Effect of spraying with bread Yeast suspension and Licorice root extract on some vegetative growth characteristics of Tamarind seedlings (*Tamarindus indica* L.) cultivated in Basra governorate

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Abstract

The experiment was carried out during the autumn season 2018-2019 in the Lathhouse of the Agricultural Research Station/Department of Horticulture and Landscaping/College of Agriculture/University of Basra. The research was conducted for a period from 1/9/2018 to 1/9/ 2019,to study the effect of foliar spraying with a suspension of bread yeast at concentrations 0,2.5,5and7.5g.l^{-1},in addition to foliar spraying with licorice extract at concentrations 0,2.5,5and 7.5g.l^{-1},and their interactions in some indicators of vegetative growth of Tamarind seedlings.

A factorial experiment was carried out according to a randomized complete block design with three replications. The indicators of the study showed that the foliar spraying treatments with bread yeast suspension led to improving most of the vegetative growth characteristics of tamarind seedlings, and the spraying treatment with a concentration of 5g.l^{-1} excelled in achieving the best results compared with the control treatment for the characteristics of plant height and leaf carbohydrate content, while the concentration of 2.5g.l^{-1} in the dry weight of the vegetative total of tamarind seedlings, but in the two characteristics of number of leaves and leaf area, none of the concentrations of yeast suspension had a significant effect. Foliar spraying of plants with licorice extract improved all vegetative growth characteristics of tamarind seedlings, and the spraying treatment with concentration 5g.l^{-1} was significantly superior in recording the best results compared with the control treatment in terms of plant height and leaf carbohydrate content, while the concentration exceeded 2.5g.l^{-1} in the rest of the studied attributes. The result of the interaction between foliar spraying with bread yeast suspension and licorice extract showed a significant effect on all vegetative growth characteristics.

Keywords: Tamarind, *Tamarindus indica* L., bread yeast , licorice.

Introduction

Tamarindus indica L. is one of the evergreen fruit trees that are grown in tropical and semi-tropical areas. During their growth, plants need special climatic and soil requirements. It is a tropical fruit plant that needs high heat and humidity. Large trees tolerate frost to a limited degree, while trees cannot tolerate it. Its cultivation is good in sandy lands and does not bear the high ground water level and poor drainage, and this is what made it one of the rare plants in Iraq and difficult to cultivate and care for (15).(28).It spreads in the equator regions such as tropical Africa and India to the Caribbean islands and areas The world with medium and high temperatures and high humidity, such as the Kingdom of Thailand(18).

India occupies the first place in the cultivation and production of tamarind at a rate of 300,000 tons

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annually with an area of about 58,624 hectares, and the equivalent of 10,200 tons is exported from it to the world to the Gulf countries and Europe (21).While the seeds that are taken from the dried fruits are not good for germination and germination is within 7to10 days of planting. It can be propagated by grafting, and that the planting distance should not be less than 13x13 meters. Trees may be planted at a distance of 10x10 meters. One tree gives more than 100 kg of yield per year. Tamarind is sold in the form of coherent red-brown blocks. It has a sweet, astringent taste and pleasant aroma.

Natural extracts are among the most important of those treatments that have contributed and contribute to the success of the cultivation of many plants. The most important of these natural extracts is the dry yeast extract, which has been considered since ancient times as a substance of high nutritional value as it contains many vitamins, salts, growth regulators and protein, and has been used in fertilization It is used in fertilizing many vegetable crops, leafy crops, fruits and other crops, as it increases the speed of growth and increases the number of leaves and branches, as in oranges, apples, peaches, and pears. Nitrogen can also be obtained. Of which, which is one of the most important elements that positively affect the growth and development of plants (25).

The licorice plant is a perennial plant that grows in many parts of the world, such as Syria, Egypt, Asia Minor, Central Asia and Europe(24).Its roots contain many mineral elements such as phosphorous, potassium, calcium, magnesium, and minor elements such as iron, zinc and manganese, being elements that activate the work of special enzymes(3). With different growth activities such as photosynthesis and the entry of elements into the synthesis of nucleic acids DNA & RNA necessary for cell division (7),(31). Several studies have indicated that spraying with bread yeast suspension and licorice extract has improved most of the characteristics of vegetative and flower growth as well as qualitative traits of the yield in many plants (5),(6),(10).

In view of the importance of plant extracts as they contain initiators or activators of plant hormones, growth materials, and major and minor elements important in plant growth and development(1). Also, the importance of the tamarind plant economically and medically, this study aimed to test the effect of foliar spraying with yeast suspension and licorice extract and the interaction between them in improving vegetative growth characteristics of tamarind plants.

Materials and methods

The experiment was carried out during the autumn season 2018-2019 in the Lathhouse of the Agricultural Research Station / College of Agriculture / University of Basra. The experiment was conducted for a period from 1/9/2018 to 1/9/2019. The seeds of tamarind plants were planted in cardboard cups containing peat moss and fine sand (Dari) at a ratio of 1:2. Plastic pots capacity of 5 kg /soil.The process of sterilizing the potting soil was carried out using the systemic fungicide Robin (granular pesticide)(active substance Metalaxyl 5%G)at a rate of 10g/pot and the systemic insecticide Rifadan (granular nematode) the active substance(Carbofuran 10% G) at a rate of 2g/pot and mixing them with the soil well ,Random samples were taken from agricultural soil and analyzed in the laboratory of the Department of Soil and Water Resources/College of

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Agriculture/University of Basra. Table (1) represents some physical and chemical properties of agricultural soil.

After planting was completed, plastic brackets were placed to keep the plants growing upright. Neutral fertilizer NPK(20:20:20)with iron(Fe0.05%), manganese(Mn 0.02%) and copper(Cu 0.03%), was added to the soil at a rate of 1g.l^{-1} and once every two weeks for the duration of the study for all plants. cultural practices i.e hoeing, weeding and controlling insect and disease infestations

Table (1) Some chemical and physical properties of agricultural soil.

Measurement type	The value	Unit
EC (1:1)	**3.18**	**ds.m^{-1}**
PH (1:1)	**6.11**	**-**
Organic matter	**3.110**	**%**
CaCO3	**109.07**	**g.kg^{-1}**
Ready Elements		
N	**34.20**	**mg.kg^{-1}**
P	**8.20**	**mg.kg^{-1}**
K	**215.3**	**mg.kg^{-1}**
Soil Separators		
Clay	**67.0**	**g.kg^{-1}**
Loam	**110.0**	**g.kg^{-1}**
Sand	**823.0**	**g.kg^{-1}**
Soil Texture	**Sandy Loam**	

The experiment included a study of two factors. The first factor was foliar spraying with bread yeast suspension at concentrations of 0, 2.5, 5, and 7.5 g.l^{-1}, respectively, and spraying with distilled as control treatment. After reaching 6 months, the plants were sprayed with yeast suspension once every 10 days. during the duration of the experiment. The second factor was foliar spraying with licorice extract at concentrations of 0, 2.5, 5, and 7.5 g.l^{-1}. Once every 10 days of the experiment, alternating with the yeast suspension. (Tween20) were added with the spray solution as a diffuser. The plants were sprayed with the above till run off using a hand sprinkler. The research was carried out as a factorial experiment 4×4 according to the Randomized Complete Block Design (RCBD) with three replications. The experiment included 48 experimental units, in each experimental unit contain 3 pots in each pot one plant. Thus, the number of experimental plants is144.The vegetative growth characteristics represented . plant height were measured using the measuring tape and the number of leaves were calculated manually, and the leaf area was calculated using the Scanner technique using the scanner according to the method (19).Digimizer program,. leaves dry weight was measured using a sensitive balance and the percentage of total carbohydrates in the leaves were estimated by the modified method of phenol-sulfuric acid, as described by (16).The data was analyzed according to the statistical program GenStat(2012). The arithmetic means were compared using the least significant difference test at the probability level of 0.05,(4).

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Results

The results of Table(**2**)showed that all concentrations of yeast suspension led to a significant increase in plant height compared to the control treatment, where the treatment with bread yeast suspension at a concentration of 5 $g.l^{-1}$ led to a significant increase in seedling height, which amounted to 59.50 $cm.plant^{-1}$ compared with the treatment 2.5 $g.l^{-1}$, which gave the lowest height of seedlings was 47.90 $cm.plant^{-1}$, while the control treatment recorded 53.40$cm.plant^{-1}$. control treatment with bread yeast suspension outperformed the rest of the other treatments in the mean number of The leaves reached 43.39 $leaves.plant^{-1}$.The results showed that spraying with yeast suspension led to a significant increase in the leaf area of the plant, and the control treatment with bread yeast suspension achieved the highest leaf area for seedlings, which reached 684 $cm^2.plant^{-1}$, followed by treatment 7.5$g.l^{-1}$ amounted to 615 $cm^2.plant^{-1}$. As for the dry weight of the leaves, the treatment with bread yeast suspension at a concentration of 2.5 $g.l^{-1}$ was superior to the rest of the other treatments, which amounted to 8.79 g, significantly over treatment 7.5$g.l^{-1}$, which amounted to 7.28g, as well as the control treatment, which amounted to8.12g.all concentrations of the yeast suspension led to a significant increase in the percentage of carbohydrates in the leaves compared to the control treatment, where the treatment with concentration 5$g.l^{-1}$ was significantly superior to the rest of the other treatments, which amounted to 33.26%, especially on the treatment 2.5$g.l^{-1}$, which amounted to 29.61%,as well as the control treatment, which amounted to 31.24%.

Table (2) Effect of foliar spraying with yeast suspension on the vegetative growth characteristics of tamarind seedlings

Effect of yeast suspension .$g.l^{-1}$					
Yeast	**Plant height ($cm.plant^{-1}$)**	**number of leaves ($leaf.plant^{-1}$)**	**Leaf area ($cm^2.plant^{-1}$)**	**Dry weight of the shoot ($g.plant^{-1}$)**	**Percentage of carbohydrates in leaves (%)**
0	53.40	43.39	684	8.12	31.24
2.5	47.90	42.50	601	8.79	29.61
5	59.50	41.86	585	8.04	33.26
7.5	56.10	41.06	615	7.28	31.61
LSD 0.05	**7.47**	**4.94**	**87.6**	**0.85**	**1.71**

As for the spraying treatment with licorice extract, the results of Table(3) showed that all treatments of spraying plants with licorice extract led to a significant increase in plant height compared to the comparison treatment, where the treatment with licorice extract at a concentration of 5 $g.l^{-1}$showed a significant increase in The height of the seedlings reached 60.10$cm.plant^{-1}$, compared with the treatment 2.5 $g.l^{-1}$, which amounted to 48.40 $cm.plant^{-1}$, while the control treatment was 52.30$cm.plant^{-1}$.The data in the same table show that treatment with licorice extract at a concentration of 2.5 $g.l^{-1}$ led to a significant increase in the number of leaves, which amounted to 42.64 $leaves.plant^{-1}$, superior to treatment

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with 7.5 g.l^{-1}, which amounted to 41.72 leaves.plant^{-1}, as for the control treatment, it amounted to 41.89 leaves.plant^{-1} in the aspect of number of leaves. While the two treatments with licorice extract sprayed on the leaves at a concentration of 7.5 and 2.5 g.l^{1} led to an increase in the leaf area, which amounted to 634 cm^{2}.plant^{-1}, which was significantly superior to the control treatment, which amounted to 592 cm^{2}.plant^{-1}.The treatment with licorice extract spraying on the leaves showed the superiority of the treatment in the dry weight of the leaves at a concentration of 2.5 g.l^{-1} over the rest of the treatments, which amounted to 8.42g, significant over the control treatment which amounted to7.18g.The treatment with the concentration of 5 g.l^{-1} was significantly superior to the rest of the other treatments in terms of the percentage of total carbohydrates in the leaves, which amounted to 32.23%,over the control treatment, which amounted to 30.60%.

Table (3) The effect of foliar spraying with licorice extract on the vegetative growth characteristics of tamarind seedlings.

Effect of licorice extract.g.l^{-1}					
Licorice	**Plant height (cm.plant^{-1})**	**Number of leaves (leaf.plant^{-1})**	**Leaf area (cm^{2}.plant^{-1})**	**Dry weight of the shoot (gm.plant^{-1})**	**Percentage of carbohydrates in leaves (%)**
0	52.30	41.89	592	7.18	30.60
2.5	48.40	42.64	634	8.42	31.93
5	60.10	42.56	624	8.22	32.23
7.5	56.10	41.72	634	8.41	30.96
LSD 0.05	**7.47**	**4.94**	**87.6**	**0.85**	**1.71**

The result of the interaction between foliar spraying with yeast suspension and licorice extract, as in Table(4)showed a significant effect on all vegetative growth characteristics, it led to a significant increase in the height of seedlings, reaching 70.30 cm.plant^{-1}, which was superior to the treatment 2.5 and 2.5g.l^{-1}, respectively, reaching 40.70cm.plant^{-1}, while the control treatment recorded 53.20cm. plant^{-1}. The data in the same table shows the binary interaction of the treatment with bread yeast suspension and licorice extract at a concentration of 7.5 and 2.5 g.l^{-1}, respectively, which led to a significant increase in the number of leaves, which reached 48.11 leaves.plant^{-1}, which outperformed the treatment 2.5 and 7. 5 g.l^{-1}, respectively, as well as the treatment of 5 and 2.5 g.l^{-1}, respectively, which amounted to 36.33 leaves.Plant^{-1}, while the control treatment amounted to 42.00 leaves. plant^{-1}.

The data of Table (4) shows the effect of the dual interaction of the treatment with bread yeast suspension and licorice root extract sprayed on the leaves at a concentration of 7.5 and 2.5 g.l^{-1}, respectively, to a significant increase in the leaf area of the plant, which reached 754cm^{2}.plant^{-1}. on the treatment 2.5 and 7.5 g.l^{-1}, respectively, amounted to 525cm^{2}.plant^{-1}. as for the control treatment, it amounted to 641cm^{2}.plant^{-1}.The table(4) shows the

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effect of the two-interference effect of spraying with bread yeast suspension and licorice extract on weight. Dry leaves at a concentration of 2.5 and 7.5 $g.l^{-1}$, respectively, which amounted to 10.34g, were significantly superior to the treatment of 7.5 and 7.5$g.l^{-1}$, respectively, which amounted to6.35g, as well as the control treatment, which amounted to 6.48g. The same table showed the effect of the binary interaction of spraying with bread yeast suspension and licorice extract on the percentage of total carbohydrates in tamarind seedling leaves, where the treatment with concentration 7.5and5$g.l^{-1}$, respectively, significantly outperformed the rest of the other treatments,reaching33.85%,especially on the treatment.2.5and 5$g.l^{-1}$,respectively, which amounted to 28.52%,and the control treatment which amounted to 29.76%.

Table (4) The interaction effect of foliar spraying with yeast suspension and licorice extract on the vegetative growth characteristics of tamarind seedlings

Interaction effect between yeast suspension and licorice extract.$g.l^{-1}$						
yeast ($g.l^{-1}$)	**Licorice ($g.l^{-1}$)**	**Plant height ($cm.plant^{-1}$)**	**number of leaves ($leaf.plant^{-1}$)**	**Leaf area ($cm^2.plant^{-1}$)**	**Dry weight of the shoot ($gm.plant^{-1}$)**	**Percentage of carbohydrates in leaves (%)**
0	0	53.20	42.00	641	6.48	29.76
	2.5	54.20	46.44	732	8.03	32.61
	5	55.00	41.89	655	9.14	33.25
	7.5	51.20	43.22	707	8.83	29.37
2.5	0	**50.00**	46.78	636	7.75	29.83
	2.5	40.70	39.67	557	7.76	30.94
	5	52.00	47.22	684	9.32	28.52
	7.5	48.90	36.33	525	10.34	29.15
5	0	61.10	41.00	553	7.58	32.95
	2.5	49.10	36.33	495	8.67	33.25
	5	70.30	42.22	605	7.80	33.30
	7.5	57.40	47.89	687	8.13	33.53
7.5	0	45.00	37.78	538	6.91	29.85
	2.5	49.60	48.11	754	9.22	30.92
	5	62.90	38.89	552	6.63	33.85
	7.5	66.80	39.44	618	6.35	31.81
LSD 0.05		**14.95**	**9.86**	**1.54**	**1.71**	**3.42**

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Discussion

The results showed that foliar spraying of tamarind seedlings with bread yeast suspension had a positive effect on most of the studied vegetative growth characteristics, and the treatment of spraying with a concentration of 5 $g.l^{-1}$ was significantly superior in recording the best results in the category of plant height, leaf content of carbohydrates and the effect of concentration 2.5 $g.plant^{-1}$ in the weight category. dry plant total, while yeast had no significant effect on number of leaves and leaf area. The increase in vegetative growth characteristics as a result of spraying with bread yeast suspension may be due to the fact that bread yeast contains many nutrients and amino acids, which are directly or indirectly involved in the production of proteins (20). It also intervenes in building enzymes as they are also proteins, which leads to increased growth through increased cell division processes, as well as the increase in cell sizes, which in turn leads to a steadily increasing plant height(26). This is consistent with what he found(13). On mandarin (tangerine) and (29). On apricot plants.

The reason for the increase may be due to the presence of vitamins, the most important of which is a group of B vitamins such as B1 and B2, which are among the most important components of bread yeast, which is the main factor in the electronic transport processes in the process of photosynthesis, which enters as enzymatic accompaniments by the enzyme Cytochrome-reductase, and this stimulates the construction processes and the production of the important glucose sugar In the growth of plants, which in turn leads to an increase in the number of leaves(14).it is noted through the results that the effect of medium and low concentrations of the suspension is hormonal, and the hormones clearly affect the low and medium concentrations, especially auxins(22).This agrees with what was found. (12). on orange plants.

The results showed that foliar spraying of tamarind seedlings with licorice extract had a positive effect on all studied vegetative growth characteristics. The treatment of spraying with a concentration of 5$g.l^{-1}$ excelled in recording the best results in terms of plant height and leaf carbohydrate content, while the concentration exceeded 2.5$g.l^{-1}$ in the other studied characteristics. The reason for this increase may be attributed to the fact that licorice extract is considered one of the distinguished growth promoters in this field, especially as it exhibits the behavior of gibberellin GA3 that encourages growth(30).through the active compound called mevalonic acid, which in turn works effectively to encourage growth(27).In addition to stimulating the action of enzymes, which increases the activity of growth activities significantly, licorice root extract contains sugars and nutrients such as NPK and other microelements(23).which is easily absorbed by the leaves when spraying these plants with this extract, which enhances the growth and increase the height of the plant (11).This result is consistent with what was mentioned (9).on olive plants and (17).on grape plants.

The reason for this increase may be due to the fact that licorice extract is rich in nutrients important for plant growth, such as potassium, magnesium, iron, zinc and phosphorous, in addition to plant growth stimulants, the most important of which is glycyrrihysic acid, which is one of the terpene compounds, and the

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first initiator of its production is mevalonic acid(8).which works to encourage growth in the plant by stimulating the cell division and elongation, which increases the number of leaves and the production of new leaves, and this is consistent with what was found(2). when spraying on pomegranate seedlings.

Conclusion

Through the experiment, we can conclude that spraying with yeast suspension and licorice extract led to a significant and clear increase in the indicators of the study. The use of those extracts, especially at the concentrations 5 and 2.5g.l^{-1}, which achieved the highest values of vegetative growth in this study, so we recommend using yeast suspension and licorice extract as a spray on the leaves as a fertilizer addition to tamarind plants in order to improve plant growth and thus obtain strong and ideal growth plants.

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