

# Effect of Foliar Spraying of Different Calcium Concentrations on Performance tomato plant.

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## Abstract:

The paper deals with Effect of foliar spraying of different Calcium concentrations on tomato plant performance, the calcium plays a key role in a diverse range of plant functions.

A study was conducted In the spring 2023 in the Al-Ajailat region, Libya , was Seedlings planted 1200 at standard distance between the standard distance between the lines is 80 cm, while the distance between seedlings in one line is 30-35 cm.

They were watered with water and addition mineral fertilizers to supplement the nutrient content to the optimal level and their growth clearly.

In experiment used three concentrations for Calcium T0 (control), T1 (200gm) , T2(300 gm) , T3 (500 gm) as to find out impact of Calcium on tomato growth.

The results showed that treatments T1 and T2 led to an increase in plant height, the number of branches, and an increase in the number of fruits, as they produced the largest amount of fruit (87.31 kg) and (82.45 kg), respectively.

The results are also proven when increased the concentration of the ca element to 500 in treatment t3, it has a

negative effect on the plant, leading to decrease in fruit to (45.48 kg).

The results of the test also, showed that no spraying with ca at treatment T0 leading to decrease fruit yield and Blossom-end rot incidence increased (BER), which produced 9.57 kg un deformed fruits and 7 kg of distorted fruits.

**Key Words:** Foliar Spray, Calcium, Flowering, Fruiting, BER.

تأثير الرش الورقي بتركيزات مختلفة من الكالسيوم في أداء نبات الطماطم

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## الملخص

يتناول البحث تأثير الرش الورقي بتركيزات مختلفة من الكالسيوم على أداء نبات الطماطم، إذ يلعب الكالسيوم دوراً رئيسياً في مجموعة متنوعة من وظائف النبات، أجريت دراسة في ربيع 2023 في منطقة العجيلات ليبيا، حيث تم زراعة 1200 شتلة على مسافة قياسية بين السطور 80 سم، بينما المسافة بين الشتلات في السطر الواحد 30-35 سم، تم سقيها بالماء وإضافة الأسمدة المعدنية لتكملة المحتوى الغذائي إلى المستوى الأمثل ونموها بشكل واضح.

تم في التجربة استخدام ثلاثة تراكيز للكالسيوم T0 السيطرة، 200gm T1، 300 gm T2، 500 gm T3 لمعرفة تأثير الكالسيوم على نمو الطماطم.

أظهرت النتائج أن المعاملات T1, T2 أدت إلى زيادة ارتفاع النبات وعدد الفروع وزيادة عدد الثمار، حيث أنتجت أكبر كمية من الفاكهة (87.31 كجم) و(82.45 كجم) على التوالي.

كما أثبتت النتائج أن زيادة تركيز عنصر الكالسيوم إلى 500 ملغم في المعاملة T3 كان لها تأثير سلبي على النبات مما أدى إلى انخفاض إنتاج الثمار إلى (45.48 كغم).

كما أظهرت نتائج الاختبار أن عدم الرش بالكالسيوم عند المعاملة T0 أدى إلى انخفاض إنتاجية الثمار وزيادة نسبة الإصابة بتعفن الطرف الزهري (BER) ، مما أدى إلى إنتاج 9.57 كجم ثمار غير مشوهة و 7 كجم ثمار مشوهة. الكلمات المفتاحية: رش ورقي، كالسيوم، إثمار، نهاية التعفن الزهري (BER).

## I. INTRODUCTION

Tomato (*lycopersicon esculentum*) It is an important vegetable crop and one of the most famous and widely used vegetable crops in the world [1],[2].

It is well known for its nutritional importance as it is the rich source of nutrients viz., Na, K, Fe and a good source of vitamin A, vitamin C, Ca, Fe, protein, Na, K, Mg and antioxidant and carotenoids [3],[4] and helps in retarding cancer and degenerative diseases [5] .

The yield potential and quality can be improved by maintaining proper fertilizer application. Tomato crop requires heavy manure and sufficient amount of fertilizers for heavy yield. For improving plant growth and development, use of organic and inorganic manure or fertilizers is essential. It is well established fact that chemical fertilizers improve plant growth directly [6]. Calcium is an essential mineral needed in plant growth and development and in serving as an intracellular messenger and is involved in many metabolic and physiological function [7].

Calcium application increases growth and number of fruits in tomato plants [8]. A low supply of calcium to fruit leads to increase tomato fruit cracking and appearance of black or gray spots on the fruits, which causes a cause of BER crop, the fruits to rot and results in a loss in the crop [9], [10].

So, the objectives of this work was to study the Effect of calcium levels as foliar application and their interactions on tomato plants grown under plastic house in sandy soil at Al-Ajailat region.

The results of the study showed that Growth variables increased significantly after using foliar spraying with Calcium on the variable observation of plant height, the number of leaves, the number of fruits

This article will be further organized as follows. In the next section, we explain proposed methodology. In section 3, we presented some experimental results and finally in section 4 we conclude our study

## II.MATERIAL AND METHODS

### A.Work field

The experiment was conducted in a 240 m<sup>2</sup> greenhouse for 4-month of tomato e production season in the Al-Ajailat region, Libya to evaluate the influence of foliar application of calcium on tomato plant.

In the spring 2023, was Seedlings planted 1200 at standard distance between the lines is 80 cm, while the distance between seedlings in one line is 30-35 cm, they were watered with water and addition mineral fertilizers (NPK) to supplement the nutrient content to the optimal level and their growth clearly.

**B. The different used treatments in study.**

In The experiment used three concentrations for Calcium, t1 (200 gm), t2(300 gm), t3 (500 gm) and t0 control (water only) for each 10 plants as to find out impact of Calcium on tomato growth and output as shown in table (1).

The foliar applications were added at branching stage flowering and fruit production after about 45 days after seedling planting, and then foliar applications treatments were added four times, 15 days between every spray.

**C. Data Colocation**

After every two weeks of foliar spraying, the following parameters have been measured (height of each plant (cm), number of clusters per plant, number of fruits per plant, weight of each fruit (gm) as shown in tables (1), (2).

**The table (1) show effect of foliar application of calcium on plant growth parameters (Plant height, Number of branches) for each treatment.**

TREATMENT		PLANT GROWTH PARAMETERS			
CALCIUM LEVELS	NPK	Number of plants	Plant height(cm)	Number of branches	mean
T1=0 (CONTROL)	40GM	10	60-80cm	5-7	6
T1=200GM	40GM	10	133-156 cm	8-10	9
T2=300GM	40GM	10	195-210cm	9-11	10
T3 =500GM	40GM	10	-200Cm 190	9-11	10

**The table (2) show effect of foliar application of calcium on plant growth parameters (number of fruits, Wight of Fruit) for each treatment.**

Treatments			plant growth parameters							Crop production rate(%) per treatment
Calcium levels	NPK	sample	Number of fruits per treatments			Wight of Fruit				
			N. Of fruit per plants	Average number of fruits	The total of fruits	Fruit weight	Average fresh fruits weight	distorted fruits	Yield (kg)	
T1=0 (control)	40GM	10	18-33	25.5	255	40-90 mg	65mg	7	9.57	4.257
T1=200GM	40GM	10	61-70	65.5	650	82-171 mg	126.5mg	0.3	82.45	36.677
T2=300GM	40GM	10	64-73	68.5	685	80-175 mg	127.5mg	0.2	87.31	38.838
T3 =500GM	40GM	10	45-62	53.5	535	52-133mg	92.5mg	4	45.48	20.231
LSD0.05		40						11.5	224.8	

### III. RESULTS AND DISCUSSION

The results of Effect concentrations of Calcium on Plant tomato can be divided as follows:

#### A. Plant height (cm) per treatment

Plant height was measured at the end of the growing season as the average of 10 plants taken randomly for each treatment using Metric tape.

The result indicated that the tallest plant of 195-210 cm was observed in the T2 (300GM) followed by the treatments T3 and T1 Their height ranges 130.33 cm to 200 cm, while treatment T0 recorded the shortest height of 60-80cm.

**B. Number of plant branches per treatment**

The most number of branches were recorded in transaction T2 was ranges from 9-11 branches, which was followed by the T1, T3 treatments, while recorded were treatment T0 The lowest number about 5-7 branches.

**C. The number of fruits per treatment**

The No. of fruits per treatment for T2 treatment was ranges from 64-73 fruits, which was followed by the t1 and t3 treatments, while The lowest yield was obtained from t0 was ranges from 18-33 fruits.

The weights of tomato fruits from different replications were averaged to determine the average fruit weight of tomato fruits (g fruit-1).

The heavier weight for the fruits was in treatment (T2) range 80-175 mg, while lighter weight in the fruits was 40-90 mg in treatment (T0).



**Picture (1) shows samples of the study**

Data in Tables (1) ,(2 ) showed that the different treatments have affected tomato plant ,we note from his experiments that spraying with two concentrations of calcium (200 and 300 mg L<sup>-1</sup>) led to an increase in flowering , maturity, an increase in the height of the plant, the number of branches and an increase in the number of fruits .

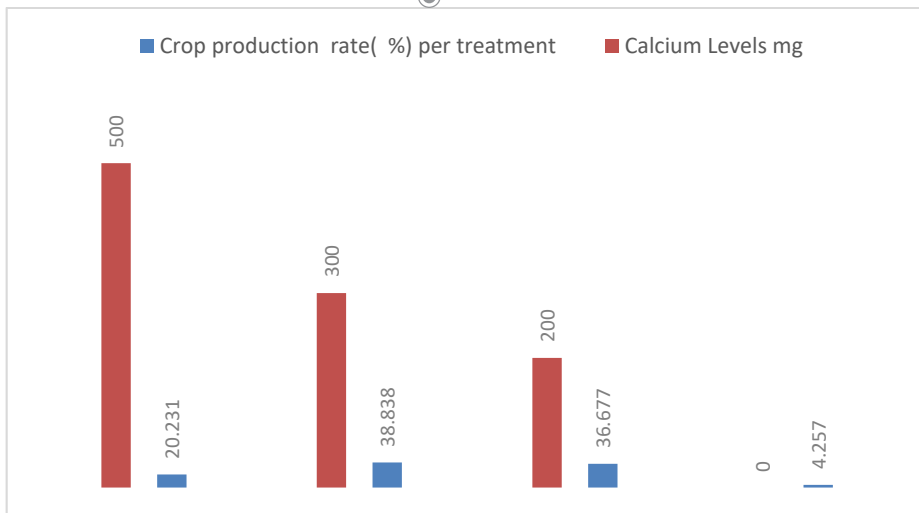
This is in accordance with the opinion of Praveen et al. [11] and Tanveer et al. [12] , which states that the addition of ca is able to increase of flowers, fertility of pollen and seeds.

The results of the test showed that treatment T3 produced the most amount of fruit (87.31 kg) , which was followed by the t1 treatment, which produced 82.45kg of fruit.

The results of the test showed that not spraying with ca at treatment t0 leading to lowest plant height of 60-80cm and recorded decrease fruit yield and Blossom-end rot incidence increased (BER ), which produced 9.57 kg unreformed fruits and 7 kg of distorted fruits.

The results are also proven when increased the concentration of the ca element to 500 in treatment t3, it has a negative effect on the plant, leading to decrease in fruit production Fruit yield (45.48). These results agree with Oke et al [13].





**Figure 1 shows crop production rate (%) per treatment**

It is clear from the figure above that the highest yield was in the treatment T2 , while the lowest yield was in the two treatments T0,T3, this agrees with Abdelhame, Which refer that the interaction of calcium as a foliar application enhanced tomato yield and nutrient[14].

#### I.V. CONCLUSION AND RECOMMENDS.

Ca deficiency causes severe reduction in crop growth and yield incidence of blossom-end rot (BER), hence Calcium nutrition is important for optimum growth, through discussion of results recorded from this trial, the following recommendations can be:

- Testing the field soil as a factor in understanding the levels of important nutrients that the plant needs.
- Consult an agricultural engineer when adding nutrients to the plant, both according to its need for them and at the required level.

- Must be made more similar experiments should be conducted for maximum yield In tomato plants or other plants.
- After tomatoes enter the flowering period; the demand for Calcium gradually increases to optimum growth plants.

## REFERENCES

[1]. Savic, S.; Liu, F, Stikic, R.; Jacobsen,S.E. Jensen, Life Science Journal, 2014.

[2]. C.R. and Jovanovic, Z. (2009). Comparative effects of partial root zone drying and deficit irrigation on growth and physiology of tomato plants. Arch Biol. Sci. Belgrade, 61: 801-810.

[3]. Jensen, C.R.; Battilani, A.; Plauborg, F.;Psarras, G.; Chartzoulakis, K.;

Janowiak, F.; Stikic, R.; Jovanovic,Z.; Li, G. and Qi, X. (2010),Deficit irrigation based on drought tolerance and root signaling in potatoes and tomatoes.

Agric. Water Manage. 98: 403-413.

[4]. Giovannucci, E. 1999. Tomatoes, tomatoes-based products, lycopene and cancer: Review of epide miologic literature. J. Natl. Cancer Inst. 91: 317

[5]. Di-Masico, P., S. Kaiser and H. Sies. 1989. Lycopene as the most efficient biological carotenoid singlet oxygen quencher. Arch. Biochem. Biophys. 274: 532-8. <https://doi.org/10.1016/0003->

[6]. Shaimaa Abd El-Hameed ,Abo-Hamad and Soad Soliman El-Feky , 2014 , Effect of Boron on Growth and Some Physiological Activities of Tomato Plant.

[7]. AKHOUNDNEJAD. Y.I, DASGAN, H. Y, ,2021, The Effect Of Foliar Calcium Application In Tomato (*Solanum Lycopersicum L.*) Under Drought Stress In Greenhouse Conditions, Turkey.

[8]. Simon, E.W. (1978). The symptoms of calcium deficiency in phosphide as an

alternative to methyl bromide in tomato crops. *Scientia Hort.*, 150: 54-58.

[9]. Holder, R. and Cockshull, K. E. 1990. Effect of humidity on the growth and yield of glasshouse tomatoes. *J. Hortic. Sci.* 65: 31–39.

[10].Holt, C. B. 1970. Measurement of tomato firmness with a universal testing machine. *J. Text. Stud.* 1: 491–501.

[11]. Praveena, R., Gosh, G., & Singh, V. (2018). Effect of foliar spray of boron and different zinc levels on the growth and yield of Kharif green gram (*Vigna radiata*). *Int. Curr. Microbiol. Appl. Science* 7 (8) : 1422 – 1428.

[12]. Muhammad Sajid, Abdur Rab, Syed Tanveer Shah, Naveed Ahmad ,Foliar application of calcium improves growth, yield and quality of tomato Cultivars , See at:

<https://www.researchgate.net/publication/336071445> , 2020.

[13]. Oke, M., Ahn, T., Schofield, A. and Paliyath, G. (2005) Effects of phosphorus fertilizer supplementation on processing quality and functional food ingredients in tomato. *Journal of Agricultural and Food*.

[14]. Ahmed Abdelhame,2018, Response of tomato plant to foliar application of calcium and potassium nitrate integrated with different phosphorus rates under sandy soil conditions, *Egyptian Journal of Soil Science*.