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## Assessment the impact of iron nanoparticles and dry yeast extract on the corn (*Zea maize L.*)

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**Abstract.** An experiment was carried out at the Glass House at the Faculty of Agriculture, Anbar University for the 2016-2017 season. Where the addition of nano-iron and dry yeast extract to evaluate the response of maize productivity to five levels of nano-iron, which is 0, 25,50, 75 and 100 mg, were sprayed on the leaves, and the yeast extract at three levels 0, 100 and 150 grams per liter spray on the leaves. The results showed the superiority of the treatments that were sprayed with nanoparticles with the highest rate of chlorophyll, the seed protein ratio and the percentage of seed oil. Significant levels were also recorded when spraying the plants with dry yeast extract. The interactions of 100 mg of nanotube and 60 g / l dry yeast extract characterized by the highest rate of chlorophyll, the oil content in the seeds (%) and the protein rate in the seeds (%) compared to other transactions.

### 1. Introduction

Nanotechnology is known as a science that studies the process of processing materials using molecular and atomic, and this technique is measured in nanometers, which is part of the millionths of a millimeter, and it is worth mentioning that this technology is used in many fields, including: agricultural, environment, industrial, And military, which played a major role in the technological revolution. [1]. The process of food production and processing is based on this technology, through the emerging nanotechnology PIN project, which includes three types of foods, for example, canola oil contains nanoparticles consisting of minerals, vitamins, phytochemicals, in addition to nanote tea, A diet chocolate, which contains many nanoparticles that contribute to taste improvement. The purpose of precision agriculture is to increase outputs and reduce inputs (fertilizers, pesticides and plants) by observing climate variables and taking some targeted actions and using sensors and nanostructures. Climate to see if crops grow most efficiently, determine the local nature and location (GPS) and are connected to the problem system and then processed. Nanotechnology applications in the agricultural field are the most important mechanisms to reach modern farming methods, which is summarized the low economic cost resulting from the lack of epidemic diseases affecting various crops such as grain as well as increasing the efficiency of fertilizers manufactured with low material cost and resistance of the agricultural product to different environmental conditions.[2]. The rapid developments have led to the emergence of new techniques and methods in various ways of agriculture and food production significantly during the past



ten years as food companies seek to produce the best agricultural crops where scientists believe that the use of nanotechnology will help food companies to produce food free of material damage the portfolio is less expensive than it is today through the use of less chemicals in the preparation and production of food in the future [3]. On the other hand, in vitro studies, so far, have put a damper on these claims. Investments in nanotechnology are thus increasing rapidly worldwide [4].

[4] The common human and plant in the need for the same nutrients such as nitrogen, phosphorus, potassium, calcium, magnesium, iron, manganese, zinc and others. Although different images of these elements and their source and quantities between both human and plant. Ground fertilization with major fertilizers yields positive results, while the addition of minor elements to the soil, especially if they are in the mineral form is often limited use, since these elements are in the form of positively charged cations, which are either oxidized or converted to the element hydroxyl. The efficiency of utilizing these microelements by different crops ranges from only 5-10%, Green nanotechnology aims to improve the quality of food by increasing the efficiency of the use of micro-fertilizers using microcapsules, nanocapsules or nanoparticles and materials as a source of micro-nutrients. First: Microcapsules: A type of fertilizer is produced by the process of packaging the fertilizers of commercial micro-elements using a thin layer of polymer material in order to protect the micro-elements from rapid stabilization of soil and control its release to the soil solution during the growing season. Through the direct diffusion of micro elements of the thin polymer layer. The polymer compounds carrying micro elements dissolve little in water but dissolve in organic acids and this means the use of these compounds with the vital activity of the soil [5].

Yeast extract is a natural bio-substance suggested to have stimulating, nutritional and protective functions when used on vegetables. Foliar 2 application of yeast was found to increase growth, yield and quality of many vegetable crops. In this connection, yeasts have been reported to be enriched source of phytohormones (especially cytokinins), vitamins, enzymes, amino acids and minerals[6]. The methods of fertilizing crops have become very different and varied now, the use of yeast mushrooms is one of those methods that are widely used for fertilizing agricultural land, where the yeast provides safe and safe nutrition for crops, because it is free of any harmful substances that may affect the plant and it is available, Large and cheap prices and very suitable for all farmers, yeast contains a lot of vitamins and nutrients needed for crops such as vitamins B group besides a lot of amino acids and many hormones that help to increase vegetable production in the early Yeast will play an important role in increasing fruit production. [7] [8].The aim of the present study, displayed the effect of iron nanoparticles and dry yeast extract in the yield and the productivity of corn (*Zea mays*) was probed. The plant growth parameters (chlorophyll, carbohydrate, and protein contents) were investigated in this research.

## 2. Materials and Methods

According Examination by atomic microscope, the size of the particle ranged 10 to 30 nm (average 20 nm). An experiment was carried out at the Glass House at the Faculty of Agriculture, Anbar University for the 2016-2017 season. Where the addition of nano-iron and dry yeast extract on maize productivity in three levels of nano-iron, which is 0, 50 and 100 mg, were sprayed on the leaves, and the yeast extract at three levels 0, 50 and 100 grams per liter spray on the leaves. The experimental design was randomized complete block design with three replications. Iron nanoparticles were added daily in different concentrations (0, 25, 50, 75 and 100 ppm) for each test plants. Each concentration was prepared in three replicates. Chlorophyll A, chlorophyll B and carotenoid pigments were accomplished based on method of [9], oil content in the seeds (%) was measured according to [10] and [11]. Protein content was measured according to [12].

Asplit-plot design based on a randomized complete block design with three replications was employed in this study. The factors included nano-iron in the main plot at three levels as well as optimum (no spray

of nano-iron). The sub-plot was sprayed with dry yeast extract at three concentrations. The irrigation was then carried out at constant intervals.

### 2.1. Preparation of yeast extract

The yeast extract (*Cerevisiae Saccharomyces*) was prepared by dissolving the specific weight of dry yeast in a liter of warm water plus the same weight of sugar and left for 12 hours to grow the yeast and multiply. Early at the beginning of flowering and repeated spraying after 10 days of the first spray and was treated treatment comparison with water free of any additives.

The iron nanoparticles were characterized by UV–Visible Spectrum, iron nanoparticles was absorptions spectra at 400 nm. According to the manufacturer for the particle sizes ranged from 10 to 30 nm (average 20 nm). The absorptions spectra are due to Plasmon excitations of particles [13]. Distribution and particle sizes were mainly depending upon spectral analysis [14]. The concentrations of iron nanoparticles were chosen in the range 20, 40, 60, 80 and 100 ppm according to other studies [15].

## 3. Results and Discussion

### 3.1. Leaf relative water contents (RWC)

Table 1 explains the significant influence of nano-iron on the Leaf relative water contents (RWC). Results are shown a superiority of the plants was sprayed 100ppm nano-iron in the highest rate of the total Leaf relative water contents (RWC), reached (67.67%), with a significant difference from the other treatments, while the lowest rate of total Leaf relative water contents (RWC) in the plants was sprayed 0ppm nano-iron reached (54.33%) with a significant difference from the other treatments.

Table 1 showed the effect of sprayed Dry yeast on the leaves of corn in both seasons on the leaf relative water contents. The results showed the superiority of the plants that was sprayed by 150g Dry yeast at a higher rate for the leaf relative water contents was (71.48%). It was the lowest rate of the leaf relative water contents it was in plants that were sprayed with 0g Dry yeast (control), all this influenced did not significantly different, so there is no direct effect of Dry yeast on the total Leaf relative water contents (RWC) in our study.

The results of statistical analysis indicated in Table 1 to outweigh the interaction between the nano-iron and the concentration of Dry yeast was sprayed indicated to superiority of the interactions (100ppm nano-iron and 150g Dry yeast ) in the highest rate of leaf relative water contents reached (71.48%) with a significant difference from the other interactions, while the lowest rate for leaf relative water contents it has been in interactions (0ppm nano-iron and 0g Dry yeast ) reached to (54.33%), That may be due to that availability of the necessary moisture in the soil and increased the concentration of Dry yeast , it has helped to increase the susceptibility of leaves on the water retention which reflected positively on the photosynthesis process thereby facilitating the transfer of food from the source to the sink.

**Table 1.** Effect of Nano -iron concentration (ppm) and dry yeast extract levels on Leaf relative water contents (RWC).

Dry yeast extract levels	Nano -iron concentration (ppm)					Average
	0	25	50	75	100	
150 g	67.67	70.45	70.84	71.22	71.48	<b>70.33</b>
100 g	61.32	62.23	63.00	63.65	63.78	<b>62.79</b>
0 g	54.33	56.55	56.89	57.11	57.89	<b>56.55</b>
Average	<b>61.10</b>	<b>63.07</b>	<b>63.57</b>	<b>63.99</b>	<b>64.38</b>	
LSD (0.05)	Nano -iron concentration (ppm) = 2.648 Dry yeast extract levels = 4.060 Nano -iron concentration (ppm) × Dry yeast extract levels = 5.921					

### 3.2. Proline content in the leaves ( $\text{mg}^{-1}$ )

Proline is one of the most commonly compatible osmolytes in drought deficit plants. Table 2 explains the significant influence of nano-iron on the proline content in the leaves ( $\text{mg}^{-1}$ ). The results are shown a superiority of the plants was sprayed (100ppm of nano-iron) in the highest rate of proline content in the leaves ( $\text{mg}^{-1}$ ), reached ( $69 \text{ mg}^{-1}$ ), with a significant difference from the other treatment. While the lowest rate of proline content in the leaves ( $\text{mg}^{-1}$ ) in plants was sprayed by (0 nano-iron) with a significant difference from the other treatment.

It has been explained the results of the effect of spray the plants by different concentrations of dry yeast on the proline content in the leaves ( $\text{mg}^{-1}$ ) was illustrated in Table 2. It was recorded that the highest rate of the proline content in the leaves ( $\text{mg}^{-1}$ ) in the concentration (150 g Dry yeast ), where they have given the proline content in the leaves ( $\text{mg}^{-1}$ ) rate reached ( $78 \text{ mg}^{-1}$ ) with a significant difference from other concentration (0, 100 g Dry yeast ). The lowest rate of the proline content in the leaves ( $\text{mg}^{-1}$ ) has appeared at the treatments that have not been sprayed with Dry yeast (control) with a significant decrease compared with other spraying treatments. Previous results showed that the Dry yeast impact clearly in an increase the concentration of amino acids in the plant, including proline this increase is believed be caused by the role of Dry yeast an increase of the plant susceptibility to stick of nitrogen and raising the susceptibility of some enzymes [16].

**Table 2.** Effect of Nano-iron concentration (ppm) and Sprayed dry yeast extract levels on Proline content in the leaves ( $\text{mg}^{-1}$ ).

Dry yeast extract levels	Nano-iron concentration (ppm)					Average
	0	25	50	75	100	
100 g	59	64	68	72	78	<b>68.2</b>
50 g	63	67	70	75	79	<b>70.8</b>
0 g	69	70	74	81	84	<b>75.6</b>
Average	<b>63.66</b>	<b>67</b>	<b>70.66</b>	<b>76</b>	<b>80.33</b>	
LSD (0.05)	Nano-iron concentration (ppm) = 1.259 Dry yeast extract levels = 2.192 Nano-iron concentration (ppm) × Dry yeast extract levels = 2.816					

Study results showed the interaction between different concentrations of Nano -iron (ppm) and concentrations of Dry yeast explained that the superiority of the interactions (100 Nano -iron (ppm) and 150g Dry yeast ) in a higher rate of the proline content in the leaves ( $\text{mg}^{-1}$ ) reached ( $84 \text{ mg}^{-1}$ ) with a significant difference from the other interactions, while the lowest rate for the proline content in the leaves ( $\text{mg}^{-1}$ ) it has been in interactions (0 Nano -iron (ppm) and 0g Dry yeast ). Increased in proline content in plants exposed to any deficit leads to increased gathering of proline due to inability the plant to bioconstruction of protein, thereby increasing the amount of amino acids within the plant, including proline which is one of the defense methods to minimize the harmful impact of the drought. The interaction between Field Capacity levels and sprayed Dry yeast, that clearly effected on this characteristic. Where that nano-iron and Dry yeast remarkably have raised the accumulate of proline in the plant and this, in turn, reflected positively on raising the plant's resistance for deficit situation.

### 3.3. Total Grain yields tons /ha

Table 3 explains the significant influence of nano-iron on the Total Grain yields tons /ha. Results are shown a superiority of the plants was irrigated (100 ppm Nano-iron concentration) in the highest rate of Total dry matter production tons/ha reached (7.412tons/ha), with a significant difference from the other treatment. While the lowest rate of Total dry matter production tons/ha in plants was sprayed with 0ppm Nano-iron concentration with a significant difference from the other treatment. Verification that the nano-iron has lead to uneven the time between the male and female flowering, which reflected negatively on the pollination process and composition of grain.

The results referred to in the Table 3 showed a significant influence of sprayed Dry yeast on the maize on total grain yields tons/ha. The results of statistical analysis showed the superiority of treatments that have been sprayed with the highest level of Dry yeast (150g Dry yeast) with the highest rate of grain yields tons/ha was (11.311tons/ha) with a significant difference from the other concentrations. While it was recorded that the lowest rate of grain yields tons/ha when the plants not sprayed by Dry yeast (control) (0Dry yeast) reported (7.412tons/ha) with a significant difference from all treatment that have been sprayed by Dry yeast.

The results indicates in the Table 3 interaction between the Nano-iron concentration and the concentration of Dry yeast was sprayed indicated to superiority of the interactions (100ppm of Nano-iron concentration and 150g Dry yeast ) in the highest rate of grain yields tons/ha reached (11.311tons/ha) with a significant difference from the other interactions, while the lowest rate for grain yields tons/ha it has been in interactions (0 Nano-iron concentration and 0 Dry yeast ) reached to (6.567tons/ha).

**Table 3.** Effect of nano-iron concentration (ppm) and sprayed dry yeast extract levels on grain yields tons/ha.

dry yeast extract levels	Nano -iron concentration (ppm)					Average
	0	25	50	75	100	
0 g	7.412	7.711	10.085	10.600	11.311	<b>9.423</b>
100 g	6.989	7.654	8.466	8.934	9.455	<b>8.299</b>
150 g	6.567	6.986	8.054	8.566	9.002	<b>7.835</b>
Average	<b>6.989</b>	<b>7.450</b>	<b>8.868</b>	<b>9.366</b>	<b>9.922</b>	
LSD (0.05)	Dry yeast extract levels = <b>0.233</b> Nano-iron concentration (ppm) = <b>0.193</b> Dry yeast extract levels × Nano-iron concentration = <b>0.522</b>					

#### 4. Conclusion

The addition of nanotubes resulted in a clear increase in all studied traits, therefore increase plant growth rate and productivity, as well as there were positive effects for use the dry yeast extract, where it was excelled all the plants that have been sprayed with dry yeast extract in a highest rate of all the studied parameters. The interaction between the iron nanoparticles, and dry yeast extract has given a significant difference in the studied parameters.

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