



Australian Government

Department of Agriculture, Fisheries and Forestry
National Residue Survey

BULK EXPORT GRAINS PROGRAM

**Residue
Monitoring Results**

July 2005 to June 2006

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Acronyms and Definitions

| | |
|--------|---|
| DAFF: | Australian Government Department of Agriculture, Fisheries and Forestry |
| NRS: | National Residue Survey |
| GCA: | Grains Council of Australia |
| APVMA: | Australian Pesticides and Veterinary Medicines Authority |
| FSANZ: | Food Standards Australia New Zealand |

Maximum Residue Limit (MRL)

An MRL is defined as the maximum concentration of a residue which is legally permitted or recognised as acceptable in or on a food, agricultural commodity or animal feed. It results from the officially authorised safe use of an agricultural or veterinary chemical, known as good agricultural practice (GAP). The concentration is expressed in milligrams per kilogram (mg/kg) of the commodity.

Australian standard

MRLs become Australian Standards when they are adopted into the *Food Standards Code*, which occurs as the result of a decision by the Australia New Zealand Food Regulation Ministerial Council (ANZFRMC) following a recommendation by Food Standards Australia New Zealand (FSANZ).

Limit of Reporting (LOR)

The LOR is the minimum concentration of a residue used for reporting purposes. Results of analyses lower than the LOR are not included in this report. Typically, the LOR is about one hundredth of the respective MRL.

Maximum Level (ML)

The ML applies to natural contaminants such as metals or toxicants rather than residues of agricultural or veterinary chemicals. An ML is established only where it serves an effective risk management function and only for those foods which provide a significant contribution to the total dietary exposure. Foods not listed may contain low levels of contaminants or natural toxicants.

Residue

A residue, for the purposes of this document, is the amount of chemical (or its metabolites) that remains on the commodity after application. The amount of residue depletes over time but varies between commodities, chemicals, application methods and environmental conditions.

Good Agricultural Practice (GAP)

GAP is defined as the nationally recommended, authorised or registered use-pattern of chemicals, that is necessary for effective and reliable pest control under actual conditions at any stage of production, storage, transport, distribution and processing of food commodities and animal feed.

Introduction

This National Residue Survey (NRS) Bulk Export Grains Program Report, covering the period 1 July 2005 to 30 June 2006, has been prepared for food and grain producing industries and others interested in the chemical residue status of Australian grain.

The results of the Milled Products, Export Container and Domestic Grain Programs are the subject of separate reports.

Executive Summary

The Bulk Export Grains Program covering wheat, barley, oats, sorghum, field peas, chickpeas, canola and lupins exported in bulk shipments, is a collaborative project involving the Grains Council of Australia (GCA), those companies involved in grain exports and NRS. The program commenced in 1964 and has been funded by industry levies since 1994.

Grain samples are collected from every bulk shipment leaving from the 18 grain export terminals, located throughout Australia.

During the reporting period, NRS arranged for the collection of 2,996 random grain samples.

Each grain sample was analysed for a range of insecticides and fungicides listed in Table 1. Some grain samples are randomly selected for an additional screen for heavy metals, environmental contaminants and for phosphine.

There was 100% compliance with Australian Food Standards.

Chemical residues below the MRL were detected in 18.2% of samples.

However, 99.9% were below ½ MRL and at least 96.5% were below 1/5th MRL. There was only one detection between ½ MRL and MRL.

No residues were detected in the 265 samples tested for organochlorines.

In 157 grain samples tested for heavy metals, there was only one reportable level of cadmium at 0.052 mg/kg, **above half** of the Australian Standard of 0.1 mg/kg, in a sample of wheat.

There were no detections of phosphine in 39 grains samples randomly selected from the 2,996 samples collected throughout the year.

Background to NRS

The NRS is part of the Australian Government Department of Agriculture, Fisheries and Forestry (DAFF) located in Canberra. The NRS was established in the early 1960s as the Commonwealth response to growing concerns about pesticide residues in major meat exporting markets. Since then the range of commodities covered by the NRS monitoring surveys has expanded and in 2005-2006, over 40 animal, plant and selected fisheries and aquaculture products were monitored.

Since 1993, all the NRS programs have been fully funded through levies on production, through a reserve fund established by the *NRS Administration Act 1992*. Partial cost recovery for the NRS was introduced in 1986 and full cost recovery since 1994.

The primary function of the NRS is to monitor chemical residues and environmental contaminants in the products of participating industries.

Export and domestic marketing initiatives are underpinned by Australia's status as a producer of clean food. Surveys for chemical residues are important as a measure of overall product quality, particularly for exporting countries such as Australia. The NRS monitoring programs help support this reputation by providing an independent and authoritative assessment of the residue status of Australian foods.

Residue monitoring is an important part of an overall strategy to minimise unwanted residues and environmental contaminants in food. It serves to identify potential problems and indicates where follow-up action is required. A history of nil residue violations and low residue detections is recognised by importing countries as evidence of good agricultural practices instituted by producers.

History of Grains Programs

Grain has been included in the NRS monitoring programs since 1964, when the NRS expanded to cover a wide range of agricultural commodities. The NRS Grains Program was independently reviewed in 1993, 1998 and 2003 in collaboration with the Grains Council of Australia (GCA) and industry.

The Grain Monitoring Program was revised following the 1993 review to provide extensive coverage of export grain, as well as wheat and milled products being processed through Australian flour mills. Following the 1998 review, NRS developed and implemented a new program, which commenced in 2000, providing greater coverage of domestically traded grain. Following the 2003 review, NRS established the Export Container Program.

All NRS Grains Programs are funded by an 0.015% 'farm-gate-value' levy on producers of participating grains which are wheat, barley, oats, sorghum, canola, field peas, chickpeas and lupins.

Sampling of Bulk Export Grain

The Bulk Export Grains Program involves the sampling of grain whilst it is being out-turned to ships at the 18 grain export terminals located throughout Australia.

Commodities monitored are wheat, barley, oats, sorghum, lupins, field peas, chickpeas and canola. The NRS currently tests a sample from each hold of every ship loading export grain. In most export grain terminals, the NRS samples are taken using automatic sampling equipment.

Samples are collected in accordance with NRS established protocols. They are then forwarded by express freight to a contracted laboratory for analytical testing. At the same time, the sample information is forwarded to Canberra where it is entered in the NRS database.

Testing

The NRS tests for a wide range of chemicals including registered 'in-crop' pesticide products and registered grain protectants used against insect infestation during grain storage. The NRS also monitors for environmental contaminants and organochlorines, which persist in the environment and, with the exception of endosulfan, are no longer used in agriculture.

Many of the chemicals, the NRS tests for in the Grains Program, are registered grain protectants. These are chemicals that may be applied to grain after harvest to prevent it being spoiled by grain insects. Residues below MRL are expected in treated grain. The registered rate of application are designed to ensure that, as the chemical breaks down and dissipates, any residue will be well below the MRL by the time the product gets to the consumer.

The tests conducted are sufficiently sensitive to detect levels well below the MRL, usually about one hundredth. MRLs are usually set in milligrams per kilogram (parts per million). For example, the grain protectant chlorpyrifos-methyl has a MRL of 10 mg/kg in cereal grain and its limit of reporting is 0.1 mg/kg.

The chemical screen for the analysis of residues and contaminants in all grain samples is at Table 1.

Data management

The NRS uses automated systems in its data management. Results from laboratories are transferred to the NRS electronically, where they are coupled to sample data. At the NRS, data are collated for industry and government use. The origin of samples can be determined from sample collection forms, which enables samples to be 'traced-back' if any follow-up action is needed.

Reporting

Residues above the MRL are considered unacceptable, but do not necessarily represent a hazard to consumers because of the generous safety margins used in the setting of these standards. Australian MRLs are generally either the same as, or more stringent than, those prescribed by the international Codex Alimentarius Commission.

Where an MRL has not been established for a chemical-commodity combination, the MRL is effectively zero and any detection is treated as a contravention.

Analyses showing residues above the MRL are reported immediately to the NRS, which then advises industry and the relevant State or Territory authority so that appropriate action can be taken.

Results are also used by the State Government agencies responsible for the management of pesticides and veterinary medicines. Australian Government bodies involved in chemical regulation and policy such as the APVMA, FSANZ and Department of Health and Ageing also use the data.

The NRS results are used by Australian delegations to international organisations such as the Codex Alimentarius Commission. Summarised national results are published annually in the *National Residue Survey Annual Report* and are available on the NRS website (www.daff.gov.au/nrs).

Program Review

The program is reviewed annually upon completion of each year's sampling program. The review covers aspects such as sampling arrangements, sampling numbers, test types, test chemicals, liaison with industry and reporting procedures.

Table 1: Chemical screen for 1 July 2005 to 30 June 2006

| | |
|---------------------------|---|
| Pesticide Residues | |
| organophosphates | azamethiphos, chlorpyrifos, chlorpyrifos-methyl, diazinon, dichlorvos, fenitrothion, malathion, pirimiphos-methyl, profenofos |
| synthetic pyrethroids | bifenthrin, bioresmethrin, cyfluthrin, cypermethrin, deltamethrin, fenvalerate, permethrin, phenothrin, piperonyl butoxide |
| fungicides | flutriafol, iprodione, tebuconazole |
| other insecticides | fipronil, indoxacarb, methoprene, carbaryl |
| Contaminants: | |
| organochlorines | aldrin, chlordane, DDT and metabolites, dieldrin, endosulfan, endrin, HCB, HCH, heptachlor, lindane and PCBs |
| heavy metals | lead, cadmium, mercury |
| Fumigant: | phosphine |

Results

Pesticide Residue Screen

In the reporting period 1 July 2005 to 30 June 2006, a total of 2,996 grain samples were collected from the 18 grain export terminals located throughout Australia.

Table 2 presents a summary of the pesticide residue screen results of the NRS Bulk Export Grains Program. These results are an aggregate of all participating establishments.

There was 100% compliance of samples with the Australian standard.

Chemical residues below MRL were detected in 14.7% of samples.

However, 87% of the residue detections were below 1/5th of the relevant MRL.

Table 2: Results for the pesticide residue screen

| Grain | Samples tested | Samples with nil residues | Number of samples with residues | | | | % compliance with Australian standard |
|--------------|----------------|---------------------------|---------------------------------|----------------------------------|----------------|-----------|---------------------------------------|
| | | | LOR to 1/5 th MRL | 1/5 th MRL to 1/2 MRL | 1/2 MRL to MRL | above MRL | |
| wheat | 2069 | 1580 | 447 | 42 | 0 | 0 | 100 |
| barley | 648 | 500 | 144 | 4 | 0 | 0 | 100 |
| canola | 140 | 131 | 9 | 0 | 0 | 0 | 100 |
| sorghum | 32 | 24 | 8 | 0 | 0 | 0 | 100 |
| lupin | 54 | 54 | 0 | 0 | 0 | 0 | 100 |
| oat | 24 | 16 | 8 | 0 | 0 | 0 | 100 |
| field pea | 23 | 23 | 0 | 0 | 0 | 0 | 100 |
| chickpea | 6 | 6 | 0 | 0 | 0 | 0 | 100 |
| Total | 2996 | 2334 | 616 | 46 | 0 | 0 | 100 |

Organochlorine screen

This screen covers a range of chemicals which, with the exception of endosulfan an insecticide registered for some agricultural uses, were widely used.

Although these chemicals are no longer in use, some are known to persist in the environment.

As shown at Table 3, there were no organochlorines were detected in the 265 samples randomly selected from the 2,996 samples collected in the reporting period.

Table 3: Results for organochlorine screen

| Grain | Samples tested | Samples with | | | % compliance with Aust. Std. |
|--------------|----------------|--------------|----------|--------------------|------------------------------|
| | | nil residues | residues | residues above MRL | |
| wheat | 137 | 137 | 0 | 0 | 100 |
| barley | 59 | 59 | 0 | 0 | 100 |
| sorghum | 17 | 17 | 0 | 0 | 100 |
| lupin | 15 | 15 | 0 | 0 | 100 |
| canola | 15 | 15 | 0 | 0 | 100 |
| oat | 10 | 10 | 0 | 0 | 100 |
| field pea | 11 | 11 | 0 | 0 | 100 |
| chickpea | 1 | 1 | 0 | 0 | 100 |
| Total | 265 | 265 | 0 | 0 | 100 |

Heavy metals screen

This screen reports on concentrations of the heavy metals lead, cadmium and mercury. The results are listed in Table 4.

These elements occur naturally throughout the environment and concentrations at reportable levels are not unusual in any biological samples.

In 157 grain samples tested, there was only one reportable level of cadmium at 0.085 mg/kg, above half the Australian Standard of 0.1 mg/kg, in a sample of wheat.

Table 4: Results for heavy metals

| Grain | Samples tested | Samples with levels above the ML | % compliance with Aust. standard |
|--------------|----------------|----------------------------------|----------------------------------|
| wheat | 108 | 0 | 100 |
| barley | 32 | 0 | 100 |
| canola | 6 | 0 | 100 |
| sorghum | 3 | 0 | 100 |
| lupins | 3 | 0 | 100 |
| oats | 2 | 0 | 100 |
| field pea | 2 | 0 | 100 |
| chickpea | 1 | 0 | 100 |
| Total | 157 | 0 | 100 |

Phosphine screen

This screen reports on concentrations of the fumigant phosphine.

A predefined number of incoming export samples have been selected at random by the laboratory and tested to determine total phosphine residues. Where residues were detected equal to or above 0.002 mg/kg, the original sample underwent a further analysis to

determine what component of the residues was due to unreacted phosphide and/or absorbed phosphine.

There were no phosphine detections at levels above the Australian Standards as shown at Table 5.

Table 5: Results for phosphine

| Grain | Samples tested | Samples with levels above the ML | % compliance with Aust. standard |
|--------------|----------------|----------------------------------|----------------------------------|
| wheat | 19 | 0 | 100 |
| barley | 7 | 0 | 100 |
| sorghum | 2 | 0 | 100 |
| oats | 2 | 0 | 100 |
| lupins | 1 | 0 | 100 |
| field pea | 4 | 0 | 100 |
| canola | 3 | 0 | 100 |
| chickpea | 1 | 0 | 100 |
| Total | 39 | 0 | 100 |