

FLOWERING AND BULB PRODUCTION OF LA LILIUM HYBRID CV. FANGIO INFLUENCED BY DIFFERENT GROUPS OF NUTRIENTS

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ABSTRACT

Lilium is a crop of great economic importance in production and commercialization of cut flower in the international market. The role of nutrients in cut flower growth, development and most importantly the quality is inevitable. An experiment was conducted during 2014-15 at Biotechnology-cum-tissue culture centre (BTCC), OUAT, Bhubaneswar where all nutrient groups, which are used in preparing Murashige and Skoog (1962) media, were used as foliar spray either alone or in combinations on the LA liliium hybrid cv. Fangio. Its flowering, post harvest and bulb parameters were studied. The analysis revealed that foliar application of MS micro nutrient solution either alone or in combination with MS vitamins, advanced the flowering processes. Plants treated with all the nutrients and vitamins showed significantly better flower length (11.08 cm), flower width (17.50 cm). All the bulb characteristics like bulb weight (46.70 g), bulb circumference (15.13 cm), number of effective roots bulb⁻¹ (15.00) were also found best in this treatment. However, the maximum vase life of the flowers (9.83 days) was seen in the treatment with MS macro only. Hence, to obtain a better quality of cut flower, it is recommended to go for the foliar application of all the nutrients and vitamins in combination.

(Key words: LA hybrid, nutrient, Murashige and Skoog media, flowering, bulb)

INTRODUCTION

Lily (*Lilium spp.*) is an excellent cut flower and ranks 4th in the global trade. Due to its size, beauty and longevity *Lilium* is one of the ten most superior cut flowers in the world (Thakur *et al.*, 2005). There are several groups of *Lilium* found with various forms, sizes and colour of blooms grown in gardens of different region. Various interspecific hybrids are also found such as Oriental x Asiatic (OA), Longiflorum x Oriental (LO), Oriental x Trumpet (OT), Longiflorum x Asiatic (LA) etc. LA hybrids generally have a larger flower size and the flowers are more clustered at the top and are more upward facing than oriental lilies. The popularity of LA hybrids is increasing over Asiatic hybrids now days. As an exotic flower crop, due to the lack of research works on its nutrient management, its commercial cultivation has been in its infancy. 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.

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. LA liliium hybrid cv. Fangio 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, coco peat and garden soil in equal proportion. Planting was done on 15th December-2014. 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 regularly once flower bud was observed. The vase life study was done under room condition after harvesting using tap water as the substrate. The data were 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⁻¹ where Potassium Nitrate @ 1900 mg l⁻¹, Ammonium Nitrate @ 1650 mg l⁻¹, Calcium Chloride @ 440 mg l⁻¹, Potassium Di Hydrogen phosphate @ 170 mg l⁻¹ and Magnesium sulphate @ 370 mg l⁻¹ were used. MS Micro nutrient solution @ 10 ml l⁻¹ 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

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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 l⁻¹.

These materials were used in the treatments either alone or in combinations (Table 1).

Table 1. Treatment details of the experiment

T ₁	Control
T ₂	MS Macro nutrients
T ₃	MS Micro nutrients
T ₄	MS Vitamins
T ₅	MS (Macro nutrients+ Micro nutrients)
T ₆	MS (Macro nutrients+ Vitamins)
T ₇	MS (Micro nutrients+ Vitamins)
T ₈	MS (Macro nutrients+ Micro nutrients+ Vitamins)

Observations on earliness parameter viz., planting to first flowering (days), colour break to first flowering (days), bud break to first flowering (days), bloom life of individual flower (days) and bloom life of whole spike (days) were undertaken. Observations on flowering characters viz., stalk length (cm), flower length (cm), flower width (cm) and vase life (days) were studied. Similarly observations on bulb parameters viz., bulb weight (cm), bulb circumference (cm) and number of effective roots were also undertaken.

RESULTS AND DISCUSSION

Effect of nutrients on flowering of liliium hybrid cv. Fangio

Foliar application of MS nutrients showed significant variations in terms of flowering characteristics in LA Liliium hybrid cv. Fangio. The data shown in table 2 (earliness) revealed that the plants sprayed with MS Micro + MS Vitamins induced significantly earlier flowering from planting (45.83 days) which was found to be at par with the foliar application of MS Micro (46.25 days) and combination of all nutrients + vitamins i.e. 46.67 days. The plants treated with MS Micro took significantly more time for flower opening from colour break (5.35 days) followed by the treatment conceiving the MS Micro + MS Vitamins (5.00 days). Similarly days to opening of first flower from bud break significantly varied and was maximum (2.83 days) in the treatments sprayed with MS Macro alone, which was closely followed by MS Micro + MS Vitamins (2.65 days) and combination of all (2.47 days). Considering the bloom life of the individual flower, the treatment combination of MS Macro + MS Micro was found to be significantly the best (7.89 days) which was statistically at par with the plants receiving all the nutrients and vitamins i.e. 7.79 days, MS macro + MS vitamins (7.69 days) and MS macro alone (7.62 days). When the bloom life of the whole spike was considered, it was significantly highest in the treatment of all nutrients and vitamins in combination (14.03 days) which

was closely at par with the foliar application of MS Macro + MS Micro (14.02 days).

The result from the above findings pursued that treatment of MS micro, advanced the flowering process. Where ever there is presence of MS micro nutrients, it resulted in earliness of flowering. This might be due to the combine effect of all micro nutrients which advanced the flowering. Zinc is an essential constituent of several important enzyme systems in plants. It controls the synthesis of indole acetic acid, an important plant growth regulator. Iron serves as an activator for biochemical processes, such as respiration, photosynthesis, and symbiotic nitrogen fixation. Copper serves as an activator of numerous plant enzymes. Manganese serves as an activator for enzymes in plant growth processes. Boron functions in the differentiation of meristematic cells. All these nutrients along with the vitamins resulted in faster metabolism and earliness in flowering. However, presence of both macro and micro nutrients helped in longer bloom life and other flowering parameters. Elangaivendhan *et al.* (2016) reported minimum days for first flower emergence (25 days) in spider lily with the application of micro nutrients (Zn + Fe). Foliar application of micro nutrients advanced the days to flower emergence (81.88) as compared to control (100.88) and macro nutrient (85.55) in Gerbera as reported by Saira Sabeer Khosa and co workers (2011). Khasif *et al.* (2014) also reported that application of foliar spray of macro and micro nutrients significantly affected the blooming period of Dahlia flowers. 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.

Effect of nutrients on quality of flowering of liliium hybrid cv. Fangio

Analysis of data from the table 2 (Flowering) revealed that application of MS micro + MS vitamins significantly increased the stalk length of the flower (9.10 cm) and found statistically at par with the MS micro treatment i.e. 8.58 cm. Flower length was significantly higher in the plants treated with all the nutrients and vitamins (11.08 cm), which was statistically at par with the treatment of MS micro alone (10.90 cm), MS macro + MS micro (10.71 cm) and MS macro + MS vitamins (10.71 cm) and the least flower length (10.04 cm) was observed in the control plot. Similarly the flower width (17.50 cm) was also found best in plat receiving all the nutrients in combination. In terms of Vase life of the flowers, plants sprayed with only MS Macro showed significantly the highest vase life (9.83 days). The results are in accordance with the findings of Elangaivendhan *et al.* (2016). They observed that foliar application of micro nutrients in spider lily significantly enhanced flower stalk length. In Rose, number of flowers plant⁻¹ and flower stalk length were maximum with B + Zn application as reported by Ahmed *et al.* (2010). Calcium enhanced life cycle of flowers of cut liliium grown



Fig. 1. Field view of variety Fangio under field condition



Fig. 2. Vase life study of variety Fangio under room condition



Fig. 3. Comparison of treatment effects on bulb characteristics of LA hybrid cv. Fangio

Table 2. Impact of nutrients on earliness, flowering and bulb production of Liliium hybrid cv. Fangio

Trt No.	Treatments	Parameters					Earliness					Flowering					Bulb	
		Planting to first flowering (days)	Colour break to first flowering (days)	Bud break to first flowering (days)	Bloom life Individual flower (days)	Bloom life whole spike (days)	Stalk length (cm)	Flower length (cm)	Flower width (cm)	Vase life of flower (days)	Bulb weight (g)	Bulb circumference (cm)	No. of effective roots					
T1	Control	53.08	4.10	1.67	6.37	12.53	7.04	10.04	14.87	6.83	37.80	12.37	9.25					
T2	MS macro	50.42	4.20	2.17	7.62	13.83	7.65	10.46	16.63	9.83	41.08	14.24	13.84					
T3	MS micro	46.25	5.35	2.83	6.98	12.94	8.58	10.90	16.50	7.83	39.50	14.00	10.66					
T4	MS Vitamins	49.74	4.65	2.33	6.61	12.74	7.46	10.63	16.88	7.17	40.71	13.50	10.63					
T5	MS(macro+micro)	49.00	4.95	1.88	7.89	14.02	7.75	10.71	17.00	9.17	42.78	14.65	14.04					
T6	MS(macro+vitamins)	49.42	4.37	1.79	7.69	13.38	7.74	10.75	17.21	8.95	43.92	15.05	14.58					
T7	MS (micro+ vitamins)	45.83	5.00	2.65	7.12	13.42	9.10	10.67	16.96	8.25	41.93	14.17	12.17					
T8	MS(macro+micro+vitamins)	46.67	4.24	2.47	7.79	14.03	8.00	11.08	17.50	9.00	46.70	15.13	15.00					
	SE(M)±	0.81	0.13	0.16	0.17	0.10	0.22	0.17	0.33	0.22	0.81	0.48	0.20					
	CD at 5%	2.41	0.39	0.48	0.49	0.30	0.63	0.49	0.96	0.63	2.41	1.43	0.56					

hydroponically as reported by Seyedi *et al.* (2013) with the use of calcium in nutrition. Calcium being the building block of cell wall, helps in enhancing vase life. 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).

Efficacy of nutrients on post harvest and bulb production of liliium hybrid cv. Fangio

A perusal of table 2 (bulb) revealed the following results on foliar application of MS nutrients and vitamins on bulb characteristics of Liliium hybrid cv. Fangio. On bulb weight characteristics the plants receiving all the nutrients and vitamins was found to be the highest (46.7 g). Similarly bulb circumference was also observed directly proportional to bulb weight and the data revealed that application of all nutrients and vitamins in combination significantly increased the bulb circumference (15.13 cm) which was statistically at par with the treatment constituting MS macro + MS micro (15.08 cm). Number of effective roots bulb⁻¹ was counted significantly more in the plants treated with MS Macro + MS Micro and MS vitamins (15.00) which was at par with the plants treated with MS macro + MS vitamins (14.58). From all the above results it was found that the plants sprayed with MS Macro + MS Micro + MS Vitamins showed the maximum bulb weight, bulb circumference and maximum number of effective roots bulb⁻¹. Application of all the nutrients resulted in better vegetation and better accumulation of photosynthates in the bulbs. The macro nutrients like phosphorus and potash helped in greater root development and bulb enlargement respectively as their primary roles. Neerja *et al.* (2005) also recorded increase in the number of bulbs and bulblets with the split application of nitrogen. Muneeb *et al.* (2015) also reported increase in various growth parameters after the application of CaCl₂ in Liliium. Calcium nitrate significantly improved bulb weight, bulb circumference, the number of bulbs plant^{e1} and propagation coefficient in liliium.

From the above data, it can be concluded that micro nutrients as foliar application has a positive impact in advancement of flowering in LA lilies. Macro nutrients

showed a better vase life. However, to obtain a better quality of cut flower, it is recommended to go for the foliar application of all the nutrients and vitamins.

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Rec. on 16.9.2017 & Acc. on 03.10.2017_