



The Effect of Colchicine on Growth of *Begonia semperflorens*.

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Abstract

Chemical mutagen can induce mutation in ornamental crops. *Begonias* are plants with bright showy leaves flowering all year round. They are used in window boxes, patio plant or as bedding plants. This experiment was conducted at the screen house, Floriculture Programme, of National Horticultural Research Institute (7^o25''N and 3^o52''E), Ibadan, Oyo State, Nigeria, to evaluate the growth and response of *begonia* to different concentrations and time of soaking in colchicine. Cuttings of *Begonia* (*Begonia semperflorens*) were planted in black polythene nursery bags of 5cm by 6cm filled with topsoil. The treatments include: (0, 300, 500 and 800) mgL⁻¹ colchicine; and four soaking time of (0, 1, 2 and 3) hr. The experiment was arranged in a Completely Randomized Design (CRD) with five replications. There were dose related effects of the mutagenic treatment on the quantitative traits. Significant difference at ($P < 0.05$) were observed on the growth of *Begonia semperflorens*. 300mgL⁻¹ dose for the varying soaking time produced higher plant height and stem diameter while 500mgL⁻¹ dose produced small leaves with decreased leaf area. *Begonia semperflorens* with improved quality were produced.

Keywords: *Begonia*, Colchicine, mutagenesis, growth and development.

INTRODUCTION

Begonia is a genus of perennial flowering plants in the family Begoniaceae. The genus contains about 1,400 different plant species. *Begonia* is found in moist subtropical and tropical climates. Some species are commonly grown indoors as ornamental houseplants in cooler climates. In cooler climates some species are cultivated outside in summertime for their bright colourful flowers, which have sepals but no petals. *Begonias* are used as ornamental plants in window boxes, patio plant or as bedding plants. They have bright showy leaves and flowers all year round. Colchicine is a polyploidising and mutagenic agent (Ramesh *et al.*, 2011). New plant varieties can be developed from seeds or vegetative cuttings through induced mutation by the use of mutagens (Ahloowalia and Maluszynski, 2001; Arulbalachandran *et al.*, 2009), The objective of this study was to determine the growth response of *Begonia semperflorens* to different concentrations

and time of soaking in colchicine, a mutagenic agent, in Ibadan, Nigeria.

MATERIALS AND METHODS

The experimental site was the screen house of the Floriculture Improvement

Programme, National Horticultural Research Institute (NIHORT), Ibadan, Oyo State, Nigeria (3^o 52'E and 7^o 25'N). Cuttings of *Begonia* (*Begonia semperflorens*) with eight (8) nodes were planted in medium sized (5cm by 6cm) black polythene nursery bags filled with topsoil. A cutting was planted per nursery bag. The experiment was 4 x 4 factorial trial with five replications. The treatments were: four concentrations of colchicine (0, 300, 500 and 800mgL⁻¹) and four soaking time where cuttings were soaked in different concentrations of colchicine (0, 1, 2 and 3 hours) before planting. The experimental design was a Completely Randomized Design (CRD) with five replications. Data were collected on plant height; stem girth, number of leaves and leaf area from three weeks after planting. An equal amount of water was



applied to each plant throughout the course of the experiment. Nursery and other cultural practices were carried out. Data collected were analyzed by SAS 2000 and means were separated by least significant difference (LSD) at ($P < 0.05$).

RESULTS AND DISCUSSION:

Effects of concentration and soaking time of colchicine on the plant height and number of leaves of *Begonia semperflorens*

Significant responses were observed in the height of begonia with different concentrations of colchicine and varying soaking time. Highest plant height was observed at 300mgL⁻¹ and 1 hour of soaking in colchicine from 3, 4, 5 and 6 weeks after planting (WAP). Highest height (10.2cm) while the non-soaked 500 mgL⁻¹ concentration of colchicine produced a significantly ($P=0.05$) lower plant height of begonia (Table 1). Highest number of leaves was observed at 800mgL⁻¹ for 3 hours of soaking in colchicine from 3, 4, 5 and 6 weeks after planting (WAP). The highest number of leaves was 5.6 at 6 WAP (Table 2).

Effects of concentration and soaking time of colchicine on the stem diameter and leaf area of *Begonia semperflorens*

Significant responses were observed in the stem diameter of begonia with different concentrations of colchicine and varying soaking time. The least stem diameter was observed at 500mg L¹ for 3 hours of soaking in colchicine. For 3, 4, 5 and 6 WAP, begonia cuttings treated with colchicine at 300 mgL¹ for 3 hours showed no increase in stem diameter. However, the highest stem diameter was observed with control treatment (0 mgL¹, 0 hr.) for 4, 5 and 6 WAP (Table 3). Significant responses were

observed in the leaf area, 500mg L¹ for 2 hours of soaking in colchicine had the highest leaf area (35.40cm² and 43.20cm²) for 5 and 6 WAP. The least leaf area observed at 300mg L¹ for 3 hours at 6 WAP was 5.20m² (Table 4).

The effect of concentration and soaking time of colchicine on growth of *Begonia semperflorens* showed significant response. Colchicine at lower concentration increased the plant height and number of leaves while at higher concentration, the plants had shorter stem diameter and leaf area which agreed with the finding of (Ahloowalia and Maluszynski, 2001; El-Nashar and Asrar, 2016). Colchicine has been used to induce mutation in several plants. The stunted growth at higher concentration is due to reduced rate of cell division (Ramesh *et al.*, 2011). The heterozygous nature of ornamental plants allows for detection, selection and conservation of mutants at different generations (Adelanwa, 2011; Mba, 2013). Mutation induction is applied with the objective of changing growth habit, vegetative and reproductive morphology (Annegret, 2003).

CONCLUSION

Induced mutation is a remarkable method for creating genetic variability in ornamentals when desirable characters are expected. The frequency and type of mutation are dependent on the concentration and duration of soaking in different mutagens.

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Table 1: Effect of concentration and time of soaking on Plant height (cm) of Begonia

| Concentration (mgL ⁻¹) | Time (hours) | Weeks after planting | | | |
|------------------------------------|--------------|----------------------|-------|-------|-------|
| | | 3 | 4 | 5 | 6 |
| 0 | 0 | 1.8 | 1.8 | 2.6 | 2.8 |
| | 1 | 3.0 | 3.5 | 3.8 | 3.8 |
| | 2 | 6.2 | 6.2 | 7.4 | 7.4 |
| | 3 | 4.1 | 4.3 | 4.3 | 4.8 |
| 300 | 0 | 5.0 | 5.0 | 5.0 | 6.6 |
| | 1 | 8.4 | 8.6 | 8.8 | 10.2 |
| | 2 | 1.2 | 1.4 | 5.6 | 6.0 |
| | 3 | 4.8 | 5.8 | 5.8 | 7.4 |
| 500 | 0 | 0.4 | 0.6 | 2.1 | 2.2 |
| | 1 | 3.0 | 3.5 | 3.6 | 3.8 |
| | 2 | 1.6 | 2.0 | 5.0 | 5.0 |
| | 3 | 0.9 | 2.7 | 2.8 | 3.4 |
| 800 | 0 | 4.5 | 4.8 | 5.3 | 5.6 |
| | 1 | 2.3 | 2.6 | 2.6 | 3.0 |
| | 2 | 4.6 | 5.0 | 5.0 | 5.9 |
| | 3 | 6.1 | 6.1 | 6.1 | 8.0 |
| LSD | | 3.994 | 4.381 | 3.774 | 4.390 |



Table 2: Effect of concentration and time of soaking on the number of leaves of Begonia

| Concentration (mgL ⁻¹) | Time (hours) | Weeks after planting | | | |
|------------------------------------|--------------|----------------------|-------|-------|-------|
| | | 3 | 4 | 5 | 6 |
| 0 | 0 | 1.8 | 2.2 | 2.6 | 2.6 |
| | 1 | 2.0 | 2.2 | 2.2 | 2.4 |
| | 2 | 3.0 | 3.0 | 3.4 | 3.4 |
| | 3 | 3.0 | 3.2 | 3.4 | 4.0 |
| 300 | 0 | 3.6 | 4.6 | 4.6 | 4.8 |
| | 1 | 2.8 | 3.0 | 3.6 | 3.6 |
| | 2 | 0.6 | 1.0 | 2.4 | 2.6 |
| | 3 | 3.6 | 3.6 | 3.8 | 4.2 |
| 500 | 0 | 0.6 | 0.6 | 0.8 | 1.0 |
| | 1 | 0.8 | 0.8 | 0.8 | 0.8 |
| | 2 | 0.4 | 0.6 | 1.6 | 1.8 |
| | 3 | 0.2 | 1.4 | 1.6 | 1.8 |
| 800 | 0 | 2.8 | 3.8 | 3.8 | 4.4 |
| | 1 | 1.2 | 1.2 | 1.4 | 1.6 |
| | 2 | 2.0 | 2.0 | 2.0 | 2.8 |
| | 3 | 4.8 | 5.2 | 5.2 | 5.6 |
| LSD | | 2.451 | 2.658 | 2.467 | 2.712 |



Table 3: Effect of concentration and time of soaking on the stem diameter (cm) of Begonia

| Concentration (mgL ⁻¹) | Time (hours) | Weeks after planting | | | |
|------------------------------------|--------------|----------------------|-------|-------|-------|
| | | 3 | 4 | 5 | 6 |
| 0 | 0 | 0.16 | 0.76 | 0.76 | 0.76 |
| | 1 | 0.14 | 0.14 | 0.16 | 0.16 |
| | 2 | 0.08 | 0.08 | 0.08 | 0.10 |
| | 3 | 0.20 | 0.24 | 0.26 | 0.30 |
| 300 | 0 | 0.20 | 0.20 | 0.20 | 0.20 |
| | 1 | 0.20 | 0.20 | 0.20 | 0.20 |
| | 2 | 0.08 | 0.08 | 0.20 | 0.22 |
| | 3 | 0.10 | 0.10 | 0.10 | 0.10 |
| 500 | 0 | 0.04 | 0.04 | 0.22 | 0.24 |
| | 1 | 0.12 | 0.12 | 0.12 | 0.12 |
| | 2 | 0.06 | 0.06 | 0.16 | 0.16 |
| | 3 | 0.02 | 0.08 | 0.10 | 0.10 |
| 800 | 0 | 0.22 | 0.22 | 0.22 | 0.22 |
| | 1 | 0.06 | 0.08 | 0.10 | 0.10 |
| | 2 | 0.18 | 0.20 | 0.20 | 0.20 |
| | 3 | 0.16 | 0.16 | 0.20 | 0.24 |
| LSD | | 0.164 | 0.271 | 0.257 | 0.262 |



Table 4: Effect of concentration and time of soaking on the leaf area (cm²) of Begonia

| Concentration (mgL ⁻¹) | Time (hours) | Weeks after planting | | | |
|------------------------------------|--------------|----------------------|--------|--------|--------|
| | | 3 | 4 | 5 | 6 |
| 0 | 0 | 4.04 | 6.60 | 7.80 | 10.60 |
| | 1 | 11.40 | 14.20 | 16.40 | 18.20 |
| | 2 | 6.80 | 6.80 | 7.20 | 9.00 |
| | 3 | 4.10 | 4.90 | 7.40 | 8.10 |
| 300 | 0 | 10.40 | 12.00 | 13.20 | 14.60 |
| | 1 | 16.80 | 21.40 | 24.00 | 29.80 |
| | 2 | 6.00 | 9.80 | 21.10 | 27.40 |
| | 3 | 2.32 | 2.60 | 2.60 | 5.20 |
| 500 | 0 | 3.00 | 4.80 | 6.00 | 18.60 |
| | 1 | 9.40 | 11.00 | 13.00 | 14.60 |
| | 2 | 12.60 | 14.40 | 35.40 | 43.20 |
| | 3 | 1.20 | 5.20 | 6.80 | 13.20 |
| 800 | 0 | 20.80 | 21.20 | 21.40 | 21.60 |
| | 1 | 3.36 | 5.80 | 5.80 | 6.80 |
| | 2 | 8.40 | 11.00 | 11.00 | 15.60 |
| | 3 | 22.40 | 22.80 | 23.60 | 25.20 |
| LSD | | 17.682 | 23.466 | 17.651 | 21.601 |