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Foliar Application of Micronutrients on Yield and Quality of Floribunda Rose

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ABSTRACT

An experiment was carried out at College of Horticulture, UHS campus, Bengaluru during 2016-17. The experiment was laid out in a Randomized Complete Block Design (RCBD) comprising of eight treatments and three replications. Treatment detail includes micronutrients viz., $MgSO_4$, $MnSO_4$, $FeSO_4$, Boron, $ZnSO_4$ and $CuSO_4$ at different levels on yield and quality of floribunda rose cv. Mirabalis. Results revealed that foliar application of T_7- ZnSO4 (0.75%) + Boric acid (0.5%) + $FeSO_4$ (1.5%) + $MgSO_4$ (0.5%) + $MnSO_4$ (1%) + $CuSO_4$ (0.3%) at 210 days after pruning. Results revealed that increased in flower diameter (4.23 cm), flower stalk length (3.99 cm), number of petals per flower (32.40), sensory evaluation score (4.60), shelf life (41.93 hour) flower yield per plant (295.73 g), 100 flower weight (253.12 g), yield per ha (16.22 tonnes) and B: C ratio (1:3.3). However it was minimum in control.

Key words: *Rose, Micronutrients, Foliar spray, Growth and Quality.*

INTRODUCTION

Roses are grown in the wide range of soil and climatic conditions and suitable for garden decoration and landscaping. They are also grown in pots, rockery and hanging basket *etc*. Commercial cultivation is for in practice among farmers production of cut flowers, loose flowers and extraction of essential oil. Scented roses are useful for perfume and allied products like rose oil, rose attar, rose water, pankhuri, gul-Roghan *etc.* Roses are also useful for medicinal purpose. It is certainly the best known and most popular of all garden flowers throughout the world and has been growing on this earth for many million years before man himself appeared[1]. Rose var. Mirabalis, belongs to the floribunda group which is stiff shrub, smaller and bushier than the average hybrid tea but less dense and sprawling than the average polyantha. Flowers are red in color known for producing better shaped flowers in cluster for a longer period. They are at their best when used in edges, borders or for mass plantings. Since they are floriferous, fast to repeat their bloom and perfect choice for landscaping. The fully opened flowers are used for preparation of garland, which is used as religious and ceremonial functions.

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Improvement in yield and quality of flowers apart from time of planting invariably depends on the nutrition enrichment of the plants. Nutrients especially the micronutrients form an important part of the plants. Foliar application of nutrients has become popular in recent times. It is an excellent supplement to root feeding, where the leaves can directly absorb the nutrients. Hence keeping in view the importance of the effect of foliar application of micronutrient on plant growth, flower yield and flower quality, the present investigation was carried out to know the effect of foliar application of micronutrients on growth, flowering, quality and yield of floribunda under open condition.

MATERIAL AND METHODS

The experiment entitled "Foliar application of micronutrients on yield and quality of floribunda rose'' was conducted at College of Horticulture, University of Horticultural Sciences Campus, GKVK, Bengaluru during 2016-2017. The spacing 1m x 0.45m and the experiment was laid out in Randomized Blok Design with eight treatments includes, *viz*., T_0 (Control) - RDF (NPK-10:10:15 g/plant, 2 split doses) + FYM (2 kg/plant), T_1 - Farmers practice - Boric acid (0.5%) + $MgSO_4$ (0.75%) + $ZnSO_4$-(0.75%), T_2 - Rose mixture (commercially available in market) Flower booster - $ZnSO_4$ (3%) + Boric acid (0.5%) + $FeSO_4$ (0.5%) + $MnSO_4$ (0.2%), T_3 - Boric acid (0.25%) + $ZnSO_4$ (0.75%), T_4 - $ZnSO_4$ (0.75%) + Boric acid (0.5%) + $FeSO_4$ (1.5%) T_5 - $ZnSO_4$ (0.75%) + Boric acid (0.5%) + $FeSO_4$ (1.5%) + $MgSO_4$ (0.5%), T_6 - $ZnSO_4$ (0.75%) + Boric acid (0.5%) + $FeSO_4$ (1.5%) + $MgSO_4$ (0.5%) + $MnSO_4$ (1%) T_7 - $ZnSO_4$ (0.75%) + Boric acid (0.5%) + $FeSO_4$ (1.5%) + $MgSO_4$ (0.5%) + $MnSO_4$ (1%) + $CuSO_4$ (0.3%).

Already established plants of rose cv. Mirabalis were used for conducting the experiment. The micronutrients were applied as per the proposed treatments at 15 days interval starting from 30 days after pruning to 210 days. Data regarding different growth parameters as plant height (cm), plant spread (cm), number of shoots per plant, shoot length (cm), leaf area (cm^2), and chlorophyll content were recorded at 30 days interval up to 210 days.

RESULTS AND DISCUSSION

Effect of foliar application of micronutrients on quality: Micronutrients had effect on quality of rose cv. Mirabalis is evident from the results. At 210 days after maximum flower diameter (4.23 cm) was recorded in treatment T_7- $ZnSO_4$ (0.75%) + Boric acid (0.5%) + $FeSO_4$ (1.5%) + $MgSO_4$ (0.5%) + $MnSO_4$ (1%) + $CuSO_4$ (0.3%) while, it was minimum (3.66 cm) in control (T_0). Increase in the flower diameter might be due to iron stimulating metabolic activity, with the stimulating effect on cell wall loosing, results on cell elongation along with cell enlargement, it results in enlarging flower and stem diameters and chelated mix micronutrients increases the flower diameter. Maximum flower stalk length (3.99 cm) and number of petals per flower (32.40) was recorded treatments T_7- $ZnSO_4$ (0.75%) + Boric acid (0.5%) + $FeSO_4$ (1.5%) + $MgSO_4$ (0.5%) + $MnSO_4$ (1%) + $CuSO_4$ (0.3%). Whereas reduced stalk length of 3.32 cm was recorded in treatment control (T_0). Increase in the flower stalk length may be due to copper because it involves in the formation of various compounds with amino acids and protease in the plant which might have increase the flower stalk length. Boron might be also involved in increasing growth of meristimatic tissue which ultimately improved the stalk length. Increased number of petals per flower might be due to optimum concentration of elements, enhance the plant growth and involves in cellular processes (i.e. photosynthesis, electron transport *etc*). This might be the reason for the maximum number of petals. Patel *et al.*[5], and Kode *et al.*[3]. The maximum quality scale (4.60), flower Minimum weight loss (25.47 g) was recorded in T_7- $ZnSO_4$ (0.75%) + Boric acid (0.5%) + $FeSO_4$ (1.5%) + $MgSO_4$ (0.5%) + $MnSO_4$ (1%) + $CuSO_4$ (0.3%) (4.60). Minimum scale (2.97) was recorded in control (T_0). Decrease in the loss of weight might be

due to application of $MnSO_4$ role in photosynthesis, carbon dioxide assimilation and nitrogen metabolism resulted in accumulation of large quantities of metabolites. Application of zinc sulphate increases the flower weight and size of the flower. Among the treatments, T_7- $ZnSO_4$ (0.75%) + Boric acid (0.5%) + $FeSO_4$ (1.5%) + $MgSO_4$ (0.5%) + $MnSO_4$ (1%) + $CuSO_4$ (0.3%) registered maximum shelf life (41.93 hrs) and control (T_0) registered minimum (32.38 hrs) shelf life. It might be due to enzymatic hydrolysis of cellular components, like that of proteins into amino acids and starch in sugars, is a major biochemical event associated with the senescence process of rose flowers. Synergistic effect of all the micronutrients may results in increase the shelf life. These findings are agreement with Kode *et al.*[3].

Effect of foliar application of micronutrients on yield: Maximum number of flowers (116.98), maximum flower weight recorded (295.73 g), The maximum 100 flower weight (253.12 g), highest flower yield (0.73 kg) per plant, highest flower yield of 16.22 tonnes per hectare was recorded in T_7- $ZnSO_4$ (0.75%) + Boric acid (0.5%) + $FeSO_4$ (1.5%) + $MgSO_4$ (0.5%) + $MnSO_4$ (1%) + $CuSO_4$ (0.3%). Increase the flower number due to higher number of shoots per plant. $MgSO_4$ with all other nutrients influenced the number of flowers positively; the synergistic effect is high with boric acid, followed by $FeSO_4$ and $ZnSO_4$. The effect of combination of micronutrients on the number of flowers is the result of their positive effect on vegetative growth and their intimate association with certain physiological and biochemical process of rose plant. Beneficial effect of magnesium, in improving the activities of certain enzymes and its positive influence in promoting the absorption and translocation of other nutrients Zn, Ca, P, K might have significant improvement in flower production. Kode *et al.*[3]. Increased vegetative characters, like plant height, more number of shoots and plant spread which helps in production of more photosynthates resulting in greater accumulation of dry matter which in turn directly or indirectly lead to the production of more number of flowers per plant Jagtap *et al.*[2].

Effect of foliar application of micronutrients on leaf nutrient content: Higher nitrogen content in leaf (3.01%) was recorded in T_6- $ZnSO_4$ (0.75%) + Boric acid (0.5%) + $FeSO_4$ (1.5%) + $MgSO_4$ (0.5%) + $MnSO_4$ (1%), whereas, higher phosphorus (0.24%), potassium (0.98%) and calcium (0.76%) was recorded in treatment T_7- $ZnSO_4$ (0.75%) + Boric acid (0.5%) + $FeSO_4$ (1.5%) + $MgSO_4$ (0.5%) + $MnSO_4$ (1%) + $CuSO_4$ (0.3%) and magnesium (0.36%) was recorded in T_1 - Farmers practice (Boric acid (0.5%) + $MgSO_4$ (0.75%) + $ZnSO_4$ (0.75%). The nutrient content was recorded maximum under the highest level of nutrients and decreased with the decrease in nutrient level in leaf. A gradual increase of nutrient content was recorded with increasing the combination of micronutrients fertilizer. This might be act as synergistic effect on the other nutrient content increase in the leaf, which would have contributed to higher relative growth rate of plants. Increase nutrient content in leaf due to accumulation of carbohydrates, which may take place gradually with advancement of crop growth. Maximum leaf zinc content (30.11 ppm) was recorded in treatment T_2 - $ZnSO_4$ (3%) + Boric acid (0.5%) + $FeSO_4$ (0.5%) + $MnSO_4$ (0.2%), followed by manganese (98.45 ppm), iron (37.57 ppm), copper (6.20 ppm) and boron (38.51 ppm) was recorded in T_7- $ZnSO_4$ (0.75%) + Boric acid (0.5%) + $FeSO_4$ (1.5%) + $MgSO_4$ (0.5%) + $MnSO_4$ (1%) + $CuSO_4$ (0.3%). Leaf nutrient content of all five nutrients (Zn, Mn, Fe, Cu and B) increased with optimum concentration of spray solution of respective nutrient. In the present investigation the foliar sprays of micronutrients combinations enhanced the leaf nutrient content of all micronutrients compared to control. This might be due to the application of these nutrients would ensure the increased intake of these nutrients. Nagaraju *et al.*[4].

Effect of foliar application of micronutrients on B:C ratio: The economics analysis revealed that the maximum gross

returns and net returns were obtained in the treatment T_7- $ZnSO_4$ (0.75%) + Boric acid (0.5%) + $FeSO_4$ (1.5%) + $MgSO_4$ (0.5%) + $MnSO_4$ (1%) + $CuSO_4$ (0.3%), followed by T_6- $ZnSO_4$ (0.75%) + Boric acid (0.5%) + $FeSO_4$ (1.5%) + $MgSO_4$ (0.5%) + $MnSO_4$ (1%) compared to other treatments. Optimum dose micronutrients increase the yield of flowers, besides beneficial effect on plant growth and development, increase yield and quality. Finally increases gross return, net return and benefit cost ratio. Sowmyalatha[6].

Table 1: Foliar application of micronutrients on quality of floribunda rose after 210 days of prunning

Treatments	Flower diameter (cm)	Flower stalk / Petiole length (cm)	Number of petals per flower	Sensory evaluation (1-5) scale	Physiological loss of weight (g)	Shelf life (hour)
T_1	3.94	3.56	31.73	3.65	38.67	37.26
T_2	3.84	3.94	32.07	3.39	34.57	36.74
T_3	3.94	3.59	31.43	3.45	34.34	37.78
T_4	3.97	3.71	31.53	3.48	31.30	39.56
T_5	3.99	3.73	31.70	3.72	28.36	40.63
T_6	4.07	3.82	31.90	3.90	28.30	40.76
T_7	4.23	3.99	32.40	4.60	25.47	41.93
T_0	3.66	3.32	31.23	2.97	40.34	32.38
S. E.m±	0.12	0.03	0.14	0.07	0.20	1.21
CD at 5%	0.19	0.23	NS	0.22	0.59	1.66
CV (%)	7.28	7.14	6.12	4.17	2.14	5.52

T_0 - Control **T_1** - Farmers practice - Boric acid (0.5%) + $MgSO_4$ (0.75%) + $ZnSO_4$-(0.75%)
T_2 - Rose mixture, Flower booster - $ZnSO_4$ (3%) + Boric acid (0.5%) + $FeSO_4$ (0.5%) + $MnSO_4$ (0.2%)
T_3 - Boric acid (0.25%) + $ZnSO_4$ (0.75%) **T_4** - $ZnSO_4$ (0.75%) + Boric acid (0.5%) + $FeSO_4$ (1.5%)
T_5 - T_4+ $MgSO_4$ (0.5%) **T_6** - T_5+ $MnSO_4$ (1%) **T_7** - T_6+ $CuSO_4$ (0.3%) NS – Non SignificantDAP - Days after pruning

Table 2: Foliar application of micronutrients on yield of floribunda rose after 210 days of prunning

Treatments	Number of flower per plant	Flower yield per plant (g)	100 flower weight (g)	Total flower yield per plant (kg)	Flower yield per ha (tonnes)	B:C Ratio
T_1	91.17	238.23	240.92	0.56	12.44	1:2.0
T_2	86.57	233.73	241.23	0.55	12.22	1:2.8
T_3	89.14	240.67	242.54	0.57	12.60	1:2.6
T_4	90.98	239.53	245.3	0.58	12.88	1:3.1
T_5	93.93	253.73	248.11	0.62	13.70	1:2.9
T_6	112.40	290.57	249.06	0.70	15.55	1:2.9
T_7	116.98	295.73	253.12	0.73	16.22	1:3.2
T_0	81.17	235.57	237.97	0.54	11.99	1:3.3
S. E.m±	2.24	2.65	0.94	0.03	0.35	
CD at 5%	8.81	8.03	4.05	0.10	2.32	
CV (%)	6.82	7.17	7.43	9.01	6.82	

T_0 - Control **T_1** - Farmers practice - Boric acid (0.5%) + $MgSO_4$ (0.75%) + $ZnSO_4$-(0.75%)
T_2 - Rose mixture, Flower booster - $ZnSO_4$ (3%) + Boric acid (0.5%) + $FeSO_4$ (0.5%) + $MnSO_4$ (0.2%)
T_3 - Boric acid (0.25%) + $ZnSO_4$ (0.75%) **T_4** - $ZnSO_4$ (0.75%) + Boric acid (0.5%) + $FeSO_4$ (1.5%)
T_5 - T_4+ $MgSO_4$ (0.5%) **T_6** - T_5+ $MnSO_4$ (1%) **T_7** - T_6+ $CuSO_4$ (0.3%) NS – Non SignificantDAP - Days after pruning

Table 3. Effect of foliar application of micronutrients on leaf nutrient content (ppm) of floribunda rose after 210 days of prunning

Treatments	N	P	K	Ca	Mg	Zn	Mn	Fe	Cu	B
T_1	2.99	0.20	0.98	0.74	0.36	10.12	70.11	20.14	5.11	32.14
T_2	2.91	0.21	0.98	0.75	0.17	30.11	86.44	32.11	5.10	18.45
T_3	2.98	0.22	0.94	0.74	0.18	9.78	70.15	19.17	5.11	30.11
T_4	2.98	0.21	0.97	0.76	0.18	10.14	70.14	37.55	5.21	38.45
T_5	2.99	0.22	0.98	0.74	0.22	10.11	70.11	35.66	5.18	38.11
T_6	3.01	0.23	0.98	0.75	0.23	10.24	98.33	36.44	5.18	38.14
T_7	2.99	0.24	0.98	0.76	0.23	9.99	98.45	37.57	6.20	38.51
T_0	3.01	0.20	0.97	0.75	0.18	5.44	52.80	19.09	5.08	17.84
S. E.m±	0.40	0.21	0.30	0.31	0.25	0.06	0.013	0.31	0.47	0.58
CD at 5%	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
CV (%)	4.99	9.53	11.47	6.33	11.83	7.17	2.94	7.59	7.41	3.23

T_0 - Control **T_1 -** Farmers practice - Boric acid (0.5%) + $MgSO_4$ (0.75%) + $ZnSO_4$-(0.75%)
T_2 - Rose mixture, Flower booster - $ZnSO_4$ (3%) + Boric acid (0.5%) + $FeSO_4$ (0.5%) + $MnSO_4$ (0.2%)
T_3 - Boric acid (0.25%) + $ZnSO_4$ (0.75%) **T_4** - $ZnSO_4$ (0.75%) + Boric acid (0.5%) + $FeSO_4$ (1.5%)
T_5 - T_4+ $MgSO_4$ (0.5%) **T_6** - T_5+ $MnSO_4$ (1%) **T_7** - T_6+ $CuSO_4$ (0.3%) NS – Non Significant DAP - Days after pruning

CONCLUSION

This experiment was finally concluded that improvement in the yield and quality parameters of floribunda rose with different micronutrients combination. Based on the results, it concluded that treatment T_7- $ZnSO_4$ (0.75%) + Boric acid (0.5%) + $FeSO_4$ (1.5%) + $MgSO_4$ (0.5%) + $MnSO_4$ (1%) + $CuSO_4$ (0.3%).

REFERENCES

1. Brother, F., Roses. *Penguine,* Great Britain (1965).
2. Jagtap, H. D., Golliwar, V. J. And Thakre, S. A., Effect of foliar application of micronutrients on growth and flowering of rose under poly house conditions. *Asian J. Hort.,* **7(1):** 25-27 (2012).
3. Kode, S. K., Reddy, A. S., Pratap, M., Rao, P. V. And raju, B. G., Effect of different micronutrients sprays on growth, flower yield and vase life of Rose Cv. Sophia Loren. *NASS.,* **33(2):** 206- 230 (2015).
4. Nagaraju, C. G., Reddy, T. V. And Madaiah, D., Effect of N, K and multiplex on growth, production and quality harvest of field grown roses cv. Gladiator. *J. Orn. Hort.,* **6(4):** 279-287 (2003).
5. Patel, H., Bhatt, D., Patel, G. D., Chawla, S. L., And Gurjar, T., Effect of foliar application of micronutrients on growth and flowering of Rose cv. Top Secret under poly house condition. *Intl. J. Life. Sci*. **11(1):** 603-606 (2016).
6. Sowmyamala, B.V. And Nagaraju, H.T., Effect of organic manures and inorganic fertilizers on post harvest life of gaillardia (*Gaillardia pulchella* cv.D.G.S-1) *Int. J. Agric. Sci.,* **9(2):** 823-824 (2013).