



Response of three Cucumber cultivars to Calcium foliar feeding.

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Abstract

A field experiment was carried out for the year 2022- 2023 in Al- Dahra region located within 45.25 longitude and 31.39 latitude to find out the response of cucumber plants to foliar spraying with different levels of calcium. The experiment included nine treatments in which three cultivars of cucumber were used, namely Maha, Saturn, and Ramie cultivars. Codes V₁, V₂ and V₃ were taken, respectively, and three calcium levels (0, 100, and 200 mg/ L). A factorial experiment was applied using completely randomized blocks (R.C.B.D) with three replications. The averages were compared according to the (L.S.D) test at a probability of 5%.

The two cultivars V₂ and V₃ were significantly superior in the characteristic of dry weight, which did not differ from each other, as they recorded the highest averages of 63.19 and 64.34 g. plant⁻¹, while the cultivar V₃ excelled in the characteristic (number of fruits, fruit weight, and yield of a single plant) as it gave averages for these characteristics, it amounted to (22.19 fruit per plant, 104.87 g per plant, and 2.314 kg per plant), respectively.

Calcium spray treatment 200 mg/ L was significantly superior in traits plant height and dry weight, and the two highest averages were 172.0 cm and 70.03 gm.plant⁻¹, while there is no significant difference with calcium 100 mg/ L in the number fruits, weight fruit, and one plant yield.

The two- way interaction had a significant effect on dry weight and fruit weight, as the mean of these two characteristics was 74.93 g. plant⁻¹ and 115.42 g. fruit⁻¹.

Keywords: cultivars, Calcium sulfate.

Introduction

Cucumber is one of the most widely cultivated summer crops around the world. Africa is considered its original home. Its fruits are harvested while they are green and unripe, so they do not resemble many cucurbits. The nutritional value of cucumber fruits lies in the fact that they contain vitamins and nutrients such as Ca, Fe, P and K, in addition to its many medicinal benefits, as it helps relieve pain resulting from skin irritation and included

in the treatment of many chronic diseases and the urinary tract, as it contains on amount of potassium 50- 80 mg per 100 g (Sumathi *et al.*, 2008 and Waseem, 2008).

Foliar nutrients are used to treat nutrient deficiencies, strengthen crops, and accelerate plant growth. According to a study by Oosterhuis (2007), the uptake of nutrients by the leaves is 10- 100 times faster than by the roots.

Calcium is considered as an essential nutrient for plant through its participation in building the cell wall of plant cells, as it

contains 60- 70% of the total tissue (Rab and Haq, 2012). It also acts as a regulatory ion in horticultural crops, as it receives cellular signals of the plasma membrane from many biotic and abiotic sources. As it causes changes in gene expression and thus it is an essential component of many enzymes (Dodd *et al.*, 2010). The study aimed at the possibility of improving the growth of cucumber crops, increasing production and improving its quality by using calcium.

Materials and Methods

The experiment was conducted in the Al-Dahra region located within 45.25

longitude and 31.39 latitude in the planting season 2022- 2023 to demonstrate the response three cucumber cultivars to foliar spraying with different levels of calcium sulfate (0, 100 and 200 mg/ L) and their effect on growth and yield according to a global experiment that included.

The first factor: three varieties of cucumber took the following symbols:

- 1- Maha (V₁)
- 2- Saturn (V₂)
- 3- Rami (V₃)

The second factor: three levels of calcium sulphate:

- 1- concentration of 0 mg/ L (control)
- 2- concentration of 100 mg/ L
- 3- Concentration of 200 mg/ L

Table 1: Soil physical and chemical properties.

Parameters	Unit	Value
clay	(%)	34
silt		18
sand		48
Texture		Sandy clay loam
N	Ppm	1.48
P		45.00
K		167.00
EC	ds.M-1	4.36
PH	-	7.80
TDS	Ppm	2.92
NaCl	Ppm	6.4

Cucumber seeds planted on 3/10/2022 and transferred in the soil of the greenhouse at the age of 30 days, after the experimental soil was divided into six terraces, each two terraces representing a repeat, the distance between them is 1.5 m, the length is 3 m, the width is 30 cm, the distance between the plants is 25 cm.

Studied traits:

At the end of the growing season, ten plants were randomly selected to measure their some vegetative and fruiting characteristics:

1. Plant height .
2. Dry weight (g)
3. Number of fruits. Plant⁻¹.

4. Fruit weight.

5. Single plant yield (Kg).

The results were analyzed statistically (ANOVA) Al- Rawi & Khalafalla (2003) using Genstat software, and coefficient averages were compared.

Discus the results

Plant height.

Table (2) shows that the cultivars were not significant for the plant height characteristic.

From the same table, we notice a significant difference for the above trait with an increase in the concentration of calcium spraying on cucumber plants, as

the treatment of spraying 200 mg/ L calcium was significantly superior to the rest of the treatments and recorded the average plant height was 172.0 cm, with an increase of 37.05%, while the control treatment gave an average plant height 125.50 cm, this result agreed with what he said (Nasrollahzadeh- asl *et al.*, 2015). This increase may be attributed to the role

of calcium in increasing the activity of plant cell division as a result of its effective effect in increasing the level of cytokinin that encourages cell division, in addition to the fact that calcium has a structural function in the cell wall and cell membranes (He *et al.*, 2015)

The dual interaction had no significant effect on this trait.

Table 2: Effect of Cultivar and Calcium sulfate on plant height .

variety (V)	Levels of Calcium (mg/ L)			Rat of variety
	0	100	200	
V ₁	130.6	145.4	164.7	146.9
V ₂	131.7	137.3	174.2	147.7
V ₃	114.1	143.7	177.2	145.0
Rat of Calcium	125.5	142.1	172.0	
L.S.D. (0.05)	V = N.S		Ca = 10.29	VCa = N.S

Dry weight (g).

It is noted from table (3) that two cultivas V₂ and V₃ were significantly superior to the cultivar V₁ in the dry weight characteristic, they did not differ significantly from each other and recorded a dry weight of 63.19 and 64.34 g, this result agreed with (Al- Motori, 2010 and Al- Taie, 2016). This may be attributed to the genetic characteristics of each variety. Also there was a significant effect with calcium spraying on the dry weight of cucumber plants, as it gave spraying

calcium at a concentration of 200 mg/ L the highest average liter for the above grade was 70.03g. However, the average dry weight for the control treatment was 47.98 g. This may be attributed to the role of calcium in activating photosynthesis, which reflected positively on the plant dry matter (Zhu *et al.*, 2015). That agrees with (Kim, 2019).

From table (3) we notice a significant difference in the dry weight of the binary overlap.

Table 3: Effect of Cultivar and Calcium sulfate on Dry weight .

Variety (V)	Levels of Calcium (mg/ L)			Rat of variety
	0	100	200	
V ₁	44.94	50.74	61.08	52.25
V ₂	50.92	64.56	74.08	63.19
V ₃	48.09	70.01	74.93	64.34
Rat of Calcium	47.98	61.77	70.03	
L.S.D. (0.05)	V = 4.197		Ca = 4.197	VCa = 7.270

Number of fruits

From table (4), it is noted that the V₃ variety outperformed the rest of the

cultivars in terms of the number of fruits, so that it gave fruits that amounted to 22.19 fruit. While the V₁ variety produced 18.24

fruit. The reason for this may be related to the genotypes of the variety and success of its cultivation in the region (Gustavo *et al.*, 2020).

Also, the table showed an increase in the number of fruits with an increase in the concentration of spraying with the element calcium. The spraying treatment (200 mg/ L) recorded the largest value 22.54 fruit, which did not differ significantly with a concentration of (100 mg/ L). this is what

he referred to (Nasrollahzadeh- asl *et al.*, 2015). This may be attributed to superior plant height and dry weight in tables (2) and (3), and increase in the formation of flowering principles, which led to an increase in the number of fruits.

While the results of the bilateral interaction between the factors of the study did not show significant differences in the characteristics of the number of fruits, table (4).

Table 4: Effect of Cultivar and Calcium sulfate on Fruits number per Plant⁻¹

variety (V)	Levels of Calcium (mg/ L)			Rat of variety
	0	100	200	
V ₁	16.09	19.25	19.93	18.42
V ₂	15.87	21.12	23.24	20.08
V ₃	18.49	23.63	24.45	22.19
Rat of Calcium	16.81	21.33	22.54	
L.S.D. (0.05)	V = 1.903		Ca = 1.903	VCa = N.S

Fruit weight (g)

Table (5). The cultivars indicated significant differences among in terms of fruit weight between the cultivars, as the V₃ cultivar gave the highest mean for this trait, which amounted to 104.87 g. fruit, with a percentage increase of 16.08%. This may be related to the genetic characteristics of the cultivar.

From the same table, an increase in fruit weight was observed gain with calcium spray. The calcium spray (200 mg/ L) recorded an average fruit weight 105.78 g. fruit, which in turn did not differ from the level of (100 mg/ L). The reason for increase may be due to the efficiency of

biomass and the increase in dry weight table (3), the food representation processes through the important role of calcium in the mechanism action of guard cells and increase in the concentration of CO₂ between cells and the accumulation of dry matter and its transfer to the fruit, which led to reflected positively on weight of the fruit in addition to calcium maintains the stability of the cell's plasma membrane and thus the ion exchange balance (Dodd *et al.*, 2010 and Qu *et al.*, 2012).

While the two- way interaction had an effect on the fruit weight characteristics, an average of 115.42 g was recorded.

Table 5: Effect of Cultivar and Calcium sulfate on Fruit weight .

variety (V)	Levels of Calcium (mg/ L)			Rat of variety
	0	100	200	
V ₁	73.88	95.63	101.50	90.34
V ₂	93.86	104.36	100.43	99.55

V ₃	89.21	109.99	115.42	104.87
Rat of Calcium	85.65	103.32	105.78	
L.S.D. _(0.05)	V = 3.319		Ca = 3.319	VCa = 5.748

1- Single plant yield (Kg)

The table below indicated that V₃ variety was significantly superior in yield per plant and average 2.314 Kg, while both V₁ and V₂ variety recorders yields of 1.490 and 1.933 Kg respectively. This may be due to the genetic characteristics of the V₃ variety, in addition to its suitability to the conditions of the region.

We also note the superiority of the yield of one plant with an increase in the calcium concentration as spraying 200 mg of

calcium on the plant gave a yield 2.292 Kg. This result agreed with his findings (Majeed and Al- Hamzawi, 2010). Perhaps reason due to the positively results number and weight fruits in tables (4) and (5) aforementioned. This result agreed with what was reached (Qustavo *et al.*, 2020).

While the results of the bilateral interaction between the two study factors did not show any significant differences for the above trait, table (6).

Table 6: Effect of Cultivar and Calcium sulfate on single plant production

variety (V)	Levels of Calcium (mg/ L)			Rat of variety
	0	100	200	
V ₁	1.540	1.037	1.893	1.490
V ₂	1.490	2.120	2.190	1.933
V ₃	1.553	2.597	2.793	2.314
Rat of Calcium	1.360	2.086	2.292	
L.S.D. _(0.05)	V = 0.246		Ca = 0.246	VCa = N.S

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