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Effect of paclobutrazol and B-nine on morphological development of *Primula malacoides* Franch

NEHA DOGRA, RAJESH BHALLA and BHARATI KASHYAP

Department of Floriculture and Landscape Architecture
Dr YS Parmar University of Horticulture and forestry
Nauni, Solan 173230 HP, India
Email for correspondence: nehadogra-coadfl@pau.edu

ABSTRACT

An experiment was conducted at the experimental farm of department of Floriculture and Landscape Architecture, Dr YS Parmar University of Horticulture and Forestry, Nauni, Solan, HP from September 2012 to March 2013 with the objective to study the effect of B-nine and paclobutrazol on vegetative growth of *Primula*. The experiment was laid out in a completely randomized design consisting of 19 treatments replicated thrice each having 5 pots. Rooted seedlings were planted in pots of 6 inch size containing sterilized potting mixture of sand/soil/vermicompost in equal ratio. Paclobutrazol (10, 15 and 20 ppm) and B-nine (500, 1000 and 1500 ppm) were sprayed on rooted seedlings at 8-10 cm height. All the paclobutrazol treated plants resulted in reduced plant spread, inter-nodal length, leaf colour and number of leaves per plant whereas B-nine treated plants resulted in reduced plant height.

Keywords: Paclobutrazol; B-nine; vegetative growth; internodal length; primula

INTRODUCTION

The commonly grown *Primula malacoides* belonging to the family Primulaceace which is a native of China is a non-hardy species generally grown in pots as an annual for indoor use. It is known as fairy primrose because of its light, airy and graceful appearance of foliage. The plants form a compact basal mass of thin-textured, pale green, ovate, pointed and deeply dentate foliage with ruffled edges. The compact and dwarf growth habit as well as freedom of profuse flower production of primula make it especially desirable for growing in pots/containers. A well grown plant simultaneously produces a number of elegant flower stems. These are excellent winter and spring flowering herbaceous plants. The plant growth regulators modify physiological processes of the plants and ultimately affect yield and quality of blooms. Retardants can delay cell division and elongation in shoot tissues resulting in influential effects. Growth retardants like cycocel (CCC) and ancymidol (A-Rest)

have been widely used in primula for many years. However paclobutrazol developed triazole is quite effective in checking growth of primula. Time of application also has a huge impact on the effectiveness of growth retardants on the crop.

MATERIAL and METHODS

The investigation was carried out at the experimental farm of department of Floriculture and Landscaping, Nauni, Solan, Himachal Pradesh. Seedlings of *P malacoides* were planted in shade net house on 1 September 2012 (one seedling per pot) in pots of 15 cm size containing a potting mixture of sand : soil : vermicompost in equal ratio. After 30 days of transplanting ie on 1 October 2012 plants were treated with single spray of PBZ (10, 15 and 20 ppm) and B-9 (500, 1000 and 1500 ppm). After 45 days ie on 16 October 2012 single and double spray of B-9 and PBZ were given and after 60 days (triple spray) ie on 31 October 2012 and after 90 days of transplanting double spray and triple spray were given ie on 30 November 2012. Before the application of PBZ and B-9 all pots were irrigated thoroughly. The pots were kept under 75 per cent shade net house to fulfill the light requirement which was up to 30000 lux. To maintain the health and presentability of pots standard plant protection measures were adopted which included fortnightly drenching and spraying with mancozeb @ 2 g/l and carbendazim @ 1 g/l alternatively. To control the white flies yellow sticky traps were hung at a height of 30 cm above the plants.

RESULTS and DISCUSSION

The results of the investigation presented in Table 1 show that height reduction was achieved with the application of both of the growth retardants over control with maximum reduction (44.00%) being caused by the application of triple spray of B-9 (T_{18}) @ 500 ppm each over control. The reduction in plant height with B-9 and PBZ application might be due to inhibitory role of growth retardants on cell division and cell elongation of apical meristematic cells and also on the GA_3 biosynthesis (Cathey 1964, Cathey 1975). It is well known that increase in height of a plant is a result of endogenous GA level but paclobutrazol is well known inhibitor of gibberellins biosynthesis as it specifically inhibits the microsomal oxidation of ent-kaurene in the isoprenoid pathway of GA biosynthesis (Davis et al 1988).

Plant spread is known to be suppressed with paclobutrazol. On the contrary in present investigation both the retardants increased plant spread over control. Maximum plant spread (27.16 cm) was recorded with the application of triple spray (5 ppm each) of PBZ and was at par with B-9 whereas minimum plant spread was achieved in control (19.13 cm). The increase in plant spread might be due to decrease in plant height and increase in leaf number.

Table 1. Effect of paclobutrazol and B-nine on vegetative growth of *Primula malacoides* Franch

Treatment	Plant height (cm)	Plant spread (cm)	# leaves/plant	Leaf colour	Internodal length (cm)
T_0	34.83	19.13	30.00	Green Group-137A	7.00
T_1	25.56	23.10	38.15	Green Group-139A	4.83
T_2	25.50	23.20	44.00	Green Group-139A	4.93
T_3	24.50	22.37	37.00	Green Group-139A	4.91
T_4	24.50	24.03	37.73	Green Group-139A	5.17
T_5	23.83	24.47	36.00	Green Group-139A	4.87
T_6	28.90	27.17	46.00	Green Group-139A	3.67
T_7	24.00	20.67	43.83	Green Group-139A	4.67
T_8	24.96	21.97	35.83	Green Group-139A	4.93
T_9	27.10	20.93	40.00	Green Group-139A	4.53
Mean	25.44	23.10	39.84		4.72
T_{10}	28.30	23.40	33.67	Green Group-138A	4.50
T_{11}	28.03	23.47	41.00	Green Group-138A	4.60
T_{12}	25.03	21.57	42.00	Green Group-138A	5.07
T_{13}	27.07	21.47	40.00	Green Group-138A	4.97
T_{14}	25.33	21.57	39.50	Green Group-138A	5.07
T_{15}	22.70	23.33	36.67	Green Group-138A	4.83
T_{16}	27.10	22.33	37.40	Green Group-138A	4.87
T_{17}	21.30	22.60	37.50	Green Group-138A	4.53
T_{18}	19.50	22.80	38.50	Green Group-138A	4.97
Mean	24.93	22.50	38.41		4.82
$CD_{0.05}$ (Control and retardants)	3.96	2.38	3.80		0.85
Treatments	5.31	3.19	5.10		1.14

T_0: control, T_1: PBZ (single spray @ 10 ppm), T_2: PBZ (double spray @ 5 ppm each), T_3: PBZ (triple spray @ 3, 3 & 4 ppm), T_4: PBZ (single spray @ 15 ppm), T_5: PBZ (double spray @ 7. 5 ppm each), T_6: PBZ (triple spray @ 5 ppm each), T_7: PBZ (single spray @ 20 ppm), T_8: PBZ (double spray @ 10 ppm each) T_9: PBZ (triple spray @ 6, 7 & 7 ppm), T_{10}: B-9 (single spray @ 500 ppm), T_{11}: B-9 (double spray @ 250 ppm each), T_{12}: B-9 (triple spray @ 150, 150 & 200 ppm), T_{13}: B-9 (single spray @ 1000 ppm), T_{14}: B-9 (double spray @ 500 ppm each), T_{15}: B-9 (triple spray @ 300, 300 & 400 ppm), T_{16}: B-9 (single spray @ 1500 ppm), T_{17}: B-9 (double spray @ 750 ppm each), T_{18}: B-9 (triple spray @ 500 ppm each)

Similar results have been obtained by Pinto et al (2005) who reported that the use of paclobutrazol improved the plant spread diameter and canopy shape of potted zinnia. This increase in plant spread might be due to gradual increase in leaf area of side shoots. Increase in leaf area was a result of increase in thickness of leaves, number of layers in palisade tissue and number of chloroplast and starch grains in spongy cells (Reddy et al 1999) with the use of B-9.

Both the growth retardants increased number of leaves per plant as compared to control. As regards the effect of paclobutrazol and B-9 spray maximum number of leaves per plant (46.00) was recorded when the plants were sprayed thrice with PBZ (5 ppm) which caused 34.78 per cent increase in number of leaves over control. The increase in number of leaves with PBZ spray may be attributed to the fact that the retardants are known to inhibit the apical dominance thereby resulting in enhanced lateral growth. Similar results were obtained by Zawadzinska and Dobrowolska (2004) in *Pelargonium* x *hortorum.*

Application of triazole plant growth regulators commonly produces plants with darker green leaves than untreated plants and this greening effect of triazole is the result of increased chlorophyll concentration (Wang and Gregg 1994). The present investigations also revealed that paclobutrazol at different concentrations in all the treatments resulted in darker green leaves as compared to B-9 and control. These findings are in congruity with the findings of Jin et al (2010) who reported intensified darker green leaves when *Primula forbesii* plants were sprayed with PP333 and B-9.

Paclobutrazol also reduces shoot length by reducing internode extension (Andrasek 1989). In the present experiment also all the treatments were effective in reducing the length of internodes. Highest reduction (47.57%) over control was reported with triple application of PBZ (5 ppm each). Gad et al (1997) reported that paclobutrazol decreased internodal length by 52.2 and 60.9 per cent compared to control when applied as foliar spray on *Fuchsia magellanica* cv Beacon.

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