

Project Summary

Growth Regulator Evaluation in Australian Rice Crops

Australian rice growers must produce high yielding crops of specialty rice cultivars that offer consistent grain quality within parameters set by a discerning market. This ensures returns that are competitive with alternate uses for irrigation water and land. Lodging becomes a major constraint in high yielding rice production as the canopy structure is flattened and the capacity to accumulate photosynthates reduced. Harvest efficiency can be diminished, upsetting the logistical schedule and reducing grain quality due to the increased spread of grain moisture contents within the sample.

Tall stature rice varieties such as Koshihikari and YRK 5 are important and profitable to grow for specialty markets. Tall stature at high yield levels is a recipe for crop lodging. Australian ricegrowers regularly encounter lodging in Koshihikari rice and more recently in new short season cultivars. Methods of managing lodging include drill seeding (versus water seeding) rice and reducing nitrogen inputs during early stages of crop development. Both techniques present management limitations that may ultimately reduce crop or farm yield potential.

Anti-gibberellins are a class of agro-chemical used to suppress endogenous gibberellin production in a range of crops. In Australia, paclobutrazol (CULTAR), prohexadione-calcium (REGALIS) and trinexapac-ethyl (MODDUS EVO) have been registered for use in a range of crops and turf over the past 25 years. In cereals they are commercially applied around early stem extension to lower crop stature, reduce lodging and improve harvest index.

This project examined the potential role for anti-gibberellins (and particularly trinexapac-ethyl) to prevent lodging of high yielding rice crops. Results demonstrated that trinexapac-ethyl applied @ 12.5 – 25 gai/ha at GS 30-32 can prevent lodging in tall statured and late sown rice cultivars. However, there is risk of yield decline if lodging does not occur. Results from this research could be used to support a registration application to the APVMA for this purpose.

Background

Rice crop lodging involves weakening of the plant stems at their base, leading to their failure to support the maturing heads. Lodging is a major constraint in rice production as the

canopy structure is flattened and the capacity to accumulate photosynthates reduced. Harvest efficiency can be reduced, due to the increased difficulty of gathering and threshing the crop, disrupting the delivery to storage schedule and reducing grain quality due to the increased spread of grain moisture contents within the sample. Lodged crops are particularly hard on the operation of grain harvesters and are often responsible for machinery breakages due to uneven and difficult threshing and separation of the grain.

Tall stature rice varieties such as Koshihikari remain important and profitable to grow for specialty markets. Tall stature at high yield levels is a recipe for crop lodging. Australian ricegrowers regularly encounter lodging in Koshihikari rice and more recently in new short season cultivars such as YRK5.

Objectives

- Develop a reliable data package to support commercial use of anti-gibberellin sprays applied in the late vegetative and early reproductive phases of rice crop development to prevent or alleviate crop lodging.
- Develop an understanding of the potential effects of anti-gibberellin seed treatments on growth of rice seedlings.



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Methods of managing lodging include drill seeding (versus water seeding) rice and reducing nitrogen inputs during early stages of crop development.

A potential option for management are anti-gibberellins which are a class of agro-chemical used to suppress endogenous gibberellin production in a range of crops. In Australia, paclobutrazol (CULTAR), prohexadione-calcium (REGALIS) and trinexapac-ethyl (MODDUS EVO) have been registered for use in multiple crops and turf over the past 25 years. In cereals they are commercially applied overseas around early stem extension to lower crop stature, reduce lodging and improve harvest index.

This project examined the potential role for anti-gibberellins (and particularly trinexapac-ethyl) to prevent lodging of high yielding Australian rice crops.

Research

Eleven replicated field trials were conducted on a range of properties in the southern Riverina over three seasons. Trial designs were randomised complete blocks using three or four replications of plots 3m x 8m. Normal good agronomic practice was adopted at each site. Treatments were applied with a hand held propane powered spray boom fitted with five Airmix F01-110 nozzles calibrated to deliver 100 l/ha of spray solution

Outcomes

Trinexapac-ethyl @ 12.5 – 25 gai/ha applied during stem extension stages of growth (GS30-37) consistently reduced rice crop stature and lodging. Where lodging occurred, rice grain yields were increased by application of trinexapac-ethyl. In the absence of lodging, trinexapac-ethyl treatments often reduced rice grain yields. Prohexadione-calcium was more active than trinexapac-ethyl on an equivalent rate basis.

These results could be used to register trinexapac-ethyl for control of crop lodging in rice. Trinexapac-ethyl and paclobutrazol seed dressings both suppressed early shoot growth of rice seedlings at the rate of <100 mg ai/kg seed

Implications

Long strawed medium grain rice varieties remain in demand in both local and international markets. Growing these varieties at high yield potentials is fraught with risk of lodging.

Results from this project offer a means of reducing the likelihood of severe lodging in rice, thus improving confidence in producing tall stature rice cultivars. Benefits are accrued in such circumstances by growers (in the form of increased \$ returns), millers (in the form of improved millouts due to grain quality being improved) and the broader rural community (in the form of additional income).

Demonstration of yield penalties due to trinexapac-ethyl application are of concern and would temper any enthusiasm to apply the treatment. The impact of severe lodging on rice is profound, however, so rice growers and agronomists are likely to consider application of trinexapac-ethyl when punting for very high grain yields both with tall statured varieties (>7 t/ha) and with semi-dwarf medium grain rice varieties (>13 t/ha).



Lodged rice slows harvest operations and can lower grain quality and whole grain mill-out.

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Effect of trinexapac-ethyl on lodging of Koshihikari rice, Mason property, Tongaboo, NSW 2016. Untreated in foreground and background, increasing rates of trinexapac-ethyl applied perpendicular to peglines behind Mr Mason.

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