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Plumbago Growth Control with Collate, Piccolo and Topflor Substrate Drenches

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Results of a current research project being conducted at NC State University are reported here.

Plumbago (*Plumbago auriculata*) is a blue flowering shrub that grows to a height of 2-3 m. This South African native is used for foundation and container plantings in zones 9-11, and grown in cooler climates as a tropical annual. While its pale blue flowers make plumbago a desirable landscape addition, the growth pattern in the conventional nursery setting tends to be uneven. Growers desire to control excessive shoot growth and increase lateral branching in order to produce a plant with greater market appeal.

While a number of PGRs have successfully been used to control plant height (Whipker, 2015), a limited number have been tested on plumbago. The

Summary of Findings

- Three PGRs were applied as substrate drenches; paclobutrazol [1,2,4, or 8 (mg/pot a.i.)], flurprimidol [0.5, 1, 2, 4 (mg/pot a.i.)], or ethephon [125, 250, 500, 1000 (ppm)] to determine the efficacy of controlling excessive growth of 'Imperial Dark Blue' plumbago.
- Plumbagos were very responsive to both paclobutrazol and flurprimidol drenches. For growers desiring a moderate to high degree of control, 1 mg/pot a.i. drenches of either PGR could be suitable under NC conditions. All concentrations greater than 1 mg/pot a.i. resulted in excessive control and should be avoided.
- All Ethephon drench concentrations were more consistent in controlling diameter and increasing branching and flowering than paclobutrazol or flurprimidol. With the use of ethephon at 125 to 250 ppm, plumbago growers have another PGR available to control excessive stem elongation and improve the flowering of plumbago.



Ethephon Drench [Collate (mg/L)]



0



125

Plumbago
'Imperial Dark Blue'
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current recommendation is to apply an ethephon (Collate/Florel) foliar spray of 1000 ppm one week before pinching (Whipker, 2015). A Texas A&M study evaluated the effectiveness of paclobutrazol (Bonzi/Piccolo) and uniconazole (Concise/Sumagic) foliar sprays and drenches on plumbago (Arnold and McDonald, 2001). No statistically significant effects were observed in canopy growth or flowering with paclobutrazol applications. In a follow up trial, higher paclobutrazol drench concentrations (40 to 80 mg·L⁻¹) resulted in severely stunted growth when plumbago were transferred to the landscape and less flowering. Foliar sprays of uniconazole at 60 to 120 mg·L⁻¹ provided inconsistent growth control, affecting some plants while not others, resulting in no significant differences. No other research studies are reported on the effects of PGRs on plumbago.

The study had two objectives. The first was to determine whether a suitable lower drench concentration of paclobutrazol could be found. The second objective was to evaluate the effectiveness of flurprimidol and ethephon

drenches at controlling excessive plant growth without significantly delaying flowering.

Materials and Methods

'Imperial Dark Blue' plumbago seedlings (102 cell size) were transplanted on 16 January 2015 into 1 gallon, round plastic pots filled with Fafard® 1P (Fafard, Anderson, S.C.) substrate. Plants were fertilized as needed with 150 ppm N using 13N-2P-13K. Greenhouse day/night set point temperatures were 75/65 °F. The plants were grown under natural day lengths.

The plant growth regulators were applied on 13 March 2015. Drench treatments consisted of paclobutrazol at 1, 2, 4, or 8 mg/pot a.i., flurprimidol at 0.5, 1, 2, or 4 mg/pot a.i., or ethephon at 125, 250, 500, or 1000 ppm. These were applied using 6 oz of solution per pot. The day of treatment, total plant height (measured from the pot rim to the uppermost part of the inflorescence) was recorded.



Ethephon Drench [Collate (mg/L)]



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First flowering dates were recorded as plants bloomed. In the first week of May 2015, total plant height and plant diameter were recorded. The data was statistically analyzed to determine differences.

Results and Discussion

Paclobutrazol. The response of 'Imperial Dark Blue' plant height was less as the PGR concentration increased. The smallest plants were 42% shorter when treated with 4 mg/pot a.i. paclobutrazol as compared to the non-treated controls, but no significant differences were found between the different dosages due to large variations in plant growth. These results, variable height and excessive stunting, were also reported by Arnold and McDonald (2001) with paclobutrazol drenches.

'Imperial Dark Blue' plant diameter also was smaller as the dose increased. Excessive stunting was observed with all paclobutrazol concentrations. Plants treated with 1 mg/pot a.i. of paclobutrazol were 48% smaller than the untreated controls. Concentrations greater

than or equal to 2 mg/pot a.i. were all similar in the degree of growth control, with the plants being greater than or equal to 59% smaller, as compared with the untreated control. No significant differences were found among the first flowering dates of any of the paclobutrazol drench concentrations and the non-treated control. The mean number of days until flowering was 95.

Flurprimidol. 'Imperial Dark Blue' plant height was shorter as the PGR concentration increased. No height control occurred in the 0.5 mg/pot a.i. flurprimidol drench concentration. Flurprimidol concentrations greater than or equal to 1 mg/pot a.i. resulted in significantly shorter plants (greater than or equal to 30 %), with no further increase in control as the concentration increased.

'Imperial Dark Blue' plant diameter was also smaller as the rate increased. Plants were 41, 51, 60, and 64 % smaller in diameter when treated with 0.5 to 1, 2, and 4 mg/pot a.i. of flurprimidol, respectively, when compared to the non-treated control plants. Excessive stunting was observed with concentrates greater than or



Drench Comparisons



0



1 mg Piccolo



1 mg Topflor

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equal to 1 mg/pot a.i. The use of flurprimidol drenches did not delay flowering. The mean number of days until flowering was 94.

Ethephon. No significant differences were found among heights or first flowering dates of any of the ethephon drench concentrates or the non-treated control. The mean for plant height was 37.5 cm and the mean first flowering date was 96 days after transplanting. One possible explanation for the lack of significant height differences is that as the plant shoots grew, they began to arch downward. Height then became a measure of how fast the shoots had grown, those not arching being taller than longer, bending, shoots.

'Imperial Dark Blue' plant diameter was significantly different and decreased as the dose increased. The smallest plants averaged 53 cm when treated with 1000 ppm ethephon, a 38% smaller diameter. Plants were 16, 24, 30 and 38% smaller in diameter when treated with 125, 250, 500, and 1000 ppm of ethephon, respectively, when compared to the non-treated control plants. Unlike paclobutrazol and flurprimidol results, an increase in lateral branching was observed as plant diameter decreased. This resulted in an increase of blooming inflorescences as the plants aged.

Conclusions

'Imperial Dark Blue' plumbago was responsive to anti-GA inhibitors such as paclobutrazol and flurprimidol. As in the Arnold and McDavid (2001) study, plumbago plants treated with paclobutrazol drench displayed excessive stunting and variable results. While smaller diameters would allow wholesale producers to fit more plants in growing areas and shipping carts, excessive stunting reduces retail appeal at concentrations greater than or equal to 2 mg/pot a.i.. Similar results were seen with flurprimidol treatments greater than or equal to 2 mg/pot a.i.. The excessive stunting and high dosages reduce the benefits of using either in container nursery crops. If growers desire to have a high degree of growth control, 1 mg/pot a.i. drenches of either paclobutrazol or flurprimidol would be the starting point for conducting their own trials.

Ethephon works with a different mode of action than the anti-GA PGRs paclobutrazol and flurprimidol (Currey et al., 2012). Ethephon drenches of 125 to 250 ppm offer consistent control of plant diameter, improved branching, and increased inflorescences without delayed flowering.

Based on the results of this study, the growth effects of ethephon drenches are gradual. This limits the risk of overdosing the plants with a PGR as occurs in paclobutrazol and flurprimidol drenches. While plant diameters are not as small as plants treated with paclobutrazol or flurprimidol, plants treated with ethephon drenches had a higher aesthetic appeal. A few plants were shown to local growers and they expressed a preference for the plant shape, flower power and overall aesthetic value of the plants treated with 125 to 250 ppm ethephon.

Acknowledgments

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