

Effect of triple superphosphate fertilizer and spraying with licorice root extract In the growth and production of tomato

Lycopersicon esculentum Mill

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Abstract:

executed Experience during season Agricultural2022-2023 conducted in One Houses Plastic in Al-Fadliyah district, which is located to the south of Dhi Qar Governorate, 13 kilometers from the center of the city of Nasiriyah , on plants Tomato *Lycopersicom esculentum mill* .Classify ,WijdanWith a purpose study impact impact Fertilizer Super phosphate Triple In concentrations,1.5, 0) 2,5)gm.plant-1 f Spraying With extract Root Sweat licorice (in concentrations)0 , 5 , 10)gm.l-1 on the growth The vegetative And syphilis To plant Planted tomatoes inside Houses Plastic.At a fertilization rate of seven Payments And ten Sprinkles from Abstract during season the growth , And I use design sectors Random Complete(RCBD.)With three Duplicates And compared Averages According to a test less difference moral when level Prospect0.05And it can summary Results With what Come:

1-superiority Moral For plants TransactionB2Fertilizing with fertilizer Super phosphate The trio is focused(2.5Gloom.plants-1)in all adjectives Thoughtful.

2-Excellence the focus10gm.l from Extract Sweat licorice in all characteristics the growth Study of tomato plants.

3-Excellence treatment Interference between concentration2,5gm.plant-1 for fertilizerP2O5And focus10gm.l-1 For extract Sweat licorice in characteristics Length the plant,the weight Dry To grow The vegetative,chlorophyll He got it One plant, which I reached the value(200.5poison,205.6Gloom,48.0, SPAD 7.39kg plants⁻¹),on Relay.exceptrate Phosphorus,rate Materials Solid Melted TSSThe overlap betweenconcentration 1,5Gloom.plants-1For fertilizer P2O5And focus10Gloom.Liter-1For extract Sweat licoriceSo he gave0.47),6.17) sequentially.



Introduction:

considered as Tomato *Lycopersicon esculentum* mill Which tracking the family Nightshade Solanaceae Of crops Veganism Which comes By rank The first from where Space Cultivated Annually in Iraq. Consumption is As for Fresh Oh Manufactured using Recommendations Scientific The correct one beginning from to choose item the appropriate with to provide better Circumstances And transactions Until harvest, marketing and manufacturing are possible more productivity lonliness Space Than decrease from Cost Production and more The return(Ahmed, 2006)And come Importance Food Tomato contains Its fruits on Materials Carbohydrates In addition to Contain it on Vitamins A, B, CAnd salts Iron Calcium and phosphorus.And it contains Its fruits on Antagonists OxidationAntioxidantthe mission Medically, it is source good For lycopene Lycopene, And she source good For potassium And vitamin C,that Back to her Impact in Preservation on heart Salim And healthy.And it counts practical Fertilization Oh addition Nutrients For plants practical Basic to get on higher He got it And better Quality For less Costs And that With an increase efficiency practical Fertilization By choice Type Fertilizer the appropriate To plant specific And in Soil Certain And in The appointment the appropriate And in quantity Suitability And the way Occasion Used To add it Which from Like her that verification better Response from before the plant For this Fertilizer(Abu Dahi And Yunus,1988)

As he explained (Ortaz, 2002)that loss Items Feeder Especially Phosphorus It is considered from Problems Common in Lands agricultural.And it increases This is amazing the problem With an increase Applications the operation For fertilizers under Circumstances Tropical As high degree the heat that effect Negatively on Readiness Items Feeder asThe tomato crop is one of the crops with high fertilizer requirements that may reach 312 kg/dunum of superphosphate fertilizer, and providing balanced nutrients, especially phosphorus, is one of the major problems in the agricultural process.KProblems with retaining phosphorus in the soil despite adding high levels of fertilizerPhosphorusTherefore, addressing these problems has become necessarySuch asReducing fertilizer levels and adding them in multiple batches(2010), Lange and Vlek. Phosphorus is considered one of the major nutrients abundant in soil, but it is the most diluted and least mobile in the soil solution. It has a high ability to be absorbed by the soil and is usually fixed in organic soils. It is considered the least readily available element in agricultural soils. Its use in developed countries causes high pollution problems in agricultural soils. Calcareous soils, in which the percentage of CaCO₃ is 23%, absorb it and seep into it noticeably (Salman 2003). Spraying natural nutritious plant extracts also works to improve the growth and



production of the plant. The most important of these are Extracts: Licorice extract. The roots of this plant contain glycyrrhizic acid, sugars, starch, dyes, and many mineral elements. Many researches have indicated that this extract is effective in influencing the growth and production of many plant species (Sahi, 2005), in addition to being an available and widespread plant. And cheap. Likewise, identifying varieties that respond to the climatic conditions in Iraq and the influence of some modern agricultural applications are important factors for stimulating growth and increasing the yield of this plant in quantity and quality.

This study aims to:-

- 1- Stimulating growth and increasing yield in tomato plants.
- 2- Improving the qualitative characteristics of fruits.
- 3- Testing the efficiency of licorice extract (as a natural product) and addition of the element phosphorus, as well as the interaction between them, in tomato growth and yield.

Methods and Materials:

Field experiment site:

A field experiment was carried out during the winter agricultural season (2022-2023) in Dhi Qar Governorate, in Al-Fadhliyah district, Al-Khader area, 13 km from the center of the governorate, for the purpose of studying the effect of spraying with licorice root extract and triple superphosphate fertilizer on the vegetative and flowering growth of tomato hybrids. Samples were taken from Different locations at a depth of (0-30) cm. The samples were mixed together for homogeneity, air-dried, smoothed, and passed through a sieve with a hole diameter of 2 mm. A composite sample was taken to conduct chemical and physical analyzes on it, as in Table (1).

Table (1) Some chemical and physical characteristics of the soil sample before planting

Unit	the value	Adjective
	7.8	Soil reaction (pH)
DC-Siemens M-1	7.03	electrical conductivity (ECe)
%	0.2	Organic matter
mg.kg-1N soil	12.9	Ready nitrogen

mg.kg-1P soil	4	Clear phosphorus
mg.kg-1K soil	155	Ready potassium
Soil separators		
Sandy loam		Histology
%	20.0	Clay
%	38.4	the sand
%	31.5	Alluvial

Land preparation

The greenhouse was prepared by plowing and leveling the entire soil of the greenhouse, then it was divided into six lines, each line being 56 meters long, and Radomil pesticide was added at a rate of 3 kg per dunum for the purpose of preventing fungal diseases. Then I added soil to each line so that the line was 15 cm above the floor of the plastic house, and the distance between one line and the other was 70. Two seeds were planted in one hole, and they thinned out to one plant two weeks after planting, and I left a distance of 100 cm at the entrance and end of the plastic house.

The variety.. The seeds of the tomato hybrid (Wejdan) were grown and approved in Iraq for unlimited growth, produced by the company American peto seed.

Preparation of licorice extract

I took the roots of the licorice plant from the local market, dried them in the sun for a week, then crushed and ground them with an electric grinder with holes (0.5 mm), then soaked the licorice root powder in warm water for 24 hours before spraying (Al-Abdali, 2002).

Experiment design:A factorial experiment was carried out using a completely randomized block design (RCBD) with three replicates and 9 experimental units for each factor:

The first factor: Licorice root extract:

The treatments were sprayed with ten sprays between one spray and another over a period of two weeks

A0: No spraying

A1: Spraying with licorice extract (5g/L)

A2: Spraying with licorice extract (10 g/L)

The first factor: triple superphosphate fertilizer ((TSP %46)

Fertilizer was added to the ground in seven batches: the first batch with seed planting, two batches during vegetative growth, two batches during the flowering period, and two batches after fruit set.

B0: Without fertilization.

B1: Adding superphosphate Triple (1.5 gm. Plant-1)

B2: Adding superphosphate Triple (2.5g. Plant-1)

Length the plant(poison): It was completed measurement Length the plant from Surface Soil is where the root is connected to the soil to the top Terminal in end season the growth.

rate Subject Dry For papers : It was completed Taking the paper Adult Fourth near the top For seven plants I took Randomly for every loneliness Experimental after 60 One day from Seedlings And at beginning The genie To estimate Subject Dry In which , where It was completed cleaning Papers then register the weight Tender she has then Developed in oven electrical oven on degree heat 70M For a period 48 hour And even stability the weight then register the weight Dry And after that It was calculated Subject Dry As a ratio percentage As in The equation The following percentage of dry matter = $\text{dry weight} \div \text{fresh weight} \times 100$

Chlorophyll percentage: Saucepan content chlorophyll in Papers by device ((Chlorophyll meter Type 502- spad (Minnotti et al., 1994) go run this Measurement after five Fairies before noon (Al-Shahmani, 2014).

One plant yield: It was completed Her account according to The equation The following

The result Total For the unit Experimental (kg)

He got it the plant the one (kg) = (Akkab) 2013)

number plants Unit Experimental



Phosphorus ratio in Papers: I took the paper Fifth lowest the top Developing from all plants from the plants The five Selected Randomly before Flowering the plant And after Flowering (Al-Sahhaf, 1989) After that, the samples were digested and prepared Saucepan Phosphorus in Samples Digested using device Spectrum Chromatography Spectrophotometer and on Length wavy 882nm after to prepare Solutions Phosphorous Standard, according to road (Sommers and Olsen (1982)

rate Materials Solid Melted the college (TSS): It was completed Measure it With a device refractometer And that Extracting juice The fruits during paper Purification in all treatment And I recorded reading the device on Basis Materials Solid Melted the college As a ratio percentage (TSS)

And compared Averages when Use less difference moral (LSD) when level Prospect 0.05

Result and discussion

Plant length:

We note from Table No. (1) There are significant differences in the levels of triple superphosphate fertilizer in increasing the rate of plant height, as we note that the highest plant length was in treatment B2 (2.5 g. plant⁻¹), which gave 195.4 cm, while the plant length in comparison treatment B0 was the lowest plant length. (175.4 cm) The increase in plant height may be due to the addition of superphosphate fertilizer leading to an increase in root growth and thus increasing the absorption of water and nutrients dissolved in it by the plant roots, some of which are activated by vital activities in the plant, including increased cell division and elongation, which reflects positively on the plant. Increasing the length of the plant, and this is in agreement with Raheem and Issa (2018). It is clear from the results of the same table that there are significant differences for the licorice extract in increasing the rate of plant height. The highest plant length at the concentration of 10 g L⁻¹ reached 192.5 cm, while the length of the plant at the concentration of 0 ml L⁻¹ reached 175.5 cm. The reason for this may be due to the hormonal nature of the extract, as well as the fact that licorice contains substances similar to the effect of the growth regulator (auxin) and enzymes, especially by increasing the elements Mg and K and their role in that, and then increasing the division of cells of the growing shoot, which has a positive effect on the length of the plant. This is consistent with what Herby (Issa and (2017) found in their study on faba bean plants when they used different concentrations of licorice extract and yeast suspension. It is also clear from the table that there are significant interactions between triple superphosphate fertilizer and spraying with licorice roots



in the average plant length, especially in the A2B2 treatment, in which the plant length increased to 200.5 cm compared to the comparison treatment in which the plant length reached 166.7 cm.

Table No. (1) The effect of triple superphosphate fertilizer and spraying with licorice root extract and their interaction on plant length (cm.1-plant)

an average Extract Sweat licorice	B2	B1	B0	TSP Extract Sweat licorice
175.5	188.8	180.9	166.7	A0
185.3	197.1	183.6	175.3	A1
192.5	200.5	192.8	184.2	A2
	195.4	187.8	175.4	an averageTSP
LSD0.05				
Licorice	TSP		Interference	
6.1	4.8		NS	

Dry weight of shoots:

It is noted from the results of table (2) There was a significant effect of the B2 triple superphosphate fertilizer treatment on the dry weight of the shoots, giving the highest rate of 200.8 grams compared to the comparison treatment. B0, which gave the lowest value, which amounted to 187.8 grams. This may be due to the increase in the surface area of the roots when treated with triple superphosphate fertilizer, which led to an increase in the absorption of water and nutrients, which may be reflected in an increase in the effectiveness of photosynthesis, an increase in the carbohydrates produced, and the accumulation of dry matter in the vegetative system (and these results agreed With the results of Al-Kafaji and others (2018), the results of Table (2) also showed that spraying with licorice extract had a significant effect, as the concentration of 10 g.l-1 gave the highest average dry weight of the shoot, reaching 197.5 g, compared to the comparison treatment, which gave the lowest. An average of 185.9 grams. The reason may be attributed to the effect of the extracts containing some nutritional elements, which increased the leaf area, which is important in the



plant's vital activities, thus increasing the efficiency of the photosynthesis process and increasing the carbohydrates produced, which is reflected in the accumulation of dry matter in the shoot, and this is consistent with the star (2005) The table shows (2) There was a significant interaction in the dry weight of the shoots, as the A2B2 treatment outperformed the rest of the treatments in giving the highest average dry weight of 205.6 grams compared to the comparison treatment A0B0, which gave the lowest average of 180.3 grams.

Table No. (2) The effect of triple superphosphate fertilizer and spraying with licorice root extract and their interaction on the dry weight of the shoots (gm.plant-1)

an average Extract Sweat licorice	B2	B1	B0	TSP Extract Sweat licorice
185.9	194.1	183.5	180.2	A0
195	202.7	191.9	190.4	A1
197.5	205.6	194.2	192.8	A2
	200.8	189.9	187.8	an averageTSP
LSD0.05				
Licorice		TSP		Interference
2.9		2.1		1.6

Chlorophyll ratio:

Show results Schedule (3) that addition Fertilizer P₂O₅ may be gave more Moral in Standards the growth so reach higher Average for content chlorophyll By an amount 45.9 In the transaction B2 By analogy With comparison treatment And it has He is consoled The reason is the branching and good growth of the roots, which help absorb elements, including phosphorus, which is involved in the synthesis of the chlorophyll molecule. Likewise, the spraying treatment with licorice did not give any significant differences. We also note the presence of significant differences in the interaction between P₂O₅ With licorice extract gave the treatment A2B2 The highest phosphorus content was reached 0.48 She also gave the treatment A0B0 Lowest concentration of phosphorus 33.2.

Schedule number(3)impact Fertilizer Super phosphate Triple And Spraying With extract Root Sweat licorice And interference Between them in rate chlorophyll Total in Leaves plants Option SPAD))

an average Extract Sweat licorice	B2	B1	B0	TSP Extract Sweat licorice
38.8	44.4	38.7	33.2	A0
39.4	45.2	39.0	33.9	A1
42.7	48.0	44.1	36.1	A2
	45.9	40.6	34.4	an averageTSP
LSD0.05				
Licorice		TSP		Interference
NS		2.1		0.9

One plant yield:

It is noted from the results presented in Table No.4) There was a significant effect of plants growing under conditions of fertilization with triple superphosphate, as A2 plants excelled in giving the highest average yield per plant, amounting to 7.05 kg. Plant-1. It was significantly superior to the comparison treatment, which gave the lowest average plant yield of 4.99 kg. Plant-1. This may be due to the triple superphosphate fertilizer treatments causing an increase in plant height and an increase in the dry weight of vegetative growth (Table 1, 2), as well as other vegetative indicators, which had a positive impact on the yield of a single plant. This result is consistent with Al-Zahawi (2007).

The results are shown in the table (4) There was a significant effect of spraying with licorice root extract on the average yield of one plant, as the 10 g concentration treatment was superior. liter-1, giving the highest yield per plant of 6.75 kg.plant-1 compared to the comparison treatment, which gave the lowest average yield per plant of 5.52 kg. Plant-1. This may be attributed to the effect of the elements contained in the extract in raising the efficiency of the photosynthesis process and then increasing the amount of manufactured carbohydrates and their transfer from their manufacturing sites to their storage sites in the fruits, which led to an increase in the vegetative



growth parameters mentioned above, and this was reflected in an increase in plant yield, and these results agree. With Imran (2004) when studying the cucumber plant.

It appears from the table (4) There was a significant effect of the binary interactions between the two variables studied on the average yield per plant. The interaction treatment A2B2 gave the highest yield per plant, 7.39 kg.plant⁻¹, compared to the lowest number of fruits in the comparison plants, A0B0, which amounted to 4.31 kg.plant⁻¹.

Table No. (4) The effect of triple superphosphate fertilizer and spraying with licorice root extract and their interaction on the yield of one plant (kg.plant⁻¹)

an average Extract Sweat licorice	B2	B1	B0	TSP Extract Sweat licorice
5.52	6.75	5.49	4.31	A0
5.97	7.02	6.00	4.90	A1
6.75	7.39	7.11	5.77	A2
	7.05	6.20	4.99	an averageTSP
LSD0.05				
Licorice		TSP		Interference
0.9		1.3		0.7

Percentage of phosphorus in leaves (%):

from table (5) We notice that there is a significant effect of the triple superphosphate fertilizer treatment on the percentage of phosphorus in the leaves. Treatment B2 gave the highest percentage of phosphorus concentration, reaching 0.44, compared to the comparison treatment, which gave the lowest value, which was 0.41. This may be due to the increase in the surface area of the roots and the increase in their branches when the TSP treatment led to an increase. Absorption of the added fertilizer, which may be reflected in an increase in the effectiveness of photosynthesis, an increase in



carbohydrates produced, and the accumulation of dry matter in the vegetative system (and these results agreed with results with Al-Kafaji and others (2018). The same results showed that spraying with licorice extract had no significant effect. It appears Table No. (5): There is a significant interaction in the dry weight of the shoots, as the A2B1 treatment outperformed the rest of the treatments in giving the highest concentration of phosphorus, which amounted to 0.47, compared to the comparison treatment A0B0, which gave the lowest concentration, amounting to 0.38.

Table No. (5) The effect of triple superphosphate fertilizer and spraying with licorice root extract and the interaction between them on the percentage of phosphorus in the leaves (%)

an average Extract Sweat licorice	B2	B1	B0	TSP Extract Sweat licorice
0.39	0.40	0.40	0.38	A0
0.43	0.46	0.43	0.41	A1
0.46	0.46	0.47	0.45	A2
	0.44	0.43	0.41	an averageTSP
LSD0.05				
Licorice		TSP		Interference
NS		0.03		0.02

rate Materials Solid Melted(TSS)%

Table no(6)It shows that there is no effect morally For a transaction Fertilizer Super phosphate Triple in rate Dissolved solids . And it showed Self Results that Spraying With extract Sweat licorice Effect morally So it was higher rate For materials Solid Melted in Transaction A2So it was 6.71And it has Back that to more Space Surface For the roots and more Its branches When spraying led to Increase absorption



Nutrients, thus increasing photosynthesis processes and increasing the formation of sugars (Taayeen et al. 2016). And it shows schedule number(5)existence overlap moral in Percentage of dissolved solids , so I excelled treatment A2B1on Rest Interactions in give higher concentration For phosphorus reach 6.17comparison With a transaction Comparison A0B0that she gave less concentration reach 4.19.

Schedule number(6)impact Fertilizer Super phosphate Triple And Spraying With extract Root Sweat licorice And interference Between them in rate Materials Solid Melted(%)

an average Extract Sweat licorice	B2	B1	B0	TSP Extract Sweat licorice
4.56	4.99	4.50	4.19	A0
5.84	6.14	5.91	5.46	A1
6.71	6.01	6.17	5.95	A2
	6.05	5.86	5.20	an averageTSP
LSD0.05				
Licorice		TSP		Interference
1.3		NS		0.7

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