



Enhancement of Growth and Productivity of Cucumber (*Cucumis sativus* L.) through Calcium Based Fertilizer

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ABSTRACT

The present study was carried out at Research Farm, Krishi Vigyan Kendra (RVSKVV), Manavar (Dhar), during *kharif* season 2020. Total 7 treatments were used in Randomized Block Design (RBD) with three replications to study the effect of calcium based fertilizer on yield attributes and yield of cucumber. All the treatments significantly improved growth, attributed and yield of cucumber as compared RDF alone treatments. Among the various treatments the maximum plan height and flower setting was recorded with the application of RDF + Turbocalcio Plus @ 2 kg at 25 DAT and 40 DAT (T₅) in comparison to other treatments. However, the less number of days (31.50) to flower appearance was recorded with the application of RDF + Turbocalcio Plus @ 2 kg at 25 DAT and 40 DAT. Significantly higher yield parameters viz., length of fruit (15.85 cm), girth of fruits (12.06 cm), weight of fruits (146.83 g/fruit) and number of fruit/plant (16.50) and fruit yield (324.67 q/ha) were RDF + Turbocalcio Plus @ 2 kg at 25 DAT and 40 DAT (T₅) which was statistically similar with RDF + Turbocalcio Plus @ 2 kg at 25 DAT and 60 DAT (T₆) and RDF + Turbocalcio Plus @ 1 kg at 25 DAT 2 kg at 40 DAT and 2 kg at 60 DAT (T₇).

Key Words: Calcium, Cucumber, Flower appearance, flower setting, Fruit yield

INTRODUCTION

Cucumber (*Cucumis sativus* L.) is extensively grown vegetable crop of *Cucurbitaceae* family. Due to its economic importance as a high value vegetable crop both in domestic and overseas markets due to more consumer preferences quality production of cucumber is the need of the day (Jakhar *et al*, 2016). Calcium is macronutrient which plays a very important role in plant growth and nutrition, as well as in cell wall deposition. Lower levels of calcium in plants affect growth and development of plant. As a soil amendment, calcium helps to maintain chemical balance in the soil, reduces soil salinity, and improves water penetration leads to improve crop growth, development and yield (Shafeek *et al*, 2013 and Siddique *et al*, 2017).

Calcium (Ca) is a major component of cell walls having 60-70% of its total tissue. It helps in maintaining cell wall integrity and membrane permeability. Calcium is the basic component of many enzymes (Akink and Simsek, 2004). Application of supplemental Ca decreased the Na content in plant parts and increased the K content (Dabuxilatu, 2005). It is considered as important mineral elements that regulates fruit quality and enhances its post-harvest life through decrease the physiological disorders like water core, bitter pit and internal breakdown. As a versatile signaling ion of calcium (Ca²⁺) act at multiple sites in diverse networks of signaling cascades. It serves as a major regulatory ion in Horticultural crops. These pathways receive signals from a wide array of biotic and abiotic sources, and cause changes

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Enhancement of Growth and Productivity of Cucumber

Table 1. Effect of calcium based fertilizer on growth parameters of cucumber.

Sr. No.	Treatment	Plant height at harvest	Flower appearance (days)	Flower setting		
				35 DAS	50 DAS	70 DAS
1	T ₁ : RDF (Without calcium treatment)	151.50	33.00	3.02	12.20	2.60
2	T ₂ : RDF + Turbocalcio Plus @ 2 kg at 25 DAT	151.97	31.83	3.25	13.47	2.60
3	T ₃ : RDF + Turbocalcio Plus @ 2 kg at 40 DAT	151.90	32.67	3.50	13.93	4.43
4	T ₄ : RDF + Turbocalcio Plus @ 2 kg at 60 DAT	153.50	32.47	3.63	14.20	4.47
5	T ₅ : RDF + Turbocalcio Plus @ 2 kg at 25 DAT and 40 DAT	156.23	31.50	3.93	15.23	5.43
6	T ₆ : RDF + Turbocalcio Plus @ 2 kg at 25 DAT and 60 DAT	154.57	31.83	3.97	15.07	5.33
7	T ₇ : RDF + Turbocalcio Plus @ 1 kg at 25 DAT 2 kg at 40 DAT and 2 kg at 60 DAT	154.77	31.73	3.50	15.03	5.18
	SEm±	0.88	0.28	0.09	0.24	0.16
	C.D at 5%	2.71	0.87	0.26	0.75	0.50

in gene expression (Dodd *et al*, 2010). Ca²⁺ as an essential plant nutrient actively participates in cell wall structure, cellular signaling responses, and membrane function. Calcium deficiency causes a decline in the growth, reduce leaf size, yield, and in extreme situation it also causes the necrosis of young leaves (Hao and Papadopoulos, 2004 and Gustavo *et al*, 2020). With an objective to improve the cucumber production and quality by supplementing calcium, this study was undertaken.

MATERIALS AND METHODS

This study was carried at Research Farm, Krishi Vigyan Kendra (RVSKVV), Manawar (Dhar), during *kharif* season 2020. The experiment was laid out on Randomized Block Design (RBD) with seven treatments and replicated three times. This field study was conducted for improving the productivity and quality of cucumber in relation to 7 treatments (T₁ : RDF (without calcium treatment), T₂: RDF + Turbocalcio Plus @ 2 kg at 25 DAT, T₃: RDF + Turbocalcio Plus @ 2 kg at 40 DAT, T₄: RDF + Turbocalcio Plus @ 2 kg at 60 DAT, T₅ : RDF + Turbocalcio Plus @ 2 kg at 25 DAT and 40 DAT, T₆: RDF + Turbocalcio Plus @ 2 kg at 25 DAT and 60 DAT and T₇: RDF + Turbocalcio Plus

@ 1 kg at 25 DAT 2 kg at 40 DAT and 2 kg at 60 DAT). The experimental soil was medium to black soil with pH of 7.5 and organic carbon 0.38per cent. The soil was low in available nitrogen (220.2 kg/ha) medium in available phosphorus (14.10 kg/ha) and high in potassium (460.5 kg/ha). Sowing of cucumber seeds were done manually in each treatments plot. Basal dose of NPK (40-60-60) kg/ha were applied to all treatments plot by soil dressing method. Other cultural practices were also performed as per recommended for cucumber cultivation. The observations were recorded on various growth parameters plant height, flower appearance. The quality parameters *viz.*, length of fruits, girth of fruits, weight of fruits and flower setting at 35, 50 & 70 DAT were recorded. The Yield parameters were recorded number of fruits/plant (picking wise), number of fruits/plant, fruit yield/plant and yield/ha. The data obtained were statistically analyzed.

RESULTS AND DISCUSSION

The plant height, flower appearance and flower setting were significantly affected by the application of different doses of calcium based fertilizer (Table 1). The data showed that taller plant were recorded

Enhancement of Growth and Productivity of Cucumber

Table 2. Effect of calcium based fertilizer on yield attributes and yield of cucumber.

Sr. No.	Treatment	Length of fruit (cm)	Girth of fruits (cm)	Weight of fruits (g)	No. of fruit/plant	Fruit yield (q/ha)
1	T ₁ : RDF (Without calcium treatment)	14.10	11.54	136.73	12.47	241.03
2	T ₂ : RDF + Turbocalcio Plus @ 2 kg at 25 DAT	13.47	11.94	137.50	13.40	248.77
3	T ₃ : RDF + Turbocalcio Plus @ 2 kg at 40 DAT	14.74	11.73	138.50	14.77	270.57
4	T ₄ : RDF + Turbocalcio Plus @ 2 kg at 60 DAT	15.13	11.67	140.23	15.47	305.40
5	T ₅ : RDF + Turbocalcio Plus @ 2 kg at 25 DAT and 40 DAT	15.85	12.06	146.83	16.50	324.67
6	T ₆ : RDF + Turbocalcio Plus @ 2 kg at 25 DAT and 60 DAT	15.79	11.97	146.23	16.23	314.67
7	T ₇ : RDF + Turbocalcio Plus @ 1 kg at 25 DAT 2 kg at 40 DAT and 2 kg at 60 DAT	15.69	11.67	146.33	16.30	312.97
	SEm±	0.20	0.09	0.36	0.33	4.90
	C.D at 5%	0.61	0.27	1.10	1.02	15.11

with the application of RDF + Turbocalcio Plus @ 2 kg at 25 DAT and 40 DAT (T₅) which was statistically similar with RDF Turbocalcio Plus @ 2 kg at 25 DAT and 60 DAT (T₆), RDF + Turbocalcio Plus @ 1 kg at 25 DAT 2 kg at 40 DAT and 2 kg at 60 DAT (T₇) and RDF + Turbocalcio Plus @ 2 kg at 60 DAT. While, the smaller plants were noticed with the application of RDF only (without calcium). The result was in confirmation with Rab and Haq (2012) who observed that application of calcium at the rate of 0.3% significantly increased plant height. The maximum flower setting at 35, 50 and 70 DAS was observed under RDF + Turbocalcio Plus @ 2 kg at 25 DAT and 40 DAT (T₅) which was at par with RDF Turbocalcio Plus @ 2 kg at 25 DAT and 60 DAT (T₆), RDF Turbocalcio Plus @ 1 kg at 25 DAT 2 kg at 40 DAT and 2 kg at 60 DAT (T₇) and RDF + Turbocalcio Plus @ 2 kg at 60 DAT. The results that the less number of days (31.50) to flower appearance was recorded with the application of RDF + Turbocalcio Plus @ 2 kg at 25 DAT and 40 DAT (T₅) followed by T₇, T₆, T₄ and T₂. While, the more number of days (33.0) taken into

flower appearance was recorded in RDF alone (T₁). Natesh *et al*, (2005) reported that macronutrient has beneficial effect on the growth of chilies, while optimum dose of these macronutrients have significant effect on days to flowering. Tegopati *et al*, (1997) stated that calcium chloride maintained higher total chlorophyll content therefore it might affect days to flowering of cucumber plant. These results were in line with the findings of Jan *et al*, (2013) and Siddique *et al*, (2017).

The yield attributes and yield of cucumber significantly affected by the application of different doses of calcium based fertilizer (Table 2). Among the various treatments, significantly higher yield parameters *viz.*, length of fruit (15.85 cm), girth of fruits (12.06 cm), weight of fruits (146.83 g/fruit) and number of fruit/plant (16.50) were RDF + Turbocalcio Plus @ 2 kg at 25 DAT and 40 DAT (T₅) which was statistically similar with RDF + Turbocalcio Plus @ 2 kg at 25 DAT and 60 DAT (T₆) and RDF + Turbocalcio Plus @ 1 kg at 25 DAT 2 kg at 40 DAT and 2 kg at 60 DAT (T₇). Similarly, highest fruit yield (324.67 q/ha) was also recorded

Enhancement of Growth and Productivity of Cucumber

with the application RDF + Turbocalcio Plus @ 2 kg at 25 DAT and 40 DAT (T_5) which was statistically similar with RDF + Turbocalcio Plus @ 2 kg at 25 DAT and 60 DAT (T_6) and RDF Turbocalcio Plus @ 1 kg at 25 DAT 2 kg at 40 DAT and 2 kg at 60 DAT (T_7). However, the lowest yield attributes and yield of cucumber was recorded under RDF treatment. This result comes in accordance with the results of El-Tohamy *et al*, (2006) who found that, spraying of pepper plant with calcium chloride maintained higher total chlorophyll content. This in turn might affect flower number and fruit setting of cucumber. The results were in agreement with that of Chapagain and Menzies (2003) observed that application of Calcium can significantly increase the reproductive growth and yield. These results are in line with the findings of Al-Hamzawi (2010), Siddique *et al*, (2017) and Gustavo *et al*, (2020).

CONCLUSION

It is concluded that higher growth attributes and productivity of cucumber could be achieved by application of RDF + Turbocalcio Plus @ 2 kg at 25 DAT and 40 DAT.

REFERENCES

- Akinki I B and Simsek M (2004). Ameliorative effect of potassium and calcium on the salinity stress in embryo culture cucumber (*Cucumis sativus* L.) *J Biological Sci* **4**: 361-365.
- Al-Hamzawi M K (2010). Effect of calcium nitrate, potassium nitrate and Anfaton on growth and storability of plastic houses cucumber (*Cucumis sativus* L.). *American J Pl Physi* **5**(5): 278-290.
- Chapagain R and Menzies E (2003). Influence of calcium and magnesium on the growth and yield of tomato. *J Veg Sci* **17**(3): 132-139.
- Dabuxilatu I M (2005). Interactive effect of salinity and supplemental calcium application on growth and ionic concentration of soybean and cucumber plants. *Soil Sci Plant Nutr* **51**: 549-555.
- Dodd A N, Kudla J and Sanders D (2010). The language of calcium signaling. *Ann Rev Plant Biol* **61**: 593-620.
- El-Tohamy W A, Ghoname A A and Abou-Hussein S D (2006). Improvement of pepper growth and productivity in sandy soil by different fertilization treatments under protected cultivation. *J Applied Sci Res* **2**(1): 8-12.
- Gustavo E, González-Terán, Fernando C Gómez-Merino, Libia I, Trejo-Téllez (2020). Effects of silicon and calcium application on growth, yield and fruit quality parameters of cucumber established in a sodic soil. *Acta Sci Pol Hortorum Cultus* **19**(3):149-158.
- Hao X and Papadopoulos A P (2004). Effects of calcium and magnesium on growth, fruit yield and quality in a fall greenhouse tomato crop grown on Rockwool. *J Pl Sci* **83**: 903-902.
- Jakhar R K, Singh A K and Kumawat N (2016). Yield attributes and yield of cucumber (*Cucumis stivus* L.) cultivars as influenced by growing conditions in arid zone of Rajasthan. *Environm Ecol* **34** (4C): 2258-2261.
- Jan I, Rab A and Sajid M (2013). Influence of calcium chloride on physical characteristics and soft rot incidence on fruit of apple cultivars. *The J Anim Plant Sci* **23**(5): 1352-1359.
- Natesh N, Vyakaranahal B S, Shekhargouda M and Deshpande V K (2005). Effect of Micronutrients and Organics on Growth, Seed Yield and Quality of Chilli. Department of Seed Science and Technology, University of Agricultural Sciences, Dharwad-580 005. *Karnataka J Agric Sci* **18**(2): 334-337.
- Rab A and Haq I (2012). Foliar application of calcium chloride and borax influences plant growth, yield, and quality of tomato (*Lycopersicon esculentum* Mill.) fruit. *Turk J Agric For* **36**: 695-701.
- Shafeek M R, Helmy Y I, El-Tohamy W A and El-Abagy H M (2013). Changes in growth, yield and fruit quality of cucumber (*Cucumis sativus* L.) in response to foliar application of calcium and potassium nitrate under plastic house conditions. *Res J Agric Biol Sci* **9**(3): 114-118.
- Siddique S, Ayub G, Nawaz Z, Zeb S, Khan F S, Ahmad N, Khan A and Rauf K (2017). Enhancement of growth and productivity of cucumber (*Cucumis sativus*) through foliar application of calcium and magnesium. *Pure Appl Biol* <http://dx.doi.org/10.19045/bspab.2017.60040>
- Tegopati B, Prahardini-dan PER and Santoso P (1994). Pengaruh paclobutrazol, pemupukan dan pengairan terhadap pembungaan dan produksi mangga. *Bull Penel Hort* **6**(1): 27-3 20

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