AJH
eISSN- 0976-724X

THE ASIAN JOURNAL OF HORTICULTURE
Volume **10** | Issue 2 | December, 2015 | 216-221
Visit us -*www.researchjournal.co.in*

RESEARCH PAPER

DOI : 10.15740/HAS/TAJH/10.2/216-221

Article history **:**
Received : 25.06.2015
Revised : 25.10.2015
Accepted : 10.11.2015

Effect of micronutrients (Fe and Zn) on growth of chrysanthemum (*Chrysanthemum morifolium* Ramat.)

TARA CHAND SAINI[1], N.D. POLARA[2] AND A.A. BAJAD

Members of the Research Forum

Associated Authors:
[1]Rural Horticulture Extension Office, Manawar, DHAR (M.P.) INDIA

[2]Department of Horticulture, College of Agriculture, Junagadh Agricultural University, JUNAGADH (GUJARAT) INDIA

Author for correspondence :
A.A. BAJAD
Department of Floriculture and Landscape Architecture, College of Horticulture, Dr. Y. S. Parmar University of Horticulture and Forestry, NAUNI, SOLAN (H.P.) INDIA
Email : bajadankush6@gmail.com

ABSTRACT : The present experiment was conducted on effect of micronutrients (Fe and Zn) on growth, flowering, flower yield and quality of chrysanthemum (*Chrysanthemum morifolium* Ramat.) cv. IIHR – 6". Growth was influenced by different levels of ferrous sulphate. The maximum plant height at 60 DAT (56.11 cm) and 90 DAT (72.33 cm), plant spread in N-S (30.67 cm) and E-W (22.67 cm) direction at flower bud initiation stage and in N-S (38.78 cm) and E-W (31.56 cm) direction at full bloom stage, number of primary branches (4.19) and secondary branches (24.89) at full bloom stage, leaf area (37.11 cm^2), number of suckers per plant (20.33), fresh weight (306.67 g) and dry weight (35.44 g) of plant were obtained at $FeSO_4$ @ 0.8 per cent (F_4). In case of different levels of $ZnSO_4$, the maximum plant height at 60 DAT (53.67 cm) and 90 DAT (70.33 cm), plant spread in N-S (29.75 cm) and E-W (21.83 cm) direction at flower bud initiation stage and in N-S (37.58 cm) and E-W (30.75 cm) direction at full bloom stage, number of primary branches (4.13) and secondary branches (23.00) at full bloom stage, leaf area (35.33 cm^2), number of suckers per plant (18.33), fresh weight (297.50 g) and dry weight (33.00 g) of plant were obtained at $ZnSO_4$ @ 0.5 per cent (Z_3).

KEY WORDS : Micronutrients, Ferrous sulphate, Zinc sulphate, Foliar application, Chrysanthemum

HOW TO CITE THIS ARTICLE : Saini, Tara Chand, Polara, N.D. and Bajad, A.A. (2015). Effect of micronutrients (Fe and Zn) on growth of chrysanthemum (*Chrysanthemum morifolium* Ramat.). *Asian J. Hort.*, **10**(2) : 216-221.

Chrysanthemum (*Chrysanthemum morifolium* Ramat.) is one of the commercially exploited flower crop belongs to the family 'Asteraceae', comprising of about 200 species and is known as "queen of East and glory of East". It is commonly known as 'Gaul e Dhaudi' and 'Sevanti' in Hindi and Gujrati, respectively. It is native to the northern hemisphere and is widely distributed in Europe and Asia. However, it is believed that, its origin is China (Carter, 1980). Japan, China, Holland, France, England, America and India are now the major commercially chrysanthemum producing countries. In India, the area under chrysanthemum is around 18.38 thousand ha with production of 175.67 MT of loose flowers (Anonymous, 2013). The commercial cultivation of flowers is presently confined to West Bengal, North Eastern States, Maharashtra, Andhra Pradesh, Karnataka, Tamil Nadu and Rajasthan.

Iron and zinc deficiency can be corrected by application Fe and Zn sources to soil or foliar sprays. Foliar sprays of ferrous sulphate and zinc sulphate or chelates are found to be more effective and efficient than soil application in flowers and several other crops. Fertilizer requirement for basal soil application of Fe and Zn is very high compared to foliar application of ferrous sulphate and zinc sulphate solution and as such soil application is uneconomical. Iron and zinc chelates are more efficient than inorganic sources in combating iron and zinc deficiency but due to high cost of synthetic carriers, farmers do not prefer using chelate (Singh, 2004). The quality of chrysanthemum flowers is influenced by application of micronutrients, although required in smaller quantities, they are essential for crop growth and development. In recent past, micronutrients are gradually gaining momentum among the flower growers because of their beneficial nutritional support as well as their potential to ensure high yield with better quality. Studies have revealed the beneficial effect of $FeSO_4$ and $ZnSO_4$on marigold with maximum growth, flowering, yield and quality parameters, like plant height, plant spread, number of branches, early flowering, number of flowers per plant, flower weight, flower yield, flower diameter and leaf chlorophyll content (Balakrishnan *et al*., 2007).

Considering the popularity of chrysanthemum and its potential for capturing markets, it is an urgent need to address this important aspect of quality flower production in chrysanthemum in India. In view of the above mentioned facts, the present study on the effect of micronutrient (Fe, Zn) on growth, flowering, flower yield and quality of chrysanthemum (*Chrysanthemum morifolium* Ramat.) cv. IIHR-6".

RESEARCH METHODS

The present experiment on the effect of foliar application of micronutrient ($FeSO_4$ and $ZnSO_4$) on growth, flowering, flower yield and quality of chrysanthemum (*Chrysanthemum morifolium* Ramat.) cv. IIHR – 6 was carried out at Jamuvadi Farm, Plot number 2(B), Department of Horticulture, College of Agriculture, Junagadh Agricultural University, Junagadh, during the years 2013-14.

The experiment was laid out in Factorial Randomized Block Design (FRBD) with three replications and twelve treatment combinations. The treatment comprised of four levels of ferrous sulphate *viz.*,control (water spray) (F_1), 0.2 per cent (F_2), 0.5 per cent (F_3),0.8 per cent (F_4) and three levels of zinc sulphate *i.e.* control (water spray) (Z_1), 0.2 per cent (Z_2) and 0.5 per cent (Z_3).

RESEARCH FINDINGS AND DISCUSSION

The findings of the present study as well as relevant discussion have been presented under following heads :

Plant height (cm) :

The results regarding the plant height at different level of $FeSO_4$ and $ZnSO_4$ are presented in Table 1.

The highest plant height at 60 days after transplanting (56.11 cm) and at 90 days after transplanting (72.33 cm) was obtained with treatment $FeSO_4$ at 0.8 per cent (F_4) (Table 1). An increase in plant height was due to iron acts as an important catalyst in the enzymatic reactions of the metabolism and would have helped in larger biosynthesis of photoassimilates thereby enhancing growth of the plants. Similar results were also obtained by Ganga *et al*. (2008) in chrysanthemum, Ganga *et al*. (2009) in orchid, Tank (2010) and Chandanshive (2011) in rose, Khosa *et al.* (2011) and Bashir *et al.* (2013) in gerbera, Rao (2005) and Fakhraie (2012) in gladiolus.

The highest plant height at 60 days after transplanting (53.67 cm) and at 90 days after transplanting (70.33 cm) was obtained with treatment $ZnSO_4$ at 0.5 per cent (Z_3). This increase in vegetative growth characters of chrysanthemum due to application of zinc sulphate might be on account of synthesis of tryptophan, a precursor of indole acetic acid (auxin) which is accelerated by zinc and as such helps the plant to maintain apical dominance, polarity and growth.It is in conformity with the observations of Barman and Pal (1990); Misra (2001) in chrysanthemum; Jat *et al.* (2007) in marigold, Khosa *et al.* (2011); Bashir *et al.* (2013) in gerbera, Kakade *et al.* (2009) in china aster, Kumar *et al.* (2010) in sunflower; Tank (2010) in rose, Katiyar *et al.* (2012) and Singh *et al.* (2012) in gladiolus and Kumar *et al.* (2003) in carnation.

Plant spread (cm) :

The data regarding the plant spread at different levels of $FeSO_4$ and $ZnSO_4$ are presented in Table 2.

The maximum plant spread in N-S (30.67 cm and 38.78 cm) and E-W (22.67 cm and 31.56 cm) direction was recorded in treatment $FeSO_4$ at 0.8 per cent (F_4) at flower bud initiation and full bloom stage, respectively (Table 2). Ferrous sulphate is a essential components of several dehydrogenase, proteinase, peptidase and promotes growth 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 plant spread. Similar results were also obtained by Kumar *et al*. (2010) in marigold, Deshmukh and Wavhal (1998) in china aster.

The maximum plant spread in N-S (29.75 and 37.58 cm) and E-W (21.83 and 30.75cm) direction was recorded in treatment $ZnSO_4$ at 0.5 per cent (Z_3) at flower bud initiation and full bloom stage, respectively. Plant spread encouraged due to the $ZnSO_4$ could be attributed to improved root system of plants resulting in absorption of more water and nutrients and its utilization. Moreover, micronutrients activate several enzymes(catalase, peroxidase, alcohol, dehydrogenase, carbonic dehydrogenize, tryptophane synthates etc.) and involved themselves in chlorophyll synthesis and various physiological activities. Similar results were also obtained by Kakade *et al.* (2009) in china aster.

Number of branches per plant :

The branches are the skeletal structure of the plant. The number of primary and secondary branches per plant at different levels of $FeSO_4$ and $ZnSO_4$ are shown in Table 3.

The number of primary branches (4.19) and secondary branches (24.89) were observed significantly highest with the foliar application of treatment $FeSO_4$ at 0.8 per cent (F_4) at full bloom stage. $FeSO_4$ activates several enzymes (catalase, peroxidase, alcohol, dehydrogenase, carbonic dehydrogenize, tryptophan synthases etc.) and involved itself in chlorophyll synthesis and various physiological activities by which plant growth and development are encouraged. The present result is in agreement with the results obtained by Kumar *et al.* (2010) in marigold, Chandanshive (2011) and Tank (2010) in rose and Khosa *et al.* (2011) and Bashir *et al.* (2013) in gerbera.

Table 1 : Effect of foliar application of micronutrients ($FeSO_4$ and $ZnSO_4$) on plant height of chrysanthemum at different stages of growth

Treatments	Plant height (cm)		
	30 DAT	60 DAT	90 DAT
Level of $FeSO_4$			
F_1-$FeSO_4$ @ 0.0%	33.44	46.78	63.67
F_2 - $FeSO_4$ @ 0.2%	32.33	49.44	65.89
F_3 - $FeSO_4$ @ 0.5%	34.22	53.11	70.22
F_4 - $FeSO_4$ @ 0.8%	33.11	56.11	72.33
S.E. ±	0.84	1.20	1.18
C.D. (P=0.05)	NS	3.52	3.48
Level of $ZnSO_4$			
Z_1 - $ZnSO_4$ @ 0.0%	33.08	49.83	66.50
Z_2 - $ZnSO_4$ @ 0.2%	32.92	50.58	67.25
Z_3 - $ZnSO_4$ @ 0.5%	33.83	53.67	70.33
S.E. ±	0.73	1.04	1.03
C.D. (P=0.05)	NS	3.05	3.01

NS=Non-significant

Table 2 : Effect of foliar application of micronutrients ($FeSO_4$ and $ZnSO_4$) on plant spread of chrysanthemum at different stages of growth

Treatments	At initiation of flower bud		At full bloom stage	
	N-S (cm)	E-W (cm)	N-S (cm)	E-W (cm)
Level of $FeSO_4$				
F_1-$FeSO_4$ @ 0.0%	25.78	18.78	33.44	27.00
F_2 - $FeSO_4$ @ 0.2%	26.89	19.22	34.89	28.67
F_3 - $FeSO_4$ @ 0.5%	29.78	22.00	37.44	30.89
F_4 - $FeSO_4$ @ 0.8%	30.67	22.67	38.78	31.56
S.E.. ±	0.50	0.44	0.67	0.52
C.D. (P=0.05)	1.45	1.30	1.96	1.53
Level of $ZnSO_4$				
Z_1 - $ZnSO_4$ @ 0.0%	27.17	19.75	35.00	28.50
Z_2 - $ZnSO_4$ @ 0.2%	27.92	20.42	35.83	29.33
Z_3 - $ZnSO_4$ @ 0.5%	29.75	21.83	37.58	30.75
S.E. ±	0.43	0.39	0.58	0.45
C.D. (P=0.05)	1.26	1.13	1.70	1.32

The number of primary branches (4.13) and secondary branches (23.00) were observed significantly highest with the foliar application of $ZnSO_4$at 0.5 per cent (Z_3) at full bloom stage.This increased in vegetative growth characters of chrysanthemum due to application of zinc sulphate might be on account of synthesis of tryptophan, a precursor of indole acetic acid (auxin), which is accelerated by zinc and as such helps the plant to maintain apical dominance, polarity and growth. It is in conformity with the observations of Misra (2001) in chrysanthemum, Jat *et al.* (2007) in marigold, Khosa*et al.* (2011), Bashir *et al.* (2013) in gerbera, Kakade *et al.* (2009) in china aster, Tank (2010) in rose and Kumar *et al*. (2003) in carnation.

Leaf area (cm^2) :

The leaf area shown in Table 4 was influenced by different levels of $FeSO_4$and $ZnSO_4$.The maximum leaf area (37.11 cm^2) was recorded in treatment $FeSO_4$ at 0.8 per cent (F_4) at full bloom stage.$FeSO_4$is essential component of several dehydrogenase, proteinase, peptidase and promotes growth 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 leaf area. Similar results were also found by Bashir *et al*. (2013) in gerbera.

The maximum leaf area (35.33 cm^2) was recorded in treatment $ZnSO_4$ at 0.5 per cent (Z_3) at full bloom

Table 3 : Effect of foliar application of micronutrients ($FeSO_4$ and $ZnSO_4$) on number of primary and secondary branches of chrysanthemum at full bloom stage

Treatments	No. of primary branches	No. of secondary branches
Level of $FeSO_4$		
F_1-$FeSO_4$ @ 0.0%	2.98	16.83
F_2 - $FeSO_4$ @ 0.2%	3.53	19.11
F_3 - $FeSO_4$ @ 0.5%	4.11	23.56
F_4 - $FeSO_4$ @ 0.8%	4.19	24.89
S.E. ±	0.19	0.70
C.D. (P=0.05)	0.56	2.07
Level of $ZnSO_4$		
Z_1 - $ZnSO_4$ @ 0.0%	3.38	19.41
Z_2 - $ZnSO_4$ @ 0.2%	3.61	20.88
Z_3 - $ZnSO_4$ @ 0.5%	4.13	23.00
S.E. ±	0.16	0.61
C.D. (P=0.05)	0.48	1.80

Table 4 : Effect of foliar application of micronutrients ($FeSO_4$ and $ZnSO_4$) on leaf area and number of suckers per plant of chrysanthemum at full bloom stage

Treatments	Leaf area (cm^2)	No. of suckers per plant
Level of $FeSO_4$		
F_1-$FeSO_4$ @ 0.0%	30.00	12.33
F_2 - $FeSO_4$ @ 0.2%	31.78	14.33
F_3 - $FeSO_4$ @ 0.5%	35.78	18.89
F_4 - $FeSO_4$ @ 0.8%	37.11	20.33
S.E. ±	0.62	0.58
C.D. (P=0.05)	1.83	1.70
Level of $ZnSO_4$		
Z_1 - $ZnSO_4$ @ 0.0%	32.25	14.91
Z_2 - $ZnSO_4$ @ 0.2%	33.41	16.17
Z_3 - $ZnSO_4$ @ 0.5%	35.33	18.33
S.E. ±	0.54	0.50
C.D. (P=0.05)	1.59	1.48

Table 5 : Effect of foliar application of micronutrients ($FeSO_4$ and $ZnSO_4$) on fresh weight and dry weight of chrysanthemum at full bloom stage

Treatments	Fresh weight of plant(g)	Dry weight of plant(g)
Level of $FeSO_4$		
F_1-$FeSO_4$ @ 0.0%	247.78	26.67
F_2 - $FeSO_4$ @ 0.2%	271.67	29.00
F_3 - $FeSO_4$ @ 0.5%	298.89	33.78
F_4 - $FeSO_4$ @ 0.8%	306.67	35.44
S.E. ±	5.69	0.78
C.D. (P=0.05)	16.68	2.28
Level of $ZnSO_4$		
Z_1 - $ZnSO_4$ @ 0.0%	265.41	29.67
Z_2 - $ZnSO_4$ @ 0.2%	280.83	31.00
Z_3 - $ZnSO_4$ @ 0.5%	297.50	33.00
S.E. ±	4.92	0.68
C.D. (P=0.05)	14.44	1.97

stage. Zinc sulphate though stimulating metabolic activity with stimulating effect on cell wall loosing, increased cell elongation along with cell enlargement. All these caused effect on increased leaf area, thereby causing increased photosynthetic area. Thus enhanced in carbohydrate food material. Similar results were also obtained by Bashir *et al*. (2013) in gerbera.

Number of suckers per plant :

The result in Table 4 indicates the effect of different level of $FeSO_4$ and $ZnSO_4$ on number of suckers per plant.

The maximum number of suckers per plant (20.33) was recorded in treatment $FeSO_4$ at 0.8 per cent (F_4). Number of suckers per plant increased by involving in oxidation reduction process, photosynthesis and breakdown of protein synthesis.

The maximum number of suckers per plant (18.33) was recorded in treatment $ZnSO_4$ at 0.5 per cent (Z_3). Zinc sulphate plays a vital role in production of number of suckers per plant by involving in oxidation reduction process, photosynthesis and breakdown of auxin and protein synthesis. $ZnSO_4$ 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 suckers.

Fresh and dry weight of plant (g) :

At full bloom stage, maximum fresh weight (306.67 g) and dry weight (35.44 g) of plant was recorded in treatment $FeSO_4$ at 0.8 per cent (F_4).$FeSO_4$ plays a vital role in production of vegetative growth and ultimately encourage the biomass of plant which results in increased fresh and dry weight of plant (Table 5).

At full bloom stage, maximum fresh weight (297.50 g) and dry weight (33.00 g) of plant was recorded in treatment $ZnSO_4$ at 0.5 per cent (Z_3). $ZnSO_4$ plays a vital role in production of vegetative growth and ultimately encourage the biomass of plant which results in increased fresh and dry weight of plant. These results are in agreement with findings of Mona *et al*. (2002) in marigold and Siddiqui *et al*. (2009) in sunflower and Tariq *et al*. (2013) in gladiolus.

Conclusion:

From the present experiment, it can be concluded that $FeSO_4$ @ 0.8 per cent was found to be best for plant height, plant spread, number of primary and secondary branches, leaf area, number of suckers, fresh and dry weight of plant. The $ZnSO_4$ @ 0.5 per cent was also found effective for all growth, parameters.

REFERENCES

Balakrishnan, V., Jawaharlal, M., Senthil Kumar, T. and Ganga, M. (2007). Response of micro-nutrients on flowering, yield and xanthophylls content in African marigold (*Tagetes erecta* L.). *J. Orna. Hort.*,**10**(3):153-156.

Barman, D. and Pal, P. (1990). Effect of micronutrients on growth and flowering of *Chrysanthemum morifolium* cv. CHANDRAMA. *Haryana J. Hort. Sci.*, **28** (1) : 78-79.

Bashir, M.A., Waqas, A., Ahmad, K.S., Shafi, J., Shehzad, M.A., Sarwar, M.A., Ghani, I. and Iqbal, M. (2013). Efficacy of foliar application of micro nutrients on growth and flowering of *Gerbera jamesonii* L. *Universal J. Agric. Res.*,**1**(4): 145-149.

Carter, C.D. (1980). *Introduction to floriculture* (Ed. R.A. Larson) Academic Press, New York.

Chandanshive, P.D. (2011). Effect of micronutrients on growth, flowering and cut flower yield of rose (*Rosa hybrid* Linn.) cv. FIRST RED under protected condition. M.Sc. (Hort.) Thesis. Junagadh Agricultural University, Junagadh, GUJARAT (INDIA).

Deshmukh, M.R. and Wavhal, K.N. (1998). Effect of iron on growth and flowering of aster. *J. Maharashtra Agric. Univ.*, **23** (2): 99-101.

Fakhraie, M.L. (2012). Application of micronutrients $FeSO_4$ and $ZnSO_4$ on the growth and development of gladiolus variety Oscar. *Internat. J. Agric. & Crop Sci.*, **4** (11) : 718-720.

Ganga, M., Jegadeeswari, V., Padmadevi, K. and Jawaharlal, M. (2008). Response of chrysanthemum cv. Co.1 to the application of micronutrients. *J. Orna. Hort.*, **11**(3) : 220-223.

Ganga, M., Padmadevi, K., Jegadeeswari, V. and Jawaharlal, M. (2009). Performance of *Dendrobium* cv. SONIA 17 as influenced by micronutrients. *J. Orna. Hort.*, **12**(1) : 39-43.

Jat, R.N., Khandelwal, S.K. and Gupta, K.N. (2007). Effect of foliar application of urea and zinc sulphate on growth and flowering parameters in African marigold (*Tagetes erecta* L.). *J. Orna. Hort.*, **10**(4): 271-273.

Kakade, D.K., Rajput, S.G. and Joshi, K.I. (2009). Effect of foliar application of 'Fe' and 'Zn' on growth, flowering and yield of china aster [*Callistephus chinensis* (L.) Nees]. *Asian J. Hort.*, **4** (1) : 138-140.

Katiyar, P., Chaturvedi, O.P. and Katiyar, D. (2012). Effect of foliar spray of zinc, calcium and boron on spike production of gladiolus cv. EUROVISION. *Hort. Flora Res. Spectrum*, **1** (4): 334-338.

Khosa, S.S., Younis, A., Rayit, A., Yasmeen, S. and Riaz, A. (2011). Effect of foliar application of macro and micro nutrients on growth and flowering of *Gerbera jamesonii* L. *American-Eurasian J. Agric. & Environ. Sci.*,**11**(5): 736-757.

Kumar, B.N. A., Bhat, S.N. and Shanwad, U. K. (2010). Effect of micronutrients on growth and yield in sunflower (*Helianthus annuus* L.). *Curr. Adv. Agric. Sci.*, **2**(1): 51-52.

Kumar, J., Mir, A. and Singh, P.V. (2003). Effect of Mn and Zn sprays on carnation. *J. Orna. Hort.*,**6**(1): 83.

Kumar, P., Singh, D. and Kumar, S. (2010). Effect of pre-harvest micronutrient foliar spray on growth, flowering and seed production in marigold. *Prog. Agric.*, **10**(1): 182-183.

Misra, H.P. (2001). Response of chrysanthemum to zinc and boron on growth, yield and quality of flowers. *Sci. Hort.*,**7**: 201-208.

Mona, Y.K., Naguib, N.Y. and Sherbeny, S.E. (2002). Response of *Tagetes erecta* L. to compost and foliar application of some micronutrients. *Arab Uni. J. Agric. Sci.*,**10**(3): 939-964.

Rao, K.S.P. (2005). Influence of iron nutrition on growth, flowering and corm yield in gladiolus. *J. Orna. Hort.*, **8**(4): 293-295.

Siddiqui, M.H., Oad, F.C., Kaleem, A.M. and Gandhi, A.W. (2009). Zinc and boron fertility to optimize physiological parameters, nutrient uptake and seed yield of sunflower. *Sarhad J. Agric.*, **25**(1): 53-57.

Singh, A.K. (2004). Effect of spacing and zinc on growth and flowering in gladiolus cv. 'SYLVIA'. *Prog. Hort.*, **36**(1): 94-98.

Singh, J.P., Kumar, K., Katiyar, P.N. and Kumar, V. (2012). Influence of zinc, iron and copper on growth and flowering attributes in gladiolus cv. SAPNA. *Prog. Agri.*,**12**(1): 138-143.

Tank, A.K. (2010). Effect of foliar application of micronutrients on growth and flowering of rose (*Rosa hybrida*) cv. FIRST RED under polyhouse condition. M.Sc. (Hort.) Thesis. Junagadh Agricultural University, Junagadh, GUJARAT (INDIA).

Tariq, Saeed, Hassan, Imran, Jilani, Ghulam and Abbasi, Nadeem Akhtar (2013). Zinc augments the growth and floral attributes of gladiolus, and alleviates oxidative stress in cut flowers. *Sci. Hort.*, **164** : 124–129.

WEBLIOGRAPHY:

Anonymous (2013). Horticultural Database. National Horticulture Board, Ministry of Horticulture, New Delhi. *http.www.nhb.gov.in*

10th Year
★★★★★ of Excellence ★★★★★