

Plant Growth Retardants for Fine Turf and Roadsides/Utilities¹

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Introduction

Plant growth retardants (PGR's) or inhibitors are being used increasingly to suppress seedheads and leaf growth due to rising mowing costs and danger posed to operators and other personnel. Traditionally, plant growth retardants have been used in the South to suppress bahiagrass (*Paspalum notatum* Flugge.) seedhead production exclusively in low maintenance areas such as highway roadsides, airports, and golf course roughs. However, in recent years, new chemicals which may be used in higher maintained commercial situations have been developed.

Several undesirable characteristics which have been associated with growth retardants include: phytotoxicity (burn) of treated leaves from 4 to 6 weeks following applications; reduced recuperative potential from physical damage to treated turf; and increased weed pressure due to reduced competition from treated plants. Normally, growth retardants are used in low maintenance areas; therefore, these undesirable characteristics do not pose a problem to

most managers. However, several growth regulatory materials have recently been developed for use on hybrid bermudagrass fairways and St.

Augustinegrass. Vertical topgrowth (clippings) is suppressed, but horizontal spread (runners) is not. Therefore, turf recovery from golf club divots and other injuries occurs while topgrowth remains suppressed. Other uses involve areas where mowing has been discontinued due to heavy rains, equipment failure, etc., but topgrowth remains suppressed if the grass is treated. **Note: These retardants used on hybrid bermudagrass and St. Augustinegrass do not satisfactorily suppress seedhead development.**

PGRs are separated into two groups, Type I and Type II, based on their method of growth inhibition or suppression. Type I inhibitors are primarily absorbed through the foliage and inhibit cell division and differentiation in meristematic regions. They are inhibitors of vegetative growth and interfere with seedhead development. Their growth inhibition is rapid, occurring within 4 to 10 days, and lasts 3 to 4 weeks, depending on application rate. Mefluidide,

1. This document is AGR-17, one of a series of the Environmental Horticulture Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida. Original publication date April 1, 1999. Reviewed September 2, 2006. Visit the EDIS Web Site at <http://edis.ifas.ufl.edu>.

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chlorflurenol, and maleic hydrazide are examples of Type I inhibitors that inhibit mitosis in growth and development. Other Type I PGRs that inhibit plant growth and development through interruption of amino acid or organic acid biosynthesis are herbicides used at low rates. Being herbicides, their margin of safety is narrow and are very rate dependent. Examples of Type I herbicide regulators include glyphosate, imidazolinones, sulfonylureas, sethoxydim, and fluazifop.

Type II inhibitors are generally root absorbed and suppress growth through interference of gibberellic acid bio-synthesis, a hormone responsible for cell elongation. Type II PGRs are slower in growth suppression response, but their duration is usually from 4 to 7 weeks, again, depending on application rate. Type II PGRs have little effect on seedhead development and results in miniature plants.

Paclobutrazol and flurprimidol are root absorbed Type II PGRS while trinexapac-ethyl is a foliar absorbed Type II PGR and is systemically translocated to the site of activity. Fenarimol is a type II fungicide that also suppresses annual bluegrass on putting greens.

Root absorbed PGRs are activated by irrigation or rainfall after application and have less likelihood of over-lap leaf burn. Foliar absorbed materials (e.g., mefluidide, MH, and trinexapac-ethyl) require uniform and complete coverage for uniform response and must be leaf absorbed before irrigation or rainfall occurs. Usually low gallonage is used for foliar absorbed materials to minimize runoff from the leaf surface while high gallonage is used for root absorbed materials.

Timing of application for seedhead suppression is somewhat important. Applications made after seedhead emergence may not be effective. For bahiagrass, mow the area as seedheads initially emerge (usually in late May to early June) to knock these and weeds present down. Begin plant growth retardant treatment about two weeks following mowing or just prior to new seedhead appearance. Additional applications 6 to 8 weeks later may be required if new seedheads begin to emerge. A complete weed control program must accompany any plant growth retardant use. Typically, annual

broadleaf weeds will become established in PGR use areas as the treated grass is not actively growing, therefore, is not providing its usual competition. Normally, 2,4-D and/or dicamba is included in this broadleaf weed control. Other postemergence herbicides such as Velpar, for grass weed control, may also be incorporated in low maintenance bahiagrass areas. Table 1 lists chemicals, application rates, and general remarks about each product used to suppress plant growth.

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Table 1. Chemicals for Seedhead and Plant Growth Suppression

Chemical (Trade Names)	Active Ingredient per Acre	Amount of Product Per Acre	Remarks
Low Maintenance Bahiagrass			
sulfometuron-methyl (Oust 75 DG)	0.02	1/2 oz/30-50 gal water	Foliar absorbed. Apply to bahiagrass in spring or 7 to 14 days after first mowing. Do not use a surfactant. Do not apply to wetlands or where runoff water may drain onto cultivated lands or forests. Do not apply to turf less than 3 years old. Treated areas may appear less dense and temporarily discolored. Read and follow all label recommendations before use. Often tank-mixed with Roundup, Campaign and/or Velpar. Do not exceed recommended rate.
maleic hydrazide (Retard 2 1/4 lb/gal, Royal Slo-Gro 1 1/2 lb/gal, Liquid Growth Retardant 0.6 lb/gal)	3 lb 1 1/3 gal/50 gal water (Oust 75 DG) 2 gal/30-50 gal water 5 gal/45 gal water		Foliar absorbed. Apply to bahiagrass in spring or 7 to 14 days after first mowing. Do not use a surfactant. Do not apply to turf less than 3 years old and do not reseed within 3 days after application. Treated areas may appear less dense and temporarily discolored. Do not use on St. Augustinegrass, and do not apply to bahiagrass under drought conditions. Read and follow all label recommendations before use. A 12-hour rainfree period is required for optimum activity.
glyphosate (Roundup 4 lb/gal) glyphosate + 2,4-D (Campaign 2.5L)	0.18-0.22 lb	4 to 8 fl oz/10-25 gal water 16 to 24 oz/A	Foliar absorbed. Apply to bahiagrass only. Note: Glyphosate is a nonselective herbicide if applications exceed these recommended rates. Make application after full greenup of bahiagrass (timing will vary across the state). Treated areas may appear less dense and temporarily discolored. Initial application of Roundup 4L at 8 oz/A followed by 4 to 6 oz/A 6 weeks later has provided good results. Read and follow label recommendations prior to use.
Bermudagrass and St. Augustinegrass			
mefluidide (Embark 2S) (Embark Lite 0.2S)	0.125 to 1.0 0.125	1/2 to 4 pts/15-150 gal water 5 pts (St. Augustinegrass)	Root absorbed. Apply to common bermudagrass (4 pts/A Embark 2S) and St. Augustinegrass (Embark Lite) only. Apply in spring approximately 2 weeks before seedhead appearance. Do not apply to turf within 4 growing months after seeding, and do not reseed within 3 days after application. Treated turf may appear less dense and temporarily discolored. Adding 1 to 2 qts of a nonionic surfactant per 100 gal of spray solution may enhance suppression; however, discoloration may also be increased. <i>Poa annua</i> seedhead control in fairways is with 1/2 pt/A in early January. Iron applications may lessen discoloration. Read and follow label recommendations before use.

Table 1. Chemicals for Seedhead and Plant Growth Suppression

Chemical (Trade Names)	Active Ingredient per Acre	Amount of Product Per Acre	Remarks
flurprimidol (Cutless 50 WP)	3/8 to 1 1/2	3/4 to 3 1/2 lb to 200 gal water	Root absorbed. Apply to bermudagrass or zoysiagrass golf course fairways, hard-to-mow and trimmed areas. Provides 4 to 8 week suppression. Must be uniformly applied and irrigated in with $\frac{1}{2}$ inch water. Flurprimidol does not completely control seedheads. Temporary turf discoloration may follow this treatment. St. Augustinegrass, bahiagrass, and common bermudagrass require the higher rate. Repeat applications every 4 weeks on Tifway bermudagrass with 1.0 lb/A will minimize turf injury.
trinexapac-ethyl (Primo 1EC)	0.1 to 0.75	0.75 to 6 pints/20 to 100 gal water	Foliar absorbed. Low rates are for hybrid bermudagrass, centipedegrass, and St. Augustinegrass; medium rates are for common bermuda while the high rate is for bahiagrass. One hour rain-free period is needed after application. Mowing one week after application improves results and appearance as will repeat applications in two to four weeks. Do not exceed 21 pints/A per year. Seedhead suppression is provided only for hybrid bermudagrass. Temporary turf discoloration may follow treatment. Do not add a surfactant.
paclobutrazol (TGR Turf Enhancer 50WP) Turf Growth Regulator + fertilizer 0.82%	1/2 to 1 0.6 to 0.9 lb	1 to 1 1/2 lb/43 to 100 gal water 73 to 110 lb	Root absorbed. Apply to well-maintained St. Augustinegrass or hybrid bermudagrass fairways. Used on overseeded golf greens during winter for turf enhancement and for annual bluegrass suppression. Do not apply to saturated soils and treat only dry foliage. Repeat applications 8 weeks apart may be made. Read and follow recommendations before use.
Foliar Suppression of Overseeded Bermudagrass			
trinexapac-ethyl (Primo 1EC)	0.1 to 0.75	0.75 to 6 pints/20 to 100 gal water	Apply trinexapac-ethyl before verticutting, scalping, spiking, or other similar operations or 1 to 5 days before seeding. Trinexapac-ethyl will allow the use of less severe base preparation practices. Check the label for the type of turf and setting (greens, tees, electron transport chain.) Use upper- end label rates when there is strong bermudagrass competition. Use normal seeding rates and maintain fertility.

Table 1. Chemicals for Seedhead and Plant Growth Suppression

Chemical (Trade Names)	Active Ingredient per Acre	Amount of Product Per Acre	Remarks
mefluidide (Embark 2S)	0.125	1/2 pts/15-150 gal water	Root absorbed. Do not apply to turf within 4 growing months after seeding, and do not reseed within 3 days after application. Treated turf may appear less dense and temporarily discolored. Adding 1 to 2 qts of a nonionic surfactant per 100 gal of spray solution may enhance suppression; however, discoloration may also be increased. <i>Poa annua</i> seedhead control in fairways is with 1/2 pt/A in early January. Iron applications may lessen discoloration. Read and follow label recommendations before use.
flurprimidol (Cutless 50W)	3/8 to 1 1/2 lb	3/4 to 3 lb/50 to 200 gal water	Root absorbed. Apply to zoysiagrass or bermudagrass in late spring-early summer and, or late summer-early fall. Time the second application at least 3 months before expected dormancy. Do not apply to putting greens. Do not exceed 1/2 lb/A per application on sandy soils. Irrigate with 1/2 in. water and resume mowing 3 to 5 days after application.
paclobutrazol (TGR Turf Enhancer 50 WP)	1/4 lb	1/2 lb/40 to 100 gal water	Root absorbed. Repeat applications may be made 3 weeks apart. Do not use if <i>Poa annua</i> exceeds 70%. Application should be in early January.
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