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IMPACT OF THE BIO-FERTILIZER NITROXI AND ZINC ON THE VEGETATIVE GROWTH OF POMEGRANATE SEEDLINGS (*PUNICA GRANATUM L.*) CV. SALIMI

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Abstract:

This study was concluded in the green-house in one of the private nurseries in the Kirkuk- city- Iraq, during the growing season of 2021 to study the response of pomegranate seedlings *Punica granatum* L. to the biological fertilizer Nitroxi by adding it to the planting medium with three concentration (0, 75 and 150) mg L^{-1} and foliar spray With zinc in three concentrations (0, 50, 100) mg L^{-1}, and the effect of interactions between the studied factors on the vegetative and root growth characteristics of pomegranate seedlings, the experiment was carried out according to a (RCBD) and the averages were compared according to the Duncan polynomial test at the probability level (0.05), the results showed that the use of the bio-fertilizer Nitroxi by adding it to the cultivation medium at a concentration of (150) mg L^{-1} In the studied traits (seedlings height, seedling diameter, branches number, number of leaves, leaf content of chlorophyll, area of one leaf, vegetative group dry weight, root system dry weight), spraying with zinc at a concentration of (100) mg L^{-1} Significant value in the traits (seedling height, seedling diameter, branches number, number of leaves, chlorophyll content of leaves, area of one leaf, vegetative group dry weight, root system dry weight).

Keywords Nitroxi, pomology, zinc, salami, bio-fertilizer.

INTRODUCTION

pomegranate *Punica granatum* L. belongs to the family Punicaceae, which means the apple with many seeds, and it is one of the oldest types of fruits whose fruits are eaten and mentioned in the holy books of Jews and Christians as the pomegranate was mentioned in the Holy Qur'an three times (Muhammad, 2006 And Aloun, 2017) The history of the pomegranate tree goes back to the late Neolithic and Bronze ages between 6000 to 3000 BC. The Mediterranean Basin. It was introduced to America by the traveler Christopher Columbus in 1500 AD, and he entered Spain through the Arab conquest. It is believed that the original home of the pomegranate is the Arabian Peninsula or Iran (Janick, 2005 and Mahmoud 2019). Pomegranate is rarely multiplied by seed because it is a tiring and not practical method, but the mind is the most widely used and widespread in the areas of pomegranate cultivation and is considered very practical, especially when the largest number of plants is desired (Youssef and others, 1980). The naturally produced bio-fertilizer is prepared in a biological way by introducing a group of microorganisms in sufficient numbers, and it has no ill or bad effect on the soil and the environment, and microorganisms play an important role in increasing soil fertility around the root zone of plants. Biological fertilizers contain strains of microorganisms, including fixing atmospheric nitrogen or preparing phosphorous in a soft form that can be absorbed by the roots of plants and has a role in the formation of plant hormones, thus increasing the resistance of plants to drought and lack of moisture. A gram of biofertilizer contains at least 10 million cells of known strains of living organisms (Delapierre and Anandaraj, 2010). Biofertilizer is a natural preparation that contains a compatible group of beneficial microorganisms that improve the growth and increase the yield by increasing photosynthesis, improving soil properties, and increasing its fertility through the secretion of enzymes, organic acids, plant growth regulators, and antibiotics that inhibit the growth of some organisms Pathological microscopy (Javaid and Mahmood, 2010). Nitrogen is one of the basic elements and one of the main components of amino acids, and it enters the composition of enzymes, some growth regulators, and cell membranes, and it is obtained mainly from the soil (Ali, 2012). It is a highly mobile element within the plant and moves from inactive tissues to active tissues. It also helps to form large leaves rich in chlorophyll. Nitrogen deficiency can be easily observed when the leaves of the plant are small in areas with a light green color that tends to yellow, and the branches are weak and short (Al-Duri and Al-Rawi, 2000). The nitrogen fertilization process is one of the most important agricultural operations that are carried out in nurseries to encourage the growth of seedlings and obtain good seedlings, especially in terms of the diameter of the main stem to facilitate the process of grafting (Al-Araji et al., 2005). The method of spray fertilization

is effective in increasing the quantity and quality of the crop as well as the abundance of vegetative growth (Kuepper, 2003). The foliar feeding also reduces the environmental pollution resulting from the addition of fertilizer compounds to the soil (Allen and David, 2006). And EL-Emam and EL-Ahmar (2003) to the possibility of rapid treatment of the deficiency in the basic elements in plants by spraying their solutions on the vegetative parts, which has a quick and faster effect compared to those added from fertilizers to the soil. Zinc is an essential element for plant growth and plant development and is required for the production of the amino acid tryptophan. Some studies have shown that there is a relationship between flower production and zinc treatment (Rutkowski et al., 2006). It is a micronutrient that plays an important role in promoting vegetative growth, flowering, yield, and quality of fruits (Chaturvedi et al., 2005). The role of zinc in cell division and protein synthesis has been known for a long time, but in the 1990s a new section of zinc-dependent protein molecules was identified in DNA, and it has a role in gene regulation (Vallee and Falchuk, 1993 and Coleman, 1992).

MATERIALS AND METHODS:

This study was concluded in the one of the private nurseries in the city of Kirkuk_Iraq, during the growing season of 2021, during the period from 1/3-1/7/2021, to study the impact of pomegranate seedlings *Punica granatum* L. to the biological fertilizer Nitroxi by adding it to the cultivation medium with three concentrations. Zero, 75 and 150) mgL^{-1} and foliar spraying with zinc at three concentrations (0, 50, 100 mg L^{-1}) using ZnSo4.7H2O (33% zinc) as a source of zinc, and the effect of interactions between the studied factors on vegetative and root growth characteristics and the leaves' content of macronutrients (NPK). The experiment was carried out according to a (RCBD) as a factorial experiment with three replications and four seedlings for each experimental unit the following studied traits were studied:

1- Height of the seedling (cm): it was measured by measuring tape from the surface of the soil bag to the top of the seedling.

2- Diameter of the stem (mm): it was measured using the foot (Caliper Vernier) from the location of the first lateral branch of the main stem with a height of (5 cm) from the soil surface and for all experimental units.

3- Number of branches.$seedlings^{-1}$.

4- Number of leaves.$seedlings^{-1}$.

5- The chlorophyll (SPAD): It was estimated by the chlorophyll meter of the type of SPAD unit according to the method (Jemison and Williams, 2006).

6- The area of one leaf: The length and width of the fifth and sixth leaves were taken from the top of the vegetative branches after the end of the experiment using the equation: - (L.W) = 0.785
(Al-Khattab, 2004).

7- Vegetative group dry weight (gm $seedlings^{-1}$): they were placed In the electric oven at a temperature of (65°C - +5) for 48 hours or until the weight is stable, then it was weighed by a sensitive electronic scale.

8- Root system Dry weight (gm. $seedlings^{-1}$): After the roots cut from the vegetative system were dried by air, they were placed in the electric oven at a temperature of (65°C -+5) for 48 hours or until the weight was stable, then they were weighed by a sensitive electronic scale.

RESULTS AND DISCUSSION:

Table (1) impact of the bio-fertilizer Nitroxi and zinc on some vegetative growth characteristics of pomegranate seedlings

Nitroxi mg L^{-1}	Zinc mg L^{-1}	seedling Height (cm)	Stem Diameter (mm)	branches Number	Leaves number
0	0	99.19 e	2.66 g	1.59 h	278.12 f
	50	103.93 d	3.36 ef	1.93 g	285.06 e
	100	105.57 d	3.18 f	2.25 f	29.40 d
75	0	110.63 c	3.73 e	2.86 e	296.70 d
	50	115.82 b	4.30 d	2.98 e	304.89 c
	100	116.86 b	4.77 c	3.24 d	325.31 b
150	0	121.52 a	5.33 b	3.90 c	332.81 a
	50	122.34 a	5.73 b	5.88 b	336.52 a
	100	124.73 a	6.90 a	6.43 a	337.77 a
Average Nitroxi	0	102.72 c	3.07 c	1.92 c	285.53 c
	75	114.43 b	3.27 b	3.03 b	308.97 b
	150	122.87 a	3.91 a	5.43 a	335.70 a
Average	0	110.44 b	3.90 c	2.81 c	302.54 c

zinc	**50**	**113.85 a**	**4.46 b**	**3.59 b**	**308.82 b**
	100	**115.72 a**	**4.95 a**	**3.98 a**	**318.82 a**

The results obtained in Table (1) show that there is a significant superiority when using the bio-fertilizer Nitroxi by adding it to the planting medium at aconcentration of (150) mg L^{-1} in studied traits: seedling height (cm), seedling diameter (mm), number Branches, seedlings^{-1}, number of leaves, seedlings^{-1}. We also note that there is a significant superiority when spraying with zinc at a concentration of (100) mg.L^{-1} in the studied traits: seedling height (cm), seedling diameter (mm), number of branches seedling^{-1}, number of leaves seedling-1, and also we can note from the table The interaction of (150) mg L^{-1} of bio-fertilizer and (100) mg L^{-1} of zinc was significantly superior to all the concentrations used, and the highest value was recorded compared to other treatments in the studied traits, seedling height (cm), seedling diameter (mm). Number of branches , seedling , number of leavess, seedling.

Table (2) impact of the bio-fertilizer Nitroxi and zinc on some vegetative growth characteristics of pomegranate seedlings

Nitroxi mg L^{-1}	**Zinc mg L^{-1}**	**Chlorophyll SPAD**	**Leave area (cm)**	**Dry weight of the vegetative characteristics**	**Dry weight of the root characteristics**
0	**0**	**34.42 h**	**3.26 f**	**13.33 d**	**11.32 g**
	50	**36.73 g**	**3.46 f**	**14.34 c**	**12.33 f**
	100	**38.79 f**	**4.23 e**	**14.43 c**	**13.61 e**
75	**0**	**42.34 e**	**4.52 de**	**14.80 bc**	**14.44 cd**
	50	**44.32 d**	**4.92 cd**	**14.93 b**	**14.22 d**
	100	**44.62 d**	**5.31 bc**	**15.75 a**	**13.47 cd**
150	**0**	**46.80 c**	**5.66 b**	**15.76 a**	**14.77 bc**
	50	**48.06 b**	**6.56 a**	**16.12 a**	**14.97 b**
	100	**49.35 a**	**6.56 a**	**16.22 a**	**15.46 a**
Average Nirtoxi	**0**	**36.65 c**	**3.65 c**	**14.03 c**	**12.42 c**
	75	**43.76 b**	**4.92 b**	**15.15 b**	**14.38 b**
	150	**48.05 a**	**6.23 a**	**16.03 a**	**15.07 a**
Average zinc	**0**	**41.19 c**	**4.48 c**	**14.63 c**	**13.51 c**
	50	**43.02 b**	**4.98 b**	**15.15 b**	**13.84 b**
	100	**44.25 a**	**5.33 a**	**15.46 a**	**14.51 a**

DISCUSSION:

The addition of Nitroxi led to an increase in all vegetative growth characteristics As shown in Tables (1,2), the increase in the vegetative growth characteristics mentioned may be due to an increase in nitrogen fixation, an increase in the formation of growth-promoting substances or organic acids, and an improvement in the absorption of elements, Haggag et al., (2014). Perhaps this is due to the effect of fertilizer It is vital that nitrogen catalyze The plant produces auxins and encourages cell division and cell elongation, and then the increase in plant height. especially the growing tops of the stems, which contain high concentrations of auxins, which work to elongate cells, which is the basic elongation of the stem. Also, nitrogen has an important role in the formation of compounds ATP energy and its activation for the photosynthesis process, which increased the production of nutrients and stored them within the plant tissues, which stimulated growth, including the number of leaves and the production of a high percentage of processed carbohydrates and protein, and then increased the diameter of the main stem (Al-Sahaf, 1989)) and then led to growth growth and with regard to the total chlorophyll content in the leaves, This is due to the role of nitrogen in the formation of important organic compounds in biological processes within the plant, as well as its entry into the formation of the chlorophyll molecule and its important role in the synthesis of amino acids and proteins, and this is important in The structure of the plant cell, including the chloroplasts (Al-Nuaimi, 1999), or the reason for the entry of nitrogen into the formation of the porphyrin ring, which enters the formation of chlorophyll (Mohammed, 1985). An increase in the rate of cell division and elongation, that is, an increase in their size and number, which leads to an increase in the leaf area (Develin and Withham, 1993). The moral superiority when treated with zinc is due to the role of zinc in increasing the chlorophyll content in leaves, which is necessary to raise the efficiency of photosynthesis and the formation of the amino acid tryptophan, which is necessary for cell elongation. (Cakmak et al., 1998), Resulting in an increase in leaves and microelements, the role of coenzymes plays in activating many enzymes and they participate in photosynthesis, and this affects the increase in the accumulation of carbohydrates in cells and is reflected in plant growth (Mostafa et al., 1996) Increasing the number of leaves. The cells and their large size that causes the growth of roots, and what we

mentioned is reflected in the characteristics of vegetative growth that caused the moral superiority of all the above-mentioned characteristics.

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