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EFFECT OF NANO-SPRAYING ZINC AND NANO-CALCIUM AND THEIR INTERACTIONS ON CHEMICAL COMPONENT RATIOS OF *OCIMUM BASILICUM* SEEDS BY GAS CHROMATOGRAPHY-MASS SPECTROMETRY (GC-MS)

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Abstract:

The experiment was designed with randomized complete block. It consisted of two factors and with three replications. The first factor consisted of three concentrations (1.5gm - 3gm - 4gm .liter^{-1}) in addition to the comparison factor. The second factor consisted of two concentrations (2gm - 4gm .liter^{-1}) in addition to the comparison factor.

Aim of the research:

To verify the effect of two types of Nano-fertilizers on the growth and the active substance of the basil plant and to know the increasing and different concentrations of the Nano-fertilizers in the vegetative and physiological indicators and the production of the active substance of the basil plant. Determining the optimal concentrations for each factor, as well as the combination resulting from their interaction in giving the highest vegetative and physiological indicators and the production of the active substance.

Methods of work:)Detection of Chemical Component of *Ocimum basilicum* Seeds by(GC-MS

The extraction process was carried out according to the method of Muhit et al. (2010), as 1 gm of crushed leaves was extracted.

Dry by 10 ml of methanol (99%) with stirring for 5 minutes, then left for 6 hours at room temperature, then filtered through a fine filter (0.45 µm) connected to a medical syringe to be.

After that, its chemical components were detected, as this test was conducted in a research laboratory / Department of Chemistry / College of Science / University of Al-Qadisiyah. For the purpose of estimating and diagnosing the active compounds using a Japanese-made Shimadzu 2010 (GC-MS) device equipped with a GC Clarus 500 Perkin Elmer system that includes an Auto sampler [AOC-10i+s] for compounds and gas chromatography linked to the mass spectrometry instrument, according to the conditions. Regarding the method, the active compounds were determined based on the interpretation of the mass spectrum of (GC-MS).. and after obtaining the mass spectrum of each compound, the results were processed through the GC-MS program (solutions) and the definition of the separated Peaks curves based on the database of the Institute. The National Institute for Standards and Technology (NIST) contains more than 62,000 known patterns, and compares the resulting spectrum of the unknown component with a range of known compounds in the library supplied with the device to verify the name, weight, molecular, and structure of the components of the test materials.

1-The proportion of the active ingredient Eugenol(%)

It was noted from the results of the statistical analysis of table (1) the significant significance of spraying with Nano-zinc and Nano-calcium and their interactions in the average percentage of the active substance in basil seeds, as the Nano-zinc fertilizer with a concentration of 4 g.L^{-1} recorded the highest average percentage of the active substance Eugenol, which reached 2.035% compared to With comparison plants the average was 1.542%.

It was also observed that spraying calcium Nano fertilizer on shoots of *Ocimum basilicum* plant significantly increased the proportion of the active substance Eugenol from 1.63% for comparison plants to 1.887% and 1.7935% for plants treated with concentrations of 2 and 4 g.L^{-1}, respectively. Significant bilateral interaction between zinc fertilizer Nanotechnology and Nano-calcium fertilizer gave significant differences for the percentage of the active substance Eugenol, as the concentration of zinc nanoparticles was 4 g.l^{-1} with the concentration of 2 g.l^{-1} calcium nanoparticles having the highest mean significant mean of the percentage of the active substance Eugenol reaching 2.485%.

Compared with comparison plants with an average of 1.363%.

Table (1) Effect of spraying different concentrations of zinc Nano-fertilizer and calcium Nano-fertilizer and their interactions on the average percentage of Eugenol (%) in the seeds of the plant *Ocimum basilicum*

Average effect of zinc Nanoparticles	**)Nano Calcium Concentrations (gm.L^{-1}**			**Zinc concentrations Nanoparticles (g m .L $^{-1}$)**
	4	**2**	**0**	
1.542	**1.911**	**1.351**	**1.363**	**0**
1.497	**1.659**	**1.273**	**1.56**	**1.5**
2.007	**2.018**	**2.439**	**1.563**	**3**
2.035	**1.586**	**2.485**	**2.034**	**4**
	1.7935	**1.887**	**1.63**	**Average effect of calcium Nanoparticles**
to overlap= 0.437		**for calcium Nanoparticles =0.202**	**for zinc Nanoparticles =0.218**	**LSD$_{(P<0.05)}$**

(%)Linolinic

Percentage of the active ingredient acid2-

The results of table (2) gave significant differences for spraying zinc Nano fertilizer and calcium Nano fertilizer and the interaction between them in the average percentage of the active substance Linolinic acid in basil seeds, as the zinc Nano -fertilizer with a concentration of 4g.L^{-1} recorded the highest average percentage of the active substance Linolinic acid reached 0.477 % compared to comparison plants with an average of 0.124%. It was also noted that spraying calcium Nano-

fertilizer on shoots significantly increased the proportion of the active substance Linolinic acid, as it was recorded at a concentration of 2 g.l^{-1}, the highest average of which was 0.405%.
Compared to control plants with an average of 0.251%.
The significant bilateral interaction between zinc Nano-fertilizer and calcium Nano-fertilizer gave a significant superiority to the proportion of the material
Linolinic acid was effective, as the concentration of 3 g.l^{-1} Nano-zinc fertilizer and 2 g.l^{-1} calcium Nano-fertilizer had the highest mean significant percentage of the active ingredient Linolinic acid amounted to 0.876% compared with the control plants.

Table (2) Effect of spraying different concentrations of zinc Nano-fertilizer and calcium nano-fertilizer and their interactions on the average percentage of Linolinic acid (%) in the seeds of the plant *Ocimum basilicum*

Average effect of zinc Nanoparticles	**)Nano Calcium Concentrations (gm.L^{-1}**			**Zinc concentrations Nanoparticles (g m .L $^{-1}$)**
	4	**2**	**0**	
0.124	**0.122**	**0.251**	**0**	**0**
0.426	**0.742**	**0.248**	**0.289**	**1.5**
0.453	**0.261**	**0.876**	**0.222**	**3**
0.477	**0.303**	**0.244**	**0.883**	**4**
	0.357	**0.405**	**0.349**	**Average effect of calcium Nanoparticles**
to overlap= 0.099		**for calcium Nanoparticles =0.049**	**for zinc Nanoparticles =0.058**	**LSD$_{(P<0.05)}$**

(%)Percentage of active ingredient Cinnamene3-

The results of table (3) gave significant differences for spraying with Nano-zinc fertilizer and Nano-calcium fertilizer and the interaction between them in the average percentage of the active substance, cinnamene, in basil seeds, as 1.5 g.l^{-1} of zinc Nano-fertilizer recorded the highest average percentage of the active substance, which reached 0.723%, compared with 0.723% compared with Comparison plants with an average of 0.429%.
It was also observed that spraying calcium Nano-fertilizer on the shoots of basil plants significantly increased the proportion of the active substance, Cinnamene, as it recorded, at a concentration of

1.5 $g.l^{-1}$, the highest average percentage of the active ingredient, Cinnamene, which reached 0.515%, compared to comparison plants with an average of 0.587%.

The significant interaction between zinc Nano-fertilizer and Nano-calcium fertilizer gave a significant superiority to the percentage of the active substance Cinnamene, as the zinc Nano-fertilizer at a concentration of 1.5 $g.l^{-1}$ with calcium Nano-fertilizer at a concentration of 4 $g.l^{-1}$ recorded the highest significant average of the percentage of the active substance Cinnamene reached 1.098 % compared to comparison plants with an average of 0.389%.

Table (3) Effect of spraying different concentrations of zinc Nano-fertilizer and calcium Nano-fertilizer and their interactions on the average percentage of cinnamene (%) in seeds of plan *Ocimum basilicum*

Average effect of zinc Nanoparticles	**)Nano Calcium Concentrations ($gm.L^{-1}$**			**Zinc concentrations Nanoparticles ($g\ m\ .L^{-1}$)**
	4	**2**	**0**	
0.429	**0.399**	**0.499**	**0.389**	**0**
0.723	**1.098**	**0.411**	**0.661**	**1.5**
0.452	**0**	**0.595**	**0.76**	**3**
0.367	**0.561**	**0**	**0.539**	**4**
	0.515	**0.376**	**0.587**	**Average effect of calcium Nanoparticles**
to overlap= 0.071		**for calcium Nanoparticles =0.038**	**for zinc Nanoparticles =0.043**	**$LSD_{(P<0.05)}$**

Percentage of the active ingredient Chavicol(%)4-

It was noted from the results of Table (4) the significant effect of spraying Nanoparticles of zinc in recording the highest significant average percentage of the active substance Chavicol in basil plant seeds, as it reached 3.233% when spraying the plant with a concentration of 4 $g.l^{-1}$ compared to comparison plants, which had an average percentage of the active substance Chavicol in *Ocimum basilicum* seeds. Its seeds are 2.967%.

As for the effect of Nano-calcium fertilizer, its addition led to a significant increase in the average percentage of the active substance Chavicol in the seeds of the basil plant over the seeds of the comparison plants, as it reached 3.100% and 3.093% when treated with 2 and 4 $g.L^{-1}$, respectively, compared to 2.097% for the plants. Comparison The significant interaction between zinc Nano-fertilizer at a concentration of 4 $g.l^{-1}$ and calcium Nano-fertilizer at a concentration of 2 $g.l^{-1}$ gave the highest significant average of the percentage of the active substance Chavicol in the seeds of the basil plant, which reached 4.028%, compared with the control plants.

Table (4) Effect of spraying different concentrations of zinc Nano-fertilizer and Nano-calcium fertilizer and their interactions on the average percentage of Chavicol (%) in seeds of plant *Ocimum basilicum*

Average effect of zinc Nanoparticles	**)Nano Calcium Concentrations (gm.L^{-1}**			**Zinc concentrations Nanoparticles (g m .L $^{-1}$)**
	4	**2**	**0**	
2.967	**3.141**	**2.741**	**3.02**	**0**
2.807	**2.742**	**3.037**	**2.642**	**1.5**
2.045	**3.542**	**2.594**	**0**	**3**
3.233	**2.947**	**4.028**	**2.724**	**4**
	3.093	**3.100**	**2.097**	**Average effect of calcium Nanoparticles**
to overlap= 0.738		**for calcium Nanoparticles =0.379**	**for zinc Nanoparticles =0.408**	**LSD$_{(P<0.05)}$**

Discussion

The increase in the active substances Eugenol, Linolinic acid, Cinnamene and Chavicol (Tables1,2,3,4) as a result of treatment with Nano-fertilizers of zinc and calcium is due to the role of nanoparticles in increasing the speed of biological reactions and due to the large surface area and small size of the particles. Ruttkay-Nedecky et al. (2017) nanoparticles that increase the speed of reactions leading to the production of growth materials and stimulate enzymatic activity, given that each of its own enzymes leads to an increase in the vegetative characteristics of the plant and an increase in the production of secondary metabolite compounds in the leaves (Agrawal and Rathore, 2014).

Attention to the topic of aromatic and medicinal plants lies in their being the first main sources of medicines since the inception of creation, as man used them in his food, to relieve his pain, and to treat his various diseases, as part or in its entirety, after soaking it with water, boiling it, or making a poultice (smear) from it, and searching for the active substance that it contains with the same effect Effective therapeutic based on the concept of prior plant experience.

And with the advancement of technology and science, researchers and scientists have become able to separate the active substances from their plant sources and prepare them in a manner that suits the requirements of their use and the pathological condition that they treat. Through the methods of extracting it, we enter into the mechanism of biosynthesis of active substances in plants through stimulation with external or internal factors, the benefit of which is the increase in the chemical content of the plant and its clear return on several areas, including the food and medical industries.

However, the basil plant under study is an example of what was mentioned. Above (Zahra et al., 2020, Bhattacharjee et al., 2020, Monika et al., 2020, Mulat et al., Sile, et al., 2020).

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