

Original Research Article

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Studies on the Effect of Integrated Nutrient Management on Propagation of *Alstroemeria* cv. Pink Panther through Rhizome under Nilgiris Condition

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ABSTRACT

The present investigation was conducted to know the studies on the effect of integrated nutrient management on propagation of *Alstroemeria* cv Pink Panther through rhizome under Nilgiris condition was carried out during the year 2017-2018. The experiment was laid out in a Randomized Block Design (RBD) with ten treatments. Single rhizomes were planted in the plot area of 1 x 1 m² and spacing of 30 x 30 cm during the *Kharif* season. Among the treatments days for sprout initiation (16.54 days), rhizome length (14.36 cm), rhizome weight (85.12 g), number of rhizomes (10.67 nos), number of storage roots (6.87 nos) and number of fibrous roots (8.32 nos) were recorded in the treatment T₆. Thus it can be concluded from the findings that application of 100 % RDF (30:15:30 g/m²) + Biofertilizers (Azospirillum 1.5 g/m² + Phosphobacteria 1.5 g/m²) + FYM 2500 g/m²+750 g/m² Vermicompost) can be recommended for propagative parameters for *Alstroemeria* under Nilgiris condition.

Keywords

Kharif season,
Biofertilizers,
Inorganic fertilizers

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Introduction

Alstroemeria L. also known as Peruvian lily or Lily of the Incas belonging to the family Alstroemeriaceae is a potential cutflower and also a potted plant having huge demand in international trade among the cutflowers. Flowers vary in wide range of colours. With the advancement in greenhouse cultivation technologies, *alstroemeria* is emerging as a competitive greenhouse cutflower crop from the past two decades. Genus *Alstroemeria* is a

well-known perennial monocot consisting of several species. *Alstroemerias* are rhizomatous perennials, consisting of sympodial fleshy and multi-stemmed rhizomes. The leaves are entire, grey green to dark green in colour, hairless and thick. Depending on the environmental conditions, the shoots are either reproductive or vegetative. *Alstroemeria* usually are of three types that are butterfly type consisting of shorter stems and peduncles, orchid types having longer stems and peduncles and most of the today's hybrids belong to the aurantiaca type which has

intermediate length stem and peduncles.

Alstroemeria is commonly propagated by the division of rhizomes. For quick and productive crop, active growing healthy and disease free divisions are necessary. It is also done through seeds, but this is generally avoided due to variability. The aerial shoot arises from an underground sympodial rhizome attached to thick fleshy roots. The rhizomes develop into vertical shoots and later generate lateral rhizomes which also produce flowering shoots.

Major cultivation of alstroemeria is found in Netherlands occupying around 110 hectare and total area in the world accounts for 400 hectare. In India majority of alstroemeria is cultivated in hilly regions of Himachal Pradesh and Jammu and Kashmir. In southern part of India in Tamil Nadu Nilgiris is well known for alstroemeria cultivation where production contributes around 58.60 lakh stems under 5.86 hectare area.

Nutrition plays essential role in crop growth. Application of adequate nutrients at required quantity at the destined time period is highly important as it affects the crop production. Soil fertility deterioration and loss of soil quality caused by use of inorganic fertilization consisting on chemical based fertilizer application can be substituted by organic fertilizers composed of organic wastes from plant and animal residues which are renewable and also promotes soil health. Use of chemicals alone might result in environmental hazards that might result in imbalance in the ecosystem. Henceforth sustainable method such as integrated nutrient application has been highly recommended.

Alstroemeria an uprising crop in cutflower industry has sparse information regarding the nutritional requirement. Due to the lack of experimental evidence on the response of

alstroemeria to the inorganic nutrition and organic nutrients on productivity potential and quality of alstroemeria, this research was concentrated more on integrated nutrient management in alstroemeria

Materials and Methods

The present investigation was carried out during the year 2017-2018 to study the effect of integrated nutrient management on propagation of Alstroemeria cv Pink Panther through rhizome under Nilgiris condition. The experiment was conducted in Horticultural Research Station, TNAU, The Nilgiris which is located at 11.4025°N Latitude, 76.735° E Longitude and at an Altitude of 2635 m above Mean Sea Level. The mean annual rainfall of The Nilgiris is 1632 mm. The average maximum and minimum temperature is 26.0°C and 2°C respectively. The average relative humidity is 75 per cent. The experiment was laid out in a Randomized Block Design (RBD) with ten treatments replicated thrice and treatment details are furnished in table 1. The Alstroemeria rhizomes were divided and healthy rhizomes were selected from mother block. Single rhizomes were planted and in the plot area of 1x 1 m² and spacing of 30x30 cm. All organic manures like Farm Yard Manure (FYM), Vermicompost (VC) and bio-fertilizers viz., Azospirillum and phosphorus solubilizing bacteria applied as per the treatment. N applied as basal at the time of planting and remaining 50 % N was applied in splits at 45 days after planting. One third of P and K applied at the time of planting and remaining splits were applied at every three months interval as per the treatments. In each replication five plants were selected for recording biometrics observations on days for sprout initiation, rhizome length, rhizome weight, number of rhizomes, number of storage roots and number of fibrous roots. The data generated during the course of study was

subjected to statistical analysis as prescribed by Panse and Sukhatme (2000).

Results and Discussion

The propagative characters of alstroemeria are very much important as they play a key role in deciding the vegetative and the reproductive growth contributing to the ultimate crop yield. These parameters differed among the various treatments and results indicated that significant variation was observed among the treatments for all the characters were presented in table 2.

The earliest sprouting was noticed from 16.54 days in the treatment T₆ and the treatment T₁₀ recorded the late sprout initiation of 20.22 days. FYM and vermicompost are very good insulating agents and these constituents have a higher temperature comparatively. This higher temperature could be the reason for early sprouting. Relatively, FYM have a high water retention capacity. The continued availability of moisture in the FYM helped the rhizome sections to sprout earlier by allowing cells at

the growing point to expand rapidly. These findings are in accordance with the reports of Gupta *et al.*, (2008) in gladiolus.

Number of rhizomes per plant is one of the most prominent characters, since it has an active role in storage of assimilates and propagative material of the crop. The treatment T₆ produced more number of rhizomes (10.67nos) followed by T₅ (10.12nos). The number of rhizomes formed depends upon the time of initiation of branching. Media with organic base allow a head start for new above ground growth which in turn provides photosynthates for underground organs. This early initiation of new rhizome allows more time for branching and hence, more number of rhizomes at the harvest. This increase in the mineral constituents might have exerted more number of leaves, since nitrogen is the chief constituent of amino acid and coenzymes of biological importance. This is in concurrence with the findings Singh *et al.*, (2014) in tuberose.

Table.1 Treatment details

T₁	150% RDF (45:30:45 N:P:K g/m²)+ Biofertilizers (Azospirillum 1.5 g/m²+ Phosphobacteria 1.5 g/m²)
T₂	150% RDF (45:30:45 N:P:K g/m ²)+FYM 2500 g/m ² + 750 g/m ² Vermicompost
T₃	150% RDF (45:30:45 N:P:K g/m ²) + Biofertilizers (Azospirillum 1.5 g/m ² + Phosphobacteria 1.5 g/m ²) + FYM 2500 g/m ² + 750 g/m ² Vermicompost
T₄	100 % RDF (30:15:30 g/m ²) + Biofertilizers (Azospirillum 1.5 g/m ² + Phosphobacteria 1.5 g/m ²)
T₅	100 % RDF (30:15:30 g/m ²)+ FYM 2500 g/m ² + 750 g/m ² Vermicompost
T₆	100 % RDF (30:15:30 g/m ²) + Biofertilizers (Azospirillum 1.5 g/m ² + Phosphobacteria 1.5 g/m ²) + FYM 2500 g/m ² + 750 g/m ² Vermicompost
T₇	50% RDF (15:7.5:15 g/m ²) +(Azospirillum 1.5 g/m ² +Phosphobacteria 1.5 g/m ²)
T₈	50% RDF (15:7.5:15 g/m ²) + FYM 2500 g/m ² + 750 g/m ² Vermicompost
T₉	50% RDF (15:7.5:15 g/m ²) + Biofertilizers (Azospirillum 1.5 g/m ² + Phosphobacteria 1.5 g/m ²) + FYM 2500 g/m ² + 750 g/m ² Vermicompost
T₁₀	Recommended dose of fertilizers N:P:K (30:15:30 g/M ²) Control

Table.2 The effect of integrated nutrient management on propagative characteristics of *Alstroemeria*

Treatments	Days for sprout initiation	Rhizome length	Rhizome weight	Number of rhizomes	Number of storage roots	Number of fibrous roots
T1	20.15	12.31	65.17	8.26	3.38	4.71
T2	18.32	12.42	66.32	8.54	4.52	5.21
T3	18.62	12.81	73.46	8.10	5.20	5.14
T4	19.14	13.52	75.28	9.20	4.46	5.28
T5	16.78	14.12	82.35	10.12	6.42	7.69
T6	16.54	14.36	85.12	10.67	6.87	8.32
T7	17.12	13.75	76.18	9.40	6.10	5.32
T8	18.65	12.21	72.51	8.80	4.60	5.24
T9	17.47	11.96	68.72	8.60	4.90	5.16
T10	20.22	11.32	63.56	8.16	3.25	4.11
Mean	18.30	12.87	72.86	8.94	4.97	5.61
SEd	0.24	0.07	0.51	0.07	0.05	0.10
CD(0.05)	0.48	0.15	1.10	0.14	0.12	0.20

The highest rhizome length was produced in T₆ (14.36 cm) followed by T₅ (14.12 cm) T₇ (13.75 cm) and T₁₀ (11.32 cm) which recorded the lowest rhizome length during the experimental period. Biofertilizers provide favourable environment for underground storage organs that allows unhindered extension of the new rhizomes. This is because of the low bulk density of the organic matter mixtures which keeps the medium light and porous for rhizome development. The present findings are in agreement with the observations of Ahmad Ali *et al.*, (2014) in gladiolus. The maximum rhizome weight of (85.12 g) was registered in the T₆ followed by T₅ (82.35 g) while T₁₀ recorded the minimum weight of (63.56 g). The biofertilizers especially Azospirillum due to their physico-chemical properties enhanced the formation of fleshy storage roots which accumulated more nutrients and water and ultimately increased the weight of the rhizome cluster. These findings are in accordance with Gupta and Gupta (2007) in

Alstroemeria. The storage and fibrous roots together constitute the root system of the *Alstroemeria*. Storage roots mostly develop into rhizomelets and fibrous roots helps in the crop stand. The development of the roots was significantly influenced by the application of organic and inorganic manures. The maximum number of storage roots ranged from 3.25 to 6.87. The maximum number of storage roots was recorded in the treatment T₆ of 6.87nos whereas the minimum number of storage roots 3.25nos was recorded in the treatment T₁₀. With respect to the number of fibrous roots, maximum number of fibrous roots was noticed in the treatment T₆ of 8.32 nos followed by treatments T₅ which showed 7.69 nos. T₁₀ (control) recorded the minimum number of fibrous roots of 4.11 nos. Rhizomes provided with biofertilizers have stored more carbohydrates through effective photosynthesis. The increase in root spread might be due to storage of carbohydrates and nitrogen compounds in the rhizomes. The carbohydrates and soluble nitrogen

compounds translocate from leaves to rhizomes that helps in the formation of new rhizomelets and allows better root spread. This is in concurrence with the findings of Singh *et al.*, (2014) in alstroemeria. The results of the present investigation thus revealed that among the 10 treatments Alstroemeria cv pink panther species T₆ (100 % RDF (30:15:30 g/m²) + Biofertilizers (Azospirillum 1.5 g/m² + Phosphobacteria 1.5 g/m²) + FYM 2500 g/m² + 750 g/m² Vermicompost) performed better in terms of propagative characters for Alstroemeria under Nilgiris condition

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