Nitrogen and Calcium Requirement for Improved Quality of Lowland Chrysanthemums

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Introduction

Nutrition programs may have great influence on flowering plants either on growth, flowering and keeping quality. Reports on nutrition effects for chrysanthemums mainly were based on cool climatic condition but scarcely available under tropical conditions where temperature and light intensity are high. Thus studies should be conducted to determine nutrition requirement of chrysanthemums grown under lowland tropical climatic condition, so as production areas would be explored to lowland areas.

Nitrogen and calcium are two major of utmost important elements known to have influence on growth and postharvest quality. Nitrogen application during early plant growth had impact on flowering and flower quality. Although high N levels could decrease flower longevity, N however is required particularly during early growth to ensure quality of foliage and blooms. Terminating N fertilization 3 weeks before flowering reduced leaf browning and increased longevity of potted mum. Calcium on the other hand, has been reported to improve postharvest life of potted roses and increase durability of many fruits. Thus regulating the use of N and Ca levels and application program are essential to be conducted for growth and postharvest improvement for lowland chrysanthemums.

Materials and Methods

Cut chrysanthemums (*Dendrathema grandiflora* vr. 'Snowdon") were grown in soilless culture system under lowland conditions. Plants were grown in pots containing coconut coir dust and sand (4:1 v/v) and placed under a noninductive photoperiod by lighting with incandescent lamps from 19 to 22 HR for the first 5 weeks, followed by natural daylenght thereafter. Plants were supplied with basic nutrient solution (mgL^{-1}): 60 P, 300 K, 50 Mg, 75 S, 12 Fe, 2 Mn, 0.3 B, 0.1 Cu, 0.2 Mo, 0.1 Zn. All lateral shoots and flower buds except the terminal bud were removed. Plants were harvested for growth determination. The newly expanded leaves and flowers were analyzed for nutrient content. For flower longevity study, flowers with diameter of 3.5–4.5 cm and stalk 45 cm long were put in vases containing distilled water and placed in a room maintained at ±20°C with 12hr light period daily. Flower longevity was recorded when 30% of the petals wilted. All four experiments used a randomized complete block design with four replications and between 12-16 plants per experimental unit.

Expt. 1 Determination of optimum N level for improved growth and flower quality. The N levels tested were 100, 150, 200, 250, 300 and 350 mgL^{-1}. Calcium level used was 170 mgL^{-1} (based on Cooper Formulation). *Expt. 2* Determination of optimum Ca level for improved growth and flower quality. The Ca levels tested were 50, 100, 150, 200 and 250 mgL^{-1}. Nitrogen was given at 200 mgL^{-1}. *Expt. 3.* Determination of optimum combination level of Ca and N for improved growth and flower quality. The levels used were 150, 200 and 250 mgL^{-1} for Ca and 200 and 300 mgL^{-1} for N. *Expt. 4.* Nitrogen application program for optimum growth and flower quality. Four application programs based on amount and time of application were used.

Results and Discussion

Expt.1 Although during the first month of growing period N did not significantly affect growth, chrysanthemums require high level of N for early maturity and vaselife. At 200 and 300 N, plants respectively, flowered 5 and 7 days ealier than those receiving 100 N. Nitrogen did not significantly affect flower diameter and longevity. However, vaselife could be extended 2 to 3 days with 250 and 300 N. Soluble carbohydrate content was higher at 250 to 350 N. At harvest, plants receiving between 250 to 300 N accumulated the highest amount of dry weight. Our data indicated that level of 200 to 300 is the optimal level of N for shorter production period and possibly improved vaselife. *Expt*

*2:*Calcium levels did no affect plant maturity and the first bud appearance. However, flowers were bigger with increasing Ca levels and the maximum diameter was at 200 Ca. Flower grown at 50 Ca reached fully open stage 2.8 days earlier than those at 200 Ca. However, Ca at 200 mgL^{-1} prolonged the vase life of flowers, which was extended up to 4 days compared to 50 Ca. Results suggested that Ca at 150 to 200 can be considered as optimal level for chrysanthemums for flower quality. *Expt. 3*: Plants receiving combination of 300N with 200-250Ca produced the highest biomass. At 300 N & 200 Ca plants flowered 3 weeks earlier than those at 200N & 200Ca or 200N & 150 Ca and produced bigger flowers with longer vase as compared with other N & Ca combinations. Soluble carbohydrate content was higher at 300 N & 200 Ca. Results suggested that combination of 300 N and 200 Ca was the best for growth and flower quality. *Expt. 4*: A significant reduction in early plant growth was recorded with the lowest N supplied during the first 20 days of growth. Nitrogen at 200 mgL^{-1} probably was the critical level for early vegetative development. For early flowering, 300 N was needed. Maintaining high levels of N throughout the plant growth was not required since reduction of N from 300 to 200 or 75 mgL^{-1} during flowering stage did not jeopardize plant and flower development.

Conclusions

The early growth stages of chrysanthemum grown under lowland condition are critical periods with respect to N availability. Based on growth performance and flower quality, 200 to 300 mgL^{-1} N and 150 to 200 mgL^{-1} Ca appeared to be optimal level for lowland chrysanthemums. When combined, 300 mgL^{-1}N and 200 mgL^{-1} Ca is recommended. Nitrogen could be reduced gradually to as low as 75 mgL^{-1} during flower development.

Benefits from the study

1.Information gathered can be used by growers to expand the chrysanthemums production which normally grown at limited higher elevation to lowland areas. 2. Understanding the nutrient uptake pattern of lowland chrysanthemum in relation to physiological stages 3. Contribute in training and research at undergraduate and graduate levels

Patent(s), if applicable :

Nil

Stage of Commercialization, if applicable :

Nil

Project Publications in Refereed Journals:

Nil

Project Publications in Conference Proceedings

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Graduate Research

Name of Graduate	Research Topic	Field of Expertise	Degree Awarded	Graduation Year
Liza Ismail	**Nitrogen and calcium fertilization for lowland cut chrysanthemums**	**Plant Nutrition**	**M.Sc**	**2004 (expected year)**

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