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RESEARCH PAPER

Efficacy of micro-nutrients on growth and flower production of China aster [*Callistephus chinensis* (L.) NEES] cv. PRINCESS

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Abstract : The field trials were conducted during winter season of 2002-2003 to study the efficacy of micro-nutrients on growth and flower production of China aster [*Callistephus chinensis* (L.) NEES] cv. PRINCESS in plot A-7 of the R.B.S. College Agricultural Farm, Bichpuri, Agra in Randomized Block Design with nine treatments *i.e.* T_1- Control (Spray of zinc sulphate 0.0 %),T_2- (Spray of zinc sulphate0.2%),T_3- (Spray of zinc sulphate 0.4%),T_4- (Spray of ferrous sulphate 0.0%),T_5- (Spray of ferrous sulphate 0.2%),T_6-(Spray of ferrous sulphate 0.4%),T_7- (Spray of copper sulphate 0.0%),T_8- (Spray of copper sulphate 0.2%),T_9-(Spray of copper sulphate 0.4%). It was observed that overall that maximum plant height was find out in treatment T_5 (63.00cm), maximum diameter of main stem (cm) was recorded in treatment T_5 (3.09), maximum number of leaves was found in treatment T_5 (125.40), maximum plant spread along and across the row (cm) was found in treatment T_5 (38.34), maximum number of laterals was found in treatment T_5 (31.44), maximum length of longest leaf (cm) was found in treatment T_5(10.69cm), maximum width of the longest leaf (cm) was found in treatment T_5 (7.34cm), maximum green weight of plant canopy at final was found in treatment T_5 (401.25), maximum dry weight of plant canopy at final was found in treatment T_5(72.39), maximum date of visibility of flower bud was found in treatment T_5 (131.33), maximum date of colour break was found in treatment T_5(139.29), maximum date of full blooming was found in treatment T_5 (160.07), maximum date of harvesting of floral heads was found in treatment T_5(162.18), maximum fresh weight of floral head (g) was found in treatment T_5(4.96), maximum length of floral head (cm)was found in treatment T_5 (3.20 cm), maximum width of floral head (cm) was found in treatment T_5 (6.21cm), maximum length of floral stalk (cm) was found in treatment T_5 (21.67cm) and maximum diameter of floral stalk (cm) was found in treatment T_5 (0.27cm).

Key Words : Copper sulphate, Growth, China aster, Zinc sulphate, Ferrous sulphate

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INTRODUCTION

Flowers convey human feeling as love (rose, tulip, carnation), sorry, jealous (French marigold), regard (daffodil), self-esteem (narcissus), message (iris),pride

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(amaryllis). Departure (sweat pea), luxury (stock), presumption (snapdragon) and purity (Oily). Floricultural crops have their own importance from ancient times and they are used for indoor and outdoor decorations. Worship as well as for the improvement of environment. Floriculture is fast emerging as a lucrative venture in the world and is becoming a potential money spinner. Many kinds of ornamental plants are grown for domestic, international trade in the developed and developing countries.

Today floriculture is being recognized as lucrative profession with much higher potentials for net returns per unit area than from most of the field crops or even some horticultural crops. More than 150 countries were involved in floriculture trade during 2000. International flower market is at Alsmeer in the Netherlands. Contribution of Netherlands in international floriculture trade is 57 per cent followed by Colombia 14 per cent, Israel 4 per cent, Kenya and Ecuador 3 per cent, Thailand and Spain 2')/.0 and India 2 per cent. Germany 21 per cent is the largest importer of live plants. The production of flowers is estimated to be more than 5 lakh tones of loose flowers and over 680.6 million cut-flowers with stem. However, some estimates suggest that trade of flowers is to the tune of 250 crores and Delhi market alone put the trade value at more than Rs. 50 crores. Availability of excellent varieties of ornamental annuals has enabled the garden lovers to produce the flower of their choice throughout the year in India. Commercial production of cut-flowers has also proved of constant increase in recent past.

China aster belongs to the family Asteraceae genus *Callistephus* [*Klullistephus chinensis* (L.) NEES] which is one of most popular, showy, well known annuals. The flowers have wide range of type, size and shape and are having very food keeping quality. All colours except the pure yellow are present in aster which is used as cut flower in vases and floral decoration and for making garlands, bouquets etc.

China asters [*Callistephus chinensis* (L.) Nees.] despite having lost some popularity over the years in the European and American floricultural business because of disease and insect problems, are still popular choices for late summer and autumn bloom. The taller types are excellent cut flowers while the dwarf types are important to the bedding plant grower. Most cultivars on the market today are tolerant to aster or fusarium wilt (Mastalerz and Holcomb, 1985). China aster is cultivated as a cut flower both in the field and under protection (Post, 1950; Warren Auman, 1980) and is excellent for garden landscaping (Ballinger, 1985), or for decorative use as a potted plant (Hay *et al.*, 1976). China aster is an erect, branching annual, with ovate or triangular ovate leaves with dentate margins funning a basal rosette in the young plant, but spirally arranged on the stems. The leaves gradually become smaller and spatulate in the upper parts of the stem where they become indistinguishable from bracts (Cockshull, 1985 and Webb *et al.*, 1988).

MATERIAL AND METHODS

The experiment, as field trials, were conducted during winter season of 2002-2003 to study the efficacy of micro-nutrients on growth and flower production of China aster [*Callistephus chinensis* (L.) NEES] cv. PRINCESS in plot A-7 of the R.B.S. College, Agricultural Farm, Bichpuri, Agra. The research farm is situated at 27°10'N latitude and 70°50° longitude at a height of 168.4 m above the mean sea level which lies in the seal-arid and sub-tropical region of Uttar Pradesh at the distance of eleven kilometers in South-West of Agra City on Agra-Bhratpur Road. The experiment was laid out in Randomized Block Design with 9 treatments *i.e.*, T_1- Control (Spray of zinc sulphate 0.0 %),T_2- (Spray of zinc sulphate0.2%),T_3- (Spray of zinc sulphate 0.4%),T_4 - (Spray of ferrous sulphate 0.0%),T_5 - (Spray of ferrous sulphate 0.2%),T_6 -(Spray of ferrous sulphate 0.4%),T_7 - (Spray of copper sulphate 0.0%),T_8- (Spray of copper sulphate 0.2%),T_9- (Spray of copper sulphate 0.4%). Observations of vegetative parameters *i.e*. height of the plant (cm), diameter of main stem(cm), number of leaves, plant spread along and across the row (cm), number of laterals, length of longest leaf (cm), width of the longest leaf (cm), fresh and dry weight of plant canopy at final (g) less roots, flower buds and floral heads, date of visibility of flower bud, date of colour break, date of full blooming., date of harvesting of floral heads, fresh weight of floral head (g), length of floral head (cm), width of floral head (cm), length of floral stalk (cm), diameter of floral stalk (cm).

RESULTS AND DISCUSSION

The data given in tables showed that the vegetative growth parameters were significantly influenced by different treatments. The maximum plant height was found in treatment T_5 (63cm) (Table 1) significantly

Table 1 : Efficacy of micro-nutrients on growth and flower production of China aster [*Callistephus chinensis* (L.) NEES] cv. PRINCESS

Treatments	Notations	Characters									
		Height of the plant (cm)	Diameter of main stem (cm)	Number of leaves	Plant spread along and across the row (cm)	Number of laterals	Length of longest leaf (cm)	Width of the longest leaf (cm)	Green weight of plant canopy at final	Dry weight of plant canopy at final	Date of visibility of flower bud
T_1 Control (Spray of zinc sulphate (0.0 %)	Z_0	33.98	2.2	66.10	27.51	16.1	8.62	5.88	147.44	47.60	105.9
T_2 (Spray of zinc sulphate (0.2%)	Z_1	51.05	2.6	111.77	35.13	22.9	9.76	6.84	291.96	61.45	120.5
T_3 (Spray of zinc sulphate (0.4%)	Z_2	55.64	2.6	117.62	36.88	24.7	10.34	6.97	322.85	66.41	125.7
T_4 (Spray of ferrous sulphate (0.0%)	F_0	41.41	2.3	84.51	33.31	18.2	9.10	6.28	212.18	54.32	112.9
T_5(Spray of ferrous sulphate(0.2%)	F_1	63.00	3.0	125.40	38.34	31.4	10.69	7.34	401.25	72.39	131.3
T_6 (Spray of ferrous sulphate (0.4%)	F_2	53.94	2.6	111.77	35.69	24.2	10.09	6.88	316.99	67.17	123.2
T_7 (Spray of copper sulphate (0.0%)	C_0	47.95	2.4	98.40	33.72	23.8	9.62	6.61	266.66	59.05	117.8
T_8 (Spray of copper sulphate (0.2%)	C_1	59.79	2.7	121.07	37.35	27.1	10.21	7.07	359.81	68.73	128.4
T_9 (Spray of copper sulphate (0.4%)	C_2	48.97	2.4	103.37	34.16	21.6	9.58	6.69	281.14	60.57	119.4
S.E.±		0.057	0.073	0.123	0.043	0.09	0.064	0.030	0.135	0.062	0.074
C.D. (P=0.05)		0.172	0.218	0.368	0.130	0.27	0.191	0.091	0.403	0.186	0.221

Table 2 : Effect of foliar spray of micro-nutrients (Zn, Fe and Cu) singly and combination on flower productivity 2002-03

Treatments	Notations	Characters							
		Date of colour break	Date of full blooming	Date of harvesting of floral heads	Fresh weight of floral head (g)	Length of floral head (cm)	Width of floral head (cm)	length of floral stalk (cm)	Diameter of floral stalk (cm)
T_1 Control (Spray of zinc sulphate (0.0 %)	Z_0	114.33	130.40	132.33	2.36	2.07	4.73	10.75	0.17
T_2 (Spray of zinc sulphate (0.2%)	Z_1	128.81	147.33	149.44	3.87	2.68	5.49	17.54	0.23
T_3 (Spray of zinc sulphate (0.4%)	Z_2	133.84	153.88	155.88	4.40	2.91	5.89	19.64	0.24
T_4 (Spray of ferrous sulphate (0.0%)	F_0	121.33	137.62	139.69	3.03	2.32	5.33	14.67	0.20
T_5(Spray of ferrous sulphate (0.2%)	F_1	139.29	160.07	162.18	4.96	3.20	6.21	21.67	0.27
T_6 (Spray of ferrous sulphate (0.4%)	F_2	131.40	150.62	152.33	4.12	2.73	5.81	18.24	0.24
T_7 (Spray of copper sulphate (0.0%)	C_0	127.22	144.84	146.84	3.57	2.48	5.69	16.03	0.22
T_8 (Spray of copper sulphate (0.2%)	C_1	136.66	156.36	158.22	4.54	3.01	6.13	20.34	0.26
T_9 (Spray of copper sulphate(0.4%)	C_2	128.14	146.58	148.74	3.83	2.54	5.42	16.52	0..22
S.E.±		0.073	0.087	0.112	0.011	0.015	0.020	0.032	0.001
C.D. (P=0.05)		0.219	0.260	0.335	0.032	0.046	0.061	0.096	0.004

superior than others followed by treatment T_8 (59.79 cm) which was also reported by Sommer and Lipman (1926) who have already established that zinc is the essential element for plant.

The maximum diameter of main stem (cm) (Table 1) was recorded in treatment T_5 (3.09) which was statistically at par with others followed by treatment T_8 (2.77). Similar results was also observed by Bhattacharjee and Singh (2000) who studied change in T.S.S, TFAA and diameter of main stem sprayed with $ZnSO_4$ (0.5%) and $FeSO_4$ (1-2%). The maximum number of leaves was found in treatment T_5 (125.40) which was superior than others followed by treatment T_8 (121.07). Kanwar and Dhingra (1962) found that 0.6 per cent solution of $ZnSO_4$ was most effective for leaves and reducing of chlorosis. The maximum plant spread along and across the row (cm) was found in treatment T_5(38.34) which was superior than others followed by treatment T_8 (37.35) .The maximum number of laterals was found in treatment T_5 (31.44) which was superior to others followed by treatment T_8 (27.18). Kelin and Mann (1940) reported that zinc participates in the metabolism of plant as an activator of several enzymes e.g. carbonic anhydrases. The maximum length of longest leaf (cm) was found in treatment T_5 (10.69cm) which was superior than others followed by treatment T_8 (10.21cm). The maximum width of the longest leaf (cm) was found in treatment T_5 (7.34cm) which was superior than others followed by treatment T_8 (7.07cm). Boodly (1964) reported optimum conc. of micro-nutrient in chrysanthemum tissue to be (50-100ppm), B (20-30ppm), Cu (50-100ppm), Zn (25-100ppm) and Mn (50-150ppm). The maximum green weight of plant canopy at final was found in treatment T_5 (401.25) which was superior than others followed by treatment T_8 (359.81). Hasek and Fornhan(1975) reported that spray of 80 ppm on zinc-deficiency *Lilium longiflolium* corrected the deficiency symptoms of the minor nutrient. The maximum dry weight of plant canopy at final was found in treatment T_5 (72.39) which was superior than others followed by treatment T_8 (68.73). The maximum date of visibility of flower bud was found in treatment T_5 (131.33) which was superior than others followed by treatment T_8 (128.40) .The maximum date of colour break (Table 2) was found in treatment T_5 (139.29) which was superior than others followed by treatment T_8 (136.66). The maximum date of full blooming was found in treatment T_5 (160.07) which was superior than others followed by treatment T_8 (156.36). The maximum date of harvesting of floral heads was found in treatment T_5 (162.18) which was superior than others followed by treatment T_8 (158.22). The maximum fresh weight of floral head (g) was found in treatment T_5 (4.96) which was superior than others followed by treatment T_8 (4.54). The maximum length of floral head (cm) was found in treatment T_5 (3.20cm) which was superior than others followed by treatment T_8 (3.01cm). The maximum width of floral head (cm) was found in treatment T_5 (6.21cm) which was superior than others followed by treatment T_8 (6.13cm). The maximum length of floral stalk (cm) was found in treatment T_5 (21.67cm) which was superior than others followed by treatment T_8 (20.34cm). The maximum diameter of floral stalk (cm) was found in treatment T_5 (0.27cm) which was superior than others followed by treatment T_8 (0.26cm).

Conclusion:

In view of the above, for growing a profitable florist crop of China aster cv. PRINCESS having maximum production of quality floral heads when zinc, iron and copper each at 0.2 per cent concentration through $ZnSO_4$, $FeSO_4$ and $CuSO_4$, respectively applied at 30 and 45 days after planting.

REFERENCES

Ballinger, R . (1985). *Flower gardening in New Zealand*. The Caxton Press. Christchurch. New Zealand.

Bhattacharjee, S.K. and Singh, U.C. (2000). Post-harvest life and quality of "Raktaganda" rose as affected by different kinds of inorganic salt as holding solution. *Orissa J. Hort.*, **27** (1) : 63-68.

Boodley, J. (1964). Fertiling In: *Chrysanthemum* (Ed) Langhans, R.W. Itacca,cornell,Uni.,185p.

Cockshull, K.E. (1985). *Callistephus chinensis*. In: A.H. Halevy. (ed.) CRC *Handbook of flowering*. Volume ll. CRC Press Inc., U. S. A.

Hasek, R.F. and Fornhan, D.S.(1975). Japanese Grorgiakbik response to zinc. Flower and Nursery Report. Sep.-Oct. pp.5-7.

Hay, R., Synge, P.M. and Kalmbacher, G. (1976). *The colour dictionary of flowers and plants for home and garden*. Compact Ed. Crown Publishers, Inc. NEW YORK, U.S.A.

Kanwer, J. S. and Dhingra, D. R.(1962). Effect of micro-nutrients sprays of the chemical composition of citrus leaves and incidence of Chklorosis. *Indian J. Agric.Sci.*, **32** :309-314.

Keilin, D. and Mann,T.(1940). Cabonic on the effect of micro-nutrients on growth and yield of tuberose (*Polianthes tuberosa* L.) cv. " SINGLE".*Hort.J.*, **6** (1) : 69-70.

Mastalerz, J.W. and Holcomb, E.J. (1985). Bedding plants HI. A manual on the culture of bedding plants as a greenhouse crop. Pennsylvania Flower Growers. U.S.A .

Post, K . (1950). *Callistephus chinensis* (China aster). Florist crop production and marketing. Orange Judd. NEW YORK, U.S.A.

Sommer and Lipman (1926). *Principles and practices of agronomy.* Kalyani Publishers, Ludhiana (PUNJAB) INDIA.

Warren Auman, C. (1980). Minor cut crops. In: R.A. Larson (Ed.). *Introduction to floriculture*. Academic Press, NEW YORK, U.S.A.

Webb, C. J., Sykes, W.R. and Garnock-Jones, P.I. (1988). *Flora of New Zealand*. Volume **4**. Christchurch, New Zealand.