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STUDY THE EFFECT OF DRY BREAD YEAST *SACCHAROMYCES CEREVISIAE*, IN SOME QUALITIES OF VEGETATIVE GROWTH AND NUTRITIONAL STATUS OF THE *LENS CULINARIS*

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Abstract

The study was conducted in, which is one of the private nurseries in the province of Najaf, so as to test the viability of dry bread yeast on internal nutritive content and vegetative growth of *Lens culinaris* plants. The plants where treated after 20 days from sowing by concentrations (0,10, 20) g/L of yeast solution and by foliar application or glaucoma around roots and method of integration between by tripled separates the one and the other 10 days. Results of the study showed that there are significant differences in the studied growth indicators and characteristics of leaves inner chemical of plants treated different concentrations and with all the methods used compared with plants is not treated with a solution of yeast. As noted by the results that the highest rate in the traits of the stem has reached (43.90 cm, 6.59 cm; 10.98) for the length of the stem and the length of the internodes and the number of nodes respectively, in the plants treated by spray and glaucoma around roots with (10) g / L. With regard to the characteristics of the stem, the results pointed to the positive effect of the dry bread yeast solution which reported significant differences in the characteristics of leaves, compared with the control treatment and the highest rate of the number of leaflets, and leaf area, and the content of total chlorophyll was (26.00, 11.840 cm 2, 154.67 mg/100 g wet weight) respectively when plants treated by spray and glaucoma around roots together with (10) g / L, as well as in fresh and dry weight where this treatment gave the highest average (0.0382 g, 0.462 g) and respectively. The results also indicated thst there were significant differences in the chemical characteristics of the leaves when treated with a solution of dry bread yeast, where the treatment of overlapping recorded between spraying and glaucoma around the roots with (10) g / L higher rate to the percentage of nitrogen, phosphorus and potassium were 1.23 and 2.67 and 3.08 respectively, in the amount of total carbohydrates and proteins, reaching its highest level at which the transaction amounted to 16.90 and 8.889 respectively.

Keywords**:** *Lens culinaris; Saccharomyces cerevisiae*; bread yeast; vegetative growth.

Introduction

Leguminous plants are so important in increasing soil fertility by the stabilization of atmospheric nitrogen by Rhizobia bacteria through co-living with legume plant (Rashdi and Taj Eddin, 1988).However, leaf fall in legume plants, as well as buds, blossoms, and even immature pods leads to low lentil yield (*Culinaris lentil*) which is of high economic importance. This is why researchers and farmers tried to reduce this problem by finding solutions that the most important of which were the use of plant growth catalysts and mineral elements (Wanas, 2002). In recent years, attention has been paid in the late studies to the use of bio-fertilizers to increase the yield of different vegetables and use them in a healthy way free from pollution problems (El-Bassiony *et al*., 2014).

The yeast (*Saccharomyces cervisiae*) is considered as a biologic catalyst and natural biological fertilizer that clearly enhances the growth and yield of many crops (Abd El-Motty *et al*., 2010). It is a natural source of cytokinins that stimulate cell division, cell differentiation and stimulation of protein synthesis, nucleic acids and chlorophyll production (Amer, 2004), which are added in two ways either by foliar spraying or by adding it to the soil (El-Ghamring *et al.,* 1999). It also contains some major and minor nutrients and growth regulators (such as algalins and Auxins), sugars and vitamins, especially vitamin B. Abou (EL-Yazied and Mady, 2012). It has a clear and important role in increasing the efficiency of enzymes and improving nutrient absorption and other factors which stimulate vegetative growth of plants in general (Abbas, 2013). At the same time, the yeast works on CO_2 release, which is positively reflected in the increase of the total production of photosynthesis (Khalil and Ismael, 2010).

At present, there is considerable interest in the possibility of using yeast as natural and safe factor to stimulate plant growth, as it is considered as a promising factor to stimulate the growth of many different plant crops. In recent decades, yeast became a successful alternative to chemical fertilizer and is safe for humans, animals and the environment (Omran, 2000). Studies and researches conducted on the yeast solution to determine the positive effect of this solution on vegetative growth and internal nutrient content showed that the yeast solution had a positive effect as it contains Tryptophan, which is the source of IAA formation (Moor, 1979). (Mostafa and Abou Raya, 2003). It has been found that the application of yeast solution on the soil enhanced all studied growth parameters in the Grand nain banana plant compared to the non-yeast control group. (Mady, 2009). It was also discovered that foliar spraying to Vicia faba with the yeast extract caused a significant increase in many growth indicators such as leaves number, the dry weight of leaves and stems as well as leaves area and the amount of chlorophyll the leaves contain. (EL-Yazied and Mady, 2012). It has been also discovered that treating of *Vicia faba* L. plants with concentrations 2.5 and 5 ml/L stimulated growth in most studied parameters such as the amount of raw proteins, total sugars and free amino acids (Marzauk *et al*., 2014). The yeast extract has encouraged all growth indicators in pea plants, including leg, leaf and internal food content (Saleh and Issa, 2014; Saleh and Issa 2014). It has been indicated that there is a clear effect when spraying the yeast suspension and Licorice root extract in the characteristics of vegetative and tuberous growth of the wild orchid plant *Anacamptis coriophora* (Haggag *et al*., 2015). The treatment of *Vicia faba* L. plants with a concentration of

(6ml / L) of yeast extract gave the highest value in plant length and fresh and dry weights for branches and leaves.

Jackson (1958) it has been found that foliar spraying with the yeast extract at 1% concentration resulted in a significant increase in the major mineral elements in leaves such as Nitrogen, Phosphorus and protein for olive leaflets *Olea europea* L. The results obtained on (Cottenie *et al.*, 1982) bean plants *Phaseolus vulgaris* L. indicated that spraying plants with yeast solution has caused a noticeable increase in the percentage of proteins and carbohydrates of the leaves (Chapman and Pratt, 1982). It has been found that the highest increase in dry weight of soybean plants treated with yeast extract was at 4% concentration, which recorded the highest percentage of carbohydrates, proteins, phenols and fats. For the economic importance of *Lens culinaris* and to seek the best possible ways to ensure a vegetable growth and a rich yield of lentil plant (*Lens culinaris*), the study was conducted aiming to determine the effect of yeast solution on the vegetative growth characteristics of lentils, such as stem, leaf, mineral features and the internal nutrition of leaves, as well as determining the best method to use the yeast either by spraying or injecting the area around the roots to result in the best studied qualities.

Materials and Methods

Experiment location

The study was conducted in one of the private plantation fields in the province of Najaf, and planting was made by selecting an area of land of 9 m^2. The soil was mixed of sand and bitmus by 1:1 and was thermally sterilized. Plastic planting pots were used in which the mixed soil was placed, then lentil seeds of local type were planted by putting three seeds in each pot and three pots in each area that were treated, then the experiment was made in the randomized blocks. During the planting period, all required services were provided such as irrigation, fertilizing and spraying the seedlings with urea solution with a concentration of 1% twenty days after planting to encourage growth.

Preparation of Yeast Solution

The yeast was prepared by melting 10 g and 15 g in one liter of warm water, with two spoons of sugar to activate the yeast, and left for 24 hours and then filtered by a piece of cloth (Dubois *et al.*, 1956) After (30, 40, 50) days of the planting, the yeast solution was applied three times, ten days between each time and another using both ways of foliar spraying and injecting around the roots and overlap with three concentrations (0, 10, 20) g/l. Then all operations of service for plants were performed by irrigation when needed and fertilization of urea with a concentration of 1% for two times after (20 days) and (35) days from planting.

Under- Study Indicators: it was measured by taking three plants randomly from each experimental unit and it was as follows:

- **Leg characteristics**: The leg length was measured by the metric ruler from the contact point of the plant with the soil as well as the measurement of the length of the internodes by selecting the first three internodes starting from the base of the stem for each of the three plants and taking out the rate. As for the number of the nodes, it was calculated by the number of all the nodes on the main stem of each plant and for three plants in each treatment.
- Leaf characteristics: it was calculated as follows:

❖ The leaves number / plant: calculated by selecting ten leaflets randomly from each plant of experimental unit and taking out the rate.

❖ Leaf size: Measured according to method (Tartoura, 2001) and as per the following equation:

Average leaflet area per one = leaflet length × leaflet width × 0.583

❖ Total amount of chlorophyll: calculated by method (Pawte *et al.*,1985) and using Spectrophotometer.

❖ Fresh weight per leaflet: Calculated by taking 10 full grown leaflets randomly from each of the three plants in the experimental unit and placing them in a sensitive scale and then calculating the weight rate with the rates of other plants.

❖ Dry weight per leaflet: After drying the fresh leaflets which fresh weight was already measured, they were put in the oven at 70 ° C for 72 hours and until the weight is fixed, then weighed to see the dry weight and take out the rate.

- **Mineral Elements:** The percentage of Nitrogen in the leaves was measured using Kjeldahl and according to method (Yeo *et al.*,2000) Phosphorus percentage was measured by Spectrophotometer according to method (Shalaby and El-Nady 2008). As for Potassium, its percentage was measured using the Flame photometer according to method (Mekki and Ahmed , 2005).
- **Proteins and carbohydrates :** The amount of total proteins was measured using the Biodrop device (manufactured by Cleaver Scientific / origin: England, code number: BioDnR) and according to the method mentioned in the device manual. The amount of carbohydrate percentage in the leaves was measured as per method (Czerpak *et al.,*1994).

Statistical Analysis

The experiment was designed according to the design of the complete randomized blocks. The results were statistically analyzed using the SPSS program. The lowest significant difference was selected at the probability level of 5% to compare the rates obtained from the measured indicators.

Results and Discussion

Stem Characteristics

The positive effect of using yeast solution on the stem characteristics of the treated plants compared with control treatment can be concluded from the results mentioned in table (1). The treatment of plants with yeast solution with 10 g/L with both ways of spraying and injecting around the roots exceeded the results of all other treatments, and recorded the highest stem length of 43.90 cm. However, the differences were not significant compared to the other treatments, except for control treatment and concentration treatment (20) g/l by both ways of spraying and injecting which recorded the least use of yeast solution (35.66 cm).

It may appear in the same table that there is a difference in the positive effect of the yeast solution on the length of the internodes. Some treatments showed a significant higher results in this characteristic compared with the control group, while no other treatments recorded the same. The plants that were treated with a concentration of (10) g/l with both ways of spraying and injecting around the roots recorded a significantly higher results and highest stem length of 6.59 cm, while treating the plants with a concentration of (10) g/l by injecting around the roots only recorded the lowest rate of this characteristic for the plants treated with yeast which reached (3.26 cm).

Moreover, the results recorded in the same table showed a significant difference in the most of treatments using yeast solution with the number of nodes as compared to control group. The treatment of plants by spraying and injecting around the roots with a concentration of (10) g/l recorded the highest results in this characteristic as well, with the highest number of nodes which reached 10.98. Whereas the treatment of plants with a concentration of (20) g/l with both ways of spraying and injecting around the roots recorded the lowest rate of this characteristic for the plants treated with the yeast solution which reached 7.6.

The results may be attributed the fact that the yeast solution contains a lot of mineral nutrients that are important for plant growth (Marzauk *et al.*, 2014) as well as their production of some plant growth regulators such as cytokines and Gibberellins that stimulate the plant's Physiological processes and increase cell division and expansion, thus increasing plant vegetative growth (Chapman and Pratt 1982). At the same time, the positive effect of yeast solution in increasing stem growth may be due to the direct or indirect effect of yeast through its ability to change the conditions surrounding the roots and alter the acidity of the soil and thus absorb the elements that positively affect plant growth (Amadi, 1991) In addition to that, the yeast contains the enzyme Trehalose-6-phosphate, which is the key element to the vital manufacture of trehalose, which improves plant growth (Al-Nuaimi,1984).

Table 1 : The effect of yeast solution on some stem characteristics.

Nodes Number	Internode Length (cm)	Stem Length (cm)	Treatments
6.6	2.48	31.80	Control
9.8	5.84	40.55	Spraying (10 G/L)
8.9	3.26	37.37	Around root injecting (10 G/L)
10.5	6.15	42.99	Spraying (20 G/L)
9.8	4.45	43.88	Around root injecting (20 G/L)
10.98	6.59	43.90	Spraying + Injecting (10 G/L)
7.6	3.35	35.66	Spraying + Injecting (20 G/L)
2.3	2.4	7.2	L. S. D.

Characteristics of Leaves

The results shown in Table (2) showed that there was a significant increase in the characteristics of the leaves using yeast solution and for most treatments, with both ways of spraying and injecting around the roots and overlap between them. The treatment of plants with concentration of 10 g/L with both spraying and injecting together showed the best results and gave the highest increase in the number of leaflets/plant which reached to 26.00 compared to the non-treated plants, which gave the lowest rate of 153.67 and gave a significant increase in the leaf area of 10.840 cm2 compared to the comparison treatment which gave the lowest rate of 5.650 cm 2. Besides, table 2 showed that the yeast had a positive effect on the chlorophyll content of the leaves. Both treatments of only spraying at 20 g / L and both spraying and injecting at 10 g / L showed a significant increase in this characteristic. However, the latter recorded the highest rate of Chlorophyll which reached 153.67 mg/g and fresh weight compared to non-treated plants, which gave a low rate of 130.99 mg/g.

Regarding the effect of yeast on the fresh weight of the single leaf, it can be noted in the same table as some of the treatments were significantly high while others were not. The plants that were treated with spray and injecting around roots together with a concentration of 10 G /L recorded the highest rate of fresh weight of the single leaflet which reached 0.462 g, compared to the control treatment, which recorded the lowest rate of 0.118 g.

The same table shows the variable effect of the yeast on the dry weight of each leaflet. Some treatments showed significant differences, while others did not. The plants treated with the concentration of 10 g / L with spraying and injecting showed significantly higher results in this point and recorded the highest rate of 0.0379 g. While the non-treated plants showed the lowest rate of dry weight of the leaflet which was 0.0182 g.

The significant increase in leaf growth caused by yeast solution may be attributed to the increase in photosynthetic pigments due to the role of cytokines (which is produced by the yeast) in delaying leaves senescence through reducing the degradation of chlorophyll and enhancing the building of RNA and proteins (Marzauk *et al.*, 2014)The increase in leaf content of chlorophyll may be due to the fact that yeast contains vital growth regulators that affect the balance between photosynthesis and respiration in the plants (Abou EL-Yazied and Mady, 2012).

The increase in the building of dry material in the leaves may be due to the stimulation of yeast in producing carbohydrates and proteins (Sarhan *et al.*, 2011) and stimulating photosynthetic process that contributes to the accumulation of dry material in the leaves (Mady, 2009). The increase in leaf content of chlorophyll may also be due to the fact of yeast containing cobalt and manganese (Dawood and Sadak, 2013). Which both have an important role in influencing chlorophyll and Chloroplasts. The addition of cobalt increases the leaf content of chlorophyll A and B as well as carotenoids (EL-Desuki *et al*., 2013) or through the role of manganese in the production of chlorophyll, as it contributes to the structure of Chloroplast (EL-Desuki *et al*., 2013). The reason may also be that the spray of yeast caused an increase in the level of internal growth regulators in leaves such as cytokinines and Auxins and reduced their content of bscesic acid (Mady, 2009).

Table 2 : The effect of dry bread yeast solution on some leaf characteristics.

Leaflet Dry Weight gm	Leaflet Fresh Weight gm	Leaf area/ plant cm^2	TTL chlorophyll rate Mg/g fresh weight	Number of Leaflets/ plants	Treatments
0.0182	0.118	5.650	130.99	15.47	Control
0.0210	0.285	9.442	145.02	21.70	Spraying (10 gm/L)
0.0234	0.232	8.256	139.70	18.21	Around root injecting (10 gm/L)
0.0303	0.430	9.895	147.45	24.92	Spraying (20 gm/L)
0.0362	0.311	8.933	136.74	21.89	Around root injecting (20 gm/L)
0.0379	0.462	10.840	153.67	26.00	Spraying + Injecting (10 gm/L)
0.0382	0.289	7.560	134.16	19.66	Spraying + Injecting (20 gm/L)
0.013	0.21	3.2	11.2	5.5	L. S. D.

Mineral Elements N, P, K

The treatment of lentils with a concentration of 10 g/L by both spraying and injecting around the roots showed the highest significant difference in the percentage of the major elements of plants such as nitrogen, phosphorus and potassium which reached (3.08, 2.67 and 1.23) respectively. While non-treated plants recorded the lowest percentage of nitrogen, phosphorus and potassium at a rate of (1.27, 1.55, 0.50) respectively. With respect to other treatments, they showed a variable effect of yeast with either the existence of differences by the control treatment and non-existence of any significant differences as compared to the control group. The results in Table (3) indicate the significant increase caused by the yeast solution in the leaves content of the mineral elements and its readiness to be absorbed by the plants (Abbas, 2013).

Table 3 : Effect of yeast solution on the percentage of some mineral elements in leaves.

Potassium %	Phosphorus %	Nitrogen %	Treatments
0.50	1.55	1.27	Control
0.80	2.20	2.45	Spraying (10 gm/L)
1.00	2.28	2.17	Around Root Injecting (10 gm/L)
1.08	2.34	2.33	Spraying (20 gm/L)
1.12	2.47	2.65	Around Root Injecting (20 gm/L)
1.23	2.67	3.08	Spraying + Injecting (10 gm/L)
0.62	2.4	1.08	Spraying + Injecting (20 gm/L)
0.7	0.8	1.3	L. S. D.

The results may be attributed to the fact that yeast has a positive effect to increase photosynthesis through its effect on the characteristics of leaves and their content of chlorophyll as well as the aforementioned dry material, and that the higher composition of the materials produced by photosynthesis, the higher amount of inorganic nutrients are, so that they can convert the resulting materials from the process of photosynthesis to various vital materials which are needed for the vegetative growth. The level of nutrition needed for the plant for the highest growth during the vegetative period should be balanced with the presence of appropriate levels of other nutrients (Al-Othman and Asaf, 2009) and this may prompt the plant to absorb both phosphorus and potassium in larger quantities as they represent two of the largest three elements needed for the plant (Hussein and Khalaf, 2011). The yeast may also contain some of the major nutrients such as nitrogen, phosphorus, potassium, sugars and vitamins, which lead to increase these elements after the treatment of plants (Mostafa and Abou Raya, 2003). The role of yeast may also be attributed to its effect on enzymatic activity, the production of some plant hormones, improvement of nutrient absorption ability, conversion of phosphorus from insoluble to soluble, and increasing its absorbability by plants, all of these increase the content of the mineral elements in the plants (Abbas, 2013).

The total carbohydrates and proteins contained in the leaves:

It is clear from the results of table (4) that the yeast had a positive role in the accumulation of protein and total carbohydrates in the leaves, and that the plants treated with 10 g/l concentration by spraying and injecting around the roots were the best in giving the highest percentage of total carbohydrates which reached 16.86 as compared to non-treated plants, which recorded the lowest rate of 9.19.

Table 4 : The effect of dry bread yeast solution on carbohydrates and proteins in leaves.

TTL Carbohydrates Rate	TTL Protein Rate	Treatments
9.19	2.084	Control
14.34	4.162	Spraying (10 gm/L)
13.56	3.565	Around Root Injecting (10 gm/L)
16.87	7.734	Spraying (20 gm/L)
14.93	6.392	Around Root Injecting (20 gm/L)
16.86	8.879	Spraying + Injecting (10 gm/L)
10.46	3.896	Spraying + Injecting (20 gm/L)
3.9	4.2	L. S. D.

The results in the same table indicate the higher results caused by the treatment of plants with yeast in the leaves content of total proteins, the highest rate of total proteins was 8.879 as recorded with treatment of plants with yeast solution by spraying and injecting together with a concentration of 10 g/L as compared with the control group, which gave the lowest rate of 2.084. The increase in the total carbohydrate may be due to the role of yeast in increasing the leaf area which is exposed to photosynthetic process, in addition to increasing the leave content of the pigments, which eventually lead to increase the efficiency of the leaves in the process of photosynthesis and the accumulation of sugars which are the direct components of this process (Mady, 2009). Or that the yeast stimulates the release of Co_2 from fermentation process, which will later contribute in the process of photosynthesis and increase the overall output of the process (Khalil and Ismael, 2010). The increase of protein may also be due to the fact that the yeast contains amino acids and lipids as well as vitamins and some mineral elements which increase the total proteins content of the leaves (Abd El-Motty *et al*., 2010). The yeast also has stimulating effects on cell division, expansion and protein synthesis out of amino acids (Fathy and Farid, 1996). which helps to increase the accumulation of proteins in treated plants.

The current study concludes the positive effect of the dry yeast solution with a concentrations of 10 and 20 g/L with both methods of spraying and injecting around the roots on most characteristics of vegetative growth and the internal nutrient content of the treated plants as compared with the untreated plant. The treatment of plants with 10 g/ with both methods of spraying and injecting around the roots together recorded the best rates of vegetative growth and internal food content.

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