



Floral Initiation of Poinsettia (*Euphorbia Pulcherrima*) as Affected by Photoperiod and Different Rates of Paclobutrazol

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ABSTRACT

The study aimed to determine the effect of paclobutrazol on the growth and flowering of poinsettia. Specifically, it aimed to: determine the flowering response of poinsettia applied with different rates of paclobutrazol; determine the rate of paclobutrazol most suited for the flowering of poinsettia; and determine the effect of day length on the growth of poinsettia.

This study was conducted at Sultan Kudarat State University, Tissue Culture Nursery, EJC Montilla, Tacurong City. The study was laid in a 3x3 factorial in Completely Randomized Design. Treatments consisted of the following: Factor A was day length, categorized into 8 hours (control); 10 hours (2 hours extended); and 12 hours (4 hours extended), and Factor B dealt with the rates of paclobutrazol with the following applications: water only (control); 50 ppm, and 100 ppm. Each was replicated (3) three times with 10 experimental plants per treatment.

Results showed that in terms of plant height and shoot length, poinsettia responded better when exposed to 12 hours day length. The earliest number of days to floral initiation was reached by those poinsettia exposed to 10 hours day length, while the earliest number of days to flowering and better plant vigor was obtained in plants exposed to 8 hours day length.

The application of 50ppm paclobutrazol favors the growth and flowering of poinsettia.

Keyword: Day length, Floral Initiation, Paclobutrazol, Photoperiod, Poinsettia

I. INTRODUCTION

Flowers have always been considered as the symbol of grace and elegance and a feast for man's eyes. Flowers are used in religious festivals and all other occasions. Ornamental plants and cut flowers are grown throughout the world. However, in the Philippines, the industry is confined only to a few small growers. Recently, an increased awareness and recognition of high return on investments, rapid population growth, higher standard of living, spread of hotels and restaurants, influx of tourists and choosy consumers have led to more demands and more supply.

The economic importance of ornamentals has been increasing in many countries, and international demand has rapidly expanded. Cut flowers represent the largest segment of the industry, followed by flowering pot plants, tree and nursery crops, flower bulbs, and other propagation materials.

Poinsettia (*Euphorbia pulcherrima*) is a shrub or small tree, typically reaching a height of 0.6–4 metres (2 ft 0 in–13 ft 1 in). The plant bears dark green dentate leaves that measure 7–16 centimeters (2.8–6.3 in) in length.

The colored bracts are often mistaken for flower petals because of their groupings and colors, but are actually leaves. There are over 100 varieties of poinsettias. Though once only available in red, there are now poinsettias in pink, white, yellow, purple, salmon, and multi-colors. The red poinsettia still dominates over other color options. 'Prestige Red', ranks among the best-selling hybrids. The bract colors are created through photoperiodism, which means that plants require darkness to change color. At the same

time they need abundant light during the day for the brightest color.

Fertilization, therefore, is important to replenish the lost element needed for plant growth and flowering response. Paclobutrazol inhibited growth considerably and contributed to the increase in fruit formation not only for grapes but also for many other tree species [1].

There are rates and methods of applying fertilizers to various crops to promote high yield. Hence, this study was conducted to promote a basic source of information for growth and flowering of poinsettia. Likewise, this study will be useful as guide for technology to growers, producers and entrepreneurs of flowering plants.

Thus, the study was conducted to determine the effect of paclobutrazol on the growth and flowering of poinsettia. This study was only limited to the growth and flowering response of poinsettia applied with different rates of paclobutrazol.

This was conducted at Sultan Kudarat State University (SKSU) Tissue Culture Nursery, EJC Montilla, Tacurong City, from September- December 2014.

METHODOLOGY

The materials used in this study were as follows: 270 uniform stem cuttings of poinsettias, 270 pieces of polyethylene bags, ordinary garden soil, plywood, paintbrush, ball pen, record book, graduated cylinder, shovel, wheel barrow, 4pcs. incandescent bulb (50w). Male/female socket, receptacle, flat cord wire no.16, safety box/main switch and tools.

The study was laid in a 3x3 factorial in Completely Randomized Design. Treatments consisted of the following: Factor A was day length, categorized into 8 hours (control); 10 hours (2 hours extended); and 12 hours (4 hours extended), and Factor B dealt with the rates of paclobutrazol with the following applications: water only (control); 50ppm, and 100ppm. Each was replicated (3) three times with 10 experimental plants per treatment.

The soil media was composed of garden soil. All the 270 plants were properly arranged in rows based on the treatment to be applied. Lighting tools and materials were procured and installed at the research

area, which is the SKSU Nursery. A licensed electrician was hired to install the lighting system for security and safety. Application of paclobutrazol was done two times a month. The solution was applied by using a drench in order to ensure that it penetrated the roots.

The following data were gathered: Plant Height (cm), Shoot Length(cm) Number of Days to Floral Initiation, Number of Days to Flowering, Plant Vigor, and Reaction to Pests and Diseases.

Data gathered were statistically analyzed using the analysis of variance in Completely Randomized Design. The Least Significance Difference (LSD) test was employed to compare the significant difference between or among treatment mean values.

RESULTS AND DISCUSSION

Number of Days to Floral Initiation

Statistical analysis revealed that there was no significant difference among the treatments tested. Numerically, the number of days to floral initiation ranged from 21.16, 20.01, 21.57 days, respectively.

On the other hand, poinsettia applied with 50ppm paclobutrazol (B₂) was observed to initiate flower induction within 17.43 days, followed by the control plants (B₁) with water only, and 100ppm (B₃) of paclobutrazol with the mean of 20.92 and 24.39, respectively. Results can be attributed to the effect of paclobutrazol which was noted to enhance early flowering of mango and rambutan. Various plant growth regulators have proven to be effective in inducing flowering of pineapple such as ethylene releasing hormones.

On the other hand, paclobutrazol is very popular nowadays especially on fruit crops such as rambutan, [2] durian [3] mango [4], and pineapple [5] it is a potent plant growth retardant, which is active on a broad range of plant species. It has potential agronomic importance in controlling the vegetative growth of plant.

Furthermore, it was found that there was a significant interaction effect between paclobutrazol and day length. Poinsettia applied with 50ppm paclobutrazol exposed to 10 hours day length initiated flower induction earlier (A₂ B₂), while the latest to initiate flowering were applied with 100ppm paclobutrazol,

regardless of day length exposure with a mean of 23.77 and 25.30 days, respectively.

Results were supported by the findings of [6] that postharvest application of a small amount of paclobutrazol to the soil significantly promoted

flowering and fruiting in plants. Early flowering enhanced fruit maturity. Treated trees and pineapple flowered three to four weeks early, which reduced the time fruiting by at least two weeks. [5] Moreover, [5] stated that the application of the PBZ weeks before flower induction of pineapple was highly significant.

Table1. Number of Days to Floral Initiation of Poinsettia as Affected by Day length and Rates of Paclobutrazol after first application of PBZ, SKSU, 2015

Factor A (Day length)	Factor B (Rates of Paclobutrazol) ^{2/}			Mean
	B ₁ (Water only)	B ₂ (50ppm)	B ₃ (100ppm)	
A ₁ . 8hours	19.72 ^c	18.47 ^c	25.30 ^a	21.16
A ₂ . 10 hours	20.40 ^{bc}	15.53 ^d	24.10 ^a	20.01
A ₃ . 12 hours	22.63 ^b	18.30 ^c	23.77 ^{ab}	21.57
Mean ^{1/}	20.92 ^b	17.43 ^c	24.39 ^a	20.91

^{1/} Treatment means having common letters superscript are not significantly different at 1% level.

^{2/} Treatment means having common letters superscript are not significantly different at 5 % level.

Number of Days to Flowering

Statistical analysis revealed that there was no significant difference among the treatments tested.

The earliest number of days to flowering was shown by poinsettia exposed to 8 hours day length with a mean of 28.34.

On the other hand, poinsettia applied with 50 ppm paclobutrazol (B₂) was observed to be the earliest (27.38) to flower, followed by plants treated with water only (B₁) and plants applied with 100 ppm (B₃) of paclobutrazol with a mean of 28.39 and 29.42, respectively. The result of the study was supported by the findings of [7] that a direct way of paclobutrazol to stimulate flower initiation is by inhibition of shoot growth. Flower initiation in apple and pear [8] is correlated with marked shortening of the plastochrone i.e. the average time interval between the appearance of successive primordial within the bud, prompting the suggestion that floral initiation might be triggered by the accumulation of a critical number of primordial with bud.

Table 2. Number of Days to Flowering of Poinsettia as Affected by Day length and Rates of Paclobutrazol, SKSU, 2015

Factor A (Day length)	Factor B (Rates of Paclobutrazol)			Mean ^{1/}
	B ₁ (Water only)	B ₂ (50ppm)	B ₃ (100ppm)	
A ₁ . 8hours	55.73	64.97	59.68	60.13 ^b
A ₂ . 10 hours	63.33	67.53	65.37	65.41 ^a
A ₃ . 12 hours	62.83	71.87	67.77	67.49 ^a
Mean ^{2/}	60.63 ^c	68.12 ^a	64.27 ^b	63.34

^{1/} Treatment means having common letters superscript are not significantly different at 1% level.

Plant Height (cm)

Statistical analysis revealed a highly significant difference among the treatments tested. Poinsettia exposed to 12 hours (A₃) day length grew tallest with a mean of 67.49 cm. The shortest height was observed in plants with 8 hours exposure to sunlight.

In terms of the effect of paclobutrazol, it was observed that poinsettia applied with 50 ppm paclobutrazol gained the tallest plant height with a mean of 68.12 cm; control plants (water only) got the shortest height with a mean of 60.63 cm.

Result can be attributed to the stress-related effect of plants. The higher the degree of light the plant receives the faster the photosynthesis effect. Hence, the plant will develop faster.

However, no interaction effect was found between the day length and rates of paclobutrazol. Plant height ranged from 55.73 cm to 71.82 cm regardless of the rates of paclobutrazol and day length exposure.

Table3. Plant Height (cm) of Poinsettia as Affected by Day length and Rates of Paclobutrazol, SKSU, 2015

Factor A (Day length)	Factor B (Rates of Paclobutrazol)			Mean
	B ₁ (Water only)	B ₂ (50ppm)	B ₃ (100ppm)	
A ₁ . 8hours	28.50	27.30	29.23	28.34
A ₂ . 10 hours	28.17	27.50	29.50	28.39
A ₃ . 12 hours	28.50	27.33	29.53	28.46
Mean _{1/}	28.39 ^b	27.38 ^c	29.42 ^a	28.73

1/ Treatment means having common letters superscript are not significantly different at 1% level.

2/ Treatment means having common letters superscript are not significantly different at 1% level

Shoot Length

Statistical analysis revealed that there was a significant difference among the treatments tested. Poinsettia exposed to 10 hours (A₂) and 12 hours (A₃) day length exhibited the longest shoot with a mean of 53.08 cm and 55.15 cm, respectively. While the shortest shoot with a mean of 41.13 cm was found in plants with 8 hours exposure to sunlight. This can be attributed to light intensity levels that have a significant effect on photosynthesis, which directly relate to the plant's ability to grow fast.

In terms on the effect of paclobutrazol, it was observed that poinsettia applied with 50ppm paclobutrazol got the longest shoot of 54.68 cm and the shortest from control plants (water only) 42.93 cm. Results were contrary to the findings of [5] that paclobutrazol enhance rosette formation of pineapple leaves thereby showed stunted and shorter growth of pineapple plants. This may be due to the time of the conduct of the study which was a short day period; hence, poinsettia was unaffected by paclobutrazol.

Meanwhile, no interaction effect was found between day length and paclobutrazol in terms of shoot length.

Table4. Shoot Length (cm) of Poinsettia as Affected by Day length and Rates of Paclobutrazol, SKSU, 2015

Factor A (Day length)	Factor B (Rates of Paclobutrazol)			Mean _{1/}
	B ₁ (Water only)	B ₂ (50ppm)	B ₃ (100ppm)	
A ₁ . 8hours	3.33	3.67	3.33	3.44 ^a
A ₂ . 10 hours	3.67	3.33	2.67	3.22 ^a
A ₃ . 12 hours	2.67	2.67	2.33	2.56 ^b
Mean	3.22	3.22	2.78	3.07

1/ Treatment means having common letters superscript are not significantly different at 1% level.

2/ Treatment means having common letters superscript are not significantly different at 1% level.

Plant Vigor

Statistical analysis revealed that there was a significant difference among the treatments tested. Result showed that 8 hours and 10 hours day length exhibited vigorous poinsettia plants with healthy green leaves gaining a mean of 3.44 and 3.22, respectively. Plants with 12 hours extended day length was observed to be moderately vigorous. In terms of levels of paclobutrazol, no significant difference was found among the treatments tested. Numerically, results were 3.22, 2.78, respectively, with more or less vigorous plants.

Likewise, there was no interaction effect between day length and paclobutrazol in terms of the number of days to flowering.

Table 5. Plant Vigor of Poinsettia as Affected by Day length and Rates of Paclobutrazol, SKSU, 2015

Factor A (Day length)	Factor B (Rates of Paclobutrazol)			Mean
	B ₁ (Water only)	B ₂ (50ppm)	B ₃ (100ppm)	
A ₁ . 8hours	3.33	3.67	3.33	3.44
A ₂ . 10 hours	3.67	3.67	3.67	3.67
A ₃ . 12 hours	3.37	3.67	3.33	3.56
Mean	3.56	3.67	3.44	3.56

1/ Treatment means having common letters superscript are not significantly different at 5% level.

Reaction to Pests and Diseases

Statistical analysis revealed no significant difference among the treatments tested. Results revealed that plants were slightly damaged of fungal disease with mean ranging from 3.33 to 3.67.

In terms of levels of paclobutrazol, there was no significant difference found among the treatments tested. Numerically, the mean results were 3.56, 3.67, 3.44, respectively, with slightly damaged plants.

Table 6. Reaction to Pests and Diseases of Poinsettia as Affected by Day length and Rates of Paclobutrazol, SKSU, 2015

Factor A (Day length)	Factor B (Rates of Paclobutrazol)			Mean1/ Mean2/
	B ₁ (Water only)	B ₂ (50ppm)	B ₃ (100ppm)	
A ₁ . 8hours	35.63	47.13	40.63	41.13 ^b
A ₂ . 10 hours	48.84	56.00	54.40	53.08 ^a
A ₃ . 12 hours	44.33	60.91	60.20	55.15 ^a
Mean2/	42.93 ^b	54.68 ^a	51.74 ^a	49.79

CONCLUSION

Based on the results, it is concluded that the application of 50ppm paclobutrazol favors the growth and flowering of poinsettia. Floral initiation of poinsettia is initiated earlier by exposure to 10 hours day length; while the number of days to flowering and plant vigor are better enhanced by exposure to 8 hours day length. Plant height and shoot length are increased when exposed to 12 hours day length.

Thus, the researcher recommends that floral initiation of poinsettia is enhanced with 8 hours to 10 hours exposure to visible lights/day length regardless of the rates of paclobutrazol.

It is recommended that a similar study be made using shorter (less than 8 hours) day length, preferably during the long day period specifically, April – August.

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