

## Plant Growth Regulators

Plant growth regulators (PGRs) are synthetic compounds that can beneficially modify plant growth and development. These compounds function by altering hormonal activity. In western Canadian cereal crops, PGRs can work to produce shorter stems, reduce lodging and maintain grain yield.

Overall, lodging is still a major production constraint in high yield environments, and growers are looking for agronomic solutions. Researchers have found that lodging can reduce cereal yields by 7 to 35 per cent. PGRs can help reduce this major concern.

PGRs are not new agri-chemicals. Ethephon (active ingredient in Ethrel) was discovered in 1965 and is one of the oldest PGRs on the market. PGRs are used worldwide for several functions:

- improve lodging resistance
- promote fruit ripening
- stimulate flowering in horticultural crops

PGR performance depends on crop species and cultivar. Some PGRs work better on some crop species than others. For example, in response to chlormequat chloride (Manipulator), wheat is most responsive, barley has an intermediate response and oats are the least responsive. Additionally, not all cultivars show similar height or lodging responses to PGRs. At present, PGRs are only registered for use on wheat in western Canada.

PGRs are applied to the crop foliage. In cereals, they change plant physiology by reducing cell elongation, reducing stem length, shortening the uppermost internodes and peduncle, and they may alter stem diameter. Even if tillers are not exposed to the PGR, the elongation retarding effect can be observed on the tiller.

However, plant hormones act in concert, with the levels of one hormone affecting other hormones, so PGRs may have secondary effects, such as delayed senescence, increased resistance to environmental stress, or shifting assimilates to the roots resulting in increased root growth. PGRs can positively or negatively affect yield, but results are inconsistent depending on crop lodging, environmental conditions, crop species and cultivar.

PGRs are systemic but non-residual, which can result in undesirable side effects such as stem elongation in some varieties and temporary, short term height reduction. PGRs can also alter tiller growth.

Recent research found negligible PGR effects on yield but a significant protein response. The protein content of AC Foremost wheat not receiving a PGR was 12.5 per cent, with Manipulator 12.4 per cent and with trinexapac-ethyl 12.5 per cent.

The significantly lower protein content of Manipulator-treated wheat could be concerning when protein levels are near the minimum requirements. However, when either PGR was used in combination with a foliar fungicide application, protein reductions were avoided.

Correct application timing is critical for successful results. For Ethrel, apply when most of the tillers are between early flag leaf emergence to swollen-boot stage (Zadoks stages 37-45). DO NOT apply Ethrel after more than 10 per cent of the awns have emerged (Zadoks 49). Correct stage of application is critical to ensure crop safety with Ethrel.

Manipulator is registered for application between the two-leaf stage (Zadoks stage 12) to the flag leaf collar visible stage (Zadoks stage 39). However, Alberta research has found the most effective application time for consistent height reductions is between Zadoks GS 30-32 (the beginning of stem elongation, when the first internode begins to elongate and the top of the inflorescence is at least 1 cm above the tillering node, to the time when the second node is at least 2 cm above node one). Application outside this window may be less effective, but no crop injury has been reported.

Research suggests that ideal staging for trinexapac-ethyl on wheat is similar to Manipulator, at Zadoks GS 30-32 to 37. Additional research is required for both Manipulator and trinexapac-ethyl to identify the appropriate time of application and the option of co-application with fungicides



Figure 1. AAC Brandon (81 cm, VG) treated with dual PGR – Manipulator + trinexapac-ethyl (left); no PGR (center left), trinexapac-ethyl (center right) and Manipulator (right).

Source:

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