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THE EFFECT OF PINCHING AND SPRAYING WITH ZINC ON SOME OF THE QUALITIES OF VEGETATIVE AND FRUITY GROWTH OF CASTOR PLANT (RICINUS COMMUNIS L.)

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Abstract:
A factorial experiment was carried out according to the design of the complete random sectors (R.C.B.D.) during the spring of 2021 in agricultural fields at the University of Diyala in alluvial mixed soils to study the effect of two dates of pinching as well as the comparison treatment (non-pinching, 15, 40) days after cultivation and spraying with zinc in two concentrations with the treatment of non-spraying (300,150,0) ppm, to study their effect on some of the vegetative and fruity growth traits of the castor plant (Ricinus communis L.). The results showed the following: The process of pinching the growth tip of a plant (the first pinching) significantly exceeded the average characteristic of the dry weight of the leaves and plant (g), the number of fruits in the plant-1 and the weight of 300 seeds (g) and the yield of seeds in the plant and amounted to 68.7 g, 383.4 g, 115.7 g, 78.81 g, 53.55 g respectively,and the spraying coefficients with zinc at a concentration of 300 ppm showed significant superiority in the average quality of dry weight of the leaves and plant (g), the number of fruits of the plant, and the weight of 300 seeds (g) and amounted to 67.0 g, 374.0 g, 112.8 g, 76.66 g respectively, and the overlap between the two trial factors (the first earring with zinc spraying at a concentration of 300 ppm) had a significant effect on the characteristic of the dry weight of the leaves and plant (g), the number of fruits of the plant and the weight of 300 seeds (g) and were 72.4 g, 407.1 g, 121.9 g, 80.63 g respectively.

Keywords: Foliar Feeding, Pinching, Zinc, Castor

INTRODUCTION:

Castor (Ricinus communis L.) is one of the plants that belong to the (Euphorbiaceae family), a perennial crop that is industrially important for the production of oilseeds and is grown in warm tropical and temperate environments (Bisht and Bhattacharya, Anjani;2011, 2012), and studies indicate that the origin of the plant is from Africa although well adapted to various climatic conditions in many parts of the world (Vasconcelos et al., 2010). India, China, Brazil, Russia, Thailand, Ethiopia, and the Philippines are the world's leading castor-producing countries (Damodaram and Hegde, 2011). India is the world's largest exporter of castor oil, with the other two major producers being China and Brazil (Ramos et al., 1984). Species of it are found in different regions of Iraq as oily plants or windbreakers (Ogunniyi, 2006).

Castor is a highly durable and drought-resistant crop that tolerates different types of soils and grows even in the lateral lands of roads and fields for the strength of the germination of its seeds despite the surrounding conditions (Canoira et al., 2010; Hincapie et al., 2011). According to studies, the area occupied by the plant has reached 1.525 million hectares in 30 countries, India ranks first with about (65%) of the total global production and meets 80-90% of the global needs for castor oil (Baldwin and Cossar, 2009). Some mechanical processes, including Pinching, are used as an important method of obtaining a greater number of major vegetative branches (Abbas and Jurani, 2006).

It is one of the agricultural methods used to encourage the growth and productivity of plants, as the removal of the apical bud of the stem or the removal of the top of the plant with the pinching of the growth tip removes the source of apical dominance (toxins) and the material is converted to the side shoots and the growth of buds or side branches is encouraged (Lowes, 2009). Thus increasing the vegetative total, vegetative area, rate, and efficiency of the photosynthesis process which is reflected in the increase in the yield of seeds and oil (Lakshmi et al., 2015). Foliar feeding is also an important method in modern agriculture, as studies have shown the possibility of supplying the plant with various nutrients by spraying it with diluted solutions on the vegetative part as complementary and therapeutic nutrition faster and more efficiently when nutrients are lacking, especially in limestone and saline lands

(Wittner, 1999). Because zinc is an important micronutrient and is poorly prepared in limestone soils (Ojeda-Barrios et al., 2014). Due to intensive cultivation or the increasing use of highly degradable soil fertilizers such as ammonium phosphate and triple superphosphate fertilizer, this element has led to the depletion and deficiency of this element in those soils, which is an essential element in plant nutrition (Graham and Rengel, 1993). Its deficiency or non-availability at the levels required in the plant environment leads to a decrease in the productivity of many agricultural crops (Mengel and Kirkby, 2001). It is also an essential element of the plant as it plays an essential role in the formation of chlorophyll, the construction of carbohydrates and proteins, and the activation of enzymes in the plant (Al-Sahaf, 1989). As well as its role in the formation of the amino acid tryptophan that makes up the hormone (Indol Acetic Acid) IAA responsible for the division and elongation of cells, the maintenance of cell structure and photosynthesis (Hassan et al., 1990 and Marschner, 2012). Because of the scarcity of studies on castor crops in Iraq, this study was carried out with the aim of finding out the effect of pinching and spraying with zinc on the Dry leaf weight and plant and Number of fruits and Weight of 300 seeds.

Materials and working methods-:

A field experiment was conducted during the spring season of 2021 in one of the fields of the Faculty of the Agriculture / University of Diyala in alluvial blended soil (Silt Loam). To study the effect of pinching growth tip and foliar spraying with zinc sulfate on the yield of seeds and oil of castor plant (Indian variety), as the area of the experimental unit was 3.8 m × 3.2 m and inside it four pinching and the distance between one pinching and another 80 cm and between one hole and another 60 cm and with a vegetation density of 20833 plants. E-1, leaving a distance of 1 m between the repeaters and along the experimental units to open the drives and irrigate the crop. A working experiment was used according to the Randomized Complete Block Design (RCBD) design, and the land allocated for the experiment was prepared to be plowed and fertilized with phosphorus in the amount of 100 kg. E-1 and at the rate of one batch before planting when plowing.

Urea was added in 200 kg.h^{-1}, the first batch was added at planting and the second half of nitrogen was added twenty days after germination. The seeds were planted in the field on 5/3/2021 manually and by 3 seeds per hole and irrigated the experimental land, and the number of irrigations was 13 irrigations, the date of emergence of plants was 7-9 days from planting, and then the plants were diluted to one plant per hole when the growth of plants reached the stage of holding two real leaves and before the earring process. The fruits of the plants were harvested on 31/7/2021 in the first batch and there is a second batch after 15 days when the fruits are colored brown and the seeds ripen in them. The studied traits below were calculated on a single plant basis and at the rate of seven plants randomly taken from the mean lines per experimental unit.

1- Dry leaf weight (g/plant^{-1}): Take the leaves of 7 plants at maturity and dry them in an electric oven at a temperature of 70 ° C and for 72 hours until the weight is stable and then record the dry weight of them using a sensitive electric scale and at the rate .

2- Dry weight of the plant (g/plant^{-1}): 7 plants were taken from the middle lines at full maturity and dried in the field in August and then took a sample of them and put in an electric oven (Oven) at a temperature of 70 ° C and for 48 hours and then recorded their dry weight using a sensitive electric scale and according to the rate after the weight was adjusted based on its humidity percentage.

3-Number of fruits/plant^{-1}: The number of dry fruits of 7 plants randomly taken from the middle lines of each experimental unit was calculated according to the rate for them.

4- Weight of 300 seeds (g): This was done by taking 300 seeds randomly taken from the seed yield per experimental unit and then weighed using a sensitive electrical scale.

RESULTS AND DISCUSSION:-

1: Dry weight of leaves (g):-

The results of the statistical analysis in Table (1) showed a significant effect between the average coefficients of pinching growth tip of the plant, and the data indicate that the treatment (first pinching) of the developing apex gave the highest average of the characteristic of the dry weight of the leaves amounted to 68.7 g, compared to the comparison treatment (non-earring) which gave the lowest average was 57.7 g, and maybe because the process of developing apex earring led to an increase in the vegetative area exposed to light Thus improving photosynthesis activity in the plant and increasing the growth and dry weight of the leaves (Lakshmi et al., 2015). The same table also shows significant differences between the spraying coefficients with zinc, and the spraying treatment exceeded by a concentration of 300 ppm and gave the highest average dry weight of the leaves at 67.0 g, although it does not differ significantly from the spraying treatment at a concentration of 150 ppm, compared to the comparison treatment (no spraying) which gave the lowest average of 59.7 g. This may be because zinc has a major role in the manufacture of the amino acid tryptophan, which is the basis for the manufacture of the hormone (indole acetic) necessary for the elongation of cells, as well as the role of zinc in the construction of many metabolic compounds that enter into the growth and expansion of cells and the construction of new cells that lead to an increase in leaf space and thus increase the dry weight of the leaves (Cakmak et al., 1988). There was a significant overlap between the two factors (earring and spraying with zinc) and the interference treatment (first earring and spraying with zinc at a concentration of 300ppm) gave the highest rate of dry weight characteristic of the leaves at 72.4 g, compared to the comparison treatment of interference (no spraying and without earring) which gave the lowest rate of 53.7 g.

Table (1) Effect of pinching and spraying with zinc on the characteristic of dry weight of the leaves g / plant^{-1}

Spraying with zinc treatment / Pinching treatment	Non-spraying	ppm150	ppm 300	Average
Non-pinching	53.7 E	59.3 D	60.0 D	57.7 C
First pinching	64.1 CD	69.7 AB	72.4 A	68.7 A
Second pinching	61.3 CD	66.9 ABC	68.6 AB	65.6 B
Average	59.7 B	65.3 A	67.0 A	

2- Dry Weight Of The Plant (G)

The results of table (2) showed significant differences in the average coefficients of pinching growth tip of the plant, if (the first pinching) gave the developing peak the highest average dry weight of the plant of 383.4 g, compared to the comparison treatment (non-pinching) which gave the lowest average was 326.6 g, due to the fact that the process of developing apex earring of the plant led to the promotion of the growth of lateral shoots instead of apical Meristem . The longitudinal growth of the stem was interrupted resulting in a relative increase in vegetative buds and thus an increase in the weight of the dry matter of the plant (Beveridge, 2006). The results of the same table showed significant differences between the zinc spray coefficients on the dry weight of the plant, the spraying treatment excelled at a concentration of 300 ppm and gave the highest average dry weight characteristic of the plant at 374.0 g, although it does not differ significantly from the treatment of spraying with zinc at a concentration of 150ppm, compared to the comparison treatment (no spraying) which recorded the lowest average of 339.6 g, and this result may be explained by the role of the element zinc in increasing the efficiency of photosynthesis and increasing the number of cells and their large size and thus increasing the growth rate leading to an increase in the dry weight of the plant (Abdul Abbas et al., 2017). There was a significant overlap between the two factors (pinching and spraying with zinc) and the interference treatment (first pinching and spraying with zinc at a concentration of 300ppm) gave the highest rate of dry weight characteristic of the plant at 407.1 g, compared to the comparison treatment of interference (no spraying and without pinching) which gave the lowest rate of 311.7 g.

Table (2) Effect of pinching and spraying with zinc on the characteristic of the dry weight of the plant (g)

Spraying with zinc treatment / Pinching treatment	Non-spraying	ppm150	ppm 300	Average
Non-pinching	311.7 E	334.2 DE	333.9 DE	326.6 C
First pinching	360.6 BC	382.4 B	407.1 A	383.4 A
Second pinching	346.4 CD	369.3 BC	381.0 B	365.5 B
Average	339.6 B	362.0 A	374.0 A	

3- Number of fruits / plant^{-1}

The results of Table (3) showed significant differences between the coefficients averages of the pinching growth tip of the plant, if (the first pinching) gave the highest average of the characteristic of the number of fruits in the plant amounted to 115.7 g although it does not differ significantly from the treatment (second pinching), compared to the comparison treatment (non-pinching) which recorded the lowest average of the attribute was 99.6 g and may be due to the fact that the process of pinching growth tip of plant redirects and balances nutrients towards the emergence of flowering, which stimulates the growth of growth Fruiting buds thus increasing their numbers (Lasisi, 2004, Marie et al., 2007). The results of the same table showed significant differences between the coefficients average of spraying

with zinc on the urban total, If spraying at a concentration of 300ppm gave the highest average of the characteristic of the number of fruits in the plant amounted to 112.8 g, although it does not differ significantly from the spraying treatment at a concentration of 150 ppm, compared to the comparison treatment (non-spraying) which gave the lowest average of the characteristic of the number of fruits in the plant was 103.1 g, due to the effect of zinc in fertilization and pollination and thus the increase in the number of fruits (Mohammadi et al., 2015). There was a significant overlap between the two factors (pinching and spraying with zinc) and the interference treatment (first pinching and spraying with zinc at a concentration of 300ppm) gave the highest rate of the characteristic of the number of fruits in the plant at 121.9 g, compared to the comparison treatment of interference (no spraying and without pinching) which gave the lowest rate of 95.1 g.

Table (3) The effect of pinching and spraying with zinc on the characteristic of the number of fruits.plant^{-1}

Spraying with zinc treatment / Pinching treatment	Non-spraying	ppm150	ppm 300	Average
Non-pinching	95.1 E	102.1 ED	101.7 ED	99.6 B
First pinching	109.1 BCD	116.2 AB	121.9 A	115.7 A
Second pinching	105.2 CD	112.3 BC	114.9 AB	110.8 A
Average	103.1 B	110.2 A	112.8 A	

4- Weight of 300 seeds (g)

Table (4) shows that there are significant differences between the coefficients of the pinching growth tip of the plant, if the treatment (first earring) gave the highest average trait weight of 300 seeds of 78.81 g, compared to the comparison treatment (non-pinching) which gave the lowest average of the attribute was 73.31 g, and the reason for this is explained by the fact that the process of pinching growth tip of plant has a positive effect in increasing the number of branches that led to an increase in the leafy area and the rate of production of carbohydrate compounds in the plant and their transfer to seeds. Thus gaining weight (Al-Tarakji et al., 2010). The results of the same table indicate that there are no significant differences between the spray coefficients with zinc. There was a significant overlap between the two factors (pinching and spraying with zinc) and the interference treatment (first pinching and spraying with zinc at a concentration of 300ppm) gave the highest average of 300 seed weight characteristic of 80.63 g, compared to the comparison treatment of interference (no spraying and without pinching) which gave the lowest rate of the attribute was 71.96 g.

Table (4) Effect of pinching and spraying with zinc in the characteristic of 300 seed

Spraying with zinc treatment / Pinching treatment	Non-spraying	ppm150	ppm 300	Average
Non-pinching	71.96 C	73.53 BC	74.43 BC	73.31 B
First pinching	77.16 ABC	78.63 AB	80.63 A	78.81 A
Second pinching	73.70 BC	75.13 ABC	76.66 ABC	75.16 B
Average	74.27 A	75.76 A	77.24 A	

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