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## Impact of various nutrients on flowering and bulb production of oriental *Lilium hybrid* cv. Sorbonne

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### Abstract

The role of nutrients for a quality produce especially in succulent and highly priced floricultural crops are inevitable. A research work was conducted at Bio-technology cum Tissue culture Centre, OUAT to evaluate the role of nutrients on *Lilium hybrids*. Different nutrient solutions, both alone and in combinations, were applied as foliar spray on oriental *Lilium hybrid* cv. Sorbonne and performance was evaluated for different characters. Plants sprayed with only water were taken as control. Other treatments were done with the dose of nutrients used in preparation of tissue culture Murashige and Skoog (MS) medium (1962) in different combinations. The analysis revealed that foliar application of all the nutrients in combination, i.e., MS Macro + MS Micro + MS Vitamins was proved to be superior in all the flowering characters like Flower length, Flower width, Bloom life of whole spike, Bloom life of individual flower and also in bulb characters such as bulb weight, bulb circumference, number of effective roots per bulb etc. Vase life of the flower was found to be the maximum when MS Macro nutrient solution was used in the treatment.

**Keywords:** oriental lily, bulb, flowering, Murashige and Skoog

### Introduction

Lily (*Lilium spp.*) is an excellent cut flower and ranks 4<sup>th</sup> in the global trade (Desh raj-2015)<sup>[10]</sup>. It is a species of great economic importance in production and commercialization of cut flower in the international market (Jimenez *et al.*, 2012)<sup>[5]</sup>. Due to its size, beauty and longevity *Lilium* is one of the ten most superior cut flowers in the world (Thakur *et al.*, 2005)<sup>[13]</sup>. This highly prized cut flower is among the most beautiful and elegant looking flowers, which makes it popular for different occasions, whether it is for alleviating a sad soul or for a joyous occasion like wedding. Due to its increasing consumer preference its market is growing vigorously not only in India, but also in state like odisha. High quality fresh cut lilies have a distinct competitive edge over lilies from out of state. Proper plant nutrition is essential for successful production of floricultural crops in open and also under protected conditions. Quality is one of the most important characters in the cut flower industry and this is influenced by application of nutrients. To reach out the competitive export and domestic markets, quality plays a vital role. Integrated supply of micronutrients with macronutrients in adequate amount and suitable proportions is one of the most important factors that control the plant growth in flower crops. So this experiment was carried with the objectives to study the impact of foliar application of nutrients on vegetative growth, flowering behaviour, post harvest and bulb production of Asiatic *Lilium hybrid* cv. Tresor.

### Materials and methods

The research work was carried out under the shade net structure of RKVY project at Biotechnology cum Tissue Culture Centre (BTCC), Orissa University of Agriculture and Technology Bhubaneswar, Odisha during the year 2014-16. Oriental *Lilium hybrid* Sorbonne was taken as experiment material. Experiment was laid out with 8 treatments and 4 replications and each replication having 3 plants planted in pots with a media mixture of FYM, cocopeat and garden soil in equal proportion. They were supplemented with a common dose of starter fertilizer dose in equal quantities invariable of treatments. Plants were treated with MS macro nutrient, MS micro nutrient and MS Vitamins solution either alone or in combinations for this experiment. Data was collected for various qualitative and quantitative parameters and was analysed using Completely Randomized Design (CRD). The nutrient solution used for experiment is cited below.

MS Macro nutrient solution (Hi- Media- TS 1068-10 ) applied @ 100 ml/L where Potassium

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Nitrate @ 1900 mg<sup>l</sup><sup>-1</sup>, Ammonium Nitrate @ 1650 mg<sup>l</sup><sup>-1</sup>, Calcium Chloride @ 440 mg<sup>l</sup><sup>-1</sup>, Potassium Di Hydrogen phosphate @ 170 mg<sup>l</sup><sup>-1</sup> and Magnesium sulphate @ 370 mg<sup>l</sup><sup>-1</sup> were used.

MS Micro nutrient solution @ 10 ml<sup>l</sup><sup>-1</sup> was applied, where the microelements viz. Manganese sulphate @ 16.9 ppm, Boric acid @ 6.2 ppm, Potassium Iodide @ 0.83 ppm, Zinc Sulphate @ 8.6 ppm, Copper sulphate @ 0.03 ppm, Ammonium Molebedate with Ferrous sulphate @ 27.8 ppm mixed with Luke warm water were used.

MS Vitamins like Glycine @ 2.0 ppm, Nicotinic acid @ 0.5 ppm, Thiamine HCl @ 0.1 ppm, Pyrodoxine HCl @ 0.5 ppm were used and applied @ 1 ml<sup>l</sup><sup>-1</sup>.

These materials were used in the treatments either alone or in combinations.

## Result and Discussion

### Effect of nutrients on flowering of *Lilium hybrid* cv. Sorbonne.

Impact of nutrients on flower characteristics of *Lilium hybrids* cv. Sorbonne was recorded and the data (Table no-01) revealed that the minimum days taken for opening of first flower opening from planting was also observed in the treatments sprayed with MS Micro + MS Vitamins (56.40 days). The plants treated with MS Micro took more time for flower opening from colour break (6 days) and the least time was taken by the treatment of MS Vitamins only (3.58 days). Similarly, days taken for opening of first flower from bud break was significantly maximum (2.54 days) in the treatments sprayed with MS Micro. Stalk length was studied in all the treatments and the results revealed that the treatments receiving MS Micro and Vitamins in combination showed the maximum stalk length (8.22 cm) which was at par with the plants treated with all (8.04 cm) and the least stalk length (6.43 cm) was observed in the plants of the control plots. Flower length was significantly higher in the plants treated with all the nutrients and vitamins (13.48 cm) which was statistically at par with the treatment of MS micro only (13.43 cm). Similarly the Flower width was also found significantly the best in the plants sprayed with all the nutrients and vitamins as foliar application (21.21 cm) and it was statistically at par with the plants receiving the treatment of MS Macro + MS Vitamins (20.5 cm). Bloom life of the individual flower was significantly enhanced by the application of MS Macro + MS Micro + MS Vitamins (7.75 days) which is very close and at par with the plants receiving all MS Macro + MS Micro i.e. 7.58 days. When the bloom life of the whole spike was considered, it was significantly highest in the treatment of all nutrients and vitamins (14.17 days) which was at par with MS macro + MS micro application (14.00 days) and the lowest flowering period was seen in the control plots (12.39 days).

The result from the above findings pursued that the plants treated with MS Micro + MS Vitamins significantly advanced the days to opening of first flower from planting, whereas application of MS Micro significantly delayed the flower opening from colour break and from bud break. This result corroborates with the experimental findings of Khosa *et al.* (2011) [7], who reported that application of micronutrients solution decreases the number of days for flower emergence in gerbera. Days to flower emergence

were shortened with increased fertilization of micro nutrients. The emergence days were shortest for plants fertilized with NPK (15:32:7) + micro power in dahlia cv. Fresco (Khasif M *et al.* 2014) [6]. Ahmad *et al.*, (2010) [1] also reported that micro-nutrients application gives early and maximum flowering plant<sup>-1</sup> in Rose.

However MS Macro + MS Micro + MS Vitamins was proved to be the best in all the flowering characters like Flower length, Flower width, Bloom life of individual flower and Bloom life of whole spike. Khasif *et al.* (2014) [6] also reported that application of foliar spray of macro and micro nutrients significantly affected the on blooming period of flowers. The result showed that maximum blooming period of *Dahlia hybrida* (50.3 days) was obtained under NPK (15:32:7) + micro power, treatment followed by NPK (15:32:7) + chelated mix micro-nutrients (49.3 days) and NPK (17:17:17) (38.6 days) respectively.

### Efficacy of nutrients on post-harvest and bulb production of *Lilium hybrid* cv. Sorbonne

A perusal of efficacy of foliar application of nutrients on post-harvest and bulb production of oriental *Lilium hybrid* cv. Sorbonne (Table no-02) revealed the following results.

Foliar application with MS Macro + MS Micro + MS Vitamins in combination significantly enhanced the bulb weight (39.62 g), bulb circumference (15.3 cm) number of effective roots per bulb (15.84). This clearly indicates the role of major macro nutrients on bulb production of oriental *Lilium hybrid* cv Sorbonne. Muneeb *et al.*, (2015) [8] reported that Calcium nitrate significantly improved bulb weight, bulb circumference, the number of bulbs plant<sup>-1</sup> and propagation coefficient in lilium. Neerja *et al.* (2005) [9] also recorded increase in the number of bulbs and bulblets with the split application of nitrogen.

Where as in terms of vase life of the flower, Treatment of only MS Macro nutrients was significantly found to be the best (9.83 days).

This may be due to the direct effect of calcium present in the macro solution which is an important constituent of cell wall and known to increase vase life by countering ethylene production. Calcium is otherwise known as building block of cell wall, hence strengthens the cell wall and prolongs vase life. Similar results were obtained by several scientists in various cut flowers. Calcium enhanced life cycle of flowers of cut lilium grown hydroponically as reported by Seyedi *et al.* (2013) [12] with the use of calcium in nutrition. He narrated that 6 mM calcium produced maximum longevity of cut flowers in *Lilium* cv. Tresor. The use of calcium nitrate and calcium chloride increase calcium concentration in aerial organs including the stem tissues which has a direct effect on increasing the life cycle of the flowers after harvesting (Buchanan *et al.*, 2000) [2]. Leaves are capable of withholding the highest concentrations of calcium, in aerial organs. This is the response in relation to stomata closure and their release of moisture via the stoma. Geraspolus & Chebli 1999 on Gerbera, De Capdeville *et al.*, 2005 [4] on Roses, reported Calcium increases postharvest longevity of fresh cut flowers. Reddy *et al* (2016) [11] experimented on Gladiolus and reported Spikes are harvested from the plots treated with calcium nitrate at 3-4 leaf and spike emergence stage showed better longevity than control.



**Fig 8:** Comparison of treatment effects over control in *Lilium hybrid* cv. Sorbonne

**Table 1:** Impact of nutrients on flower characteristics of *Lilium hybrid* cv. Sorbonne

Trt. No	Parameters Treatments	Planting to first flowering	Colour break to first flowering	Bud break to first flowering	Stalk length (cm)	Flower length (cm)	Flower width (cm)	Bloom life of individual flower (days)	Bloom life of whole spike (days)
T1	Control	63.59	4.12	1.17	6.43	10.08	16.92	6.14	12.39
T2	MS macro	62.25	4.04	1.42	7.10	11.87	19.58	7.33	13.75
T3	MS micro	59.00	6.00	2.54	7.00	12.30	18.92	6.75	13.08
T4	MS Vitamins	61.17	3.58	1.53	7.09	10.30	19.63	6.51	12.67
T5	MS macro+ MS micro	60.58	5.17	2.25	8.01	12.55	19.92	7.58	14.00
T6	MS macro+ MS vitamins	60.92	4.25	1.93	7.87	12.13	20.50	7.23	13.58
T7	MS micro+ MS vitamins	56.40	4.21	1.92	8.22	13.43	19.87	6.84	13.20
T8	MS (macro+micro+vitamins)	57.09	4.00	2.00	8.04	13.48	21.21	7.75	14.17
	SE(m)±	0.59	0.18	0.12	0.22	0.15	0.42	0.15	0.21
	CD at 5%	1.72	0.54	0.37	0.64	0.45	1.23	0.43	0.62

**Table 2:** Impact of nutrients on post-harvest and bulon b characteristics of *Lilium hybrid* cv. Sorbonne

Trt. No.	Parameters	Vase life of flower (days)	Bulb weight (g)	Bulb circumference (cm)	No of effective roots
T1	Control	7.00	30.23	13.63	10.52
T2	MS macro	9.42	34.28	14.38	14.40
T3	MS micro	7.75	32.85	13.75	10.96
T4	MS Vitamins	7.08	33.40	13.68	11.16
T5	MS macro+ MS micro	9.08	37.38	14.48	15.17
T6	MS macro+ MS vitamins	8.79	37.98	14.70	15.34
T7	MS micro+ MS vitamins	8.17	34.80	14.00	13.58
T8	MS (macro+micro+vitamins)	9.00	39.62	15.30	15.84
	SE(m)±	0.14	1.19	0.31	0.21
	CD at 5%	0.40	3.47	0.90	0.60

### Conclusion

MS Macro + MS Micro + MS Vitamins maximized the flower bud length, flower bud width, flower length, flower width, bulb weight and bulb circumference in this variety, whereas the vase life of this application followed the maximum vase life obtained by application of MS Macro nutrient solution alone. Hence it can be recommended to apply foliar spray of all the nutrients and vitamins together for a qualitative as well as quantitative produce.

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