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MEDIA RELEASE

Tomorrow's harvest – what's next in the biotech pipeline (National, 9 October 2009)

By Kylie Paulsen

Significant improvements in wheat yields have been achieved over the past 50 years while the global area sown to crops has remained reasonably constant. The release of new varieties and improvements in agronomic practices have been largely responsible for these yield increases.

The start of systematic breeding in the late 1800s through to today's improved varieties has been driven by the adoptions of new technologies such as selective and mutation breeding, statistical computer-based analysis of field data and more recently marker assisted selection.

The ongoing improvement in varieties, despite an increasingly competitive production environment, has been achieved through the willingness of breeders and the farming community to adopt new technologies.

Biotechnology, genomics and phenomics are now emerging as key new technologies for developing even better varieties and helping ensure that yields continue to increase. Genomics provides scientists with tools to understand and investigate the 30,000 genes in barley and the 100,000 genes in wheat and then, with phenomics, determine which genes are involved in determining the quality characteristics, the disease or the abiotic stress response.

Using this information, crop improvements can then be effected using either marker assisted selection or genetic modification.

The Australian Centre for Plant Functional Genomics (ACPFG) – a major initiative of the Grains Research and Development Corporation and the Australian Research Council – is funded to understand fundamental plant processes that can subsequently be manipulated to increase biotic stress tolerance in wheat and barley, commonly encountered by cereal crops in Australia and overseas.

Drought, salinity and nutrient deficiency are abiotic stresses which are the subject of particular focus by the ACPFG.

Speaking at recent GRDC grower Updates at Cummins and Minnipa in South Australia, ACPFG research scientist Dr. Andrew Jacobs said the centre was generating drought tolerance markers for the selection of adapted lines in conventional breeding programs, and developing transgenic cereal lines carrying genes for adaptation to drought from a range of drought-tolerant sources. Dr. Jacobs said the development of salt-tolerant crops was also a major focus.

"We are also using genomics and associated technologies to investigate the mechanisms cereal crops employ to tolerate toxic levels of soil boron," Dr. Jacobs said.

"One of the main genes involved in boron tolerance has now been identified, which will enable breeders to enhance the efficiency of breeding for boron tolerance, either through conventional or transgenic breeding programs."

By studying the genes involved in transporting nitrogen in plants, researchers are working to improve the way plants use nitrogen fertilizer. And as Dr. Jacobs says, reducing the amount of fertilizer needed could reduce environmental pollution and save farmers money.

The ACPFG has over the past year or so achieved a number of research advances which have opened a wide range of new options. The centre has now developed several new technologies that have the potential to significantly improve stress tolerance in cereals.

Dr. Jacobs said the translation of these findings into practical outcomes remained a challenge, however, the centre was now in a position to demonstrate the practicality of many of the research outcomes and this will help build the necessary delivery pathways.

“To deliver the benefits of this research to the cereal growing community at an increased rate, the ACPFG has links with many wheat and barley breeding programs and major research organizations,” Dr. Jacobs said. “This increases the efficiency of providing research outcomes to farmers.”

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