

# What is Primo MAXX?

Primo MAXX™ is the newest addition to the growing Turf and Ornamental product portfolio from Syngenta Canada. Primo MAXX is a unique management tool that allows golf course superintendents to better manage turfgrass on their courses. It does this by actually altering the way turfgrass grows, resulting in more compact, healthier grass that produces fewer clippings.

Turfgrass treated with Primo MAXX is typically darker green than untreated turf. This darkening occurs two to six weeks after application, and is caused by 1) slower growing tissue, 2) an increased amount of chlorophyll per unit leaf area, and 3) a more compact leaf canopy.

Primo MAXX can reduce the grass clipping yield by approximately 50%. Mowing often takes less time and is easier on equipment because of the shorter, more compact nature of turfgrass treated with Primo MAXX.

As vertical growth slows, energy is redirected to lateral stems and below ground plant parts. The redirected energy is used to produce increased food reserves, bigger root systems, and increased lateral stem development for thicker healthier turf.

The healthier plant will help to delay the onset of stress, improve stress survival, and enhance stress recovery, under stressful conditions.



10 DAA<sub>3</sub> – 69.7% Clipping Reduction

# How does it work?

Trinexapac-ethyl, the active ingredient in Primo MAXX, inhibits gibberellic acid biosynthesis, resulting in decreased cellular elongation and internode length. After application, any new growth has shortened internodes, more tillers, and reduced vertical growth compared to untreated turf.

Mixed properly and sprayed on turf, Primo MAXX is absorbed quickly by the foliage and translocated systemically to the crowns.

Because the grass absorbs Primo MAXX quickly, it is rainfast in 3 hours.

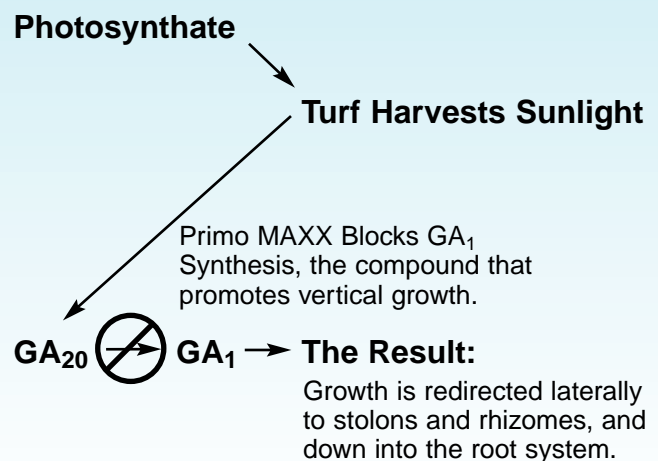
Results are usually apparent 5 to 7 days after application.

Increased density in cool-season turfgrasses



Annual bluegrass treated with the label rate throughout the growing season.  
Dr. Frank Rossi, University of Wisconsin, 1994-1996.

## Primo MAXX's Mode of Action



# How to use Primo MAXX

Primo MAXX can be easily applied using conventional spray equipment. The key to a successful application is to apply Primo MAXX only when the turfgrass is actively growing and not under stress.

Turfgrass variety affects both the application rate and timing. You may apply Primo MAXX to turfgrass throughout the growing season as long as the plant is actively growing.

Primo MAXX applied at the label rate will provide regulation of the turf for 4 weeks.

Primo MAXX may be applied at 1/2 of the label rate when applied every two weeks. Use this approach during the summer when turf growth begins to slow due to the high temperatures or where lightening of Annual bluegrass is a concern.

# Where to use Primo MAXX

Primo MAXX is recommended for use on fairways, tees, greens, roughs, and around gardens and the clubhouse.

## Fairways & Tees

Use Primo MAXX on the fairways & tees to create thicker healthier turf with the ability to withstand stress, and reduce clipping yields by approximately 50%. This reduction in clippings means fewer buckets to dump, less dragging, smaller compost piles, and reduced equipment wear.

## Greens

Primo MAXX will improve turf quality and density, and reduce clippings on the greens, creating a smoother, consistent putting surface.

## Roughs

Primo MAXX can improve turf quality and colour in the roughs while decreasing the mowing frequency,

particularly when the turf is actively growing. On hard-to-mow areas, Primo MAXX will reduce labour, and risk of injury. Primo MAXX does not stain walkways, cart paths, markers, or equipment, and is not corrosive.

## Clubhouse

Make edging/banding applications along curbs, parking lots, cart paths, around trees, shrubs, and flower beds to reduce trimming, without leaving unsightly areas of dead grass.

### DO NOT Apply

If Turf is dormant

If Turf is under Stress

< 3 hours before rain

2 weeks before or after intensive cultural practices (aerification, verticutting)

If disease is present as recovery will be slowed

More than 7 times per year

Directly to flowers as slight discolouration may occur

### DO NOT Mow

1 hour before an application

4 hours after an application

# Cool-Season Turfgrass Species

Primo MAXX regulates the growth of all major cool-season turfgrass species. How long and to what degree Primo MAXX works on stoloniferous and rhizomaceous turfgrasses depends on the dosage that the plant receives. Shortened internodes are evident when new growth emerges, which may be 5 to 7 days after application.

On basal tillering species, such as Annual bluegrass, fescue, and ryegrass, the effects of Primo MAXX are not seen as easily because the shortened internodes are not immediately visible. Seven days after application, the treated turfgrass has increased tillers but does not produce shoots as rapidly as those in untreated areas.

# Rate Information

The following table shows application rates for Primo MAXX on various cool-season grasses. The standard rate will provide approximately 50% growth reduction over four weeks.

Environmental conditions, management, and cultural practices that affect turf growth and vigour will influence the response of the turf to Primo MAXX applications. Fertility level, moisture availability, plant health, height and frequency of mowing have been shown to influence the activity of Primo MAXX.

The rates in Table 1 provide approximately 50% growth inhibition over a 4 week period of turf growing under favourable conditions.

Primo MAXX may cause temporary lightening of Annual bluegrass after the initial application. This is usually not noticed by golfers and disappears 1 to 2 weeks after application. To minimize this effect or to enhance the green colour apply 0.1-0.25 kg of actual N/100 m<sup>2</sup> (0.2-0.5 lbs of N/1000 ft<sup>2</sup>). Recommended rates of chelated iron can also be used, if desired. Or apply lower rates of Primo MAXX, approximately 1/2 the label rate for the first application and apply more frequently or increase the rate as your comfort level increases.

Primo MAXX will also provide consistent regulation when applied every two weeks at 1/2 the rates shown in Table 1.

**Table 1 – Recommended Primo MAXX Application Rates**

Turf Type	Commercial Sod Farms and Golf Courses, including Rough areas	Commercial Sod Farms and Golf Course Tees and Fairways (Cut at 1-1.9 cm)	Golf Course Greens
	ml/100 m <sup>2</sup> (fl.oz/1000 ft <sup>2</sup> )		
Creeping bentgrass		8 (0.25)	4 (0.125)
Tall Fescue	24 (0.75)		
Kentucky bluegrass	19 (0.6)	8 (0.25)	
Perennial ryegrass	32 (1.0)	16 (0.5)	
Mixture - Creeping bentgrass/Annual bluegrass		8 (0.25)	4 (0.125)
Mixture – Kentucky bluegrass/Tall Fescue/ Perennial ryegrass	24 (0.75)		
Mixture – Kentucky bluegrass/Perennial ryegrass/ Annual bluegrass		16 (0.5)	

# Application Equipment

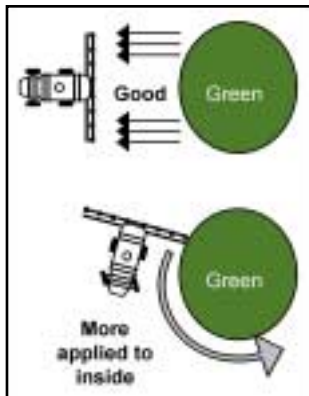
Many types of spraying equipment have been successfully used to apply Primo MAXX, including backpack sprayers, hand sprayers, boom sprayers, and with spray gun application devices.

In every case, the equipment should be calibrated correctly, have constant pressure to ensure uniform application, and be capable of providing even spray coverage.

Clean spray equipment thoroughly before use. Rinse sprayer with clean water after use and dispose of rinsate in an appropriate manner.

Due to the fact that Primo MAXX is foliar absorbed, apply Primo MAXX in 2-15 L of water per 100 m<sup>2</sup> (0.5-3.7 gal of water/ 1000 ft<sup>2</sup>), to provide uniform and thorough coverage.

When using a boom



sprayer to apply to areas with frequent curves, apply in a straight line. This will prevent an over application on the inside radius of the curve.

## Dilution Rate Calculations for Backpack sprayer

- Calculate the sprayer output, to do this follow the instructions below:
  - Fill backpack sprayer with water, record the Water Volume (W.V.) in the equation.
  - Spray out the water at working rate and measure the area sprayed with water, record the Spray Area (S.A.) in the equation.
  - Work through the calculation to determine the sprayer output.

$$\text{Sprayer output (L/100 m}^2\text{)} = \frac{\text{W.V.}}{\text{S.A.}} \times 100$$

- Calculate the amount of water for dilution

$$\text{Amount of Water (L)} = \text{Area to be treated (m}^2\text{)} \times \text{Sprayer Output (L/100 m}^2\text{)}$$

- Calculate the amount of Primo MAXX for dilution

$$\text{Amount of Primo MAXX (mL)} = \text{Area to be treated (m}^2\text{)} \times \text{Primo MAXX application rate* (mL/100 m}^2\text{)}$$

\*From Table 1 of the Label

# Primo MAXX Frequently asked Questions

**Q:** What is Primo MAXX?

**A:** Primo MAXX is a plant growth regulator that alters the way that turfgrass grows, resulting in a more compact, healthier turf that produces fewer clippings. This allows golf course superintendents to better manage their turf.

**Q:** How Does Primo MAXX Work?

**A:** Trinexapac-ethyl, the active ingredient in Primo MAXX, causes temporary inhibition of gibberellic acid biosynthesis, resulting in a decrease in cellular elongation and internode length.

**Q:** What is MEC?

**A:** MEC stands for Microemulsion Concentrate formulation. The MEC is an odourless formulation that is a highly stable liquid. It mixes completely with water, forms a clear solution, and has outstanding tank stability.

**Q:** Where can I apply Primo MAXX?

**A:** Primo MAXX may be safely applied to all areas of the golf course, including: greens, tees, fairways, and roughs.

**Q:** When is the best time to apply Primo MAXX?

**A:** Primo MAXX may be applied to turf that is actively growing. Primo MAXX should not be applied when the turf is under stress.

**Q:** How does Primo MAXX affect my fertility program?

**A:** It doesn't. When using Primo MAXX continue a normal fertility program. Primo MAXX helps to utilize fertilizer nutrients for their intended purpose of forming amino acids, proteins, chlorophyll, carbohydrates, etc. They are not lost to excessive foliar growth, so turf becomes healthier.

**Q:** How long is the turf Regulated?

**A:** At the label rate Primo MAXX will regulate growth by 50% for approximately 28 days. If applied at 1/2 the label rate Primo MAXX will provide 50% growth reduction for 14 days.

**Q:** Can Primo MAXX be sprayed on all turf species?

**A:** Primo MAXX is registered for use on all major cool-season turf species in Canada, including Annual bluegrass, Creeping bentgrass, Kentucky bluegrass, Perennial ryegrass, and Fescue.

**Q:** What are the effects of rainfall or irrigation after application?

**A:** Primo MAXX is rapidly absorbed by turf foliage, and is rainfast within 3 hours after application. Primo MAXX does not need to be irrigated or watered in.

**Q:** How does primo MAXX effect Annual bluegrass?

**A:** Annual bluegrass is the most sensitive turfgrass species to Primo MAXX. A lighter shade of green may be observed for 1 to 2 weeks after the initial application. However, darker turf colour and improved turf quality will result after regular applications of Primo MAXX.

**Q:** Can anything be done to minimize the lightening of Annual bluegrass after the initial application

**A:** Yes, apply 0.1-0.25 kg of N/100 m<sup>2</sup> (0.2-0.5 lbs of N/1000 ft<sup>2</sup>) or recommended rates of iron to minimize turf lightening or to enhance a darker green turf colour. Or apply lower rates of Primo MAXX, approximately 1/2 the label rate for the first application and apply more frequently or increase the rate as your comfort level increases. Only apply Primo MAXX to actively growing turf.

# Toxicology and Environmental Fate

The active ingredient in Primo MAXX is trinexapac-ethyl. It has a low toxicity to humans, fish, and wildlife.

Toxicological results for Primo MAXX are shown below in comparison with some commonly known substances. Although different applications and uses prevent a direct comparison, relative comparisons can be made.

Short and long-term studies with aquatic animals and birds have shown that Primo MAXX has a low toxicity, and no adverse effects on adults and offspring. Given the short persistence of Primo MAXX in the environment, long-term adverse effects such as bioaccumulation should not be expected.

Primo MAXX breaks down rapidly in soil or when exposed to light. In moist soils, Primo MAXX is hydrolyzed within 8 hours to the acid degradate, which in moist aerobic soils has a half-life of approximately 20 days. It is eventually degraded to carbon dioxide and water.

The rapid breakdown of Primo MAXX into carbon dioxide and water, combined with the rapid absorption by the foliage, allows minimal active ingredient to reach the soil surface. This reduces the mobility and thus leaching potential.

## Precautions

- Always wear protective equipment for all mixing/loading and application activities.
- Do not over-spray non-target plants on any body of water. Avoid drift to sensitive areas. Do not

contaminate aquatic systems through the disposal of waste or the cleaning/rinsing of spray equipment.

- Do not re-enter treated area until residues have dried.
- Always follow the directions on the label.

## Ecological Information

Animal	Test	Result
Mallard Duck	Oral LD <sub>50</sub>	>2,000 mg/kg
	8-day dietary LC <sub>50</sub>	>5,200 ppm
Bobwhite Quail	Oral LD <sub>50</sub>	>2,250 mg/kg
	8-day dietary LC <sub>50</sub>	>5,620 ppm
Rainbow Trout	96-hour LC <sub>50</sub>	68 mg/L
Bluegill Sunfish	96-hour LC <sub>50</sub>	>130.1 mg/L
Daphnia magna	48-hour LC <sub>50</sub>	EC =>142.5 mg/L
Summary	Low toxicity to fish and wildlife	

## Toxicological Information

Substance	Test	Animal	Result
Primo MAXX (Trinexapac-ethyl)	Oral LD <sub>50</sub>	Rat	>5,050 mg/kg*
	Dermal LD <sub>50</sub>	Rabbit	>2,020 mg/kg
	Inhalation LC <sub>50</sub>	Rat	>2.75mg/L air-4 hours
	Eye irritation	Rabbit	Moderately irritating
	Skin irritation	Rabbit	Non-irritating
	Skin sensitization	Guinea Pig	Not a sensitizer
<b>Other Substances</b>			
Aspirin	Oral LD <sub>50</sub>	Rat	1000 mg/kg
Caffeine	Oral LD <sub>50</sub>	Rat	192 mg/kg
Nicotine	Oral LD <sub>50</sub>	Rat	50 mg/kg

*\*This means milligrams of product per kilogram of animal body weight*

# Storage & Disposal

Primo MAXX may be stored for 3 years under proper conditions. Do not use or store Primo MAXX near an open flame and keep Primo MAXX from freezing. Store in original container in a secured, dry storage area.

Primo MAXX comes in a recyclable container, and is to be disposed of at a container collection site.

Contact your local distributor/dealer or municipality for the location of the nearest collection site. Before taking container to the collection site triple rinse the empty container and make the empty container unsuitable for further use.

# Pre-Stress Conditioning

8 years of USA experience at over 8000 golf courses has shown Primo MAXX will pre-condition the turf to help handle stress.

Apply Primo MAXX on a regular schedule in advance of stress to strengthen the turf. The regulated turf concentrates the growth downward into the root system helping the plant to access water and soil nutrients. The enhanced food reserves, root development, and water consumption promote turf density and playability. By managing your turf in advance of stress you can protect your course, and optimize its ability to withstand stress by producing healthier, stronger plants.

Primo MAXX will prepare your turf for the following conditions:

## Heat and Cold extremes, and Shaded Areas

With the help of Primo MAXX, your healthier plants will be better able to withstand the pressures of heat, drought, and shade.

Multiple applications of Primo MAXX, especially in the fall, promote better food reserves and rooting to help your plants survive the extremes of winter.

## Drought and Water use

Primo MAXX produces smaller more compact plants which changes the canopy architecture to a thicker and denser stand of turf, helping to shade the soil, limiting evapotranspiration, and creating better soil moisture retention.

## Improved Wear and Divot Recovery

The deeper roots and thicker turf provided by Primo MAXX will help your course to withstand the stress of wear and traffic through-out the entire season.

## Diseases

By changing the turf structure to enhance more lateral and less vertical growth, Primo MAXX helps hold fungicides longer, which can improve disease control.

# Overseeding

Primo MAXX can also be used in overseeding. An application 1 to 5 days before seeding slows existing turf shoot regrowth and reduces competition with newly seeded turf. Because trinexapac-ethyl is foliar absorbed, there is no carryover in the soil. Seed germination and development are not affected.

## Getting Started

Apply Primo MAXX before coring, verticutting, spiking, or other similar operations. Ensure seed soil contact by topdressing, slit seeding, or other appropriate means.

## Primo MAXX Application

Apply Primo MAXX 1 to 5 days before seeding. Check the label for the type of turf and whether it is on a green, tee, or fairway. Consider the competitive ability of the existing turf. Use upper-end label rates when there is strong competition from the existing turf.

## Seeding Rate

Use the normal seeding rate for your area and turf setting. High seeding rates can delay the maturation of the newly established turf.

## Fertility

Maintain a fertility program to encourage the germination of seed and seedling growth.

## Irrigation

Primo MAXX will reduce competition from existing turf so you can schedule your irrigation to optimize the germination and establishment of the new turf.

## Mowing

Primo MAXX will slow existing turf growth and may reduce mowing needs during the establishment of new seedlings, resulting in less traffic injury to new seedlings.

## Post-Overseeding Primo MAXX Application

An additional Primo MAXX application can be made at 3 weeks after seeding to continue regulation of the existing turf sward. Refer to label for application rate.

## Next Spring

Begin Primo MAXX applications after active shoot growth resumes following the spring.

## Poa Conversion

Poa annua is the most sensitive turfgrass to Primo MAXX. Aggressive application rates may be used to set back the Poa while not harming the desired turf.

## Microemulsion Concentrate

The particle size of Primo MAXX is approximately 0.1 micron. It is classified as a microemulsion concentrate. The extremely small particle size allows Primo MAXX to mix completely with water to form a clear solution that will not settle out in your spray tank.

Primo MAXX is a stable liquid formulation that has no odour, because the product does not contain petroleum solvents. No odour means fewer concerns from golfers.

## Over Application

Primo MAXX has been registered and widely used in the United States since 1997, and no turf has ever been killed by an over application.

In the event of an over application slight phytotoxicity can occur.

To correct:

- i. Immediately irrigate
- ii. Lightly fertilize
- iii. Raise cutting height (especially on greens)
- iv. Mow the turf



## Effect of Pests

Primo MAXX does not affect weeds, disease, insects, or microorganisms directly, but it does aid in the prevention of some pests.

### Weeds

Primo MAXX may reduce weeds by improving turf density. Most weed seeds are less likely to germinate in dense turf due to reduced access to sunlight.

### Disease

Primo MAXX reduces foliar growth which helps to improve fungicide performance because contact & systemic products are not removed as quickly by mowing. Repeat applications strengthen the turf plant to help fight infection.

### Insects

Primo MAXX has no effect on Insect populations.

### Microorganisms

Primo MAXX does not effect soil microorganisms.

## Fertility

Continue normal fertility program. Fertilizer nutrients are not lost to excessive foliar growth. They are utilized for their intended purpose of forming

amino acids, proteins, chlorophyll, carbohydrates, etc. resulting in a denser, healthier turf plant with increased roots and food reserves.

# Canadian Experience

Primo or Primo MAXX has been registered in the United States since 1993, and is currently used on over 8000 golf courses.

Syngenta conducted research trials in Canada during the 2000 and 2001 seasons, to evaluate Primo MAXX under Canadian golf course conditions.



Atlantic Ocean



Rocky Mountains

Trials were performed in a variety of climates and on a variety of cool season turf species, from the Rocky Mountains to the Atlantic Ocean.

The results from these Canadian trials are consistent with the results of

hundreds of trials performed at US Universities and with 8 years of experience by US superintendents.

## Testimonials

“Primo MAXX worked quite effectively, we saw good results in terms of clipping reduction.”

**Bruce Thrasher** – *Westwood Plateau Golf Club, Coquitlam, BC*

“We saw excellent results on both our greens and fairways, with darker turf colour, increased density, reduced clippings, and a consistent cut through out the day.”

**James Beebe** – *Priddis Greens Golf & Country Club, Priddis, AB*

“The clipping reduction from the 5th fairway as a result of the use of Primo MAXX was very substantial. The treated areas were strong and healthy even through the exceptionally dry 2001 season.”

**Peter Kinch** – *Glen Abbey Golf Club, Oakville, ON*

“I couldn't believe the increase in turf density after just a few applications.”

**Serge Gauthier** – *Club de Golf Islesmere, Laval, QC*

“The turf vigor without the top growth and consistent green speed throughout the day, was impressive.”

**Mike DeYoung** – *Glen Arbour Golf Club, Hammonds Plains, NS*

# Sod Production

Primo MAXX is a new tool for sod production, applied at label rate about every 4 weeks or 1/2 the label rate every 2 weeks. Primo MAXX can improve turf & sod quality, reduce equipment wear, and make labour more efficient.

## Mowing Reductions

Primo MAXX will provide 50% growth reduction for 4 weeks when applied at the label rate. Reducing the mowing frequency, mowing time, and will result in less equipment wear.

Primo MAXX eliminates the need for post mowing operations such as vacuuming or dragging.

## Turf Quality

Turf quality and density improves with repeat applications. Primo MAXX slows vertical growth and enhances production of tillers, roots, stolons, and rhizomes. Benefits include greater tensile strength, shorter time to harvest maturity, and thicker, denser sod.

## Reduced Heat Buildup

Primo MAXX may help extend pallet sod quality by reducing heat buildup due to slowed turf growth. Research in 1998 and 1999 at the University of Nebraska found that a Primo application about 10 days prior to harvest of Kentucky bluegrass reduced heat temperature in the center of the pallet 18°F. The research is on-going.

## Better Sod Establishment

Primo MAXX aids sod establishment by slowing top-growth while increasing root, stolon, and rhizome production.

Research at Iowa State University found that Primo applied 2 weeks prior to harvest had significantly better establishment than non-treated Kentucky bluegrass.

Primo MAXX application allows the turf manager to “push” establishment with irrigation and fertility while reducing mowing and equipment damage to the sod.

# Primo MAXX Spray Records

Application Info	Location(s)	Weather	Primo MAXX	Water	Comments
Date: Time: Applicator: Equipment:	<ul style="list-style-type: none"> <li>•</li> <li>•</li> <li>•</li> <li>•</li> </ul> Total Area:	Temp: Wind: Sky Condition: Clear Cloudy Overcast	Rate: Total Product:	Sprayer Output: Total Water:	
Date: Time: Applicator: Equipment:	<ul style="list-style-type: none"> <li>•</li> <li>•</li> <li>•</li> <li>•</li> </ul> Total Area:	Temp: Wind: Sky Condition: Clear Cloudy Overcast	Rate: Total Product:	Sprayer Output: Total Water:	
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