Effect Of Foliar Nutrients On Some Growth And Yield Traits In Tomato

Lanja Mohammed Shukur

Northern Technical University - College of Health and Medical Technologies

lanjamohammed@ntu.edu.iq

Abstract

The study was conducted as a randomised complete block design (R.C.B.D) trial. with three replications in a farmer's field in Kirkuk governorate for the 2024 growing season to investigate the effect of foliar nutrients (Soli Vig and ProSol) on some fruiting traits of To study the effect of foliar nutrients (Soli Vig and ProSol) on some fruiting traits of Wadi tomato variety, different concentrations of the above foliar nutrients (0, 2 and 4) g/litre were used, and through statistical analysis of the results, it was found that treatment 4 g/litre and both nutrients were significantly superior to the control and other treatments, where the highest rates of Soli Vig and ProSol for the studied traits were plant height (71.33 cm) and (74.66 cm). (33) cm and (74.66) cm respectively, number of branches (10.33) branches and (9.96) branches respectively, number of fruits (10.33) fruits and (9.96) fruits respectively, fruit weight (549.1) g and (495.16) g respectively and quotient (15.46) g and (16. 23) g respectively, as for the overlaps, the overlap in all studied traits exceeded the overlap in plant height, number of branches, number of fruits, fruit weight and yield (82.3 cm, (11.3) branches, (29.4) fruits, (681.1) g and (19.2) g, fruit weight (549.1) g and (495.16) g respectively and quotient (15.46) g and (16. 23) g respectively, as for the overlaps, the overlap in all studied traits exceeded the overlap in plant height, number of branches, number of fruits, fruit weight and yield (82.3 cm, (11.3) branches, (29.4) fruits, (681.1) g and (19.2) g respectively.

Keywords: Foliar nutrients, fruiting traits, Wadi variety, tomato

INTRODUCTION

Tomatoes are one of the most important agricultural crops in the world and are grown in many different climatic zones. Tomatoes belong to the nightshade family and are a rich source of many vitamins and minerals such as vitamin C, vitamin A and potassium. Tomatoes are used in many foods, whether fresh or processed in the form of sauces, juices or tinned foods (Joly, In addition to their nutritional benefits, tomatoes contribute to improving heart health and boostingthe immune system, and are rich in antioxidants such as lycopene, which is important in preventing some chronic diseases, and tomatoes are an economic crop with high nutritional value (Geolf, 1993), FAO data revealed that Iraq is the sixth Arab country producing tomatoes, with production reaching more than 700,000 tonnes for 2023 (Central Agency for Statistics and Information Technology, 2004).

Essential nutrients for plants are necessary for their growth and development. These elements are divided into macronutrients that plants require in large quantities, such as nitrogen, phosphorus, potassium, calcium, magnesium and sulphur, which contribute to building proteins, producing energy and promoting root and leaf growth (Anderson, 2002), 2002), there are also micro nutrients that are used in small amounts such as iron, manganese, copper, zinc and molybdenum, which play a vital role in photosynthesis, catalysing enzymes and assisting in cell synthesis, macro and micro nutrients provide a necessary balance for proper growth and overall plant health as nutrients are the self-motivators of various activities in plants (Abdul, 1988) and Hasan and(Abdullah 2021).Nutrients in plants are the necessary compounds that help plants to grow and develop in a healthy and sound manner, these elements are essential for various life processes in plants such as photosynthesis, root growth and fruit production, the plant derives these nutrients from the soil or from water absorbed by the roots.

Deficiency of any of these elements can lead to health issues such as poor growth, yellowing of leaves and loss of the ability to produce fruits, so it is important to provide balanced nutrients to plants to ensuregood health and excellent agricultural yield (Aldahan, 1987), Abdullah and Hasan (2021) and Hasan et al. (2022).

Al-Rawi (1980) found that when Wadi variety tomato plants were sprayed with levels of iron (0, 70 and 140) mg/l and three levels of zinc (0, 40 and 80) mg/l, where 140 mg/l iron and 80 mg/l zinc were superior in fruit number and plant yield, Vutly (1990) reported that spraying tomato plants with boron increased the total plant yield, and Mallick (1980) found Mallick (1980) found that spraying tomato plants with microelements led to a significant increase in the number of flowers and the percentage of nodes and less shedding of small fruits, and Arora (1983) confirmed that spraying tomato plants with microelements on the vegetative group during the flowering stage produced the best fruits, and Faraj (2003) stated that spraying tomatoes with liquid fertiliser led to a significant increase in plant height, root lengths, dry weight and yield, Al-Abbadi (1998) found that spraying tomato plants with MonteCarlo liquid fertiliser solution for three sprays when the inflorescences appeared increased plant height, number of leaves, dry weight, number of fruits and total yield, and Jones (1991) showed that foliar feeding is the best and most efficient fertilisation technique. (Blachtienberg, 1996) showed that foliar feeding has an important role in increasing the resistance of tomato plants to diseases when sprayed with potassium fertiliser at a rate of 12 kg/ha divided into ten batches.Al-Sahaf (1995) reported a response of Monte Carlo tomato plants to spraying with the nutrient solution of the two rivers liquid, where it gave the highest yield of (3.17462) tonnes/greenhouse.

Materials and Methods

The study was conducted as a factorial experiment within a randomised complete block design (RBCD) with three replications in a farmer's field in Kirkuk Governorate for the 2024 growing season. To study the effect of foliar nutrients (Soli Vig and ProSol) on some fruiting traits of the tomato variety Wadi, which is characterised by good productivity and cultivation suitable for the environmental conditions of the region, the land was ploughed with two perpendicular ploughs and levelled, and divided into mroz, the seedlings were planted on 20/3 on both sides of the mroz and the distance between one seedling and another was 30 cm. Each experimental unit contained 14 plants. Nitrogen fertiliser was added in an amount of 40 kg / dunum in two batches, the first batch at planting and the second batch 45 days after planting, while phosphate fertiliser was added in an amount of 40 kg P / dunum immediately after ploughing and before division.The study included the preparation of two solutions, the French foliar nutrient Sully (2.4 g/L) and the American nutrient Proso (2.4 g/L), and the spraying of two nutrient solutions, namely (Sully Fig TP11), a French-made fertiliser imported by Dabana & Brothers Company in Lebanon and characterised as a highly soluble and balanced fertiliser containing the following ratios N17, K17 and P17, is a nutrient product containing a range of major and essential nutrients for plant growth in general and tomatoes in particular. It is characterised by its balanced formula that contains a range of amino acids, minerals and trace elements that improve the plant's ability to absorb other nutrients.The second nutrient (American ProSol), a nutrient that contains all the major elements, sprayed after the first flowering contract - until the end of the season, sprayed every (15-20 days) spray, is another nutrient product that contains a mixture of phosphorus, potassium and some minor elements that enhance the plant's resistance to diseases and environmental stresses. ProSol is an effective product in improving fruit quality and increasing the rate of water absorption from the soil, which contributes to improving plant growth and thus obtaining a high yield. The number of sprays amounted to 7 sprays for both nutrients during the growth stages and the process of spraying nutrient solutions on the vegetative group after adding a diffuser (Zahi) in small proportions and in the early morning and until complete wetness is considered watering the experimental field one day before the spraying process to help open and close the stomata and increase the absorption process, the study was carried out as a factor experiment within a randomised complete block design (C. R. B. D.). The results were analysed by L. S. D. test at 0.05 level of probability and the studied traits were measured as follows: Plant height

(cm), number of vegetative branches, root length (cm), number of leaves, wet and dry weight of vegetative mass (g), number of fruits/plant, average fruit weight (g) and yield per plant (kg).

:Results

Plant height (cm)

The results in table (1) show the effect of using different concentration of foliar nutrient on plant height of tomato crop that there were significant differences for the nutrient solution Soli Vig and ProSol in terms of plant height (cm) and the highest rate was recorded at treatment 4 mg/litre for the two solutions (71. 33) cm and (74.66) cm, respectively, compared to the control treatment, while in the interferences, the highestinterference was recorded in (4) Soli Vig and (4) ProSol and reached (82.3) cm compared to the control treatment.

Number of branches/plant:

Table (2) showed that the effect of using different concentration of foliar nutrient on plant height of tomato crop had significant significant differences for the nutrient solution Soli Fig and ProSol in the plant height (cm) and the highest rate was recorded at the treatment of 4 mg/litre for the two solutions reached (10.33) branches and (9.96) branches respectively compared to the control treatment, while in the interventions, the highest interference was recorded at (4) Soli Fig and (4) ProSol and reached (11.3) branches compared to the control treatment.

Number of fruits/plant:

From the data of Table (4) for the number of fruits, it showed that there were significant differences between the control treatment and the rest of the treatments on the one hand and between the treatments themselves, and the highest rate was recorded at 4 mg/L for the two solutions, which reached (10.33) fruits and (9.96) fruits, respectively, compared to the control treatment, and in the interferences, the highest interference was recorded in (4) Soli Vig and (4) ProSol and reached (29.4) fruits compared to the control treatment.

Fruit weight (g):

Table (5) shows that the effect of using different concentration of foliar nutrient on fruit weight of tomato crop had significant significant differences for the nutrient solution Soli Fig and ProSol in the fruit weight rate trait and the highest rate was recorded at treatment 4 mg/litre for the two solutions (549. (1) g and (495.16) g, respectively, compared to the control treatment, while in the interferences, the highest interference was recorded in (4) Soli Vig and (4) ProSol and amounted to (681.1) g compared to the control treatment.

Amount of yield (g):

As for the amount of quotient per plant, the table showed the superiority of treatment (4) of the two foliar nutrients over the comparison treatment and recorded the highest rate of (15.46) g and (16.23) g respectively compared to the comparison treatment, while in the interference, the highest interference was recorded in (4) Sole Vig and (4) ProSol and reached (19.2) g compared to the comparison treatment.

Discussion:

Improving tomato growth and increasing its yields is one of the main objectives in modern agriculture, which calls for the use of fertilisers and plant nutrients that help improve crop quality and increase productivity. In this context, we find that some compounds and nutrients such as 'Soli Vig' and 'ProSol' have proven to be very effective in enhancing the growth of tomato plants in this research (Kanan, 1980)(AL-Bayati 2021)., and we will provide an accurate explanation of how they affect the

plant, as these nutrients contain a group of amino acids and minerals that improve the plant's ability to absorb essential nutrients that contribute to increasing the size of the plant's biomass (Faraj et al, 2003), which leads to healthier and more efficient growth as well as containing amino acids that stimulate plant physiological processes such as photosynthesis and protein synthesis, which increases the plant's ability to adapt to different environmental conditions and its effective contribution to the process of cell division and growth and enhances the growth of leaves and branches, this leads to increased productivity and crop quality (Al Abadi et al., 1998), The nutrients contain a high content of phosphorus and potassium, which enhance the formation of roots and other plant parts that contribute to increasing dry weight and phosphorus is particularly important in improvingvegetative growth and activating vital processes within plant cells, which contributes to increasing the ability to store energy in tissues and potassium, on the other hand, works to improve the water balance within the plant and promote the formation of dry cells (Zeidan, 2005), which helps reduce water loss and thus increases efficiency in dry matter formation As a result of these effects, 'Soli Vig ,Increasing the dry weight of tomatoes by promoting vegetative growth and increasing the plant's ability to store organic matter. Increasing the dry weight means increasing the overall productivity of the plant (Lutzow, 2006), improving the efficiency of resource use, which contributes to improving the yield of the crop as well as the role of nitrogen and some micronutrients in the formation of chlorophyll and increasing photosynthesis, which leads to an increase in dry weight as a result of the manufacture and accumulation of carbohydrate substances, which is consistent with the findings of Al-Muaini.(1999),Younis et al. (2022), Alatawi et al. (2024), Hasan et al. (2024), and Hasan et al. (2023).

The micronutrients present in foliar nutrients contribute to increasing the activity of enzymes and regulating the vital activities carried out by the plant, including stimulating flowering and increasing the number of flowers as a result of the nutrients contain a balanced mixture of amino acids andmicroelements such as magnesium and calcium (Al-Sayed, 2006)(ALSheikh and Aziz 2021)(Lateefet al., 2021), which stimulates the growth of roots and enhances the absorption of nutrients such as nitrogen and phosphorus and this stimulation promotes the growth of leaves and stems, which contributes to increasing the morphological area of the plant which is responsible for absorbing the largest amount of light and increasing the biomass of the plant helps to provide moreand higher quality fruits and thus increase the percentage of knots, which in turn leads to an increase in the number of fruits (Hussein et al. 2004).

As for the yield per plant (kg), the nutrients 'Solifig' and 'ProSol' play a prominent role in improving the yield of tomato plants, which includes the quantity and quality of fruits produced by the plant, as these nutrients significantly affect the improvement of vegetative growth, flower formation, and fruit development, which leads to an increase in the final yield. In addition to their role in increasing the chlorophyll content of the leaves and thus increasing the number of nodes in the flowers and reducing their shedding, which is attributed to increasing the number of fruits per plant (Al-Sahaf, 1995), Hasan and Abdullah (2021), Hasan and Abdullah (2020), Abdullah and Hasan (2021), Hasan et al. (2022), and Hasan et al. (2022)(Alobidy and Abdulsalaam 2024).

Table (1) Effect of using different concentration of foliar feeder on plant height of tomato crop.

Prosol / Sully Vig	0	2	4	Rate
0	52.4	55.6	68.3	58.76
2	54.4	56.4	73.4	61.4
4	60.2	71.5	82.3	71.33
Rate	55.66	61.16	74.66	
LSD	Sully Vig= 8.2	Prosol=7.8	Overlap =8.9	

Table (2) Effect of using different concentration of foliar feeder on the number of branches/plant for tomato crop.

Prosol / Sully Vig	0	2	4	Rate
0	9.1	9.5	8.2	8.93
2	8.2	9.1	10.4	9.23
4	8.7	11	11.3	10.33
Rate	8.66	9.86	9.96	
LSD	Sully Vig=1.2	Prosol=1.6	Overlap=1.9	

Table (3) Effect of using different concentration of foliar nutrient on the number of fruits/plant for tomato crop.

Prosol / Sully Vig	0	2	4	Rate
0	20.5	24.9	21	22.13
2	25.3	35.8	27.2	29.43
4	21.8	24.2	21.3	22.43
Rate	22.53	28.3	23.16	
LSD	Sully Vig=2.2	Prosol=2.8	Overlap=3.4	

Table (4) Effect of using different concentration of foliar nutrient on fruit weight g/plant for tomato crop.

Prosol / Sully Vig	0	2	4	Rate
0	359.1	365.6	406.3	377
2	356.1	413.1	398.1	389.1
4	396.6	569.6	681.1	549.1
Rate	370.6	449.43	495.16	
LSD	Sully Vig=25.2	Prosol=25.8	Overlap=26.9	

Table (5) Effect of using different concentration of foliar nutrient on plant yield kg/plant for tomato crop.

Prosol / Sully Vig	0	2	4	Rate
0	12.5	12.7	14.2	13.13
2	12.7	12.3	15.3	13.43
4	13.2	14	19.2	15.46
Rate	12.8	13	16.23	
LSD	Sully Vig=1.2	Prosol=1.8	Overlap=2.9	

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