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Effect of nano calcium and silicon on growth, yield and quality of gerbera (*Gerbera jamesonii* Bolus Ex. Hook) grown under shade net conditions

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Abstract

The experiment entitled “Effect of Nano calcium and Silicon on growth, yield and quality of Gerbera (*Gerbera jamesonii* Bolus Ex. Hook) grown under shade net conditions” was conducted during the Rabi season of the year 2022-2023 at College of Horticulture, Mojerla, Sri Konda Laxman Telangana State Horticultural University. Among the treatments, the treatment T₉ (Nano calcium @ 2 g/l + Silicon @ 0.5 g/l) (3 sprays at 30, 60 and 90 DAT) recorded maximum plant height (54.50 cm), plant spread in East-West direction (55.13 cm), plant spread in North-South direction (65.30 cm), number of leaves plant⁻¹ (28.40), number of suckers plant⁻¹ (5.60), leaf area (130.09 cm²), chlorophyll content (79.62), flower diameter (11.05 cm), flower stalk length (55.00 cm), number of flowers plant⁻¹ One month⁻¹ (5.60), total flower yield plant⁻¹ (22.19), longevity of the flowers on plant (18.66 days), vase life (11.46 days), minimum scape bending curvature (7.50 degrees), whereas minimum number of days taken to first flower bud initiation (45.00 days), number of days taken to first flower opening (55.00 days) was recorded by T₅ treatment (Silicon @ 0.5 g/l) (3 sprays at 30,60 and 90 DAT). However, T₁ Control (Water spray) (3 sprays at 30, 60 and 90 DAT) recorded minimum in all the parameters.

Keywords: Nano calcium, silicon, gerbera

Introduction

Gerbera (*Gerbera jamesonii*) is leading cut flower and ranks among the top ten cut flowers of the world with wider applicability in the flower industry as cut flower and potted plant. It is also known as Transvaal daisy, Barbeton daisy or African daisy and belongs to the family Asteraceae. It is a dwarf stem less herbaceous perennial herb growing in clump with solitary flower heads termed capitulum on a long slender stalk. It is popular because of its attractive color, long vase life and suitability for long distance transport (Chauhan, 2005) ^[1].

It is used for fresh and dry flower arrangement, exhibition, decoration, bouquet preparation (Patra *et al.*, 2015) ^[2]. Local and improved cultivars are grown in garden, flower bed, pots, borders, dish garden and rock garden. Flowers are different colors like white cream, yellow, pink, orange, brick red, scarlet, salmon, maroon and bicolor and are available in single, semi-double or double form.

Nano calcium, containing 75% calcium carbonate, 5% silica, 4% magnesium carbonate these nano calcium particles are extremely small and extracted from natural lime stone deposits, that enhance their ability to enter plant stomata, when applied and decompose into calcium oxide (CaO) and carbon dioxide (CO₂). Carbon dioxide is immediately taken into the process of photosynthesis (Cai *et al.*, 2009) ^[3]. Calcium is non-mobile and is absorbed as Ca⁺² ions. This is responsible for stability of cell wall and cell membrane as well as cell development.

Silicon is the 2nd most available element on Earth crust, about 32% is present in soil by weight and 1% to 10% is present in plant dry matter. This element is mostly required during vegetative as well as reproductive growth of the plant to attain healthy and maximum yield from plant (Savanth *et al.*, 1997) ^[4]. Its effect is related to improving plants resistance mechanism and the control of diseases and pests thereby enhances yield.

Materials and Methods

The present investigation entitled “Effect of Nano calcium and Silicon on growth, yield and quality of Gerbera (*Gerbera jamesonii* Bolus Ex. Hook) grown under shade net conditions” was carried out during the *Rabi* season of the year 2022-2023 at College of Horticulture, Mojerla, Sri Konda Laxman Telangana State Horticultural University. The design adopted was Completely Randomized Design with Nine treatments replicated thrice. Treatments include *viz.*, T₁-Control (Water spray), T₂-Nano calcium @ 1 g/l, T₃-Nano calcium @ 2 g/l, T₄-Silicon @ 0.25 g/l, T₅- Silicon @ 0.5 g/l, T₆-Nano calcium @ 1 g/l + Silicon @ 0.25 g/l, T₇-Nano calcium @ 1 g/l + Silicon @ 0.5 g/l, T₈-Nano calcium @ 2 g/l + Silicon @ 0.25 g/l, T₉-Nano calcium @ 2 g/l + Silicon @ 0.5 g/l

Nano calcium and Silicon were sprayed on the foliage at 3 intervals *i.e.*, @ 30,60 and 90 Days After Transplanting (DAT) and the observations recorded were plant height (cm), plant spread E-W & N-S (cm) at first flowering and 5 months, number of leaves plant⁻¹, number of suckers plant⁻¹, leaf area, chlorophyll content, number of days taken to first flower bud initiation, number of days taken to first flower opening, flower diameter, flower stalk length, longevity of the flowers on plant, vase life, scape bending curvature, number of flowers plant⁻¹ one month⁻¹, flower yield plant⁻¹, total flower yield plant⁻¹ were recorded and the data was statistically analyzed.

Results and Discussion growth parameters

The effect of Nano calcium and Silicon on growth, yield and quality of Gerbera (*Gerbera jamesonii* Bolus Ex. Hook) grown under shade net conditions and the results of the experiment were presented in Table 1 to 3

Plant height (cm) at first flowering and 5 Months

With respect to plant height in Gerbera, treatment T₉ (Nano calcium @ 2 g/l + Silicon @ 0.5 g/l) recorded maximum plant height 32.19 cm, 54.50 cm at first flowering and 5 months respectively.

Whereas T₁ Control (Water spray) recorded minimum plant height 19.00 cm, 37.60 cm at first flowering and 5 months respectively. It is might be due to Nano calcium effects on the cell division and elongation, thereby resulting in enhanced vegetative growth (Ali *et al.*, 2023) [5]. The results are conformity with the findings of Mirzaee Esgandian *et al.* (2020) [6] in gerbera.

Plant spread E-W (cm) at first flowering and 5 Months

Among the treatments T₉ (Nano calcium @ 2 g/l + Silicon @ 0.5 g/l) recorded highest plant spread in East-West direction 50.00 cm, 55.13 cm at first flowering and 5 months respectively. Whereas T₁ Control (Water spray) recorded lowest plant spread in East- West direction 40.86 cm, 43.66 cm at first flowering and 5 months respectively.

Plant spread N-S (cm) at first flowering and 5 Months

Among the treatments T₉ (Nano calcium @ 2 g/l + Silicon @ 0.5 g/l) recorded highest plant spread in North-South direction 55.53 cm, 65.30 cm at first flowering and 5 months respectively. Whereas T₁ Control (Water spray) recorded lowest plant spread in North-South direction 47.96 cm, 50.73 cm at first flowering and 5 months respectively. The increase in plant spread may be attributed due to calcium helping in

cell division and cell extension in shoot tissues (El Habbasha *et al.*, 2015) [7].

Number of leaves plant⁻¹ at first flowering

The treatment T₉ (Nano calcium @ 2 g/l + Silicon @ 0.5 g/l) recorded highest number of leaves plant⁻¹ (28.40), whereas T₁ Control (Water spray) recorded lowest number of leaves plant⁻¹ (19.09). The increase in number of leaves plant⁻¹ may be due to Calcium helping in cell division and cell elongation in shoots and establishing new cell wall parts (Burstrom, 1968) [8] and Silicon enhancing induction of leaf initial breaks *i.e.* differentiation of leaf primordial in the apical growing region, which led to more leaf number. These findings are in accordance with the findings of Abdel-Latif *et al.* (2019) [9] in garlic; Shehata, (2018) [10] in cucumber; El- Dayem, (2018) [11] in globe artichoke and Jalilzadeh *et al.* (2018) [12] in rose.

Number of Suckers plant⁻¹ at 5 Months

The treatment T₉ (Nano calcium @ 2 g/l + Silicon @ 0.5 g/l) recorded highest number of suckers plant⁻¹ (5.60). Whereas T₁ Control (Water spray) recorded lowest number of suckers plant⁻¹ (2.50). The increase in number of suckers plant⁻¹ may be due to physiological action of Nano calcium and Silicon in increasing the proportion of cell division thereby resulting in production of more number of suckers.

Leaf area at 5 Months (cm²)

Among the treatments, T₉ (Nano calcium @ 2 g/l + Silicon @ 0.5 g/l) recorded significantly highest leaf area (130.09 cm²), whereas lowest leaf area was recorded in T₁ Control (Water spray) (103.48 cm²). The enhanced growth character of gerbera may be due to Nano calcium foliar application might be due to breakdown of Nano calcium particles in intercellular spaces of leaf resulted in releasing gaseous CO₂, which enhancing the CO₂ concentration at the photo-synthetically active area within the plant leaves and by enhancing photosynthetic efficiency that led to have more leaf area (EL-Aal, 2018 in soya bean) [13]. The present findings are comparable with that of Mirzaei *et al.* (2019) [14] in gerbera.

Chlorophyll content (SPAD meter reading) at first flowering

Among the treatments, the maximum chlorophyll content (SPAD meter reading) was obtained in T₉ (Nano calcium @ 2 g/l + Silicon @ 0.5 g/l) (79.62), whereas the minimum chlorophyll content (SPAD meter reading) was recorded in T₁ Control (water spray) (49.40). It is might be due to Calcium supply had an erratic effect on tissue Magnesium concentration, Magnesium being a constituent of chlorophyll might have increased the chlorophyll content (SPAD meter reading) of the plant (Allison *et al.*, 2001 in potato) [15]. The present findings are comparable with that of Chehrazi *et al.* (2018) [16] in gladiolus and Garcla-Gonzalez *et al.* (2022) [17] in gerbera.

Flowering and yield parameters

The effect of Nano calcium and Silicon on growth, yield and quality of Gerbera (*Gerbera jamesonii* Bolus Ex. Hook) grown under shade net conditions and the results of the experiment were presented in Table 4.

Number of days taken to first flower bud initiation (days)

Minimum number of days taken for first flower bud initiation

(45 days) was recorded in T₅ (Silicon @ 0.5 g/l). Whereas T₁ Control (Water spray) recorded maximum number of days taken for first flower bud initiation (58.83 days). The early flower bud initiation can be attributed due to foliar application of Silicon, which slightly changed the leaf concentrations of macronutrients, such as Sulphur, potassium, and micronutrients such as, boron, copper, iron and manganese (Kamenidou *et al.*, 2010) [18]. The present investigation was in consistent with other reports of Seydmohammadi *et al.* (2020) [19] in lisianthus.

Number of days taken to first flower opening (days)

Minimum number of days taken to first flower opening (55.00 days) was recorded in T₅ (Silicon @ 0.5 g/l). Whereas T₁ Control (Water spray) recorded maximum number of days taken to first flower opening (71.30 days). These findings are in line with the reports of Seydmohammadi *et al.* (2020) [19] in lisianthus.

Flower diameter (cm)

The treatment T₉ (Nano calcium @ 2 g/l + Silicon @ 0.5 g/l) recorded maximum flower diameter (11.05 cm), whereas the minimum flower diameter was recorded in T₁ Control (Water spray) (8.68 cm). The increase in flower diameter due to its luxurious vegetative growth resulted in more green biomass of plant, that favored higher source to sink ratio represented the more diameter of flower. The results are in conformity with the findings of Kasem *et al.* (2023) [20] in dahlia.

Flower stalk length (cm)

Maximum flower stalk length (55.00 cm) was recorded in T₉ (Nano calcium @ 2 g/l + Silicon @ 0.5 g/l), whereas the minimum length (46.00 cm) of flower stalk was recorded in T₁ Control (Water spray). Its due to the same treatment recorded maximum flower diameter and flower stalk diameter. The present investigation was in consistent with other reports of Mohammadi Torkashvand, (2015) [21] in gerbera.

Number of flowers plant⁻¹ one month⁻¹

Among the treatments T₉ (Nano calcium @ 2 g/l + Silicon @ 0.5 g/l) recorded maximum number of flowers plant⁻¹ one month⁻¹ (5.60). While the minimum number of flowers plant⁻¹ one month⁻¹ was recorded in T₁ Control (Water spray) (2.66). Maximum number of flowers plant⁻¹ one month⁻¹ was due to the fact that, Nano calcium in combination with Silicon treated plants produced more number of leaves and leaf area which might have resulted in production and accumulation of more photosynthates that were diverted to the sink resulting in more number of flowers. These findings are in line with the reports of Tofighi Alikhani *et al.* (2021) [22] in gerbera.

Flower yield plant⁻¹ (Numbers)

The maximum flower yield plant⁻¹ was recorded in T₉ (Nano calcium @ 2 g/l + Silicon @ 0.5 g/l) in the month of March (2.86), in April (4.73), in May (5.60), and in the month of June (9.00). The minimum flower yield plant⁻¹ was recorded

in T₁ Control (Water spray) in the month of March (0.00), in April (2.26), in May (3.13) and in the month of June (5.26). Comparison over the months with regards to flower yield plant⁻¹ was observed maximum in T₉ (Nano calcium @ 2 g/l + Silicon @ 0.5 g/l) in the month of June due to the more number of suckers produced because of the favorable weather conditions.

Total flower yield plant⁻¹ (at the end of the experiment)

Among all the treatments maximum total flower yield plant⁻¹ was recorded in T₉ (Nano calcium @ 2 g/l + Silicon @ 0.5 g/l) (22.19). While the minimum total flower yield plant⁻¹ was recorded in T₁ Control (Water spray) (10.65).

Quality parameters

The effect of Nano calcium and Silicon on growth, yield and quality of Gerbera (*Gerbera jamesonii* Bolus Ex. Hook) grown under shade net conditions and the results of the experiment were presented in Table 5.

Longevity of the flowers on plant (days)

Among the treatments T₉ (Nano calcium @ 2 g/l + Silicon @ 0.5 g/l) recorded significantly maximum value (18.66 days) for longevity of the flowers on plant. While the minimum value for longevity of the flowers on plant (12.20 days) was recorded in T₁ Control (Water spray). It's due to Calcium induced delay in petal senescence by protecting membrane proteins and phospholipids from degradation, thus preserving the integrity of the membrane, and reducing ethylene production, hence maintaining tissue vitality (Torre *et al.*, 1999) [23]. The results are in conformity with the findings of El-Serafy, (2015) [24] in carnation.

Vase life (days)

Among all the treatments, the longest vase life (11.46 days) was recorded in T₉ (Nano calcium @ 2 g/l + Silicon @ 0.5 g/l), whereas minimum vase life (6.20 days) was recorded in T₁ Control (Water spray). Its due to Calcium effects on cell wall integrity and stability thereby protects from cell wall degrading enzymes (Abdolmaleki, *et al* 2015) [25]. Similar findings were reported by Mazraei *et al.* (2021) [26] in gerbera.

Scape bending curvature (degrees)

The minimum scape bending curvature was recorded in T₉ (Nano calcium @ 2g/l + Silicon @ 0.5 g/l) (7.50°), whereas significantly maximum curvature (51.40°) was recorded under T₁ control (Water spray).

The decrease in scape bending and curvature with exogenous application of Calcium may be due to high concentration of Ca²⁺ in cellular tissue affects pectin levels and aids in increasing the scape hardness by strengthening the calcium pectin combination in the cell walls, thereby slowed the conversion of insoluble pectin (IP) to water soluble pectin (WSP) during vase life resulting in less stem bending (Park, and Kim, 2022) [27]. These findings are in accordance with the findings of Garcla-Gonzalez *et al.* (2022) [17] in gerbera.

Table 1: Effect of Nano calcium and Silicon on plant height (cm) of Gerbera at first flowering and 5 months

Treatments	Plant Height (cm) at First flowering	Plant Height (cm) at 5 Months
T ₁ : Control (Water spray)	19.00 ^f	37.60 ^e
T ₂ : Nano calcium @ 1 g/l	30.30 ^{ab}	52.16 ^{ab}
T ₃ : Nano calcium @ 2g/l	30.68 ^{ab}	52.43 ^{ab}
T ₄ : Silicon @ 0.25 g/l	22.12 ^e	40.66 ^d
T ₅ : Silicon @ 0.5 g/l	25.63 ^d	45.73 ^c
T ₆ : Nano calcium @ 1 g/l + Silicon @ 0.25 g/l	26.20 ^c	48.03 ^{bc}
T ₇ : Nano calcium @ 1 g/l + Silicon @ 0.5 g/l	28.54 ^b	49.33 ^b
T ₈ : Nano calcium @ 2 g/l + Silicon @ 0.25 g/l	32.01 ^{ab}	53.33 ^{ab}
T ₉ : Nano calcium @ 2 g/l + Silicon @ 0.5 g/l	32.19 ^a	54.50 ^a
S.E(m) ±	0.54	0.50
C.D @ 5%	1.64	1.49

Table 2: Effect of Nano calcium and Silicon on plant spread (cm) of Gerbera at first flowering and 5 Months

Treatments	Plant spread (cm)			
	(E-W direction)		(N-S direction)	
	First flowering	5 Months	First flowering	5 Months
T ₁ : Control (Water spray)	40.86 ^d	43.66 ^f	47.96 ^e	50.73 ^e
T ₂ : Nano calcium @ 1 g/l	46.60 ^b	51.90 ^c	53.20 ^b	57.90 ^{bc}
T ₃ : Nano calcium @ 2 g/l	48.53 ^{ab}	53.50 ^b	54.40 ^{ab}	58.50 ^{bc}
T ₄ : Silicon @ 0.25 g/l	43.80 ^c	46.82 ^e	51.80 ^d	52.16 ^d
T ₅ : Silicon @ 0.5 g/l	45.40 ^{bc}	48.43 ^d	52.40 ^c	53.80 ^{cd}
T ₆ : Nano calcium @ 1 g/l + Silicon @ 0.25 g/l	45.60 ^{bc}	50.20 ^{cd}	52.80 ^{bc}	54.90 ^c
T ₇ : Nano calcium @ 1 g/l + Silicon @ 0.5 g/l	46.56 ^{bc}	50.68 ^{cd}	53.00 ^{bc}	57.30 ^{bc}
T ₈ : Nano calcium @ 2 g/l + Silicon @ 0.25 g/l	48.90 ^{ab}	53.73 ^b	54.53 ^{ab}	59.00 ^b
T ₉ : Nano calcium @ 2 g/l + Silicon @ 0.5 g/l	50.00 ^a	55.13 ^a	55.53 ^a	65.30 ^a
S.E(m) ±	0.427	0.455	0.405	0.416
C.D @ 5%	1.279	1.363	1.211	1.246

Table 3: Effect of Nano calcium and Silicon on number of leaves plant⁻¹ (at first flowering), number of suckers plant⁻¹ (at 5 Months), leaf area (at 5 Months) and chlorophyll content (SPAD meter reading) (at first flowering) of Gerbera

Treatments	Number of leaves plant ⁻¹	Number of suckers plant ⁻¹	Leaf area (cm ²)	Chlorophyll Content
T ₁ : Control (Water spray)	19.09 ^d	2.50 ^e	103.48 ^g	49.40 ⁱ
T ₂ : Nano calcium @ 1 g/l	27.13 ^{ab}	2.73 ^d	126.21 ^{cd}	72.07 ^d
T ₃ : Nano calcium @ 2 g/l	27.26 ^{ab}	3.46 ^c	127.07 ^c	73.70 ^c
T ₄ : Silicon @ 0.25 g/l	22.33 ^{cd}	4.16 ^{bc}	117.92 ^{fg}	51.14 ^h
T ₅ : Silicon @ 0.5 g/l	23.20 ^c	4.36 ^{bc}	118.51 ^f	60.52 ^g
T ₆ : Nano calcium @ 1 g/l + Silicon @ 0.25 g/l	25.33 ^b	4.53 ^b	120.30 ^e	66.13 ^f
T ₇ : Nano calcium @ 1 g/l + Silicon @ 0.5 g/l	27.06 ^{ab}	5.46 ^{ab}	123.73 ^d	70.82 ^e
T ₈ : Nano calcium @ 2 g/l + Silicon @ 0.25 g/l	28.26 ^{ab}	5.20 ^{ab}	128.40 ^b	75.20 ^b
T ₉ : Nano calcium @ 2 g/l + Silicon @ 0.5 g/l	28.40 ^a	5.60 ^a	130.09 ^a	79.62 ^a
S.E(m) ±	0.459	0.119	0.297	0.274
C.D @ 5%	1.375	0.355	0.890	0.820

Table 4: Effect of Nano calcium and Silicon on Flowering and yield parameters of Gerbera

Treatments	Days taken to 1 st bud initiation	Days taken to 1 st flower opening	Flower diameter (cm)	Flower Stalk Length (cm)	No. of Flowers Plant ⁻¹ per 1month	Flower yield Plant ⁻¹ (Number)				Total Flower Yield Plant ⁻¹
						March, 2023	April, 2023	May, 2023	June, 2023	
T ₁ : Control (Water spray)	58.83 ^f	71.30 ⁱ	8.68 ^d	46.00 ^e	2.66 ^g	0.00	2.26 ^d	3.13 ^d	5.26 ^d	10.65 ^h
T ₂ : Nano calcium @ 1g/l	54.30 ^e	67.50 ^h	9.26 ^{cd}	50.29 ^{de}	2.80 ^f	0.00	2.66 ^{cd}	3.20 ^{cd}	5.40 ^{cd}	11.26 ^g
T ₃ : Nano calcium @ 2g/l	52.70 ^d	63.33 ^g	9.50 ^{cd}	50.48 ^d	3.00 ^e	0.00	2.80 ^c	3.33 ^c	5.66 ^{cd}	11.79 ^f
T ₄ : Silicon @ 0.25 g/l	48.76 ^c	59.30 ^d	9.60 ^c	51.14 ^{cd}	3.60 ^{de}	1.20 ^c	3.60 ^{bc}	4.33 ^{bc}	6.20 ^{cd}	15.33 ^e
T ₅ : Silicon @ 0.5 g/l	45.00 ^a	55.00 ^a	10.43 ^{bc}	51.46 ^{cd}	3.73 ^d	1.60 ^b	3.73 ^{bc}	4.66 ^b	6.33 ^c	16.32 ^d
T ₆ : Nano calcium @ 1g/l + Silicon @ 0.25 g/l	50.23 ^{cd}	62.26 ^f	10.46 ^{bc}	52.06 ^c	4.60 ^c	2.53 ^{ab}	3.80 ^{bc}	5.20 ^{ab}	7.20 ^{bc}	18.73 ^c
T ₇ : Nano calcium @ 1g/l + Silicon @ 0.5 g/l	47.10 ^{bc}	57.50 ^c	10.63 ^b	53.92 ^{ab}	5.00 ^b	2.80 ^{ab}	4.66 ^{ab}	5.33 ^{ab}	8.40 ^{ab}	21.19 ^{ab}
T ₈ : Nano calcium @ 2g/l + Silicon @ 0.25 g/l	49.13 ^{cd}	60.40 ^e	10.53 ^{bc}	53.03 ^b	4.80 ^c	2.66 ^{ab}	3.86 ^b	5.26 ^{ab}	7.60 ^b	19.38 ^b
T ₉ : Nano calcium @ 2g/l + Silicon @ 0.5 g/l	46.53 ^b	56.53 ^b	11.05 ^a	55.00 ^a	5.60 ^a	2.86 ^a	4.73 ^a	5.60 ^a	9.00 ^a	22.19 ^a
S.E(m) ±	0.397	0.220	0.122	0.461	0.050	0.077	0.139	0.192	0.258	0.347
C.D @ 5%	1.190	0.659	0.365	1.380	0.149	0.230	0.416	0.576	0.773	1.039

Table 5: Effect of Nano calcium and Silicon on quality parameters of Gerbera

Treatments	Longevity of the flowers on Plants (days)	Vase life (days)	Scape bending curvature (degrees)
T ₁ : Control (Water spray)	12.20 ^e	6.20 ^d	51.40 ^h
T ₂ : Nano calcium @ 1 g/l	16.20 ^{cd}	8.06 ^c	30.66 ^e
T ₃ : Nano calcium @ 2 g/l	17.06 ^b	10.06 ^b	10.80 ^b
T ₄ : Silicon @ 0.25 g/l	14.06 ^d	7.06 ^{cd}	43.13 ^g
T ₅ : Silicon @ 0.5 g/l	15.13 ^d	7.33 ^{cd}	35.13 ^f
T ₆ : Nano calcium @ 1 g/l + Silicon @ 0.25 g/l	16.40 ^c	9.13 ^{bc}	26.20 ^d
T ₇ : Nano calcium @ 1 g/l + Silicon @ 0.5 g/l	16.53 ^{bc}	9.20 ^{bc}	19.80 ^c
T ₈ : Nano calcium @ 2 g/l + Silicon @ 0.25 g/l	18.06 ^{ab}	11.20 ^{ab}	8.26 ^{ab}
T ₉ : Nano calcium @ 2 g/l + Silicon @ 0.5 g/l	18.66 ^a	11.46 ^a	7.50 ^a
S.E(m) ±	0.381	0.331	0.427
C.D @ 5%	1.141	0.991	1.277

Conclusion

From the present study it can be concluded that Nano calcium in combination with Silicon significantly influences the growth, yield and quality of Gerbera. The treatment T₉ (Nano calcium @ 2 g/l + Silicon @ 0.5 g/l) showed positive effect on growth, yield and quality parameters as compared to the other treatments. Further, the foliar application of Silicon @ 0.5 g/l improved minimum number of days to first flower bud initiation and flower opening.

Future scope

The future line of work may be carried out in following lines. Effect of Nano calcium, Silicon along with nano micronutrients, effect of Nano calcium, Silicon along with nano Urea and nano DAP, Nano calcium and Silicon by different methods and times of applications, effect of Nano calcium and Silicon on different gerbera cultivars need to be conducted.

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Conflict of interest: None

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