

Plant Growth Regulators¹

Frederick M. Fishel²

This publication provides the meaning and definition of the term, “plant growth regulator,” addresses patterns of use for plant growth regulators, and provides a listing of plant growth regulators registered for use in Florida.

What are plant growth regulators?

Simply put, plant growth regulators (also known as growth regulators or plant hormones) are chemicals used to alter the growth of a plant or plant part. Hormones are substances naturally produced by plants, substances that control normal plant functions, such as root growth, fruit set and drop, growth and other development processes. Plant growth regulators are regulated as pesticides by the Florida Department of Agriculture and Consumer Services (FDACS) and must be registered with the FDACS for lawful use in Florida like any pesticide lawfully used in Florida.

FDACS Definition of “Plant Regulator”

Any substance or mixture of substances intended, through physiological action, for accelerating or retarding the rate of growth or maturation or for otherwise altering the behavior of ornamental or crop plants or the produce thereof, but not including substances intended as plant nutrients, trace elements, nutritional chemicals, plant inoculants, or soil amendments.

History and Use of Plant Growth Regulators

The use of plant growth regulators in agricultural production within the United States began in the 1930s. The first discovery and use of plant growth regulators was with acetylene and ethylene, which enhanced flower production in pineapple. Subsequently, use of plant growth regulators has grown exponentially to become a major component of agricultural commodity production.

Certain herbicides and insecticides that are not true plant growth regulators cause some plant-growth-regulating effects. For example, the widely used insecticide carbaryl is used to thin apple fruit from trees and to aid in encouraging annual bearing.

According to the American Society for Horticultural Science, plant growth regulators fall into six major classes. Table 1, below, lists these classes with the plant development function(s) that are controlled by the plant growth regulators. Table 1 also provides examples of the practical uses with which plant growth regulators are typically associated.

Table 2 provides Florida-specific information on plant growth regulators registered by the FDACS. This table also includes major commodities in the United States that are associated with plant growth regulators and the

1. This document is PI-102, one of a series of the Agronomy Department, UF/IFAS Extension. Original publication date February 2006. Revised January 2015. Visit the EDIS website at <http://edis.ifas.ufl.edu>.

2. Frederick M. Fishel, professor, Agronomy Department, and director, Pesticide Information Office, UF/IFAS Extension, Gainesville, FL 32611.

The use of trade names in this publication is solely for the purpose of providing specific information. UF/IFAS does not guarantee or warranty the products named, and references to them in this publication does not signify our approval to the exclusion of other products of suitable composition.

The Institute of Food and Agricultural Sciences (IFAS) is an Equal Opportunity Institution authorized to provide research, educational information and other services only to individuals and institutions that function with non-discrimination with respect to race, creed, color, religion, age, disability, sex, sexual orientation, marital status, national origin, political opinions or affiliations. For more information on obtaining other UF/IFAS Extension publications, contact your county's UF/IFAS Extension office. U.S. Department of Agriculture, UF/IFAS Extension Service, University of Florida, IFAS, Florida A & M University Cooperative Extension Program, and Boards of County Commissioners Cooperating. Nick T. Place, dean for UF/IFAS Extension.

primary function(s) of plant growth regulators and includes examples of trade names for plant growth regulators registered for use in Florida.

Additional Information

American Society for Horticultural Science: <http://www.ashs.org/>

Table 1. Plant growth regulator class, associated function(s) and practical uses.

Class	Function(s)	Practical uses
Auxins	Shoot elongation	Thin tree fruit, increase rooting and flower formation
Gibberellins	Stimulate cell division and elongation	Increase stalk length, increase flower and fruit size
Cytokinins	Stimulate cell division	Prolong storage life of flowers and vegetables and stimulate bud initiation and root growth
Ethylene generators	Ripening	Induce uniform ripening in fruit and vegetables
Growth inhibitors	Stops growth	Promote flower production by shortening internodes
Growth retardants	Slows growth	Retard tobacco sucker growth

Table 2. Plant Growth Regulators Registered for Use in Florida.

Active ingredient	Registered crops and functions	Trade names ^o
Ancymidol	Ornamental plants – growth inhibitor	Abide, A-Rest
Butralin	Tobacco – shoot inhibitor	Butralin
Alcohols	Tobacco – shoot inhibitor	Fair, Royaltac M, Sucker-Plucker, Off-Shoot, Contact-85
Chlormequat chloride	Ornamental flowers – shoot inhibitor	Citadel, Cycocel, E-Pro
Cytokinin [#]	Ornamental plants, vegetables, fruits including citrus – hasten maturity, enhance fruit color, growth enhancer, enhance tuber color, improve tuber quality	Conklin, Culbac, Cytoplex, Early Harvest, Foli-Zyme, Goldengro, Happygro, Incite, Megagro, Ascend, Radiate, Stimulate, Suppress, Validate, X-Cyte
Daminozide	Ornamental plants – growth inhibitor	B-Nine, Compress, Dazide
Ethephon	Turfgrass – reduces mowing frequency Various fruits, vegetables, and nuts – hastens ripening and maturity, enhance fruit color and floral stimulant Cucurbits – increases flowering Ground covers – inhibits flowering Ornamental trees – inhibits fruiting Tobacco and cotton – hastens maturity Cereal grains and grasses grown for seed – reduces lodging	Boll Buster, BolID, Cerone, Cotton Quik, Ethrel, Finish, Flash, Florel, Mature, MFX, Prep, Proxy, Quali-Pro, SA-50, Setup, Super Boll, Whiteout
Flurprimidol	Ornamental woody plants and ground covers – reduces pruning Turfgrass – reduces mowing frequency	Cutless, Legacy, Mastiff, Topflor
Gibberellic acid [#]	Small fruits, cucurbits – increase fruit set Citrus – promote rind/peel integrity, prevent fruit drop Rice, cotton – growth enhancer	Ascend, Cytoplex, Early Harvest, Falgro, Florgib, Foli-Zyme, GA3, GibGro, Green Sol, Incite, N-Large, PGR IV, Pro-Gibb, Release, Rouse, Ryzup, Stimulate
Gibberellin mixtures	Cut flowers – plant preservative Tree fruit – increase fruit size, hasten maturity, shoot stimulant Evergreen trees – floral stimulant, stimulate germination	BVB, Chrysal, Fascination, Procone
Indole-3-butyric acid (IBA) [#]	Ornamental plants and trees – root stimulant	Numerous trade products
Maleic hydrazide, potassium salt	Tobacco – shoot inhibitor Stored bulbs – sprout inhibitor	Fair, Rite-Hite, Royal, Sucker Stuff,
Mefluidide	Ground covers, shrubs, ornamental trees – reduces pruning Turfgrass – reduces mowing frequency	Embark, Sta-Lo
Mepiquat chloride	Cotton - growth inhibitor, enhance uniform fruit maturity	Pix
Mepiquat pentaborate	Cotton – growth inhibitor, enhance uniform fruit maturity	Pentia
Naphthalene-acetic acid (NAA) [#]	Ornamental plants – stimulates rooting, increase vegetative growth	DipN Grow, Goldengro, Hi-Yield
1-Naphthaleneacetamide (NAD)	Woody ornamental cuttings – rooting stimulant	Rootone
n-Decanol	Tobacco – shoot inhibitor	Antac, FST-7, Royaltac
Paclobutrazol	Ornamental flowers – promotes uniform flowering Ornamental plants – reduces internodal length Ornamental trees – growth inhibitor Turfgrass – increased plant thickness, growth inhibitor	Bonzi, Cambistat, Cutdown, Downsize, Florazol, Paclo, Paczol, Piccolo, Profile, Shortstop, Trimmit, Turf Enhancer
Prohexadione calcium	Peanut, Tree fruit, turfgrass grown for seed – growth inhibitor, reduce vegetative growth	Apogee
Trinexapac-ethyl	Turfgrass – reduces mowing frequency	Armor Tech, Goldwing, Governor, Groom, Legacy [#] , Primeraone, Primo, Provair, Solace, T-Nex, T-Pac
Uniconazole	Ornamental plants – growth inhibitor	Concise, Sumagic

*Consult individual labels for specific sites and commodities approved for use.

[#]At least one active ingredient component of product.