



Role of Growth Regulators on Turf Grass

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Plant growth regulators (PGRs), are designed to facilitate the growth and development of plants. It affects the specific plant response mechanism thereby altering the growth at specific periods or time. Plant growth regulators have numerous significant role in plants and are also getting popular in turf and landscape sector for turf maintenance program. Environmental Protection Agency defines a plant regulator as substance or mixtures of substances specified, through physiological action, to speed up or slow down the rate of growth or maturation, or otherwise alter the behavior of plants.

In addition to the above, Plant growth retardants or inhibitors are increasingly being used to suppress the formation of flower/seed heads and leaf growth due to rising costs of mowing (gasoline or electric power consumption) and danger posed to operators and other personnel during handling of lawn mowers. Traditionally, plant growth retardants have been used to suppress seed head production in bahia grass (*Paspalum notatum*) or tall fescue (*Festuca arundinacea*) exclusively in low maintenance areas such as highway roadsides, airports and golf course roughs etc. However, in recent years, new molecules are available in the market for the commercial maintenance of turf.

PGRs are classified into two groups, Type I and Type II, based on their method of growth inhibition or suppression in plants. Type I inhibitors are primarily suppress the cell division and differentiation in meristematic regions when it is applied as foliar spray. These inhibitors interfere with vegetative growth and development of flower or seed head. Their mode of action is rapid and occurring within 4 to 10 days and lasts up to 3 to 4 weeks, depending on application rates or dosage. In addition to the above, Type I inhibitors that hampers the mitosis in growth and development. The best examples of Type I inhibitors are Maleic hydrazide and Chlorflurenol. Other Type I inhibitors are mainly involved in the suppression of biosynthesis pathways of amino acid or organic acid. The examples under this category are herbicides include glyphosate, imidazolinones, sulfonylureas and fluzifop.

Type II inhibitors are absorbed through roots and are systemically translocated to the site of activity and suppress growth by hampering the cell elongation through the interference of gibberellic acid bio-synthesis pathway. It is slow in growth suppression process, but their duration is lasts from 4 to 8 weeks, depending on concentration and application method. Type II inhibitors have little effect on flower or seed head development and result in reduced growth rates. Certain chemicals viz., Paclobutrazol and Flurprimidol are absorbed by the roots, while trinexapac-ethyl is absorbed by the foliage. Fenarimol promotes ethylene production and suppresses the growth of annual bluegrass. Type II inhibitors are mostly absorbed by the roots which are activated after the regular irrigation or the spell of rain fall.

Role of Growth Regulators

Control of Seed head: In Golf course, *Poa annua* is the most prevalent weed problem due their remarkable proliferation of flower and seed heads resulting in poor playing surfaces.

This can be controlled by the application of Trinexapac-ethyl, Flurprimidol, Mefluidide and Ethephon at lower concentrations. The use of Mefluidide at appropriate time and dosage stops the growth of turf grass and eliminate seed head production. Similarly the application of Mefluidide and ethephon promotes the dark green leaves due to increase in chlorophyll content.

Promotes shade tolerance: Shading is the major the major problem noticed when the turf grass are established around the trees, shrubs or buildings. Shade mainly interfere the sunlight penetration, alters the microclimate, increase the level of relative humidity, blocks air movement and reduction in air temperature. Shade affects light quality, quantity and duration. Morphological and physiological changes that occur due to shading effect in turf grass are elongation of shoots, thinner and narrow leaves, reduced shoot and tiller numbers, poor photosynthetic rate and reduced rates of respiration and transpiration.

Certain plant growth regulators reduce the elongation of cells *viz.*, trinexapac-ethyl and paclobutrazol. The main problem associated with shade lawn is that cell elongation occurs as the shorter light wavelengths are blocked and the longer light wavelengths alone reach the turf grass. The longer wavelengths resulted with spindle growth and leads to lanky growth of turf grass.

Control of over seeding: PGRs can be effectively used for improving the over seeding problems. The objective is to slow down the growth of the existing turf grass without hampering the sprouting and establishment of new grasses.

Less water usage: Application of PGRs produce smaller leaves which in turn regulates the transpirational loss and promotes the growth of roots to deeper root zones. In addition to the above, growth regulators are used for increasing the stomatal closure and there by turf grass requires less water during the maintenance periods.

Reduces mowing frequency: Now a days PGRs are employed for reducing the growth of turf grass which in in turns controls the mowing frequency. This is more advantageous in managing the wear and tear effects of machineries and labour cost for the maintenance of turf grass. PGRs are highly useful in areas where the mowing operations are difficult *i.e* in places of mound lawns areas. This reduced mowing frequency concerns more on worker safety in difficult to reach areas. In addition to the above, application of growth inhibitors controls the clipping rate by at least by 50%, besides the control of scalping operations.

Enhanced leaf color: Application of Trinexapac-ethyl resulted with dark green turf grass due to increased chlorophyll content. Frequent application of Type-2 PGRs increases the tillering ability/capacity and tillering density of turf grass.

Enhanced growth of roots and lush green turf: The application of trinexapac-ethyl regulates the growth of roots and promotes the growth and development (photosynthesis and respiration) of turf grass. In addition to the above, application of PGRs leads to the production of smaller leaves (without compromising the aesthetic value) and thereby controls the thatch accumulation. Generally, PGRs applied turf grasses are healthier with lush green growth due to the proper production of amino acids, proteins, chlorophyll and enzymes besides controlling the nutrient loss.

Promotes wear tolerance: Frequent applications of Type II PGRs enhance the turf density and promote the better rooting and development of lateral stem (stolons and tillers). The maximum vegetative growth promotes the wear tolerance caused by the movement of public or any sports events.

Reduced freezing damage: Application of PGRs thickens the cell sap and cell wall resulting in slow growth of turf grass. This is more advantageous in managing the frost injury during winter seasons.

Weed management: Sun light and moisture are the prime requirement for the germination of weed seeds. Application of PGRs enhances the density of turf grass thereby suppressing the germinations of weed seeds.

Role of important growth regulators

a). Indole Acetic Acid: Indole acetic acid promotes cell division and hence it is mainly applied to facilitate to break the dormancy and encourage germination of seeds. It also facilitates the growth of turf grass and the production of dark colored turf leaves and firmer stems.

b). Gibberellic acid

- Controls the growth of turf grass during over seeding and promotes the growth of young seedlings
- Suppress the formation of flower or seed heads
- Control the growth of turf grass along the edges or around the tree trunks
- Improves the vigor of the turf grass, gives better leaf color, improved stress tolerance, better root and shoot development

c). Paclobutrazol: Paclobutrazol inhibits the vegetative growth by suppressing the biosynthesis of gibberellin and sterol. It reduces the height and prevents lodging of turf grass. This is mostly used as a soil drench or as a foliar spray.

d). Triacantanol: Triacantanol boost the growth of turf grass, increases the dry weight and water consumption of turf grasses.

Normally plant growth regulators are applied @ 0.1 - 0.2 % concentration. Higher concentrations lead to scorching and drying of grasses. At extreme concentrations, the grass roots are damaged and lead to the death of turf grasses.

Precautionary measures

- ❖ Application of growth regulators should be done in the morning or in the evening time.
- ❖ Watering should be avoided immediately after spraying of growth regulators.
- ❖ Avoid fertilization before or after the application of growth regulators.
- ❖ Avoid using the growth regulators during extreme climatic conditions.
- ❖ Don't mix pesticides or other fungicides while application of growth regulators.
- ❖ Avoid using the growth regulators during early periods of turf establishment

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