New Effect of Treatment with Yeast Extract and Salicylic Acid on Plant Growth of *Trigonella Foenum-graecum* l. Seedling

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ABSTRACT

This study was conducted at the Mosul University / College of Education for Girls /Department of Biology, in November on the local variety fenugreek to study the plant response to organic fertilizer (dry yeast suspension) with three concentrations: 0, 1 and 2 g/L and soaking with salicylic acid in three concentrations. They are: 0, 40 and 80 mg/l, the factorial experiment was carried out in a completely randomized design with three replications. The results of the experiment were analyzed and tested statistically by Duncan's multiple range test at a probability level of p=0.05%. The most important results obtained can be summarized as follows: - Fertilizing with organic fertilizer (dry yeast suspension) improved most of the studied characteristics, as the germination period was reduced and its speed increased, in addition to the homogeneity of germination, especially at the concentration of 2 g/L. "Soaking the seeds in salicylic acid had a clear effect of improving most of the studied traits, especially at concentrations of 40 mg/L The result s of the binary interaction between the factors under study also indicate that the best values were recorded for most of the studied traits when the factors overlapped with each other, especially when fertilizing at a concentration of 2 g/L with a concentration of 40 mg/L.

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1. Introduction

The fenugreek plant *Trigonella foenum-graecum* L. belongs to the Fabaceae family, the name of the genus *Trigonella* comes from the Latin Trigonos, meaning triangle, referring to the shape of the triangular flower, and the species name *foenum-graceum*, Greek for straw, has long been used as a fodder crop. It is an annual plant above (20-30) cm with triangular compound leaves, yellowish-white flowers and sickle-like horns, stated that the number of fenugreek species is 360 species distributed around the world naturally, most of them in dry areas around the Mediterranean, Western Asia, Europe, North and South Africa and North America, fenugreek is one of the most important medicinal plants ancient and Modern, its name was mentioned in the Assyrian sambaliltu. Its cultivation is spread as an economic crop in most countries of the world and its cultivated area is estimated during 2001 -2002 to 115.600 hectares, with a total production of 136.640 tons [1]. Fenugreek is preferred to grow in areas with moderate winters in a temperature range between (5-35)°C, and the best is 17°C. It is best grown in most types of soil, especially alluvial, clay and sandy Heavy ones have good drainage and ventilation and the most appropriate PH 7-8.5 [2]. Different types of organic fertilizers affect plant growth and yield, as it has a clear effect on the vital processes that occur within the cellular system and the implications of this on improving the growth and production of the plant, and that the bread yeast Saccharomyces cervisiae is one of the yeasts belonging to the kingdom of fungi, and it is produced in two forms, and the bread yeast is an important source of fertilization this is due to its ability to store many minerals and amino acids, as well as its ability to produce essential substances for growth such as auxins and glycocannins, gibberellins, amino acids and sugars [3], yeast also contains nucleic acids such as (Adenine, Guanine, Cytosine, Thymine and muracil), and also contain vitamins such as B6, B12 and B1 [4]. Salicylic acid is one of the naturally occurring phenols, widely utilized in the plant kingdom and characterized as one of the internal growth regulators, which regulates many plant functions under stress conditions such as photosynthesis, respiration and respiration. Proven to regulate physiological processes. Improves plant tolerance to salinity by enhancing nutrient uptake, stomatal opening and closing processes, inhibition of ethylene synthesis, Non-enzymatic antioxidant activity, such as the enzyme peroxidase [5], salicylic acid is a plant hormone that plays a role in many

physiological processes in plants and acts to regulate many physiological processes such as germination and induction of growth, [6]. In addition, salicylic acid plays an important role in modulating plant responses to environmental tensile conditions. This compound has been tested in saline tensile, dry tensile, and thermal tensile and heavy metal, It has been noted to have a physiological role in inhibiting the synthesis of ethylene absinate (ABA). Plays a role in the process of thermoregulation in some plants, has attracted the attention of Plant-acquired resistance [7], because attack of a plant by many pathogens leads to the production of proteins that help the plant defend against those pathogens, and due to the physiological roles this compound has been added to the list of well-known plant hormones such as auxins, gibberellins and cytokines, and at present it is It is considered one of the natural phytohormones, many researchers have found that treating seeds and spraying the vegetative of the plant with salicylic acid accelerates the plant in several plant species, including wheat.

2. Experimental

2.1 Materials and Methods

This study was conducted in the laboratory of the University of Mosul/Department of Biology/ College of Education for Girls, the seeds were prepared from the local market (the local variety) and from a reliable source Experiments were designed according to a completely randomized design (CRD) with two factors and three replications., the first factor soaking in dry yeast suspension at a concentration of (0, 1, 2) g/L and Factor 2 soaked in salicylic acid at con. of (0, 40, 80) mg/l, as the number of experimental units (3 x 3 x 3) was (27) experimental. The transactions under study were prepared as follows:"

2.2 Preparing a suspension of dry yeast

Dry baker's yeast suspension is activated by dissolving (0, 1, 2) grams of dry baker's yeast in 1 liter of warm distilled water at a temperature of 32°C and adding 1 gram of sugar (sucrose).

2.3 Prepare salicylic acid solution

The preparation was prepared with a weight of (0, 40, 80) mg of salicylic acid and dissolved it in 1 liter of distilled water. Seeds were immersed for 24 hours in each concentration of the treatment under study, then they were transferred to Petri dishes containing a filter paper moistened with

distilled water and placed in each 100 seeds were applied with three replicates per treatment. The comparison treatment included treatment with distilled water only. The data continued to be recorded daily until germination ceased in all transactions [8].

Studied traits:

1- Germination period (day)

Represented by the number of days required for seed germination, as germinated seeds were counted every day starting from the fourth day after planting, when the first sign appeared until germination stopped completely on the twenty-fifth day after planting.

1- **The percentage of germination**: This was done using the following equation: According to [9].

$$\text{"Germination \%"} = \frac{\text{"number of germinated seeds""}}{\text{"Total number of seeds"}} \text{ x100"}$$

3- Seed germination speed (day): This was calculated using the following equation: -

$$\text{Germination speed} = \frac{\text{total (number of seeds germinating each day x number of the day) number of germinated seeds}}{\text{The number of germinated seeds at the end of the germination period}}$$

4- Homogeneity of germination (seed / day)

It is one of the important characteristics for the growth of plants. The more homogeneous seedlings in their growth (that is, they sprouted almost at the same time), they are the same in length, thickness and strength of growth, and they are all ready for planting in the permanent field without remaining of them Seedlings not suitable for planting on time. According to the homogeneity of germination according to the following equation: -Homogeneity of germination $=$

$$\frac{\text{Number of total seeds germinated at the end of the germination period}}{\text{Number of days from the beginning of seed planting to the cessation of germination}}$$

Determination of antioxidants (%): using the method of [9] and using a linoleum acid detector and measured using a spectrophotometer at a wavelength of 234 nm.The obtained data were

analyzed statistically according to CRD (complete random design) analysis of variance method using the con. means used concentration.

3. Result and discussion

The results of Table 1 indicate that the germination period was significantly affected by the treatments under study, as it was noted that the germination period decreased when soaking with dry yeast suspension, and the least germination period was 12.00 days when soaking at a concentration of 2 g/L compared to 14.78 days for the comparison treatment. Whereas, the least period of germination was recorded when Immersion in salicylic acid at a con. of 80 mg/l resulted in 12.67 days compared to 14.00 days for the control treatment. Binary interaction data showed significant differences between treatments, with the largest differences occurring when seeds were immersed in a suspension of dry yeast at a con. of 2 g/l, with salicylic acid at a con. of 40 mg/l, which amounted to 10.33 days, while the comparison treatment recorded the lowest significant values, which amounted to 16.00 days."

Table 1: Effect of Salicylic Acid and Yeast Suspension treatment on germination period (day) in *Trigonella foenum-graecum* seeds.

Concentrations of yeast suspension g/l	**Concentrations of salicylic acid mg/l**			**Yeast effect**
	0	40	80	
0	16.00 c	14.00 bc	14.78 bc	**14.93 b**
1	13.00 a-c	13.67 bc	13.33 a-c	**13.33 ab**
2	13.00 a-c	10.33 a	12.66 ab	**11.99 a**
Salicylic acid effect	14.00 b	12.66 ab	13.59 a	

Using Duncan's multiple range test P=0. 05, each means in row for one or interactions factors with various letters are clearly diverse.

The data in Table (2) indicate that soaking the plants with dry yeast suspension did not lead to a significant increase in the percentage of germination, but it was observed that it was significantly increased when soaking with salicylic acid conc. 40 mg/l, where the most significant values were recorded 93.11% versus 91.22% for the control seedlings. The results of the two-way interaction indicated that the best significant value was obtained when we soaked the fenugreek seeds in dry yeast suspension overlapping with the treatment with salicylic acid, which was at a concentration

of 2 g/L and 40 mg/L and amounted to 94.00%, while the control treatment recorded the lowest significant value of 90.00. %

Table 2: Effect of Salicylic Acid and Yeast Suspension treatment on the percentage of germination/of fenugreek plant *Trigonella foenum-graecum.*

Concentrations of yeast suspension g/l	**Concentrations of salicylic acid mg/l**			**Yeast effect**
	0	40	80	
0	90.00 b	94.00 a	92.78 ab	**92.26 a**
1	92.33 ab	91.33 ab	93.66 a	**92.44 a**
2	91.33 ab	94.00 a	92.33 ab	**92.56 a**
Salicylic acid effect	91.22 b	93.11 a	92.92 ab	

Using Duncan's multiple range test P=0. 05, each means in row for one or interactions factors with various letters are clearly diverse". From the data in Table (3), soaking with dry yeast suspension at a concentration of 2 g/L resulted in superior germination rates, with 4.45 days of germination compared to the lowest of 4.72 days for control-treated seedlings. The seeds soaked with salicylic acid at a con. of 40 mg/l were distinguished by recording the best significant value for this trait, which amounted to 4.73 days compared to 4.51 for the comparison treatment. Soaking at a concentration of 80 mg/l of salicylic acid [10].

Table 3: Effect of Salicylic Acid and Yeast Suspension treatment on the germination speed (day) of *Trigonella foenum-graecum.*

"Using Duncan's multiple range test P=0. 05, each means in row for one or interactions factors with various letters are clearly diverse".

Concentrations of salicylic acid mg/l	**Concentrations of salicylic acid mg/l**			**Yeast effect**
	80	80	80	
0	4.74 c	4.93 c	4.49 ab	**4.72 b**
1	4.41 a-c	4.59 ab	4.65 a-c	**4.55 ab**
2	4.36 a-c	4.63 a-c	4.33 a	**4.45 a**
Salicylic acid effect	4.51 b	4.73 c	4.49 b	**4.50 a**

It appears clearly from Table (4) that soaking in dry yeast suspension, especially at a concentration of 2 g/L, recorded the greatest significant values for the homogeneity of germination, reaching 7.85 seeds/day compared to 6.35 seeds/day for the comparison treatment, while the two-interference data showed that the best Significant values were recorded when soaking with a suspension of dry yeast at a con. of 2 g/L, combined with soaking with salicylic acid at a con. of 40 mg/l, was 9.11 seeds/day, compared to the lowest significant values of 5.64 seeds/day for the control treatment [26].

Table 4: Effect of Salicylic Acid and Yeast Suspension treatment on the homogeneity of germination (seeds/day) of *Trigonella foenum-graecum.*

Concentrations of salicylic acid mg/l	**Concentrations of salicylic acid mg/l**			**Yeast effect**
	80	80	80	
0	5.64 c	6.89 bc	6.52 bc	**6.35 b**
1	7.34 ab	6.72 bc	7.10 b	**7.05 ab**
2	7.07 b	9.11 a	7.36 ab	**7.85 a**
Salicylic acid effect	6.68 a	7.57 a	6.99 a	

Using Duncan's multiple range test P=0. 05, each means in row for one or interactions factors with various letters are clearly diverse. The data in Table (5) indicate that soaking with dry yeast suspension had a significant effect on the percentage of antioxidants, and the best significant value was 18.61% when using a concentration of 2 g/L, compared to the lowest significant value for the comparison treatment, and no significant differences were observed when treating with any of the Salicylic acid conc. From observing the values of the interaction between the studied workers, it was found that the best significant value was recorded when soaking the seeds with dry yeast suspension at a con. of 2 g/l and soaking with salicylic acid at a con. of 40 mg /L amounted to 20.21%, compared to the least significant value for the comparison treatment, which amounted to 16.74%.

Table 5: Effect of Salicylic Acid and Yeast Suspension treatment on the percentage of antioxidants (%) in *Trigonella foenum-graecum***.**

Concentrations of yeast suspension g/L	**Concentrations of salicylic acid**			**Yeast effect**
	0 mg/L	40 mg/L	80 mg/L	
0	16.74 c	16.99 bc	16.82 bc	**16.84 b**
1	17.44 ab	16.92 bc	18.19 b	**17.51 ab**
2	18.17 b	20.21 a	17.46 ab	**18.61 a**
Salicylic acid effect	17.45 a	18.04 a	17.48 a	

Using Duncan's multiple range test P=0. 05, each means in row for one or interactions factors with various letters are clearly diverse. It is noted from the results of Table 1,3, 4 and 5 that the superiority of the treatment of soaking with dry yeast suspension improved most of the studied characteristics. Perhaps the reason is that the treatment of plants with it has contributed to providing suitable conditions for the growth of seeds due to the presence of yeast with a small percentage of sugar, as it provided the requirements for germination and its acceleration, such as nucleic acids And important elements such as phosphorous, iron, potassium, magnesium and others, amino acids such as Alainin, valine and others, as well as the enzymatic ability of yeast to degrade sugar stored in the seeds, all this helped to improve the germination process [11-15]. Indicated that the dry yeast suspension contains growth regulators such as auxins, gibberellins and cytokinins that improve germination and growth. We also note from the data of Tables (1) and (2) that the treatment of soaking with salicylic acid improved seed germination, and the reason may be due to its role in increasing the absorption of water and mineral elements, especially NPK, and inhibiting the effectiveness of ethylene and ABA, and it works to improve germination growth, Increase the efficiency of photosynthesis, dry matter accumulation [16]. Salicylic acid regulates the germination process and increases its uniformity [17-20]. It works by inhibiting the effectiveness of ethylene and Abscesic acid ABA, increasing efficiency [21]. Build proteins and enzymes necessary for growth [23]**.**

4. Conclusions

This research on the local variety fenugreek is successful at Mosul University's College of Education for Girls and Department of Biology. It was conducted in November and examined the plant's reaction to organic fertilizer (dry yeast suspension) at three different concentrations (0, 1,

and 2 g/L) and soaking in three different concentrations of salicylic acid. The factorial experiment was conducted in a fully randomized design with three replications, and the concentrations are: 0, 40, and 80 mg/l. At a probability level of p=0.05%, the experiment's findings were statistically examined using Duncan's multiple range test. The following is a summary of the most significant findings that were found: Fertilizing with dry yeast suspension, an organic fertilizer, accelerated germination and shortened the germination period, improving most of the features under study. in addition to the homogeneity of germination, especially at the concentration of 2 g/L. "Soaking the seeds in salicylic acid had a clear effect of improving most of the studied traits, especially at concentrations of 40 mg/L The result s of the binary interaction between the factors under study also indicate that the best values were recorded for most of the studied traits when the factors overlapped with each other, especially when fertilizing at a concentration of 2 g/L with a concentration of 40 mg/L.

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تأثير جديد للعلاج بمستخلص الخميرة وحمض الساليسيليك على نمو نبات شتلة-Trigonella foenum graecum L.

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المستخلص

أجريت هذه الدراسة في جامعة الموصل / كلية التربية للبنات / قسم الأحياء في تشرين الثاني / نوفمبر على الصنف المحلي من الحلبة لدراسة استجابة النبات للأسمدة العضوية (معلق الخميرة الجافة) بثلاثة تراكيز: 0 ، 1 و 2 غ L / والنقع بحمض الساليسيليك في ثلاث تراكيز. وهي: 0 ، 40 ، 80 ملجم / لتر ، أجريت التجربة العاملية بتصميم عشوائي بالكامل بثلاث مكررات. تم تحليل نتائج التجربة واختبارها إحصائيًا عن طريق اختبار المدى المتعدد Duncan عند مستوى احتمالية بنسبة 5 ٪. يمكن تلخيص أهم النتائج التي تم الحصول عليها على النحو التالي: - أدى التسميد بالسماد العضوي (معلق الخميرة الجافة) إلى تحسين معظم الصفات المدروسة ، حيث تم تقليل فترة الإنبات وزيادة سرعته ، بالإضافة إلى تجانس الإنبات ، خاصة عند تركيز 2 جم / لتر. "نقع البذور في حمض الساليسيليك كان له تأثير واضح في تحسين معظم الصفات المدروسة ، خاصة بتركيزات 40 مجم / لتر". كما تشير نتائج التفاعل الثنائي بين العوامل قيد الدراسة إلى أنه تم تسجيل أفضل القيم لمعظم الصفات المدروسة عندما تتداخل العوامل مع بعضها البعض ، خاصة عند التسميد بتركيز 2 جم / لتر بتركيز 40 ملغم / لتر.