Plant Growth Regulators

Plant growth regulators (PGRs) are chemicals that alter hormonal activity in a plant to modify plant growth and development. Depending on the compound and the plant, PGRs can modify plant growth by affecting shoot growth, branching, flowering, colour of fruit, root growth, leafing and leaf fall, as well as many other uses. PGRs are generally used to improve lodging resistance, promote fruit ripening, and to stimulate flowering in horticulture crops.

Effect of Lodging on Cereal Crops

Yield loss due to lodging depends on cultivar susceptibility to lodging, growth stage, severity of lodging, as well as wind and rain events. The greatest yield loss occurs when lodging happens within 20 days after anthesis. Prior to anthesis, lodged plants are able to right themselves by node bending. Lodging can reduce yield by interfering with photosynthesis and carbohydrate movement in the plant, and due to difficulty harvesting and more unthreshed heads. Grain quality in lodged plants can also be reduced by lower test weight and increased sprouting.

Types of Plant Growth Regulators

There are two main groups of PGRs used on cereal crops: ethylene releasing compounds and gibberellin inhibitors. These PGRs are intended to produce plants with shorter, thicker and stronger stems, and they may be another management tool to reduce lodging.

How Will a Crop Respond to PGR Application?

PGR's are intended to increase crop standability and harvestability by reducing cell elongation and stem length. Plant hormones can affect other hormones, so it is possible for PGRs to have secondary or unintended effects such as increased root growth, increased resistance to environmental stress, or delayed senescence. The effects of PGRs are not well known, there have been reports of PGRs resulting in stem elongation, positively or negatively affecting yield, and increased tiller growth which could increase or decrease yield.

Response to PGRs can be crop species and cultivar specific. Wheat is known to be most responsive to chlromequat chloride, followed by barley with an intermediate response, while oats are the least responsive. Not all cultivars show similar height and lodging responses to PGR application, but more research is needed to identify which cultivars are most likely to have a positive response.

PGRs are most useful in environments where lodging risk is high and the crop has a high yield potential. Consider PGRs in high yielding environments where moisture is abundant and high levels of nitrogen have been applied.

Application Timing

Applying PGRs as the correct time is critical. Before using a PGR, read the label to ensure that you are familiar with the correct stage of application and how to stage a crop correctly.

Manipulator 620

Plant growth regulator

Company:

Taminco US Inc. (PCP#31462); Distributed by Belchim Crop Protection Canada

Formulations:

620 g/L chlormequat chloride formulated as a solution.

- Container sizes - 2 x 10 L, 859 L

Crops, Rates and Stages:

Apply *Manipulator 620* when risk of lodging is high.

Note: as of January 1, 2025 www.keepitclean.ca indicates that the use of this product on certain crop types may have market access concerns. Please see introduction for more information AND *consult potential grain buyers before using this product*.

Crop*	Application	Rate (L per acre)	Stage
Barley, oats	Single Application	0.93	from 1 tiller to flag leaf collar visible
	Split Application	0.46	first application from 1 tiller to beginning of stem elongation, second application from 1 node to flag leaf collar visible
Spring wheat (including durum)	Single Application	0.7	from 1 tiller to flag leaf collar visible
	Split Application	0.3 – First application	from 1 tiller to beginning of stem elongation
		0.4 – Second application	from 1 node to flag leaf collar visible
Winter wheat	Single Application	0.7	from 1 tiller to flag leaf collar visible
	Split Application	0.4 – First Application	from 1 tiller to beginning of stem elongation
		0.3 – Second Application	from 1 node to flag leaf collar visible

*** May be applied to crops under-seeded to clover or grasses. DO NOT apply later than just before flag leaf emergence.**

DO NOT exceed 0.7 L of *Manipulator 620* per acre in a single year for wheat or 0.92 L per acre for oats and barley.

Application Information:

- **Water Volume:**
  - ***Ground:*** Minimum 40 L per acre.
  - ***Aerial:*** Minimum 20 L per acre.
- **Nozzles and Pressure:** Use a combination of nozzles and pressure designed to deliver thorough, even coverage with ***ASABE medium*** droplets. Boom height must be 60 cm or less above the crop.

How it Works:

Manipulator 620 affects the production of plant hormones responsible for cell elongation resulting in plants with shorter, thicker stems.

Effects of Growing Conditions:

DO NOT apply *Manipulator 620* to crops under stress from drought, excess moisture or nutrient deficiency. Best results from early morning or evening application.

Applications of *Manipulator 620* may be made under normal seasonal temperatures down to 1° Celsius. DO NOT apply during frost.

Tank Mixes:

None registered.

DO NOT use in a tank mixture with liquid nitrogen fertilizer.

Restrictions:

- **Rainfall:** Within 2 hours may reduce effectiveness. Avoid application when heavy rain is forecast.
- **Restricted Entry Interval:** DO NOT re-enter treated fields for 12 hours.
- **Grazing Restrictions:** DO NOT graze treated crops or cut for hay.
- **Pre-harvest Interval:** DO NOT apply later than just before flag leaf emergence.
- **Re-cropping Interval:** No restrictions the year after application.
- **Aerial Application:** May be applied by air.
- **Storage:** DO NOT freeze.

- **Buffer Zones:**

Application method	Crops	Buffer Zones (metres†) Required for the Protection of:
		Terrestrial habitat
Ground	All crops	1
Aerial (fixed wing)	Wheat (winter, spring and durum)	10
	Barley, oats	15
Aerial (helicopter)	Wheat (winter, spring and durum)	10
	Barley, oats	10

See page 43 for an explanation of the different habitats.

† **Distance measured as metres from the downwind edge of the spray boom to sensitive habitat.**

Sprayer Cleaning:
Refer to the general section on sprayer cleaning.

Hazard Rating:

Danger – Poison

Refer to the introduction for an explanation of the symbols.

Moddus

Plant growth regulator

Company:
Syngenta Canada

Formulations:
***Moddus* (PCP#33930):** 11.3% trinexapac-ethyl formulated as an emulsifiable concentrate.
- Container size - 2 x 10 L

Crops and Stages:
Moddus aids in the growth and lodging management of wheat, barley and oats and the growth of perennial ryegrass grown for seed.

Crop	Application	Rate (L per acre)	Stage
Spring wheat (including durum) and	Single Application	0.34 to 0.42	BBCH 30 to 39 (pseudo stem erection to ligule of last leaf visible). Due to risk of injury to the crop, avoid overlapping and DO NOT apply to wheat that is environmentally stressed.
	Split Application	0.17 to 0.21	Make the first application at BBCH 21 to 24 (main shoot and a maximum 4 tillers). Make the second application at BBCH 37 to 39 (flag leaf just visible to ligule of last leaf visible). Due to risk of injury to the crop, avoid overlapping and DO NOT apply to wheat that is environmentally stressed.
Oats	Single application	0.34	BBCH 30 to 39 (pseudo stem erection to ligule of last leaf visible). Due to risk of injury to the crop, avoid overlapping and DO NOT apply to oats that are environmentally stressed.
	Split Application	0.17	Make the first application at BBCH 21 to 24 (main shoot and a maximum 4 tillers). Make the second application at BBCH 37 to 39 (flag leaf just visible to ligule of last leaf visible). Due to risk of injury to the crop, avoid overlapping and DO NOT apply to oats that are environmentally stressed.

Crop	Application	Rate (L per acre)	Stage
Winter wheat	Single Application	0.34 to 0.42	BBCH 30 to 39 (beginning of stem elongation to flag leaf stage). Optimal application timing is at BBCH 30 to 32 (stem elongation up to 2 nodes detectible in stem). Use the higher rate in varieties that are more prone to lodging and in fields that are intensively managed (i.e., high fertility, high seeding rate). DO NOT apply past BBCH 39 (ligule of last leaf visible).
Barley	Single Application	0.42	Optimal application timing is at BBCH 30 to 32 (stem elongation up to 2 nodes detectible in stem). DO NOT apply past BBCH 39 (ligule of last leaf visible). Due to risk of injury to barley, avoid overlapping and DO NOT apply to barley that is environmentally stressed.
	Split Application	0.21	Make the first application at BBCH 21 to 24 (main shoot and a maximum 4 tillers). Make the second application at BBCH 37 to 39 (flag leaf just visible to ligule of last leaf visible).
Perennial ryegrass (turf type only) grown for seed	Single Application	0.69 to 1.38	Before or during stem elongation stage of development (BBCH 30 to 37). **NOTE:** Although this product is effective at any time in this growth stage the BEST timing is early, BBCH 32 (second node on the main stem is detectable). DO NOT apply to perennial ryegrass that is environmentally stressed. DO NOT apply to forage type perennial ryegrass.

Note: Due to risk of injury to the crop, avoid overlapping and DO NOT apply to crops that are or could become stressed, such as by low fertility, high temperatures, drought, frost or diseased or insect-damaged.
Environmental conditions, crop management, and cultural practices that affect plant growth and vigour will influence the response of the crop to MODDUS Plant Growth Regulator applications.

Application Information:

- **Water Volume:**
  - ***Ground:*** Minimum 40 L per acre
  - ***Aerial:*** Minimum 20 L per acre (wheat, oats and barley only)
- **Nozzles and Pressure:**
  - ***Ground:*** Use a hydraulic nozzle with 80° or 110° drift reducing flat fan (e.g. those with a pre-orifice or turbulence chamber) or air induction nozzles with up to. DO NOT use flood type nozzles, controlled droplet application equipment, spray foils or hollow cone nozzles. Use a combination of volume and pressure recommended by the nozzle manufacturer to achieve no finer than ***ASAE medium*** droplets.
- **Screens:** Use 50 mesh or coarser line strainers and screens or 80 mesh with air induction nozzles.

How it Works:

Moddus Plant Growth Regulator aids in the growth and lodging management of wheat, barley and oats and the growth of perennial ryegrass grown for seed.

Effects of Growing Conditions:

NOTE: Due to risk of injury to the crop, avoid overlapping and DO NOT apply to crops that are stressed or could become stressed following application, such as by low fertility, high temperatures, drought, frost or diseased or insect-damaged. Environmental conditions, crop management, and cultural practices that affect plant growth and vigour will influence the response of the crop to *Moddus* Plant Growth Regulator applications.

Tank Mixes:

None registered.
It is important to check the physical compatibility of tank mixes containing *Moddus* using a jar test following the WAMLEGS mixing order with proportionate amounts of mix partners and water, before mixing in the spray tank.
In some cases, tank mixing a pest control product, such as *Moddus*, with another pest control product or a fertilizer can result in biological effects that could include, but are not limited to, reduced efficacy or increased host crop injury.

Restrictions:

- **Rainfall:** Within 3 hours may reduce effectiveness.
- **Restricted Entry Interval:** DO NOT re-enter treated fields for 12 hours.
- **Grazing Restrictions:** Cereals – forage and hay – 30 days; cereals – grain and straw – harvest at maturity; perennial ryegrass for seed production – 50 days.
- **Pre-harvest Interval:** None indicated. Harvest at maturity.
- **Re-cropping Interval:** Wheat, barley and oats (0 days); all other feed and food crops (30 days).
- **Aerial Application:** Wheat, oats and barley may be applied by air. DO NOT apply by air to perennial ryegrass.
- **Storage:** Keep in original container, tightly closed, during storage. Store this product away from food or feed. Store in a cool, dry, well ventilated area and out of the reach of children and animals.
- **Buffer Zones:** None given. Avoid contact with non-target plants. Avoid overspraying water bodies or sensitive habitat.

Sprayer Cleaning:

Refer to 'Method C' in the general section on sprayer cleaning.

Hazard Rating:

 Warning – Eye Irritant

Refer to the introduction for an explanation of the symbols.