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Study of the effect of gibberellic acid and zinc sulphate in some vegetative growth and nutritional status of *Vicia fabaL.*

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Abstract:

The study was conducted in the Faculty of Education for Girls/University of Kufa for the period from 27/10/2017 until 15/1/2017 to test the effect of different concentrations of zinc sulphate and Gibberellic acid in vegetative growth and leaf content of carbohydrates and proteins of the plant of the rest. (50,100,150) mg / L of Gibberellin and (20,40,60) mg/L zíncsulphate. After 10 days of the first treatment, the plants were sprayed again until full wetness. The plants were irrigated when needed. Use the Completely Randomized Design (CRD) where the least significant difference was used at 5% (Least Significant Difference) LSN % 5 to find the differences between the averages when the coefficients were only significant. The results of the study showed that there were significant differences in the measured growth indicators of plants with different concentrations compared to non-treated plants.

The results showed that the highest rate in the length of the leg length was (43) cm when treated with the acid of the Gibberellic acid concentration (50 , 150) mg/ L . As for the characteristics of the leaves, the results indicated the positive effect of both the gibberellin and zinc sulphate With a significant difference in the properties of the leaves compared to the treatment of control and the highest average of the number of leaves was recorded in the treatment with the gibberellic acid at all concentrations (50,100,150) mg/L where it was (18.3, 16.3.16) leaf / plant.The leaf area was the highest area in the treatment with Zinc Sulphate concentration of 60 mg / I gibberellic acid and acid concentration of 150 mg / l, reaching (281, 330) cm respectively, compared with the control treatment, which gave 74.4 cm. Also recorded the highest amount of chlorophyll treatment when the concentration of zinc sulphate 60 mg / L and 40 mg / L and recorded (41.7, 40.9) respectively. The results showed that there were significant differences in the amount of carbohydrates and total proteins of the leaves when treated with the Gibberellin concentration of 150 mg / I and the amount of carbohydrates and total proteins were (6.159,0.335) respectively.

Introduction:

Leguminosae are the second most important plant families after the Gramineae family because they include many legumes grown extensively for the purpose of obtaining high-protein grains (Khafaji, 2011). The most important legumes are *Viciafaba* which is one of the main legumes of winter beans. High protein, making it one of the sources of green protein, and thus constitute an important part of the diet of peoples, especially low-income as well its importance in improving the properties of soil fertility through the process of fixing nitrogen in the soil by some bacteria (Farhan, 2012),*Vicia Faba* is one of the winter crops of the legume family, which has a protein content estimated at 25-40% (Natalia et al., 2008). This increases the importance of the crop to its high nutritional value for humans and animals as it is the cheapest crop of protein compared to high-priced animal protein. The seeds of plant contains carbohydrates, which may reach in most categories 56% and contains some mineral elements, fiber and vitamins,The yield of the rest is also attributed to its ability to improve the soil properties by stabilizing soil nitrogen in the soil through the root nodes in co-existence with the Risosome bacteria. It is therefore introduced into crop sequencing to improve soil conditions (Carmen etal , 2005). However, its resistance to dehydration is weak especially during floral period surface tension causesmost flowers to fall and the rest of the soil adapts to a wide range of soil pH (4.5 - 8.3) Either from the industrial point of animal diets and organic fertilizer is used in poor soils as well as their biological effect from the bacteria of the Rhizobia (Farhan, 2012).

That the lack of zinc in the types of crops produced has increase remarkably and perhaps the reason of intensive agriculture and the development of high varieties of productivity, which led to the depletion of these crops because of this element in the soil and also due to the increasing use of soil fertilizers high analysis such as ammonium phosphate As well as the fertilization of soil with zinc compounds, which is mainly in the nutrition of the plant as it plays an important role in many physiological and biochemical reactions, especially the activity and work enzymes and increase the capacity of plant resistance to oxidation and increase the susceptibility of roots to bear the anomaly different (Graham and Renge, 1993). Zinc has a significant role in physiological and biochemical processes. This element is involved in the metabolic reactions of both carbohydrates , proteins and auxines, as well as in the structure of cellular membranes. A number of its functions contribute to the protection of the cell from the harmful effects of some (ractive oxygen specific) reactions, ROS (Romheld 1991; Marchner1995; Cakmak2000), Brown etal, 1993 suggests that the metabolism of caarbohydrates, proteins, and auxins reduces the production of these substancesnd that the effect of their decrease leads to the slow down of many chemical reactions occuring within plant cells.

Zinc is involved in the activation of more than 300 enzymes, especially those related to the production of nucleic acids in the cell and protein metabolism (Castrup et al., 1996). The sprinkling of zinc on the vegetative group of the pods results in an increase in the components of the whole yield, thus increasing the total seed yield, it also reduce the toxicity of other elements such as boron element (Rashed and Rafique2000). Zinc supplementation of 5 kg / ha in zinc sulphate resulted in a significant effect on the yield of the seeds of the rest by 30% compared to comparative coefficient (without adding nutrients) (Soomro et al., 2000). That zinc has an essential role in the formation and maintenance of cellular membranes in higher plantsplants, noting that there is a positive correlation between the presence of zinc in the roots of the plant and the presence of phosphorus and concluded

that zinc increased the susceptibility of roots to absorption because it affected the improvement of the structure, structure and function of cellular membranes, Roots (Welch et al., 1982) Plant growth regulators have been defined as organic or processed organic matter with a few concentrations in stimulating, inhibiting or altering the physiological processes that occur in the plant. They are called plant hormones if they are produced inside The plant, Its production sites to their sites of influence in the plant in different ways (Sakri et al, 1985)

different aggregates of plant growth substances include growth promoters such as Auxins, Gibberellins, Cytokinins, and other inhibitory substances such as Abscisc Acid (AB) and ethylene (Weaver, 1972; Levite, 1985). Yassine (2001) confirmed that palnt growth regulators can be considered as factors that regulate the work of genes in plant. The physiological effects of the giberellin compounds include elongation in dwarf plant stem, modification of juvenility, fruit growth, as well as induction of seed germination. Plant hormones play an important role in seed germination. An enzymatic system is effective for the process of construction and destruction during germination. This enzymatic system was found to be under the influence of plant hormones (Hocking 1978) to increase the speed of germination by stimulating the enzymes of hydrolysis necessary for food analysis and division such as alpha amylase and beta amylase, as well as a number of enzymes, protase and Ribokinase (cokmak and Marschnor, 1988). The aim of the study was to study the effect of zinc and gibberellin in the studied traits green and quality to be optimal in giving the best qualities studied.

Materials and methods:

1) Experiment implementation location:

The experiment was conducted at the College of Education for girls for the agricultural season (2016-2017) in October and until January. The seeds of the *Viciafaba* plant were grown in nylon bags (4 kg) in a mixture of sand and bitmus at (1:1) Experiment in terms of soil and the number of aquatic so as to obtain desired results of this research.

2) Preparation of transactions:

Different concentrations of gibberellin (50,100, 150)mg/L and zinc sulphate salt) were prepared (20, 40,60) mg / L. The above concentrations were added to the plant at 2016-11-7 at 7am to wet. In the evening (sunset) and after 2 weeks, the concentrations were added again in the same way in the history of 2016-11-21. Some treatments were left without addition for comparison. Different concentrations of zinc sulphate salts and giberellin were added to seedlings of the remaining plant (20 mg / L, 40 mg / L and 60 mg / L) of zinc sulphate (50 mg / L , 100 mg / L and 150 mg / L) of giberellin and left some plant without adding for comparison.(control).

3) The indicators under study:

They were measured by taking three random plants for each experimental unit were as follows :

3-1 Plant heigh average

The length of the stem was measured by the metric ruler of the contract point of the plant with the soil was measured by selecting the first three stages starting from the stem base for each of the three plants and Plant heigh was measured. The number of the nodes was calculated by the number of all the nodes on the main stem of each plant and characteristics treatment and plant height average.

3-2 Characteristics of leaves: they were calculated as follows:

- Average number of leaves / plant: was calculated by choosing ten leaves randomly from each plant of experimental unit and average was. measured
- leaf area: it was measured according to the method (Othman and others, 2009) and according to the following equation: average leaf area per one leaf = leaf length x width x 0.583
- Total chlorophyll: calculated according to methods of Ranganna (1977) using a spectrophotometer.

3.3 Content of proteins and carbohydrates in leaves:

The amount of total protein was measured using a Biodrop device (manufactured by Cleaver Scientific L origin: England, cod e number: BDionR) and according to the method in the special manual accompanying the device. The amount of carbohydrate percentage in the leaves was measured by method of Dubois et al.,(1956)

4.3 Statistical analysis:

The experiment was designed according to the design of the completely Randomized Design (CRD). The results were statistically analyzed using the SPSS program. The least significant difference was used at the 5% probability level to compare the rates obtained from the measured indicators.

Results and discussion:

1- plant height average:

the results indicated in Table (1) indicate the positive effect of gibberellic acid in the length of the stem of the treated plants compared to the control treatment, where all the treatments exceeded their concentrations of the whole of the gibberellic acid and reached the highest on concentration (50 mg/L) its reached (43) cm. Zinc sulphate concentrations were no significant difference compared to control treatment.

The increase in plant height due to the use of gibberellic acid is due to its effect on division, expansion cellular. The cells grow after their division, and the gibberellin increases the size of the metastatic construction area and increases the proportion of dividing cells (Yassin, 2001).

Table (1): Effect of gibberellin and Zinc sulphate in plant height (cm) of *Viciafaba*L. plants.

Gibbrilic acid		Zinc sulphate	
Con.	Plant height average	Con.	Plant height average
Control	32	Control	32
50 mg/L	43	20 mg/L	29
100 mg/L	37.3	40 mg/L	32.7
150 mg/L	43	60 mg/L	33
LSD	7.2	LSD	N.S.

2- Average number of leaves:

The results shown in Table (2) showed a difference in the mean increase and the highest was recorded at the concentration of 50 mg / L of gibberellic acid with 18.3 leaves/ plant followed by the concentrations of (100, 150) mg/L where it reached (16.3 , 16) leaf/ plant respectively. Zinc Sulphate concentrations have no significant effect on leaf/ plant average. That the increase in the number of leaves when treated with the gibberellin because it plays a large role in increasing the process of cellular division and growth (Yassin, 2001) and thus an increase in the number of leaves.

Table (2): Effect of gibberellin and Zinc in average number of leaves (Leaf / plant). Of *viciafaba*L. plants.

Gibbrilic acid		Zinc sulphate	
Con.	average number of leaf	Con.	average number of leaf
Control	14.7	Control	14.7
50 mg/L	18.3	20 mg/L	15
100 mg/L	16	40 mg/L	17
150 mg/L	16.3	60 mg/L	14.7
LSD	1.2	LSD	NonSign

3- **leaf area:**

It is noted from Table (4) that the use of the growth regulator gibberellic asid led to a significant increase in the leaf area of the treated plants compared to the control treatment where it was observed that the highest leaf area was treated with gibberellin (150 mg/L). The effect of the use of zinc sulphate was also significant in all concentrations used and exceed to control treatment. Where it reached the highest leaf area at the concentration (60) mg/L of Zinc sulphate, it was (281 cm) which is also significantly higher than the other concentrations.

The increase in leaf area due to the use of the growth regulator is returns to the role of gibberellin in increasing cellular divisions and thus increasing the leaf area (Al-Aseeby, 2008). The gibberellin play a role in the softness of the cellular walls and increase their divisions, this is consistent with EL-Beheidi et al. 1998) The use of zinc sulphate is due to its primary role in plant nutrition and the importance of many physiological and biochemical interactions and processes, particularly the activity and function of enzymes (Graham and Renge, 1998).

Table (3): Effect of Gibberellin and zincsulphate in leaf area (cm) of *Viciafaba*L. plants.

Gibbrilic acid		Zinc sulphate	
Con.	leaf area	Con.	leaf area
control	74.4	control	74.4
50 mg/L	285	20 mg/L	200
100 mg/L	302	40 mg/L	252
150 mg/L	330	60 mg/L	281
LSD	55.6	LSD	32.6

4- The percentage of total chlorophyll:

Table (4) shows that the use of gibberellin did not show a significant effect on the total chlorophyll ratio of the leaves, whereas the use of zinc sulphate shows that some of the treatments were significantly higher at the concentration (40), (60) mg/L of zinc sulphate as it reach (40.9, 41.7)% , the significant increase in the total chlorophyll ratio of leaves therefore had a significant role in the physiological processes as well as in the incorporation of cellular membranes and was involved in a number of its functions (Romheld, 1991;Marschner, 1995 ; Cakmak, 2000) Nutrients. Also play an important role in the formation of chlorophyll and increased Concentration and then increase the process of photosynthesis (Hassan et al., 1990).

Table (4): Effect of gibberellin and zinc sulphate in the percentage of chlorophyll (%) of *Viciafaba*L. plants.

Gibbrilic acid		Zinc sulphate	
Con.	percentage of chlorophlly	Con.	percentage of chlorophlly
Control	37.2	Control	37.2
50 mg/L	37.8	20 mg/L	37.9
100 mg/L	35.6	40 mg/L	40.9
150 mg/L	34.9	60 mg/L	41.7
LSD	2.2	LSD	3.2

5- The percentage of carbohydrates in leaves (%):

the results of the statistical analysis of the effect of gibberellin and zinc sulphatein table (5) showed that the used of gibberellin (150 mg/L) significantly increased the percentage of carbohydrates in the leaves compared to the control treatment which reach to (16.159)%. The use of zinc sulphate was increased the highest percentage of carbohydrate in the leaves compared to the control treatment was (13.89%) at the concentration (60) mg/L. The control treatment recorded (5.457)%. The increase in the percentage of carbohydrates in the treatment of the gibberellic acid is due to the importance of the growth regulator in stimulating the process photosynthesis and increase their activity led to the production of carbohydrate substances higher than the treatment of control, which lacked the increase of physiological activity due to non- treatment of the acid of gibberellin (Al-Aseeby, 2008).

Table (5): Effect of gibberellin and zinc sulphate in leaves of carbohydrates(%) of *Viciafaba*L.plants.

Gibbrilic acid		Zinc sulphate	
Con.	percentage of carbohydrates	Con.	percentage of carbohydrates

Control	5.457	Control	5.457
50 mg/L	3.763	20 mg/L	5.666
100 mg/L	5.862	40 mg/L	0.389
150 mg/L	6.159	60 mg/L	13.89
LSD	0.6	LSD	4.4

6- Percentage of proteins in leaves (%).

Table (6) shows that the concentration of gibberellin (150) mg/L) has significantly increase the percentage of proteins in the leaves (0.335%) compared with the other two concentrations and the control treatment the statistical analysis showed that the used of zinc sulphate led to a significant decrease in the percentage of protein in the leaves. The increase in the percentage of protein in the leaves confirms the importance of the gibberellic acid in increasing the content of the leaves of the protein through its effect on the conduction of the reactions leading to the production of the protein (Al-Aseeby, 2008), and there is a presumption of receptors on the plasma membranes when they bind to the gibberellin send signals are sent to the nucleus and these signals act as a DNA binding protein to begin copying the alpha – amylase mRNA to dissolve large to small molecules such as amino acids needed to build the protein (Yassin, 2001).

Table (6): Effect of gibberellin and Zinc sulphate in percentage of proteins (%) in leavesof *Viciafaba*L. plants.

Gibbrilic acid		Zinc sulphate	
Con.	percentage of proteins	Con.	percentage of proteins
Control	0.180	Control	0.180
50 mg/L	0.104	20 mg/L	0.217
100 mg/L	0.206	40 mg/L	0.195
150 mg/L	0.335	60 mg/L	0.088
LSD	0.11	LSD	0.08

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