The Pharma Innovation Journal 2019; 8(7): 609-613

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating: 5.03
TPI 2019; 8(7): 609-613

www.thepharmajournal.com
Received: 16-05-2019
Accepted: 18-06-2019

Effect of micronutrients on growth, flower quality and yield of China aster (*Callistephus chinensis* L) under Allahabad agro climatic condition

Ashita Joseph, VM Prasad, Vijay Bahadur, Samir E Topno and Deepanshu

Ashita Joseph
Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, Uttar Pradesh, India

VM Prasad
Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, Uttar Pradesh, India

Vijay Bahadur
Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, Uttar Pradesh, India

Samir E Topno
Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, Uttar Pradesh, India

Deepanshu
Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, Uttar Pradesh, India

Correspondence
Ashita Joseph
Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, Uttar Pradesh, India

Abstract
The present experiment was carried out during November, 2018 to February, 2019 in Departmental Research Field of Department of Horticulture, SHUATS, Prayagraj. The experiment was conducted in Randomized Block Design (RBD), with ten treatments of Micronutrients, the treatments were replicated thrice. The treatments were T_0 (RDF (Control)), T_1 (RDF + Boron 0.2%), T_2 (RDF + Boron 0.4%), T_3 (RDF + Boron 0.6%), T_4 (RDF + Zinc 0.2%), T_5 (RDF + Zinc 0.4%), T_6 (RDF + Zinc 0.6%), T_7 (RDF + Iron 0.2%), T_8 (RDF + Iron 0.4%) and T_9 (RDF + Iron 0.6%). From the present investigation it is found that the treatment T_5 (RDF + Zinc 0.4%) found best in terms of Growth, Yield and quality parameters of China Aster followed by treatment T_4 (RDF + Zinc 0.2%). In terms of economics of different treatments, maximum Gross Return, Net Return and Cost Benefit ratio was also found in T_5 followed by treatment T_4 where as minimum was recorded in treatment T_0 (Control).

Keywords: China aster, micronutrients, boron, zinc and iron

Introduction
China aster [*Callistephus chinensis* (L.) Nees] belongs to one of the largest families of flowering plants, 'Asteraceae'. The genus *Callistephus* has only a single species*i.e*. *Callistephus chinensis*. It's diploid (2n) chromosome number is 18 (Huziwara, 1954). It is native to China and is one of the most important annual flower crops grown in most parts of the world. In India, it is grown traditionally for its loose flowers, cut flower and used in arranging vase, floral decorations, making garlands and venis. Among annual flowers, it ranks next to chrysanthemum and marigold.

China aster (*Callistephus chinensis* L. Nees.) is a half hardy annual and commercial flower crop. It is an important annual crop of our country. The genus *Callistephus*is derived from two Greek words *Kalistos* meaning 'most beautiful' and *Stephus*, 'a crown' referring to the flower head. The present day asters have been developed from a single form of wild species, *Callistephus chinensis*. The evolution of China aster was a history of remarkable variations. The original plant had single flowers with two or four rows of blue, violet or white ray florets. The stature was medium tall, 18 to 24 inches in height. The first change in the flower type had been the prolongation or development of central florets and the production of quality flowers.

The commercial importance of China aster is increasing in India especially in Karnataka, Tamil Nadu, Andhra Pradesh, Maharashtra and West Bengal. Its cultivation needs to be popularized as there is a tremendous scope for its usage.

The varieties grown by farmers are mainly Local Pink, Local White and Local Violet which are inferior in yield and flower quality. Varietal evaluation is an improvement method used to found the best suited varieties/cultivars for a particular region which helps to improve the varietal wealth, by evaluation new high yielding varieties with improved characters. New improved varieties are evaluated for cut flower production with long and sturdy stalk with contrasting bigger size flower-heads, extended blooming period and higher vase life.

Materials and Methods
The Experimental was conducted in Randomized Block Design (RBD) with 10 treatments of Micronutrients with three replications in the Departmental Research field of Department of Horticulture, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj during November, 2018 to February, 2019.

Total number of treatments were ten viz. T_0 (RDF (Control)), T_1 (RDF + Boron 0.2%), T_2 (RDF + Boron 0.4%), T_3 (RDF + Boron 0.6%), T_4 (RDF + Zinc 0.2%), T_5 (RDF + Zinc 0.4%), T_6 (RDF + Zinc 0.6%), T_7 (RDF + Iron 0.2%), T_8 (RDF + Iron 0.4%) and T_9 (RDF + Iron 0.6%). Variety Metadoor were used for cultivation.

Climatic condition in the experimental site

The area of Prayagraj district comes under subtropical belt in the south east of Utter Pradesh, which experience extremely hot summer and fairly cold winter. The maximum temperature of the location reaches up to 46 ºC- 48 ºC and seldom falls as low as 4 ºC- 5 ºC. The relative humidity ranges between 20 to 94%. The average rainfall in this area is around 1013.4 mm annually. However, occasional precipitation is also not uncommon during winter months.

Results and Discussion

The present investigation entitled “Effect of Micronutrients on Growth, Flower quality And Yield of China aster (*Callistephus chinensis* L) Under Allahabad Agro climatic Condition” was carried out during November 2018 to February, 2019 in Departmental Research Field of Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj (U.P.) India. The results of the present investigation, regarding the effect of micronutrients for growth, yield and flower quality of China aster, have been discussed and interpreted in the light of previous research work done in India and abroad. The experiment was conducted in Randomized block design with 10 treatments, and three replications. The results of the experiment are summarized below.

Growth Parameters

In terms of Plant height, treatment T_5 (RDF + Zinc 0.4%) recorded maximum (10.59, 42.65 and 61.71 cm) Plant height, at 30, 60 and 90 Days respectively in ten treatments of Boron, Zinc and Iron, followed by T_4 (RDF + Zinc 0.2%) with (9.28, 38.24 and 53.18 cm) at 30, 60 and 90 days respectively, where as minimum plant height (6.65, 21.71 and 42.72 cm) was recorded in treatment T_0 (Control). The plant height significantly influenced with application of micronutrient, ZnSO4 it encourages, cell multiplication, cell division and cell differentiation resulting in increased photosynthesis and translocation of food material which enhanced the plant height and is also improved root system of plants resulting in absorption of more water and nutrients and its utilization. Moreover, micronutrients activate several enzymes (catalase, carbonic dehydrogenize, tryptophane synthates etc.) and involved various physiological activities. Similar results were also obtained by Kakade *et al.* (2009) [7] in China aster, Balakrishnan (2005) [2] in marigold and Ahmad *et al.* (2010) [1] in Rose.

In terms of Plant Spread, treatment T_5 (RDF + Zinc 0.4%) recorded maximum (162.73, 431.40 and 1128.24 cm^2) Plant Spread, at 30, 60 and 90 Days respectively in ten treatments of Boron, Zinc and Iron, followed by T_4 (RDF + Zinc 0.2%) with (155.18, 412.13 and 1090.90 cm^2) at 30, 60 and 90 days respectively, where as minimum plant Spread (107.47, 194.52 and 457.74 cm^2) was recorded in treatment T_0 (Control). The plant sprayed significantly influenced with application of micronutrient, ZnSO4 it encourages, cell multiplication, cell division and cell differentiation resulting in increased photosynthesis and translocation of food material which enhanced the plant spread and is also improved root system of plants resulting in absorption of more water and nutrients and its utilization. Moreover, micronutrients activate several enzymes (catalase, carbonic dehydrogenize, tryptophane synthates etc.) and involved various physiological activities. Similar results were also obtained by Kakade *et al.* (2009) [7] in China aster, Balakrishnan (2005) [2] in marigold and Ahmad *et al.* (2010) [1] in Rose.

In terms of Number of Primary Branches/Plant, treatment T_5 (RDF + Zinc 0.4%) recorded maximum (4.90, 15.49 and 21.66) Number of Primary Branches/Plant, at 30, 60 and 90 Days respectively in ten treatments of Boron, Zinc and Iron, followed by T_4 (RDF + Zinc 0.2%) with (4.52, 14.27 and 19.29) at 30, 60 and 90 days respectively, where as minimum Number of Primary Branches/Plant (2.70, 7.28 and 14.84) was recorded in treatment T_0 (Control). Increased the number of Branches be due to micronutrients like ZnSO4 is essential component of several dehydrogenase, proteinase, peptidase and promotes growth of hormones and closely associated with growth, all these factors contributed to cell multiplication, cell division and cell differentiation resulting in increased photosynthesis and translocation of food material which enhanced the number of Branches The above result was confirmed by Pal. *et al.* (2016) [12] in Gerbera.

In terms of Secondary Branches/Plant, treatment T_5 (RDF + Zinc 0.4%) recorded maximum (32.60 and 34.37) Number of Secondary Branches/Plant, at 60 and 90 Days respectively in ten treatments of Boron, Zinc and Iron, followed by T_4 (RDF + Zinc 0.2%) with (28.67 and 32.01) at 60 and 90 days respectively, where as minimum Number of Secondary Branches/Plant (10.01 and 22.16) was recorded in treatment T_0 (Control). Increased the number of Branches be due to micronutrients like ZnSO4 is essential component of several dehydrogenase, proteinase, peptidase and promotes growth of hormones and closely associated with growth, all these factors contributed to cell multiplication, cell division and cell differentiation resulting in increased photosynthesis and translocation of food material which enhanced the number of Branches The above result was confirmed by Pal. *et al.* (2016) [12] in Gerbera.

In terms of Number of Leaves/Plant, treatment T_5 (RDF + Zinc 0.4%) recorded maximum (15.41, 43.69 and 186.21) Number of Leaves/Plant, at 30, 60 and 90 Days respectively in ten treatments of Boron, Zinc and Iron, followed by T_4 (RDF + Zinc 0.2%) with (13.80, 36.62 and 157.19) at 30, 60 and 90 days respectively, where as minimum Number of Leaves/Plant (10.42, 25.43 and 126.16) was recorded in treatment T_0 (Control). The result indicated that the foliar application of zinc might be stimulating metabolic activity with stimulating effect on cell wall loosing, increased cell elongation along with cell enlargement and cell differentiation resulting in increased photosynthesis and translocation of food material which might be enhanced the Number of leaves and leaves length. Similar results were also obtained by Bashir *et al.* (2013) [3] and Pal. *et al.* (2016) [12] in Gerbera.

In terms of Days for first Flowering, treatment T_5 (RDF + Zinc 0.4%) recorded minimum (71.07 days) for first flowering in ten treatments of Boron, Zinc and Iron, followed by T_4 (RDF + Zinc 0.2%) with (73.88 days), where as maximum Days taken for first flowering (83.25 days) was recorded in treatment T_0 (Control). Micronutrients like zinc, favour to storage of more carbohydrates through photosynthesis, which may be enhanced to flower earlier.

Similar results were also reported by Muthumanickam *et al.* (1999) [9], Senthamizhselvi (2000) [13] and Jadhav (2004) [6] in Gerbera.

In terms of Days for 50% flowering, treatment T_5 (RDF + Zinc 0.4%) recorded minimum (85.14 days) for 50% flowering in ten treatments of Boron, Zinc and Iron, followed by T_4 (RDF + Zinc 0.2%) with (87.02 days), where as maximum Days taken for 50% flowering (105.16 days) was recorded in treatment T_0 (Control). Micronutrients like zinc, favour to storage of more carbohydrates through photosynthesis, which may be enhanced to flower earlier. Similar results were also reported by Muthumanickam *et al.* (1999) [9], Senthamizhselvi (2000) [13] and Jadhav (2004) [6] in Gerbera.

In terms of Flowering duration, treatment T_5 (RDF + Zinc 0.4%) recorded maximum (72.12 days) for Flowering duration in ten treatments of Boron, Zinc and Iron, followed by T_4 (RDF + Zinc 0.2%) with (69.38 days), where as minimum Flowering duration (60.57 days) was recorded in treatment T_0 (Control). The result indicated that the foliar application of zinc might be stimulating metabolic activity with stimulating effect on cell wall loosing, increased cell elongation along with cell enlargement and cell differentiation resulting in increased photosynthesis and translocation of food material which might be enhanced the Flower quality. Similar results were also obtained by Bashir *et al.* (2013) [3] and Pal. *et al.* (2016) [12] in Gerbera.

Quality Parameters

In terms of Flower diameter, treatment T_5 (RDF + Zinc 0.4%) recorded maximum (7.81 cm) Flower diameter in ten treatments of Boron, Zinc and Iron, followed by T_4 (RDF + Zinc 0.2%) with (6.75 cm), where as minimum Flower diameter (4.77 cm) was recorded in treatment T_0 (Control). This might be due to more production of food material which subsequently increased in the quality parameters like flower stalk length, flower diameter. Similar results also reported by Muthumanickam *et al.* (1999) [9] in Gerbera, Nag and Biswas (2003) [10] and Hardeep Kumar *et al.* (2003) [5] in tuberose.

In terms of Stalk Length, treatment T_5 (RDF + Zinc 0.4%) recorded maximum (35.35 cm) Stalk Length in ten treatments of Boron, Zinc and Iron, followed by T_4 (RDF + Zinc 0.2%) with (32.52 cm), where as minimum Stalk Length (21.22 cm) was recorded in treatment T_0 (Control). The increment in stalk length might be due to enhanced cell division and cell enlargement, promotion of protein synthesis coupled with higher dry matter of apical dominance. These results are conformity with findings of Muthumanicham *et al.* (1999) in gerbera, Khan (2000) [8] in Dahlia and Ahmad *et al.* (2010) [1] in Rose.

In terms of Vase Life, treatment T_5 (RDF + Zinc 0.4%) recorded maximum (8.67 days) Vase life in ten treatments of Boron, Zinc and Iron, followed by T_4 (RDF + Zinc 0.2%) with (7.18 days), where as minimum Vase life (5.37 days) was recorded in treatment T_0 (Control). The positive impact of micronutrients like zinc, might be due to the ability of these nutrient in activating several enzymes and its involvement in chlorophyll synthesis and various physiological activities ultimately increase the vase life as observed by Bhattacharjee *et al.* (1993) [4] in cut rose.

Yield Parameters

In terms of Number of flowers/Plant, treatment T_5 (RDF + Zinc 0.4%) recorded maximum (38.90) Number of Flower/Plant in ten treatments of Boron, Zinc and Iron, followed by T_4 (RDF + Zinc 0.2%) with (35.08), where as minimum Number of Flower/Plant (27.18) was recorded in treatment T_0 (Control). Application of zinc relieved the plants from chlorosis and produced healthy green leaves which resulted in higher assimilate synthesis and partitioning of the flower growth which may in turn increase the flower production and ultimately flower yield. Similar results were also obtained by Nath and Biswas (2002) [11] in tuberose and pal *et al.* (2016) [12] in Gerbera.

In terms of Flower yield/plant, the treatment T_5 (RDF + Zinc 0.4%) recorded maximum (216.16 g) Flower yield/Plant in ten treatments of Boron, Zinc and Iron, followed by T_4 (RDF + Zinc 0.2%) with (184.30 g), where as minimum Flower yield/Plant (98.35 g) was recorded in treatment T_0 (Control). The result might be due to the micronutrients such as zinc, it helps in regulating semi permeability of cell walls, thus mobilizing more water into flowers and also increase the synthesis of iron which promotes the flower size and weight of the flowers. Similar results were also reported by Nag and Biswas (2003) [10] and Hardeep Kumar *et al.* (2003) [5] in tuberose.

In terms of Flower yield/ha, treatment T_5 (RDF + Zinc 0.4%) recorded maximum (19.21 tones) Flower yield/ha in ten treatments of Boron, Zinc and Iron, followed by T_4 (RDF + Zinc 0.2%) with (16.37 tones), where as minimum Flower yield/ha (8.73 tones) was recorded in treatment T_0 (Control). The result might be due to the micronutrients such as zinc, it helps in regulating semi permeability of cell walls, thus mobilizing more water into flowers and also increase the synthesis of iron which promotes the flower size and weight of the flowers. Similar results were also reported by Nag and Biswas (2003) [10] and Hardeep Kumar *et al.* (2003) [5] in tuberose.

Economics of cultivation

In terms of Econimics, Maximum Gross return, net returns and cost benefit ratio from flowers was found in the T_5 Maximum gross returns (Rs. 1152600.00), Net Return (Rs. 677825) and Cost Benefit Ratio (1:2.42) with application of (RDF + Zinc 0.4%) followed by T_4 (RDF + Zinc 0.2%) with Rs. 982200.00 gross return, Rs. 545304.00 net return and 1:2.24 cost benefit ratio where as minimum was recorded in treatment T_0 (Control.).

Table 1: Effect of Micronutrients on Plant height (cm), Plant spread (cm^2), Number of Primary and Secondary Branches/plant of China aster (*Callistephus chinensis* L.).

Treatment Symbol	Treatment Combinations	Plant Height (cm)			Plant Spread (cm^2)			Number of primary Branches/plant			Number of Secondary Branches/plant	
		30 DAS	60 DAS	90 DAS	30 DAS	60 DAS	90 DAS	30 DAS	60 DAS	90 DAS	60 DAS	90 DAS
T_0	RDF	6.65	21.71	42.72	107.47	194.52	457.74	2.70	7.28	14.84	10.01	22.16
T_1	RDF+ 0.1% B	7.52	28.80	47.64	122.92	294.52	700.33	3.32	10.44	17.33	21.88	25.33
T_2	RDF+ 0.2% B	7.58	31.67	43.05	128.13	311.50	743.79	3.49	11.13	18.78	22.95	29.68
T_3	RDF+ 0.3% B	8.27	32.38	38.27	127.60	303.12	731.34	3.41	10.72	16.89	21.32	23.41
T_4	RDF+ 0.2% Zn	9.28	38.24	53.18	155.18	412.13	1,090.90	4.50	14.27	19.29	28.67	32.01
T_5	RDF+ 0.4% Zn	10.59	42.65	61.71	162.73	431.40	1,128.24	4.90	15.46	21.66	32.06	34.37
T_6	RDF+ 0.6% Zn	8.41	36.05	45.49	151.67	394.02	1,019.31	4.35	13.22	18.73	26.80	31.62
T_7	RDF+ 0.2% Fe	8.40	32.81	47.78	135.73	329.45	792.57	4.12	12.62	16.17	27.32	29.38
T_8	RDF+ 0.4% Fe	9.05	35.75	50.01	140.78	343.54	887.28	4.44	13.67	17.88	27.93	31.15
T_9	RDF+ 0.6% Fe	8.90	33.10	44.14	136.67	331.61	800.93	4.29	13.26	16.06	26.68	28.88
F-test		S	S	S	S	S	S	S	S	S	S	S
SE(d)		0.233	0.477	0.351	4.954	0.767	2.184	0.030	0.218	0.343	0.603	0.411
C.V.		3.369	1.752	0.908	4.433	0.281	0.320	0.931	2.192	2.365	3.005	1.748
C.D. at 5%		0.493	1.009	0.744	10.489	1.625	4.624	0.064	0.463	0.726	1.276	0.870

Table 2: Effect of Micronutrients on Number of Leaves/plant, Days for first and 50% flowering, Flowering duration (days), Flower diameter and Stalk length (cm), Vase life (days), Number of flowers/plant, Flower yield/plant, Flower Yield t/ha and Cost Benefit ratio of China aster (*Callistephus chinensis* L.).

Treatment Symbol	Treatment Combinations	Number of Leaves/Plant			Days for first flowering	Days for 50% flowering	Flowering duration days	Flower diameter (cm)	Stalk length (cm)	Vase life days	Number of flowers/ plant	Flower yield/plant (g)	Flower yield t/ha.	Cost benefit ratio
		30 DAS	60 DAS	90 DAS										
T_0	RDF	10.42	25.43	126.16	83.25	105.16	60.57	4.77	21.22	5.37	27.18	98.35	8.73	1:1.28
T_1	RDF+ 0.1% B	11.79	31.12	144.96	77.62	98.26	63.13	5.58	24.35	5.97	30.82	135.07	12.00	1:1.58
T_2	RDF+ 0.2% B	12.20	32.42	151.27	76.20	95.69	65.05	5.84	27.19	6.58	31.01	140.41	12.48	1:1.49
T_3	RDF+ 0.3% B	11.50	30.00	147.17	78.66	99.33	64.45	5.26	26.86	6.32	30.06	132.67	11.79	1:1.77
T_4	RDF+ 0.2% Zn	13.80	36.62	157.19	73.88	87.02	69.38	6.75	32.52	7.18	35.08	184.30	16.37	1:2.24
T_5	RDF+ 0.4% Zn	15.41	43.69	186.21	71.07	85.14	72.12	7.81	35.35	8.67	38.90	216.16	19.21	1:2.42
T_6	RDF+ 0.6% Zn	12.66	34.80	174.16	75.16	90.31	68.62	6.46	31.66	6.88	34.14	172.55	15.33	1:2.12
T_7	RDF+ 0.2% Fe	11.77	32.84	169.93	77.24	95.19	66.18	6.06	30.65	6.33	31.11	160.05	14.22	1:1.68
T_8	RDF+ 0.4% Fe	12.65	33.35	176.28	76.36	94.08	67.04	6.20	31.17	6.69	33.25	165.96	14.75	1:1.53
T_9	RDF+ 0.6% Fe	12.03	31.91	173.72	77.17	96.16	65.42	5.96	29.85	6.61	30.74	157.26	13.98	1:2.05
F-test		S	S	S	S	S	S	S	S	S	S	S	S	
SE(d)		0.480	0.772	10.088	0.720	0.729	0.646	0.209	0.582	0.124	0.917	1.899	0.169	
C.V.		4.728	2.845	7.688	1.150	0.943	1.196	4.218	2.453	2.275	3.483	1.489	1.489	
C.D. at 5%		1.016	1.634	21.359	1.525	1.543	1.368	0.443	1.233	0.262	1.941	4.021	0.357	

Conclusion

Based on the present investigation it is concluded that the treatment T_5 (RDF + Zinc 0.4%) found best in terms of Growth, Yield and quality parameters of China Aster followed by treatment T_4 (RDF + Zinc 0.2%). In terms of economics of different treatments, maximum Gross Return, Net Return and Cost Benefit ratio was also found in T_5 followed by treatment T_4 where as minimum was recorded in treatment T_0 (Control).

References

1. Ahmad I, Khan MA, Qasim M, Ahmad R, Randhawa MA. Growth, yield and quality of Rosa hybrida L. as influenced by various micronutrients. Pak. J of Agric. Sci. 2010; 47:1, 5-12.
2. Balakrishnan V. Effect of micronutrients on flower yield and xanthophylls content of African marigold (*Tagetus erecta* L.). M.Sc, Thesis submitted to Tamil Nadu Agricultural University, Coimbatore, 2005.
3. Bashir AB, Ahmad W, Ahmad KS, Shafi J, Muhammad AS, Muhammad A *et al*. Efficacy of foliar application of micro nutrients on growth and flowering of *Gerbera jamesonii* L. Uni. J of Agri. Res. 2013; 1(4):145-149.
4. Bhattacharjee SK, Singh V, Saxena NK. Studies on vegetative growth, flowering, flower quality and vase life of roses. Singapore J of Primary Indus. 1993; 21(2):67-71.
5. Hardeep K, Singh S, Ahlawat VP, Yadav BS. Influence of nitrogen and zinc application on growth, flowering and chlorophyll content of tuberose (*Polianthes tuberosa* Linn.) cv. Double. Haryana J Hort Sci. 2003; 32(3&4):212-215.
6. Jadhav AH, Dalal SR, Shinde RD, Deshmukh RP. Effect of micronutrients on growth and flower production of Gerbera under polyhouse conditions. Adv. in Plant Sci. 2004; 18(2):755-758.
7. Kakade DK, Rajput SG, Joshi KL. Effect of foliar application of Fe and Zn on growth, flowering and Yield of China aster (*Callistepus chinensis* L. Nees). Asian J Hort. 2009; 4(1):138-140.
8. Khan FU. Effect of micronutrients on Dahlia. J Orna. Hort. 2000; 3(2):122-123.
9. Muthumanickam D, Rajmani K, Jawaharlal M. Effect of micronutrients on flower production in Gerbera. J Orna Hort. 1999; 2(2):131-132.
10. Nag MR, Biswas J. Studies on effect of boron on vegetative and reproductive growth in tuberose (*Polianthes tuberosa*) cv. Single. Orissa J of Hort. 2003; 30(2):39-42.
11. Nath MR, Biswas J. Studies on effect of boron on vegetative and reproductive growth in tuberose (*Polianthes tuberosa* L.) cv. Single. The Orissa J Hort.

2002; 30(2):39-42.

12. Pal Barad S, Singh AV, Khadda AK, Kumar BSD. Effect of foliar application of Fe and Zn on growth, flowering and yield of gerbera (*Gerbera jamesonii*) under protected condition. Indian J Agri. Sci. 2016; 86(3):394-398.
13. Senthamizhselvi B. Studies on the flowering and productivity of Gundumalli (*Jasminum sambac* Ait) as influenced by nutrient management techniques M.Sc. (Hort.) dissertation, Tamil Nadu Agricultural University, Coimbatore, India, 2000.