International Journal of Environmental Sciences
ISSN: 2229-7359
Vol. 11 No. 1s, 2025
https://www.theaspd.com/ijes.php

Effect of spray intervals with different concentrations of nutrient solution (Agro leaf) on the growth of tomato plant *Lycopersicum esculentum L*

Gzng Muhsn Othman
Kirkuk Health and Medical Techniques College, Northern Technical University, Department of Medical Laboratory Technology, Iraq

Abstract: In the fields of a farmer in Kirkuk governorate for the 2023-2024 growing season to study the effect of three spray concentrations of Agro leaf nutrient solution (Agro leaf). (50, 25 and 0 ppm) on total vegetative growth for three periods during the growing season after the appearance of 4-5 true leaves for the first spray and 15 days apart for the second and third sprays, respectively. The results showed that Agro leaf neutraliser had a significant effect on the vegetative growth of the plant as all concentrations of the neutraliser at the first and second sprays outperformed the control treatment significantly in leaf length, leaf width, number of leaves, floral branches and plant height (39, 22.2 and 16.73). (53), (22.2), (16.73), (5.26) and (29.03) respectively for the first spray, (43.4), (39.96), (11.96), (5.03) and (50.63) respectively for the second spray, (39.4), (33.83), (43.96), (17.96) and (88. 3) respectively for the third spray, and it is observed that by re-spraying, the production rates of the plant are increased, which confirms the positive role of the nutrient on the different plant qualities.

Keywords: Foliar nutrients, spraying intervals, Wadi variety, tomatoes

INTRODUCTION

The tomato plant is one of the important agricultural crops in various parts of the world, and is considered one of the vegetables with high nutritional value and wide popularity in the world cuisine The origin of the tomato goes back to South America (14), where it was discovered in the Andean region in the centuries BC and the tomato was initially known as 'golden berry' because of its yellow colour in some types (8), then spread to the rest of the world after the discovery of the American continent in the fifteenth century, the tomato is characterised as a herbaceous plant with a relatively short life, usually growing in warm and sunny environments, Tomatoes are grown all over the world either in the ground or in greenhouses, and it is considered a plant that requires special care (16) (7), such as regular watering and fertilization, and needs moderate temperatures for good growth, its shapes and colours vary, as they can be red, yellow, green or even purple, and there are many varieties that vary in size and shape, ranging from small 'cherry' tomatoes to large tomatoes that are used in the preparation of sauces and juices (21). Tomatoes are a rich source of vitamins and minerals such as vitamin C, potassium, magnesium, carbohydrates, small amounts of vitamins A, B, iron, phosphorus and calcium salts (22), In addition to antioxidants such as lycopene, which promote heart health and strengthen immunity, tomatoes generally contain medically important antioxidants and are a good source of lycopene. Tomatoes are also used in many dishes such as salads, juices, sauces, and appetisers, making them an essential part of the daily diet in most cultures (17)(9).

Fertilising the tomato plant with nutrients is one of the key factors that greatly affect its growth and production, the tomato plant needs a careful balance of nutrients to ensure a good and high-quality crop. Fertilisation includes providing essential elements such as nitrogen (N), phosphorus (P) and potassium (K) (23), as well as secondary elements such as calcium, magnesium and sulphur, and trace elements such as iron, zinc and manganese (15), Fertilisation must be regular and balanced, as the tomato plant requires continuous nutrition throughout its growth period, and organic fertilisers such as animal manure and compost are used, in addition to mineral fertilisers that contain the main elements, fertilisers can be applied

in the form of frequent batches or through drip irrigation to improve nutrient absorption, and fertilisation at the flowering and nodal stage is an important step that affects the quantity and quality of fruits (26), When nutrients are used correctly, it is possible to improve the productivity of the tomato plant and ensure high quality fruits rich in nutrients that are important for human health (3) and due to the exposure of Iraqi soils to washing, sedimentation and stabilisation processes Especially in the stages of availability of high amounts of nutrients to secure the needs of the plant, the importance of adding fertiliser by spraying on the vegetative part has recently emerged (6), (19), (18) (2) (20)(12).

(25) reported an increase in the number of flowers and the percentage of fruit nodes when tomato plants were treated with iron, and an increase in the concentration of calcium and magnesium in leaves compared to fruits was obtained while the concentration of phosphorus in fruits exceeded that in leaves. The concentration of calcium and magnesium in the leaf increases while the concentration of phosphorus decreases as the leaf ages when magnesium and calcium are added at levels (0 and 26. 5) (13).

Micronutrients play an important role in plant life, as they perform many important functions because they are the driving forces for all vital activities carried out by the plant, and this will certainly be reflected in the intensity of vegetative growth (4), and increased plant growth was obtained by increasing the number of branches and dry weight of the vegetative group and the content of leaves of total chlorophyll in addition to increasing the plant yield as a result of the use of potassium sulfate fertiliser on the tomato plant (1).

MATERIALS AND METHODS

The study was conducted in Kirkuk governorate for the agricultural season 2023-2024 as a factorial experiment within a cross-sectional design (C.R.B.D.) with three replications and each replication is a plastic tunnel in the fields of a farmer to study the effect of spray periods with different concentrations of Agro leaf nutrient solution on tomato plant growth, the soil was ploughed with two orthogonal ploughs and the field was planned and threshed and then planted on 1-11-2023, three concentrations were used in the experiment Five random plants were taken to study the vegetative growth traits (plant height, leaf length, leaf width, leaf width, number of leaves and floral branches), the results were analysed and the means were compared using the least significant difference (LSD) test at the 0.05 level (10).

RESULTS

The results presented in Table (1) indicated that there was significant superiority in all traits as a result of using the 50 ppm concentration of Agro leaf neutralising solution as it gave the highest average in leaf length, leaf width, number of leaves, floral branches and plant height of (39.53), (22.2), (16.73), (5.26) and (29.03) respectively for the first spray. (53), (22.2), (16.73), (5.26) and (29.03) respectively for the first spray, while the control treatment gave the lowest values of (25.6), (14.03), (11.06), (3.73) and (17.73) respectively.

Table (1) Effect of Agro leaf nutrient solution concentrations on the studied traits at the first spray.

Concentration	Leaf length	Leaf width	Number of leaves	Flower branches	Plant height
0	25.6	14.03	11.06	3.73	17.73
25	27.63	16.7	12.73	4.16	20.6

50	39.53	22.2	16.73	5.26	29.03
L.S.D	13.34	6.5	4.2	2.29	7.86

The results of table (2) showed significant superiority in all studied traits as a result of using 50 ppm concentration of Agro leaf neutralising solution as it gave the highest average leaf length, leaf width, number of leaves, floral branches and plant height of (43.4), (39.96), (11.96), (5.03) and (50.63) respectively. (4), (39.96), (11.96), (5.03) and (50.63) respectively for the second spray, while the control treatment gave the lowest average of (28.43), (24.83), (8.7), (2.83) and (28.96) respectively.

Table (2) Effect of Agro leaf nutrient solution concentrations on the studied traits at the second spray.

Concentration	Leaf length	Leaf width	Number of leaves	Flower branches	Plant height
0	28.43	24.83	8.7	2.83	28.96
25	35.3	30.96	8.93	3.5	35.4
50	43.4	39.96	11.96	5.03	50.63
L.S.D	13.22	15.88	3.22	2.07	12.16

Table (3) showed significant superiority in all studied traits as a result of using 50 ppm concentration of Agro leaf neutral solution as it gave the highest average leaf length, leaf width, number of leaves, flowering branches and plant height of (39.4), (33.83), (43.96), (17.96) and (88.3) respectively for the third spray, while the control treatment gave the lowest average of (34.73), (28.5), (42.73), (15.2) and (64.96) respectively.

Table (3) Effect of Agro leaf nutrient solution concentrations on the studied traits at the third spray

Concentration	Leaf length	Leaf width	Number of leaves	Flower branches	Plant height
0	34.73	28.5	42.73	15.2	64.96
25	36.3	32.73	37.93	12.96	77.73
50	39.4	33.83	43.96	17.96	88.3
L.S.D	13.5	12.9	14.3	6.7	16.9

DISCUSSION

The reason for the increase in the rate of growth characteristics when sprayed with the nutrient solution (Agro leaf) on the tomato plant is due to the effects of this solution on providing the essential nutrients that the plant needs during its various stages of growth, including the microelements present in the solution, especially the element zinc in the formation of the amino acid tryptophan (Tryptophan), which is important in the formation of (Indol Acetic Acid) IAA, which affects the increase in cell division (27), Agro leaf is a foliar fertiliser that contains a mixture of macro and micro elements that contribute to improving plant health and productivity. If the plant is sprayed correctly and at the right time, improvements can be seen in many growth traits such as size, leaf density, root health (24), increased flowering, and increased cell division, increased flowering and nodes Most Agro leaf

solutions contain a high content of nitrogen (N), an essential nutrient that supports the vegetative growth of the plant. Nitrogen stimulates the formation of leaves and stems, which helps the plant to absorb more light and energy through photosynthesis and this contributes to faster and better plant growth, thus increasing the amount of plant biomass (11).

Spraying with the nutrient solution and when to add it greatly enhances the growth characteristics of tomato plants by providing essential nutrients at the right time and in the right concentrations, enhances vegetative growth, strengthens the roots, improves flowering and knots and increases plant resistance to diseases and pests (29), all these factors contribute to increasing productivity and crop quality, making spraying with this solution an effective strategy in improving tomato plant production (5).

The nutrients (zinc, magnesium) in the nutrient solution have an important role as magnesium enters the chlorophyll molecule, in addition to its effective role in activating many enzymes, which increases the efficiency of photosynthesis and energy production (ATP) important in the vital processes of the plant (30), in addition to entering the synthesis of nucleic acids RNA and DNA necessary for cell division, which encourages the formation of leaf buds and thus increases the number of leaves (3).

Increased tomato yield through nutrient solution spraying is the result of providing essential nutrients needed by the plant directly through the leaves (31), the use of nutrient solution such as Agro leaf enhances the plant's ability to grow healthier and more efficiently, which reflects positively on its productivity and harvest (32), and when tomatoes are sprayed with nutrient solution, key elements such as Nitrogen contributes to the growth of leaves and stems (28), which enhances the plant's ability to photosynthesise is the primary process that provides energy to the plant (33,34), thus optimising this process leads to increased overall tomato production and increased leaf area helps improve light absorption, which enhances energy production and increases yield. (11), (9), (18).

REFERENCE

1. Abbas, J. A., 2001, Effect of fertilisation and cycocel spraying to increase the tolerance of tomato plants to soil salinity, Proceedings of the 5th Horticulture Conference, Suez Canal University, Ismailia, Egypt, Paper 210.
2. Abdullah, R.M., Hasan, S.A. (2021) . Estimation of components of genetic variance using Jinks-Hayman method analysis on the crop of faba bean (Vicia faba L.) . Int. J. Agricult. Stat. Sci. 16(1); pp. 1897-1903.
3. Abu Dahi, Yusuf Mohammed and Muayyad Ahmed Al-Younis. 1988, Plant Nutrition Manual. Ministry of Higher Education and Scientific Research. Baghdad University/Directorate of Dar al-Kutub for Printing and Publishing.
4. Abu Dahi, Yusuf Muhammad. 1995 . Effect of foliar feeding with Greenzit on growth, yield and quality of wheat grain (Triticum aestirvum L.) cultivar Abu Ghraib-3 Journal of Iraqi Agricultural Sciences. Vol. 26(1):30-34.
5. Agrwal, B., Sharma, H. G., and Ashutosh Pandey, 2004, Nutrient uptake affected by irrigation method and micronutrient applications in tomato hybrid Avinash-2. Veg. Sci., 31 (1): 78-82.
6. Ahmed, Firas Waadallah. 2006. Effect of potassium and magnesium addition to soil and spraying on the growth and yield of tomato plants under protected cultivation conditions. Master Thesis, Department of Soil. Faculty of Agriculture. Baghdad University.
7. AL-Bayati .H. J.(2021). Effect of Nitrogen and Organic Fertilization on Growth and Yield of Two Cabbage Varieties Brassica oleracae Var. Capitata. NTU Journal of Agricultural and Veterinary Sciences 1 (1) : 21-28.

8. Al-Issawi, Aboud Wahid Al-Aboud 2004. Response of three introduced rice varieties to irrigation periods and fertilisation levels on their growth, productivity and chemical contents. Doctoral Thesis - Faculty of Education for Girls - Kufa University. Iraq.
9. Alobidy. A. A. and Abdulsalaam. Sh. R.(2024). The effect of using some extraction techniques on the physical and chemical properties of essential oils of citrus peels. NTU Journal of Agricultural and Veterinary Sciences 4 (1) : 25-30.
10. Al-Rawi, Khasha Mahmoud and Abdul Aziz Mohammed Khalafallah 1980. Design and Analysis of Agricultural Experiments. Ministry of Higher Education and Scientific Research. University of Mosul . Iraq.
11. Al-Sahaf, Fadel Hussein Reda 1989. Applied Plant Nutrition. Ministry of Higher Education and Scientific Research University of Baghdad. House of Wisdom – Iraq.
12. ALSheikh. Q.S. and Aziz. J. M.(2021). Test of Nano-Fertilizer and Different Irrigation Intervals on Growth and Yield of Maize Zea mays L. NTU Journal of Agricultural and Veterinary Sciences . 1 (1) :14-20.
13. AsiegbuJ.E. and J.O. Uzo 1984 . Effects of lime and magnesium on tomato (Lycopersicon esculentum Mill) grown in ferrallitic sandy loam tropical soil-Plant and Soil Volume 74, Number 1, 53-60, DOI: 10.1007/BF02178739.
14. Besford.R.T. 2002. Effect of potassium nutrition on leaf protein concentrations and growth of young tomato plants.PLATAND SOIL.Volium42,Number2,441-451,DOI:10.1007/BF000 10019.
15. Bhatt,L. Srivastava B.K. and Singh, M.P., 2004, Studies on the effect of foliar application of micronutrients on growth, yield and economics of tomato (Lycopersicon esculentum Mill). Prog. Hort., 36(2): 331-334.
16. Bonheure D, KC Willson 1992. Mineral nutrition and fertilizers. In: K.C. Willson and M.N. Clifford (eds.). Tea cultivation to consumption. Chapman and Hall. pp. 269-330.
17. Geolf, M., and Marvin P. Prits. 1993. Phosphorus, zinc and boron influence yield components in early low strowberry. J. Amer. Soc. Hort. Sci. 118(1): 43-49.
18. Hasan, S.A., Abdullah, R.M.. (2020) Estimating the performance and gene action of a number of individual genotypes and hybrids on the crop of faba bean (Vicia faba L.) . Plant Archives Volume 20 No. 2, pp. 8981-8988.
19. Hasan, S.A., Abdullah, R.M.. (2021) Characterization of Genetic Variability Through The use of Rapds Markers, of A Group of Native and Commercial Genotypes of Bean Species. International Journal of Agricultural and Statistical Sciencesthis link is disabled, 2021, 17, pp. 1141–1147.
20. Hasan, SA Abdullah, RM Hanoon, MB. (2022)Effect of foliar application with proline on growth, yield, and quality of faba bean (Vicia Faba L.) (A review) . European Journal of Agricultural a nd Rural Education (EJARE). Vol. 3 No. 3, March 2022 ISSN: 2660-5643.
21. Hassan, Ahmed Abdul Moneim. 1988. Onion and garlic. Science and Practice in Agricultural Crops Series. First edition. Arabian House for Publishing and Distribution. Cairo, Egypt.
22. Hazra, P., Maity, T.K. and Mandal, A.R., 1987, Effect of foliar application of micronutrients on growth and yield of okra (Abelmoschus esculentus L). Prog. Hort., 19: 219-222.
23. Hosseini, S.M., Maftoun, M., Karimian, N., Rounaghi, A., Emam, Y., 2007. Effect of zinc × boron interaction on plant growth and tissue nutrient concentration of corn. J. Plant Nutr. 30, 773- 781.
24. Kumari,S. and Sharma, S. K., 2006, Effect of micronutrient sprays on tomato (Lycopersicon esculentum) seed production. Indian J. Agric. Sci., 76 (10): 676-678.
25. Mallick , M. F. R. and Muthukrishuan . 1980. Effect of micronutrients on the quality of tomoato . Vegetable Science . , 7 (1) : 6 - 12 (C. F. Hort.

26. Muftuoglu.N.Mucella, 2002.The effect of Mixed Fertilizer with or Without Zinc on the Yield and Qualityof Tomato Grown Under Canakkale Conditionsin Turkey. Pakistan Journal of Applied Sciences 2(2):329-331,2002.

27. Oktay,M.,1999.Cinko Katkili Kompoze Gubrelerin Degisik Kulture Bitkilerinin Yetistiriciliginde Kullanimi,Ege Universitesi Tarimsal Uygulama ve Arastirma Merkezi Yayim.

28. Peyvast. G. , J. A. Olfati, P. Ramezani-Kharazi and S. Kamari-Shahmaleki. 2009. Uptake of calcium nitrate and potassium phosphate from foliar fertilization by tomatoiJournal of Horticulture and Forestry Vol. 1(1) pp. 007-013March, 2009 ©2009 Academic Journals.

29. Shahmaleki. 2009. Uptake of calcium nitrate and potassium phosphate from foliar fertilization by tomato. Journal of Horticulture and Forestry Vol. 1(1) pp. 007-013March, 2009.

30. Smolen S, Sady W 2008b. Effect of various nitrogen fertilization and foliar nutrition regimes on carrot (Daucus carota L.) yield. J .Hort. Sci Biotechnol. 83: 427–435.

31. Tamilselvi, P., Vijayakumar, R. M. and Nainar, P., 2002(a), Studies on the effect of foliar application of micronutrients on growth and yield of tomato (Lycopersicon esculentum Mill.) Cv. pkm-1. South Indian Hort., 53: 46-51.

32. Verma, D,P., 1997. Balanced fertilisation for sustainable productivity of tea. Fertilizer News. 42(4): 113-125.

33. Lateef, M. A. A., Fadhil, N. N., & Mohammed, B. K. (2021, November). Effect of Spraying With Cal-Boron and Potassium Humate and Maturity Stage on Fruit Quantity, Quality Characteristics of Apricot Prunus Armeniaca L. cv." Royal". In *IOP Conference Series: Earth and Environmental Science* (Vol. 910, No. 1, p. 012038). IOP Publishing.

34. Yildiz Nesrin 2005. Respones of tomato and corn plants to ncreasing Cd levels in nutrient culture . Pak. J. Bot., 37(3): 593-- 599, 2005.