

Post-Harvest Grain Research

Grain for a growing market

Australia's grain industry produces 30-40 million tonnes of grains per annum. This includes wheat, coarse grains (barley, sorghum, oats), oilseeds (canola, cottonseed, sunflower seeds, soybeans) and pulses (field peas, faba beans, chickpeas, lupins and lentils).

Approximately 65 per cent of all grain produced is exported, earning around \$6 billion per annum.

Australia's grain export market is expected to double in the next 10 years.

Countries importing Australian grain are very sensitive about biosecurity and protecting their domestic grain production from imported biological threats.

Export and domestic markets have a zero tolerance to pests and most demand products free of chemical residues.

Biological threats to stored grain

Australia's grain industry faces a biosecurity threat from endemic and exotic pests, pathogens and mycotoxins, which can infest and infect post-harvest grain crops.

There is an urgent need to address the biosecurity risk of infestation by new insect strains which are highly resistant to traditional treatment technologies such as fumigation.

Without new protection methods, grain growers, handlers and storers will face significantly higher costs from treatment-resistant pest insects, and incursions of exotic pests and pathogens.

If grain export markets are lost, there will be serious flow-on effects to our rural communities.

Industry deregulation and corporatisation of bulk handling bodies has reduced the capacity for a whole of industry approach to biosecurity issues.

Pests build-up phosphine resistance

Australia's grain industry relies heavily on phosphine fumigation to meet market requirements for insect free grain.

Approximately 80 per cent of Australia's grain is fumigated with phosphine, mainly by growers and bulk handlers.

Phosphine is low cost, easy to use in tablet form, and leaves little or no residue. Importantly, it is one of the few treatments accepted by international markets.

Several insect pest species (e.g. Khapra beetle, psocids, red rust flour beetle, grain borer) have developed resistance to phosphine.

In the eastern states, moderate resistance to phosphine has increased from about 50 per cent in the mid 1990s, to around 80 per cent currently.

Without new treatments, experts predict bulk storage operators will apply higher dosages of phosphine, or alternative fumigants, resulting in much higher costs and even greater resistance in populations of pest insects.

Highly resistant pest insects may survive and go undetected in an export shipment, resulting in an 'incident' where an export market adversely reacts to a grain shipment due to infestation.

Increased concentrations of phosphine or other fumigants in stored grain could result in unacceptable residues that threaten a grain export market.

Research to protect grain industry

Good research underpins new technology and practices enabling Australia's grains industry to prepare for, diagnose, survey, contain and eradicate pest incursions in stored grain.

Better technology to treat stored grain will save the industry an estimated \$500 million a year.

Australia's grain industry has a strong record of adopting new technology which has sustained productivity growth of 3.2 per cent for more than 20 years.

The Grains Research and Development Corporation, and other leading R&D organisations, have helped Australia's grains industry to adopt new technology and improve its commercial, economic and environmental performance.

Biosecurity boost for stored grain

The Cooperative Research Centre for National Plant Biosecurity (CRC Plant Biosecurity) has forged a new alliance of industry, government, and science partners to develop better stored grain protection technology, training and safeguards. Three large grain handling companies involved in the project are CBH Ltd, ABB Grain Ltd and GrainCorp Operations Ltd.

The five-year, \$40 million collaborative research project will develop better knowledge, tools, training and methods to reduce the risk of resistance in grain pests. It will address biosecurity issues such as incursions of exotic pests and the risk of mycotoxin development in stored grains. There are several components to CRC Plant Biosecurity's new grain R&D project:

- **Phosphine resistance** to understand key ecological, physiological and genetic elements that cause resistance in stored grains pests. This project is being led by QDPI&F, with scientific support provided by CSIRO. Collaborating organisations include bulk handlers and marketers (CBH, ABB and GrainCorp), NSW DPI and DAFWA.
- **Treatment technologies** to develop more cost-effective phosphine treatment strategies. Research will provide an understanding of the movement of fumigants through bulk grain handling and used to design better treatment systems. This project involves CSIRO, QDPI&F, NSW DPI, DAFWA, and several bulk handling companies.
- **New treatments** to develop alternative treatment technologies, such as grain protectants and disinfestants. Studies will examine residue issues. Participants in the project are CSIRO, QDPI&F and GrainCorp.

Several new projects are being incorporated into CRC Plant Biosecurity's existing research.

- **Gene flow** research will provide data on the movement of pest insects in the grain supply chain. For example, how resistance genes are transmitted between populations. Collaborating organisations are CSIRO, QDPI&F and DAFWA.
- **Khapra beetle diagnostic** research will develop molecular diagnostic testing for Khapra beetle. Collaborating organisations are DAFWA and Murdoch University.
- **Chemometric technology and resistance monitoring** will help rapidly detect contamination by pests, pathogens or mycotoxins in stored grain. The project involves CSIRO and NSW DPI. State government departments, with support by bulk grain handlers, will conduct a phosphine resistance monitoring program.
- **Molecular diagnostic for phosphine resistance.** A rapid, accurate, high throughput diagnostic will be developed to underpin phosphine resistance management strategies.
- **Next generation, smart traps and sensing technologies** will be developed to provide accurate, sensitive information on grain quality and detection of insect infestations allowing rapid and well informed responses to threats and reduce reliance on chemical measures.
- **Grain quality biosecurity industry courses** will incorporate research results to be conducted by Charles Sturt University.

Further information:

- CRC Plant Biosecurity: www.crcplantbiosecurity.com.au
- Department of Agriculture and Food WA: www.agric.wa.gov.au (search stored grain protection)
- Queensland DPI&F: www.dpi.qld.gov.au (search stored grain protection)
- CSIRO Entomology: www.csiro.au/org/entomology
- GRDC fact sheet 'Keep Phosphine Safe': www.grdc.com.au/uploads/documents/keepssafe.pdf

About CRC Plant Biosecurity:

The Cooperative Research Centre for National Plant Biosecurity is the central coordinating body for plant biosecurity research across all Australian states and territories. CRC Plant Biosecurity is a cooperative venture between the following (core and supporting) Participant organisations, established and supported under the Australian Government's Cooperative Research Centres Programme:

Core Participants:

- Department of Agriculture and Food, Western Australia
- Grains Research and Development Corporation
- Department of Primary Industries, Victoria
- New South Wales Department of Primary Industries
- Murdoch University
- CSIRO
- Queensland Department of Primary Industries & Fisheries
- Queensland University of Technology
- Co-operative Bulk Handling Limited
- Commonwealth Department of Agriculture, Fisheries and Forestry
- La Trobe University
- Saturn Biotech Ltd
- ABB Grain Ltd
- GrainCorp Operations Ltd
- Charles Darwin University
- South Australian Research and Development Institute
- Plant Health Australia Ltd

Supporting Participants:

- University of Adelaide
- Charles Sturt University
- Horticulture Australia Limited
- Northern Territory Department of Primary Industry, Fisheries and Mines
- Southern Cross University
- University of Western Australia

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