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Reducing Mowing Frequency through the Use of Plant Growth Regulators

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Introduction

Plants produce chemicals that regulate plant growth. These chemicals are known as plant hormones. Occurring in extremely low concentrations, they influence the development and differentiation of cells and tissues. Some commonly known plant hormones include auxins, cytokinins, gibberellins and ethylene. Each plant hormone performs an unique function, such as flower initiation, stem elongation, fruit ripening, sex reversal, or leaf senescence. Plant hormones can also be artificially synthesised. Such manmade hormones are called as plant growth regulators (PGR) or phytohormones. PGRs are widely used for agriculture and horticulture. Some are also used in micro propagation for better root and shoot development.

Untreated Treated

Fig 1. PGR application in *Zoysia matrella* resulted in reduction of leaf sizes, hence reducing mowing frequency

PGR for mowing frequency reduction

To achieve quality lawns, turfgrass requires special maintenance such as regular mowing. Mowing requires the use of manpower and fuel. Coupled with the frequency required, it incurs a significant cost. The use of PGR application helps to reduce vertical growth of turfgrass, hence reducing mowing frequency.

Occurring naturally in plants, gibberellins promote flowering, cell enlargement, break seed dormancy and stem elongation. A PGR anti gibberellin compound can be applied to regulate growth and development by reducing the synthesis of gibberellins in a plant system and regulate. Trinexapac-ethyl is an anti gibberellin compound which can be applied on turfgrass to keep the leaf blades short as it restricts vertical growth. Through PGR application, the mowing frequency of a lawn may be reduced.

Research on PGR application

In a six-month study conducted by the Centre for Urban Greenery & Ecology, Trinexapac-ethyl (Primo 250 EC) was applied on three species - cowgrass (*Axonopus compressus*), seashore paspalum (*Paspalum vaginatum*) and manilagrass (*Zoysia matrella*) grown in ASM (NParks' approved soil mix). PGR was sprayed once in a month on the mowed grasses for the treatment plots whereas no PGR was applied on the control plots. All the plots were mowed every month at same height and the clippings were collected and weighed. Two concentrations of PGR were tested in the study. This is described in Table 1.1. The parameters that were measured were turf quality shoot height, clipping yield, turf cover percentage, and DGCI (dark green colour index).

Fig 2. PGR experimental plots at Hort Park

Table 1.1 PGR application rate followed in this study:

Species	Concentration of Trinexapacethyl (Primo 250 EC)	
	Lower concentration - first 3 months (Phase 1)	Higher concentration - last 3 months (Phase 2)
Axonopus compressus	1 L/ha	1.5 L/ha
Paspalum vaginatum	0.8 L/ha	1.2 L/ha
Zoysia matrella	0.8 L/ha	1 L/ha

Fig 3. Effect of PGR on the clipping yield of *Axonopus compressus*

Fig 4. Effect of PGR on the clipping yield of *Paspalum vaginatum*

Fig 5. Effect of PGR on the clipping yield of *Zoysia matrella*

Table 1.2 Percentage of clipping yield reduction for 3 turfgrass species after PGR application:

Species	Clipping yield reduction (%)	
	Lower concentration	Higher concentration
Axonopus compressus	52%	77.3%
Paspalum vaginatum	52.2%	56.9%
Zoysia matrella	79.1%	83.9%

Application:

The study demonstrated that PGR application reduced the clipping yield of turfgrasses and therefore can reduce mowing frequency. The clipping yield reduction was highest in Manilagrass. One PGR application on turf can replace at least three times of mowing. Translated into cost reduction, PGR application can save about 30% of total moving cost. In addition to savings from total mowing cost, the frequency and cost for sweeping the clippings can also be reduced. As a result, landscape productivity can be enhanced by reduction in labour requirement. PGR application resulted in the grass blades becoming darker and brighter, especially for Manilagrass. However, there was no significant difference seen on turf quality and density. Further studies may be conducted to evaluate PGR's efficiency on a larger field condition and also on other common turfgrass species.

Table 1.3 Recommended rate of PGR application

Turf Species	Axonopus compressus	Paspalum vaginatum	*Zoysia matrella*
Concentration of PGR	1.5 L/ha	1.2 L/ha	1 L/ha

Product safety information

Primo EC 250 (commercial name) was the PGR used in this study. It is a commercial PGR formulation with Trinexapac-ethyl as its active ingredient. Primo has been approved for use in 40 countries. It has been in use for 20 years in USA and so far there have been no environmental issues. In Singapore, Primo EC 250 has been tested and approved by AVA. It has also been approved by PUB for its use in water catchment areas. The toxicity of the active ingredients changes considerably when they are formulated along with selected inert materials. Once the product hits the ground it gets bound up in the soil with organic matter and clay particles. Hence not much active ingredient is found in the leachates. Primo should not be sprayed if it is raining or a heavy down pour is expected within 1 hour of application. Since there is no root uptake the product has to be left on the foliage only. Almost 80% of the product enters the leaf within the first hour. For an effective and safe application, it is recommended to follow the safety guidelines given by the manufacturer.

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