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Response the active compounds and Yield parameter For *Helianthus annus* L to potassium and Zno nanoparticles spraying

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Abstract:

In the Indian city of Kerbala, the agricultural experiment was carried out in the spring of 2022. The factorial experiment, two factors, and the impact of spraying a source amount of ZnO nanoparticles with potassium on several chemical properties of (Helianthus annus L.) were set up using three replications of the Randomized Complete Block Design (RCBD). the first factor was Zno nanoparticles control , 1, 0.5 The second factor was potassium control , 150 , 250 mg / K. L all treatments were added in two doses, The plants were harvested at full maturity after measuring all the Yield Characteristics and active compounds. The results indicate the Zno nanoparticles coefficients , (1 gm. L^{-1}) was the percentage of seeds with the highest value. Number of reported treatments per head of seed, $head^{-1}$ (28.19 seed $head^{-1}$) superior to the recorded control (23.78 seed $head^{-1}$) while the results **Potassium** (250 gm L^{-1}) was preferred since it provided the highest percentage value (27.11 seed $head^{-1}$) The control therapy had the lowest value (24.44 seed $head^{-1}$) however there was an increase (26.20 seed $head^{-1}$), while Zno nanoparticles coefficients , (1 gm. L^{-1} highest percentage of seeds (Mg h -1) and weight of 1000 seeds (g). ever recorded. treatment which was recorded (64.19 gm) superior to the recorded control (59.73 gm)

while **Potassium** (250 gm L^{-1}), The control therapy had the lowest value (60.09 gm) however there was an increase (61.83 gm). While the Zno nanoparticles coefficients , (1) proved to be the highest zinc content (%) ever measured. therapy that was documented (39.1%), superior to the recorded control (34.17%). results **Potassium** (250 gm L^{-1}) indicating the highest number in the zinc percentage (%) (38.87%). The control therapy had the lowest value (79.47%), however there was an increase (36.57%). The Helianthus annus L. extract's active components were determined by utilizing the results of the secondary metabolism screen investigation... revealed positive results for Phenol with Treatments using **Zno nanoparticles** in combination with potassium point to a (150 gm L^{-1} and 250 gm L^{-1}) therapy from potassium with the concentrations (0.5 and 1 gm. L^{-1}) while n negative results with control .
The purpose of this study is to determine the impact of potassium spraying and zinc nanoparticles on the yield characteristics and active ingredients of Helianthus annus L.

Key word: *Helianthus annus* L, **Zno nanoparticles** , potassium

Introduction

Sunflower (Helanthus annuus L.) is considered as one of the most important oil crops in the world, not only being the first oil crop in Iraq but also one of the best vegetable oils worldwide., ranking second only to soybeans, as it contains a high percentage of the main nutrients For the human body, the most prominent of which are vitamins, minerals, and essential fatty acids, as well as unsaturated fatty acids, as sunflower oil has a high concentration of unsaturated fatty acids, such oleic and linoleic acids, which are regarded as some of the unique medicinal compounds for human health, and since sunflower oil contains It is rich in naturally occurring antioxidants, including vitamin E. One of the key causes of cancer is free radicals. [1] Sunflowers are among the most important oil crops in the world. It is a member of the Asteraceae family; oils comprise With 49–39%, it is the healthiest oil because it contains unsaturated fatty acidosis, omega-3 fatty acid, and vitamins B, A, C, and E. [2].

One of the technologies including ingredients that is environmentally friendly is plant nutrition through the use of plant extracts. various outcomes [3].

There are a lot of these undiscovered compounds, and the use of Medicinal plants and significantly in recent times in several fields and in different countries and among the most

important uses In the germination, growth and nutrition of many different plant species [4].

Foliar spray Since the leaf is the foundation of photosynthesis and the majority of other essential processes, deficiencies in these elements show themselves first on the surface. Foliar feeding is the quickest option to remedy these deficiencies by directly adding nutrients to the deficient areas [5,6].

The amount of nanoparticles (NPs) in consumer items has significantly increased as a result of the advancement of nanotechnology [7]. Considered a science of the twenty-first century, nanotechnology finds disciplines, biology, chemistry, and agriculture. [8] ZnO s has significantly the biomass, height, and chlorophyll content of plants [9]. Additionally, zinc improved development raised the Glycinemax plant's root biomass [10]. When zinc oxide nanoparticles were applied topically to maize, the results showed a considerable increase in [11]. zinc demonstrated a increase in strawberry plant output, plant height, and leaf area [12,13].

Contributes to the regulation of moisture balance in the plant tissue and maintains empty swelling and regulation Movement of different papers and tropisms [14].

Good nutrition with potassium helps reduce the harmful effects of dehydration by improving the efficien Moisture use of crops and maintenance of osmotic potential and vacuum softening pressure and regulate the work of stomata and stimulate plant growth [15].

Material and method

Since the leaf is the foundation of photosynthesis and the majority of other essential processes, deficiencies in these elements show themselves first on the surface. Foliar feeding is the quickest option to remedy these deficiencies by directly adding nutrients to the deficient areas with three replications, two factors, and an aim to investigate the effects of potassium-spraying ZnO nanoparticle source level on several chemical characteristics of Helium annus L., a factorial experiment was set up.Zno nanoparticles were the initial factor (control, 0.5, 1) The second factor was potassium (control , 150 , 250 mg / K. L) all treatments were added in two

doses, The plants were harvested at full maturity after measuring all the Yield Characteristics and active compounds.

I collected soil samples from the city of India and then filled them into plastic pots measuring 32 cm in diameter and 50 cm in height, using 12 kg of soil and 50 seeds per pot.

Agriculture and crop service

Sunflower seeds were sown in the spring season on 2/3/2022 in plastic pots and placed in each pot 50 seeds at a depth of 3 cm, and after 15 days of emergence, the plants subsided The grassroots units were fertilized with potassium in the branching stage, flowering and spraying with Znonanoparticles by three concentrations of the first spray at the elongation stage and the second stage when the flower buds appear until complete wetness and the spraying time was in the early morning to avoid high temperatures in the field Spraying was done with a 16-liter sprinkler, and after completing the pollination process, the flowers were wrapped in complete bags to protect them from birds The harvesting process was conducted 16/6/2022 when the crop reached full maturity.

Characteristics of the product and its components

seeds in each head

The number seeds per head was counted manually

One thousand weight (g). Yield of seeds (Mg h $^{-1}$)

Seeds of five plants of each experimental unit were mixed and counted randomly by hand and weighed on a sensitive scale.

Zinc percentage

A mixture of sulfuric and chloric acids was used to digest the seeds, estimating their zinc content to be 2.0 g. The seeds were then prepared for zinc [17].

extracts

100g of powdered material, 100ml of alcohol solvent (70%) methanol in a 500-ml flask for extraction, 20 hours of evaporation in an oven at 40–30°C for drying, and storage at 4°C until use were the steps used to make the alcoholic extract. [18,19,20] .

Identification of phenolic compounds

Several assays were used to identify the phenol compounds [21,22 ,23].

Results

Table 1 Impact of potassium spraying and ZnO nanoparticles on seed head per number of seeds

Zno nanoparticles	**potassium**			
Control	**Contro**	**150**	**250**	**Mean**
	22.7	**23.76**	**24.87**	**23.78**
0.5	**24.87**	**25.87**	**26.65**	**25.80**
1	**25.76**	**28.98**	**29.83**	**28.19**
LSD	**1.54**			
Mean	**24.44**	**26.20**	**27.11**	
LSD Potassium	**0.45**			**LSD Zno nanoparticles**

seeds Number per head seed head-1 (27.11 seed head-1). Although there was an increase (26.20 seed head-1), the control therapy had the lowest value (24.44 seed head-1). Studies combining potassium and ZnO nanoparticles indicate a 250 gm L-1 potassium therapy at the third concentration

Table 1 shows that Zno nanoparticles varied significantly; the greatest percentage of seeds per head seed head-1 ever reported was 1 (gm. L -1). treatment that was observed to be better than the observed control (23.78 seed head-1) (28.19 seed. (250 gm L-1) was the most favorable, resulting in the highest value in the percentage of

Table2 Impact of potassium spraying and ZnO nanoparticles on Weight 1000 seeds g

Zno nanoparticles	**potassium**			
Control	**Control**	**150**	**250**	**Mean**
	58.65	**59.87**	**60.67**	**59.73**
0.5	**59.87**	**61.76**	**62.85**	**61.49**
1	**61.76**	**63.87**	**66.93**	**64.19**
LSD interaction	**1.57**			
Mean	**60.09**	**61.83**	**63.48**	
LSD Potassium	**0.54**			**LSD Zno nanoparticles**

proportion of seeds with a weight of 1000 seeds (g) was the third concentration, 250 gm L-1. Seed yield (Mg h-1) = 63.48 grammes Although there was a rise (61.83 gm), the control therapy had the lowest value (60.09 gm). Studies utilizing ZnO nanoparticles in conjunction with potassium indicate that 250 gm L-1 potassium therapy is possible

Table (2) shows that the Zno nanoparticles varied significantly; the largest value % of Weight of 1000 seeds (g) was 1 (gm. L - 1). Recorded seeds yield (Mg h -1). therapy that was observed to be better (64.19 gm) than the observed control (59.73 gm) The same table's results demonstrate that the potassium treatments had discernible advantages; the concentration with the highest

.

Table 3 Impact of potassium spraying and ZnO nanoparticles regarding the zinc (%) percentage

Zno nanoparticles	potassium			
Control	Control	150	250	Mean
	32.78	33.87	35.87	34.17
0.5	34.87	35.87	38.87	36.54
1	35.45	39.98	41.87	39.1
LSD interaction	1.89			
Mean	79.47	36.57	38.87	
LSD Potassium	0.69			LSD Zno nanoparticles

potassium treatments; the concentration with the highest percentage of zinc (%), 250 mg L-1, was the third concentration and was therefore preferred. Although there was an increase (36.57%), the control therapy had the lowest value (79.47%). Combining ZnO nanoparticles

Table (3) demonstrates the wide variation in ZnO nanoparticle coefficients; the highest zinc percentage (%) ever recorded was 1 (gm. L -1). The recorded therapy had a higher success rate (39.1%) compared to the recorded control (34.17%). The results of the same table show that there were discernible impacts on the

Table 4 phytochemical screening for Phenol.

Zno nanoparticles ($gm.L^{-1}$)	potassium ($gm.L^{-1}$)		
Control	Control	150	250
	-	+	+
0.5	+	+	+

1	+	+	+

The active components were determined by utilizing the results of the secondary metabolism screen research. Helianthus annus L. extract was used to perform a phytochemical screen, and the results showed that Phenol was present in the extract (Table 4).

with Treatments using **Zno nanoparticles** in combination with potassium point to a (150 gm L^{-1} and 250 gm L^{-1}) therapy from potassium with the concentrations (0.5 and 1 gm. L^{-1}) while n negative results with control .

Discussion

By examining the results of our most recent investigation The results emphasize the need of spraying znonanoparticls even more. This could be because zinc plays a crucial role in the creation of nucleic acids (DNA and RNA), proteins, carbohydrates, and lipids as well as in the activation of enzymes. Additionally, it functions as a regulator and cofactor for numerous enzymes [24].

he reason for this increase is due to the ideal growth of the plants treated with the nanocomposite, It increased the photosynthetic process' efficiency and positively correlated with the growth in leaf area ,the number of leaves , the diameter of the disk as well as the efficiency of the plant in its operations The physiological and biochemical factors that increased the accumulation of substances represented in the plant and thus their transfer to the reproductive organs (disc) in turn led to an increase in flowering plants, their pollination and fertilization, and then seed filling, which contributes to an increase in the number of seeds. This result agreed with what was found [25].

To researchers [26] who confirmed that nanocomposites are of great importance in the growth of sunflower plants and increasing the number of seeds .

The reason for the increase in the weight of the seed is that the nanocomposite contributes to the release of nutrients in the growth environment, the ease of penetration of the released nutrients into the cell walls of the roots and transfer to the vegetative organs of the plant, which causes encouragement of growth, the

efficiency of the physiological and biological processes that contributed to increasing the leaf area ,its content of chlorophyll. The number of leaves is , In turn, It made it possible for the plant to store more produced elements at the source, which facilitated their transit to the reproductive organs and resulted in an increase in seed weight. This outcome supported. [27]

To spray potassium nitrate at a of 400 mg / K. L A led to an increase in the **seeds Number per head** may be due to the role of potassium in Extending the grain filling time by delaying the aging of the flag paper, which increases the amount of material The manufactured plant transferred from the leaves that are the source to the grains in the spikes, which are considered as Downstream plants that are well fed with potassium are highly efficient in protein transport [28]

That spray potassium nitrate This may lead to an increase in **seeds 1000 seeds (g)** perhaps because of the way that potassium helps plants grow by boosting enzyme activity, enhancing internal biological processes, and boosting overall efficiency When a plant is growing and developing, the process of photosynthesis

, which increased their number, as well as Increasing pollen and fertilization of flowers, forming grains, and increasing their weight due to their fullness With carbohydrates and proteins [29].

Apply potassium nitrate with a 0300 mg/K. L. concentration. Acknowledge Straw has a higher zinc level, and this can be explained by potassium's beneficial influence on boosting the plant's capacity to absorb zinc in various plant sections as a result of For its role in encouraging vegetative growth and increasing the size of the root system, which increased plant growth and therefore Increased absorption of zinc as well as for the positive interaction that occurs between zinc and potassium, which is reflected Positively in favor of the plant and this confirms what he pointed out [26] .

Conclusion

Zno nanoparticles significantly enhance sunflower growth.

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