b	12.91 b	13.03 b
	4	14.05 a	14.15 a	14.23 a	14.14 a
Licorice effect		12.62 a	12.66 a	12.69 a	

The column, row and their interactions with the same letters are not significantly different from each other according to Duncan's multiple range test at level (α=0.05).

Data listed in Table (11) indicated that there is no significant effect with foliar spray of licorice root extract as individual impact on fruit diameter, while humic acid spray as individual effect significantly affected on fruit diameter at rate 4g.L^{-1} which remarked (3.65cm). Concerning the effect of interaction between humic acid and licorice extract significantly affected at a level of 4g.L^{-1}humic acid × 5g.L^{-1}of licorice (3.68 cm) on fruit diameter compared with smallest value (2.78 cm) observed from control treatments, by rising 32.37%. This might be due to the fact that humic acid is rich in organic and mineral substances that are essential for plant growth and thus increase the quality and quantity of yield (Gad *et al.*, 2012). Karakurt *et al.*, (2009) concluded that the application spray for these substances also worked to improve growth, yield and quality in at least some plant species by increasing nutrient absorption.

Table (11): Effect of licorice root extract, humic acid and their interaction on the fruit diameter (cm). plant^{-1} of summer squash plants.

Cultivar	Humic Acid (g.L^{-1})	Licorice Extract (g.L^{-1})			Humic Effect
		0	5	10	
Humic × Licorice	0	2.78 c	2.81 c	2.82 c	2.80 c
	2	3.39 b	3.37 b	3.38 b	3.38 b
	4	3.60 a	3.68 a	3.65 a	3.65 a
Licorice effect		3.26 a	3.29 a	3.28 a	

The column, row and their interactions with the same letters are not significantly different from each other according to Duncan's multiple range test at level (α=0.05).

CONCLUSION

In this study, it can be concluded that from mentioned the above results the use of licorice root extract and humic acid as individual or combination via foliar spray gave the best results on the yield traits of summer squash plants.

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کارتێکرنا مستخلصێ رەهەیێن عرق سۆسێ و ترشێ هیومیکێ ل سەر بەرهەمی فێقێ کۆلندی (Cucurbita pepo L.)

پوختە

ئەڤ ڤەکۆلینە هاتە ئەنجامدان ل زەڤیێن زەرزواتی سەر ب پشکا بیستانکاری یێن کۆلێژا چاندنێ ل زانکۆیا دهوکێ /هەرێما کوردستانا عێراقێ ل دەڤەرا سێمێلێ ل بهارا سالا 2018. مەرەم ژ ئەنجامدانا ڤێ ڤەکۆلینی بۆ تاقیکرنا سێ ئاستێن جیاواز ژ مستخلصێ رەهێن عرقێ سۆسێ (0، 5، 10) غرام بۆ هەر لیترەکی ئاڤێ دگەل رەشاندنا ترشێ هیومیکی ب سێ ئاستێن جیاواز (0، 2، 4)غرام بۆ هەر لیترەکێ ئاڤێ ل سەر ساخلەتێن چەندایتی بەرهەمێ رووەکێ کۆلندی.(cucurbita pepo L.) ژ جورێ هەجین .(Naji) تاقیکرن هاتە بنەجهکرن ب شێوەیێ تاقیکرنا فاکتەرێ ل دویڤ دیزانیا بلوکێ هەرەمەکی تەواو دارشتن (F-RCBD) ب سێ جاران. ئەنجام دیار بوون ژ لاێ ڤێ ڤەکۆلینی کۆ رەشاندنا مستخلصێ رەهینَ عرقێ سۆسێ ل سەر ئاستێ 10غرام/لیترەکی کارتێکرنەکا جیاواز هەبوو ل سەر زێدە بوونا ساخلەتێن بەرهەمی او ل سەر زی بگەهشتنا بەرهەمی (0.389کغم/رووەکی). بس رەشاندنا ترشێ هیومیکێ ل سەر ئاستێ 2غرام/لیترەکی کارتێکرنەکا بەر چاڤ هەبوو ل سەر زێدەبوونَ ساخلەتێن بەرهەمێ کولندی هەر ژ زی بگەهشتنا بەرهەمی(0.383 کغم/رووەکی) و بەرهەمێ ب کێرهاتی بۆ فروتنێ (34.86 تەن/هکتار). هەر وەسا رەشاندنا ترشێ هیومیکێ ل سەر ئاستێ 4غرام/لیترەکی کارتێکرنەکا بەر چاڤ هەبوو ل سەر زێدەبوونَ ژمارا فێقی (13.81)، درێژاهیا فێقی(14.14سم)، تێرەیا بازنەیێ فێقی (3.65سم) و تێکرایێ کێشەیا فێقی (123.41غم)، بەرهەمی گشتی (1.707کغم/رووەك)، بەرهەمی گشتی (39.61 تەن /هکتار). ژ بلی ساخلەتێ بەرهەمێ ب کێرنە هاتی بۆ فروتنێ(4.656 تەن/هکتار) بەرەڤ کێمی دا دەمێ زیدەکرنا ئاستێ رەشاندنا ترشێ هیومیکێ. سەبارەت ب رەشاندنا سەرەدریا دووانی د ناڤ بەرا مستخلصێ رەهینَ عرقێ سۆسێ ل سەر ئاستێ 10غرام/لیترەکی و ترشێ هیومیکێ ل سەر ئاستێ 4غرام/لیترەکی کارتێکرنەکا بەر چاڤ هەبوو ل سەر زێدەبوونَ ساخلەتێن بەرهەمێ د رووەکێ کولندی دا .

تأثيرمستخلص جذورعرق السوس و حامض الهيوميك على حاصل ثمار قرع الكوسة (*Cucurbita pepo* L.)

الخلاصــة

أجريت هذه الدراسة في حقول الخضروات / كلية الزراعة في جامعة دهوك /إقليم كردستان/العراق، خلال موسم النمو الربيعي سنة 2018. لدراسة تأثير الرش الورقي من مستخلص جذور عرق السوس (0 ،5 ،10 غم/ليتر) و حامض الهيوميك (0 ،2 ،4 غم/ليتر) على نوعية الحاصل لنبات القرع الصيفي (*Cucurbita pepo* L.) هجين (*Naji*).التجربة صممت كتجربة عاملية في تصميم القطاعات العشوائية الكاملة (*F-RCBD*) و بثلاث مكررات. أظهرت النتائج من خلال هذه الدراسة بان الرش الورقي من مستخلص عرق السوس بتركيز 10 غم/لتر على قرع الكوسة أدى الى زيادة معظم صفات الحاصل لنبات قرع الكوسة و كذلك ادى الى زيادة معنوية في الحاصل المبكر (0.389 كغم/نبات). بينما رش النبات بحامض الهيوميك عند مستوى 2 غم/ليتر بأن صفات الحاصل قد ازداد بشكل معنوي لنبات قرع الكوسة في كل من الحاصل المبكر(0.383 كغم/نبات) و الحاصل قابل للتسويق (34.86 طن/هكتار) بينما رش حامض هيوميك عند مستوى 4 غم/ليتر ادى الى زيادة معنوية في كل من عدد الثمار(13.81)، طول الثمرة (14.14سم)، قطر الثمرة (3.65 سم)، معدل وزن الثمرة (123.41غم)، الحاصل الكلي (1.707 كغم/نبات)، الحاصل الكلي (39.61 طن/هكتار) ما عدا صفة الحاصل غير قابل للتسويق (4.656 طن/هكتار) انخفض عند زيادة مستوى رش النبات بحامض الهيوميك. بالاضافة بأن التداخل المعاملات بين مستخلص عرق السوس عند التركيز 10 غم/ليتر و حامض هيوميك عند مستوى 4 غم/ليتر اعطى أعلى قيمة بخصوص صفات الحاصل المدروسة لنبات قرع الكوسة. ،