



*Scirtothrips aurantii*

# Review of Plant Research Biosecurity Protocols



*Uromyces genistae-tinctoriae*



Wheat Streak Mosaic Virus

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July 2003

**ISBN 0-9750223-4-2**

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# Report of the Review of Plant Research Biosecurity Protocols

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July 2003



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## Summary and Recommendations

Three recent plant incursion incidents (wheat streak mosaic virus, Scotch broom rust fungus and South African citrus thrips) had an apparent association with research institutions.

The Primary Industries Standing Committee determined that there was a need to review research biosecurity protocols and processes. The primary emphasis was to be on winter cereal breeding and germplasm collections and to identify any issues applicable to other introductions of overseas plant material. A Review Team was appointed and the review was conducted during May and June 2003. The Review Team met at AFFA, Canberra; CSIRO Black Mountain, Canberra; SARDI, Urrbrae, (including the birdcage); Australian Winter Cereals Collection, Tamworth; SunPrime, Tamworth; Leslie Research Centre, Toowoomba; Pacific Seeds, Toowoomba; Alan Fletcher Research Station, Sherwood, and AQIS, Brisbane, Knoxfield, Tullamarine and Sydney. Meetings were held with approximately 70 people.

The conclusion of the Review Team was that the framework for biosecurity arrangements for plant health in Australia is generally satisfactory. However, there are issues that need to be addressed to ensure the maintenance of Australia's unique plant health status.

The maintenance of Australia's continuing freedom from many plant pests and diseases depends ultimately on the commitment from all stakeholders in the continuum of quarantine and the effective management of Biosecurity arrangements.

### EFFECTIVENESS OF CURRENT BIOSECURITY ARRANGEMENTS

**Recommendation 1:** *It is recommended that the extent of achievements of the government's response to Post-Entry Quarantine support and facilities suggested by the Nairn report be evaluated.*

### RECORDS OF PLANT MATERIAL IMPORTED INTO QUARANTINE FACILITIES

**Recommendation 2:** *It is recommended that, as a matter of urgency, a uniform system be instituted for winter cereals to link records of lines of material, either held in quarantine, released or destroyed; to enable effective tracking of all lines of material which have entered Australia through quarantine, and that such a system subsequently be applied to all imported plant material used for research purposes.*

### INTERNATIONAL MAIL AND COURIER PROCESSING

**Recommendation 3:** *A re-evaluation be undertaken of risks inherent in current processing practices for examining mail and courier items at ports of entry. Consideration be given to issuing a standard, high visibility AQIS identification label with permits for use by consignors forwarding plant material to Australia.*

### POST-ENTRY QUARANTINE

**Recommendation 4:** *The current standards for all quarantine procedures and facilities should be appraised and then all facilities growing winter cereal seed in Post-Entry Quarantine should be examined to ensure that new standards are being met.*

**Recommendation 5:** *The Review Team recommends that institutions and AQIS urgently complete bilateral Compliance Agreements [particularly those in relation to the compliance agreements being established in relation to the Waite Campus (completion due July 2003) and the Australian Winter Cereal Collection (completion due December 2003)] as they will provide significant advantages in flexibility, easier access to specialised skills, the potential for cost savings to institutions and AQIS, and will serve to confirm the move towards a greater shared responsibility as recommended by the Nairn report.*

## QUARANTINE WASTE DISPOSAL

**Recommendation 6:** *It is recommended that research should be initiated to identify alternative technologies capable of meeting reasonable quarantine requirements for the disposal of material of quarantine concern (eg potting mix and plant residue) from Post-Entry Plant Quarantine facilities.*

## OPEN POST-ENTRY QUARANTINE

**Recommendation 7:** *It is recommended that a comprehensive review of Open Post-Entry Quarantine in relation to the importation of winter cereal genetic material be completed as a matter of urgency.*

## AQIS INSPECTORS

**Recommendation 8:** *It is recommended that appropriate, comprehensive, skills based, in-service training for the AQIS inspectorate be developed and maintained to ensure high standards of scientific competency, particularly in the biological science areas affecting quarantine.*

## AQIS COMPLIANCE

**Recommendation 9:** *It is recommended that the effectiveness and adequacy of the lines of communications between the various sectors of AFFA concerned with plant biosecurity be reviewed.*

## WINTER CEREAL BREEDING IN AUSTRALIA

**Recommendation 10:** *It is recommended that linkages between winter cereal breeders and AQIS be developed and fostered to further enhance the biosecurity system.*

**Recommendation 11:** *It is recommended that breeders make provision with any contracted service providers to ensure that their research material is maintained in a biologically isolated location, independent of that from other breeding programs.*

## INCURSION PREPAREDNESS

**Recommendation 12:** *It is recommended that PlantPlan and the projects relating to the databases of potential plant threats from significant pests not yet recorded in Australia and existing pests and diseases within Australia, be expedited and completed within the current financial year.*

**Recommendation 13:** *It is recommended that a comprehensive strategy be developed to ensure that an effective diagnostic capacity for the identification of plant pests and diseases is available to Australia.*

## PARTICIPANTS AND RESPONSIBILITIES FOR INCURSION RESPONSE

**Recommendation 14:** *It is recommended that to maintain an effective and efficient management and decision-making process, participation on management and decision-making committees be restricted to nominated members and technical experts required for the specific incursion.*

## CONTAINMENT VERSUS ERADICATION

**Recommendation 15:** *It is recommended that wherever possible, after initial responses for containment of an incursion, rapid delimiting surveys should be conducted to determine the costs and benefits of eradication or any alternative action prior to final decision-making.*

**COMMUNICATION- MEDIA**

**Recommendation 16:** *It is recommended that all emergency response plans contain an effective information/media communication strategy.*

**WSMV TARGETED SURVEY**

**Recommendation 17:** *It is recommended that the need for, and dimension of, the Spring 2003 targeted survey for wheat streak mosaic virus, should be revisited.*

**BIOLOGICAL CONTROL AGENT IMPORTATIONS**

**Recommendation 18:** *It is recommended that biosecurity protocols for all facilities working with biological control agents address all possible risks and that the quarantine protocols be well documented, widely understood and fully implemented.*

## 1. Introduction

Australia is an island continent, free from many plant, animal and human pests and diseases that cause significant losses in other countries. This status facilitates pest-free accreditation of Australia's agricultural exports and contributes to its competitive advantage in agricultural products enabling access to a broad range of markets. The value of Australia's plant based agricultural commodities in 2001 was over \$17 billion of which wheat contributed approximately \$4.4 billion (Australian Bureau of Statistics, 2002). This pest-free status also protects Australia's biodiversity and natural environment. Robust quarantine and incursion management is essential to the maintenance of this status.

Despite the stringency of Australia's plant quarantine, three recent incursions of exotic plant pests and disease have been associated with research institutions involved with the import of plant material. These incidents involved wheat streak mosaic virus (WSMV), South African citrus thrips (SACT) and Scotch broom rust fungus (SBRF).

WSMV was diagnosed from two research sites in the ACT in April 2003. This triggered the convening of the Consultative Committee on Exotic Plant Pests and Disease (CCEPPD). A national delimiting survey was undertaken to determine the distribution of the virus. The survey found WSMV at several widespread and unrelated sites in South Australia, Victoria and New South Wales. In Queensland the virus has been found at only two research facilities. There were concerns that the disease may have entered Australia via material imported into research institutions.

South African citrus thrips (*Scirtothrips aurantii*) was found at the Alan Fletcher Research Station, Brisbane in early 2002. This was thought to have been contained until further surveys determined that the thrips was more widespread. It is unclear as to how this pest thrips entered Australia. (Previously known from only Africa and associated islands and was not known to have moved to other continents). However, there is a possibility that the thrips entered the country on host material associated with biological control agents brought in for the control of the weed "Mother of Millions" (*Bryophyllum delagoense*). South African citrus thrips is known to infest "Mother of Millions" in South Africa, from where the biological control agents were sourced.

Scotch broom rust fungus (*Uromyces genistae-tinctoriae*) which was detected outside a quarantine facility at CSIRO, Black Mountain in April 2003, is believed to have entered Australia on host material associated with a mite (*Aceria genistae*) brought in for the control of Scotch broom in Australia. Breakdowns in procedural protocols were identified as the likely cause and have since been rectified.

As all three incidents were associated with research institutions, the Primary Industries Standing Committee determined that there was a need to review research biosecurity protocols and processes. The principal emphasis was to be on winter cereal breeding and germplasm collections with consideration also to be given to other issues applicable to introductions of other imported plant material.

### Terms of Reference

The full terms of reference (as adopted were):

- A high level review is to be undertaken of existing protocols and processes in place at public and private winter cereal breeding research institutions and germplasm collections in Australia to ensure the bio-safety of plant and related material. This review follows the recent discovery of WSMV in wheat plants at CSIRO and other winter cereal breeding research facilities in other parts of Australia.

- While the review is focused on cereal breeding and cereal breeding institutions, the review should take note of any identified issues applicable to other introductions of overseas plant material.
- The review will also examine protocols and compliance regimes for cereals imported for processing and purposes other than for growing.
- The Review will include:
  - the bio-safety protocols and processes at research and related institutions;
  - surveillance, awareness and diagnostic procedures;
  - accreditation of research facilities, and
  - any additional relevant information that may be acquired to achieve these objectives.
- The Review should consider not only the importation of plant and related material for research purposes but also arrangements, once released from quarantine, for the exchange of material between research facilities and collaborating organisations.
- Institutions should be considered in a broad context and include Commonwealth, State and other relevant private research facilities.
- In addition to examining existing research protocols and processes, the Review should also consider whether any systemic, cultural or other issue may contribute to incidents.
- Given the nature of the task and the short time frame, the Review should take a high level strategic look at these issues and provide a report for consideration by CEOs by 30 June 2003.
- The review may identify particular issues or areas for further, more detailed investigation.

### **Review Team**

Membership of Review Team consisted of Dr John Radcliffe, FTSE and Special Advisor to CSIRO (chairman); Mr Mick Catley, former Director of Plant Quarantine; Dr Tony Fischer Program, FTSE Manager - Land, and Water Resource 2 Research, ACIAR; Mr Keith Perrett, President, Grains Council of Australia, and Dr Kevin Sheridan, former CEO of the NSW Department of Agriculture.

The review was conducted during May and June 2003. The Review Team met at AFFA, Canberra; CSIRO Black Mountain, Canberra; SARDI, Urrbrae, (including the birdcage); Australian Winter Cereals Collection, Tamworth; SunPrime, Tamworth; Leslie Research Centre, Toowoomba; Pacific Seeds, Toowoomba; Alan Fletcher Research Station, Sherwood, and AQIS, Brisbane, Knoxfield, Tullamarine and Sydney. Meetings were held with approximately 70 people.

## **2. Australian Quarantine - Nairn Review**

The review of Australian Quarantine by Nairn *et al.* (1996) made at least 15 recommendations that led to the restructuring of how quarantine, import risk management and incursion management in relation to plant health occurred Australia. These included recommendations for:-

- the creation of a Commonwealth Chief Plant Protection Officer;
- the concept of the establishment of an Australian Plant Health Council, to facilitate a genuine industry/government partnership approach to the development and implementation of plant health policies and programs;
- the processes by which import risk analyses are undertaken;
- the strengthening of border quarantine activities;
- regulations governing the import of seeds and plant germplasm to be based on a permitted list for entry;

- tolerances for contaminants of imported seeds (including bulk grains) being consistent, equitable and based on scientific risk analysis;
- AQIS undertake regular audits of seeds, bulbs, tubers and other plant material imported for human consumption to ensure that those originating from high risk sources are not viable for propagation;
- the development of a national system for issuing import permits;
- the development of national pest and disease databases and information systems;
- the addressing of issues of unwanted contaminants in imported feedstuffs for animals;
- the increased use of X-ray technology to improve the efficiency and effectiveness of quarantine delivery at the border, including airports, seaports, mail exchanges and courier depots, and
- the investigation of the need for and optimal location and possible funding options for a national secure containment facility for plant pests and diseases.

In adopting the Nairn recommendations, the government injected considerable funding into strengthening border security, risk analysis, quarantine awareness, quarantine support (including the establishment of a Chief Plant Protection Officer (CPPO), establishment of an Australian Plant Health Council (now titled as Plant Health Australia) and establishment of an advisory council for quarantine and exports to provide advice to the Minister of Agriculture and Director of Quarantine on the functions performed by the Australian Quarantine and Inspection Service).

### **3. Plant Biosecurity Arrangements in Australia**

Although international quarantine is constitutionally a Commonwealth responsibility, policies have been, and are developed in consultation with the States/Territories at ministerial level through the Primary Industries Ministerial Council (PIMC) and its subordinate committees.

Commonwealth biosecurity arrangements for plant health in Australia are the responsibility of three operating groups within the Department of Agriculture, Fisheries and Forestry Australia (AFFA). These are the Office of the Chief Plant Protection Officer, Biosecurity Australia: Plant Biosecurity and the Australian Quarantine and Inspection Service.

#### **AFFA Plant Biosecurity Responsibilities**

##### **Office of the Chief Plant Protection Officer**

The Office of the Chief Plant Protection Officer (OCPPO), which is part of Product Integrity Animal and Plant Health, an operating group within AFFA, is responsible for the development and implementation of national policies and programs that aim to maintain or improve Australia's plant health status, as well as the national coordination of the management of plant related pest incursions.

##### **Biosecurity Australia: Plant Biosecurity**

Biosecurity Australia: Plant Biosecurity is part of Market Access and Biosecurity, an operating group within AFFA, which includes in its functions the assessment of quarantine risks associated with import proposals for plants and their products.

##### **Australian Quarantine and Inspection Service**

The Australian Quarantine and Inspection Service (AQIS) is the operating group within AFFA charged with protecting Australia from exotic pests and diseases while facilitating the international movement of people and goods and providing export certification for agricultural produce and other commodities.

Currently quarantine services across Australia are delivered under various arrangements, generally they are delivered by the Commonwealth, whereas in some areas they are provided contractually by the States or Territories (WA, NT and Tas), or by AQIS supervised non government organisations.

## **Plant Health Australia**

Plant Health Australia is a company jointly established by the Commonwealth and State/Territory Governments and Industry to facilitate a genuine Industry/Government partnership approach to the development and implementation of plant health policies and programs.

## ***Importation Requirements with Particular Reference to Winter Cereals.***

### **Protocols**

#### **The Permit**

The importation into Australia of living plant material or seeds is prohibited unless the Director of Quarantine has granted a permit. The permit will specify the conditions that are required to be satisfied for the import to occur. There are additional conditions that apply to the importation of Genetically Modified seeds.

The responsibility for implementing a number of the quarantine requirements has been devolved to institutions including several wheat breeding facilities.

A great proportion of winter cereals and other seed for sowing enters Australia by mail or courier, where it must be identified at the port of entry and referred to AQIS. Incoming mail is screened by AQIS via a number of methods including X-ray examination, random sampling and the use of quarantine detector dogs. Some seed is direct carried by importers to be left with AQIS at the point of entry. Any seed that by-passes AQIS at the port of entry and is directly received by importers (including breeding facilities) must be physically returned to AQIS.

The permit specifies conditions under which the material can enter Australia. For seed of wheat and other winter cereals this is either via closed or open quarantine. For more details of general permit conditions see Appendix A. Conditions include:

- Seed must be inspected by AQIS for freedom from live insects, soil, prohibited seeds and other plant material (e.g. leaf, stem, fruit pulp or pod material);
- All seed must be treated under AQIS supervision at a quarantine-approved premise in accordance with the following methods:
  - seed must be pre-soaked in water at ambient temperature for 4 - 5 hours on arrival; the seed must then be immersed in hot water at 54°C for 10 minutes and then dried;
  - seed must then be dusted with Thiram<sup>®</sup> seed fungicide. Thiram<sup>®</sup> must be applied as per the label instructions; all safety precautions must be followed as per the label instructions;
  - or the seed must be treated with Vitavax<sup>®</sup> 200 Flowable Fungicide, used for the control of regulated pests (particularly bunts and smuts) of the nominated cereal seeds;
  - fungicide must be applied as per the label instructions; all safety precautions must be followed as per the label instructions.

#### **Closed Post-Entry Quarantine**

- Seed must then be forwarded for growth in closed quarantine at either: a government Post-Entry Quarantine facility; or a private Post-Entry Quarantine facility approved for the growth of these seeds.

- During growth in quarantine, plants must be inspected by AQIS at the following stages of growth:
  - seedling emergence;
  - halfway through the growing period;
  - heading and flowering, and
  - harvested seed.

AQIS is required to ensure that all conditions of the permit are complied with.

### **Open Post-Entry Quarantine**

Cereal seed sourced from New Zealand can be grown in open Post-Entry Quarantine currently at four locations. Specific conditions apply (Appendix B) to open quarantine which are over and above the general import conditions pertaining to material coming into closed quarantine and include:

- limits of the amount of seed permitted (600 seed lines containing no more than 20 grams per line) without written approval from AQIS; seed must have been grown in New Zealand, and
- seed must have a phytosanitary certificate issued by New Zealand Ministry of Agriculture and Forestry.

Specific requirements for an open quarantine facility include:

- details of cereal pathogens that are endemic or recorded from the area/district;
- isolation by at least 1 kilometre from other cereal fields;
- no other cereal lines other than the imported lines may be grown at the quarantine site, and
- restrictions on the movement of equipment etc. from the site.

### **Release**

Following satisfactory completion of these procedures (closed or open post-entry quarantine), AQIS releases the seed from quarantine and it is passed onto breeders.

Subsequent to seed passing from quarantine (open or closed), breeders make selections over several generations (sometimes using out of season summer nurseries), and eventually move their material to several locations around Australia for screening, multiplication, further crossing and comparative testing.

### **Bulk Seed Imports**

Cereal seed for purposes other than for sowing, including bulk imports, may also be imported under different import permit conditions which include devitalisation.

### **Post-Entry Quarantine Facilities**

The majority of winter cereal introductions come through closed post-entry quarantine at the Australian Winter Cereal Collection, Tamworth. Other introductions are processed through:

- AQIS Post-Entry Quarantine facilities at Eastern Creek (NSW) and Knoxfield (Vic);
- South Australian Research and Development Institute, Post-Entry Quarantine facility at Urrbrae, SA;
- Department of Agriculture of Western Australia, Post-Entry Quarantine Facility at South Perth;

- Department of Primary Industries, Water and Environment (Tasmania), Post-Entry Quarantine Facility at Kingston, Tasmania;
- Department of Primary Industries, Queensland, at Eagle Farm, Queensland;
- University of Western Australia, Shenton Park (Centre for Legumes in Mediterranean Agriculture [CLIMA]);
- University of Sydney, Plant Breeding Institute at Cobbity, New South Wales, and
- Pacific Seeds at Toowoomba, Queensland.

Some imported seed may be retained in quarantine indefinitely or in some instances destroyed.

Winter cereal also enter Australia (via New Zealand) through approved “Open Quarantine” facilities at Howlong (Vic), near Lake Eildon (Vic), Werribee (Vic) and near Tocumwal (NSW).

Other than seed being released from quarantine, materials, including growing media and plant residues, from closed Post-Entry Quarantine facilities must be disposed of by an AQIS approved method which include autoclaving, high temperature incineration, composting or deep burial.

All Post-Entry Quarantine facilities are subject to AQIS audit to ensure standards are maintained in terms of both facilities and operation.

## ***Findings on Quarantine of Imported Cereal Seed***

### **Effectiveness of Current Biosecurity Arrangements**

The Review Team found that quarantine and biosecurity arrangements generally met their objectives and there was a high level of commitment by quarantine staff, whether employed by AQIS or by the importing institutions both public and private. However, there are opportunities to improve the effectiveness and uniformity of delivery of the service.

The Review Team observed that although many of the government policy objectives agreed in response to the Nairn review have been achieved, there remain variations in the quality of outcomes for the provisions for the support and facilities for Post-Entry Quarantine.

**Recommendation 1:** *It is recommended that the extent of achievements of the government’s response to Post-Entry Quarantine support and facilities suggested by the Nairn report be evaluated.*

### **Records of Plant Material Imported into Quarantine Facilities**

The AQIS Import Management System (AIMS) entries describe the number of packages in a consignment, but do not record details of the specific lines within the packages. The AIMS entry number is normally assigned by the system when a lodgement is made by either a broker or an AQIS officer. Only the importing institution records lines in each package. The AIMS entry number should be linked with all accession line records in all institutions.

**Recommendation 2:** *It is recommended that, as a matter of urgency, a uniform system be instituted for winter cereals to link records of lines of material, either held in quarantine, released or destroyed; to enable effective tracking of all lines of material which have entered Australia through quarantine, and that such a system subsequently be applied to all imported plant material used for research purposes.*

## International Mail and Courier Processing

It was noted that the screening of small envelopes for the detection of seed amongst other items of mail remains a problem, in that envelopes are aggregated into groups and often pass through quarantine screening end-on such that seed detection is difficult. It was also noted that packages opened by Australia Post staff for random quarantine inspection could remain unsecured for a considerable time before being dealt with. The facilities for containment and emergency treatment of infested/infected intercepted mail items appear to be inadequate.

It was reported that significant numbers of packages containing seed had by-passed AQIS and been delivered directly to importers. However, in recent times the proportion has decreased. The necessity for material that has by-passed AQIS to be physically returned for initial processing increases the quarantine risks due to extra transport. Scope exists for the primary processing to be undertaken at the approved premises to which it was delivered. Such opportunities for processing should be further developed.

A suggested means to reduce the risk of consignments by-passing quarantine detection is for AQIS to supply a standard, high visibility label which can be provided to consignors to help identify quarantine items. These labels could be issued with permits to accompany quarantine items coming through the mail or courier system. Such items should be addressed care of the AQIS office at the port of entry.

**Recommendation 3:** *A re-evaluation be undertaken of risks inherent in current processing practices for examining mail and courier items at ports of entry. Consideration be given to issuing a standard, high visibility AQIS identification label with permits for use by consignors forwarding plant material to Australia.*

## Post-Entry Quarantine

Historically much of post-entry quarantine was undertaken by the staff of the approved importing institution. This work is now performed either by AQIS personnel or under direct AQIS supervision.

### Closed Post-Entry Quarantine

The standards of closed Post-Entry Quarantine facilities were noted to be variable with respect to pathogen and arthropod containment, access systems for people and goods and the movement records in relationship to the particular assessed risks. Some institutions were unable to isolate different consignments undergoing quarantine, thereby providing potential for cross contamination. There was also some variability of standards between institutions and between AQIS regions.

**Recommendation 4:** *The current standards for all quarantine procedures and facilities should be appraised and then all facilities growing winter cereal seed in Post-Entry Quarantine should be examined to ensure that new standards are being met.*

The Review Team was impressed with the move towards the establishment of Compliance Agreements incorporating AQIS audits. The Waite Campus, Urrbrae, is already operating within the framework of the negotiated draft Compliance Agreement. The Review Team was advised by AQIS that the Compliance Agreements for the Waite Campus and the Australian Winter Cereal Collection at Tamworth would be completed by the end of July and December 2003 respectively.

**Recommendation 5:** *The Review Team recommends that institutions and AQIS urgently complete bilateral Compliance Agreements [particularly those in relation to the compliance agreements being established in relation to the Waite Campus (completion due July 2003) and the Australian Winter Cereal Collection (completion due December 2003)] as they will provide*

*significant advantages in flexibility, easier access to specialised skills, the potential for cost savings to institutions and AQIS, and will serve to confirm the move towards a greater shared responsibility as recommended by the Nairn report.*

The Review Team considers that plant breeders are fully aware of the consequences if they fail to comply with AQIS requirements or if there are deficiencies in their disease screening procedures. Therefore they did not share the concern expressed by Plant Health Australia about the possible inappropriateness of staff of approved Post-Entry Quarantine facilities at plant breeding institutes screening their own introductions. However, these arrangements need to be periodically monitored and reviewed to ensure full quarantine compliance.

### **Quarantine Waste Disposal**

It was noted that due to increasing requirements of the various environmental protection agencies, access to quarantine standard disposal facilities is becoming more difficult and more costly, and involves risks of greater transport distances.

**Recommendation 6:** *It is recommended that research should be initiated to identify alternative technologies capable of meeting reasonable quarantine requirements for the disposal of material of quarantine concern (eg potting mix and plant residue) from Post-Entry Plant Quarantine facilities.*

### **Open Post-Entry Quarantine**

Open post-entry quarantine has inherently greater risks for incursion of exotic seed-borne pests, but offset in the case of importations from New Zealand by the belief that there are no additional exotic seed-borne pests of crops not already found in Australia. There is an increasing use of this method for the importation of winter cereal genetic material from overseas via New Zealand. However, the Review Team noted that a review of open post-entry quarantine has been commissioned by Biosecurity Australia: Plant Biosecurity, to be undertaken by Plant Health Australia. This review has been initiated because the New Zealand list of quarantine plant pathogens of cereals has not been updated since 1994. There have been significant changes to the New Zealand Import Health Standards since the protocol was established in 1994; an expansion of northern hemisphere cereal breeding programs using New Zealand for out of season seed increase; an increase of open quarantine sites in Australia from one to four sites, and an increase in volume of seed that enters Australia via this route. Although, there have been no recorded incursions associated with open quarantine, the Review Team was shown a very poor, contaminated sample of seed brought in under the open quarantine protocol, and believes that this system warrants closer scrutiny.

**Recommendation 7:** *It is recommended that a comprehensive review of Open Post-Entry Quarantine in relation to the importation of winter cereal genetic material be completed as a matter of urgency.*

### **Other Routes of Entry of Viable Seed**

There are also risks to the cereal industries from other imports containing viable seeds including seed in ornamental products, novelty products, stuffed toys, decorative ornamentals and plant parts particularly when misdescribed as to the content. The effectiveness of the required devitalisation of whole imported grain food products (e.g. viable sunflower seed for breakfast food), and feed grains needs ongoing monitoring. Management of these risks should be consistent and commensurate with the acceptable level of protection required.

Cereal pests and diseases can enter in seeds of other species (eg canola, pasture and turf grasses) that are permitted under historical arrangements with little or no quarantine impediment apart from

inspection on arrival. Although there is nil tolerance for *Hordeum*, *Triticum* and *Triticosecale* as contaminants in imports from countries designated as having Karnal bunt, the Review Team noted that imports from other countries may have up to 35 seeds per kilogram of these species as contaminants.

### **AQIS Inspectors**

It was considered that quarantine inspectors generally provide an effective service, but are expected to encompass a very wide range of responsibilities and skills. They need to have a sound underlying biological understanding to be able to implement appropriate actions when issues arise, particularly in a time of continuing change.

**Recommendation 8:** *It is recommended that appropriate, comprehensive, skills based, in-service training for the AQIS inspectorate be developed and maintained to ensure high standards of scientific competency, particularly in the biological science areas affecting quarantine.*

### **AQIS Compliance**

It was brought to the attention of the Review Team that the wheat variety, *Kamut* from Egypt was being grown in southern NSW, but this variety had not entered Australia through the quarantine system. The Review Team was advised that AQIS Compliance staff investigated this matter, but the Review Team was unable to determine whether any subsequent assessment of the biological risks associated with this incursion incident or the need for their amelioration had been undertaken. This could indicate that there are communication problems between the various sections of AFFA concerned with such aspects of biosecurity.

**Recommendation 9:** *It is recommended that the effectiveness and adequacy of the lines of communications between the various sectors of AFFA concerned with plant biosecurity be reviewed.*

## **4. Winter Cereal Breeding in Australia**

Wheat breeding has undergone significant restructuring in recent years using a wide range of corporate structures.

The principal participants are the Commonwealth and State Governments, Universities, CSIRO, GRDC (which is a co-investor in SunPrime, Australian Grain Technologies and Enterprise Grains Australia), the New Zealand Institute for Crop & Food Research Ltd and an increasing number of private organisations. Wheat breeding centres in Australia are located at:

- the J.K. Leslie Research Centre, Toowoomba;
- the Northern Crop Improvement Centre, Tamworth;
- the Agriculture Research Institute, Wagga Wagga;
- SARDI and the University of Adelaide at the Waite Campus, Urrbrae;
- University of Western Australia, Shenton Park;
- Department of Agriculture of Western Australia, South Perth;
- Murdoch University, Murdoch;
- Victorian Institute for Dryland Agriculture, Horsham;
- LongReach Plant Breeders, Bundoora;

- Access Genetics, Alexandra;
- CSIRO Black Mountain, St Lucia and Floreat Park, and
- University of Sydney, Cobbity.

There has been increasing investment by industry through private sector structures encouraged by the Grains Research and Development Corporation (GRDC) and reduced investment by State governments. There is a continued contribution to the Australian winter cereal breeding effort from overseas sources both directly into Australia and via New Zealand, including from the International Maize and Wheat Improvement Centre –CIMMYT (Centro Internacional de Mejoramiento de Maiz y Trigo) and the International Centre for Agricultural Research in Dry Areas (ICARDA). Private cereal breeding programs have been increasing.

The main source of introduced genetic resources for winter cereals in Australia is the Australian Winter Cereal Collection at Tamworth, New South Wales, one of eight plant genetic resource centres in Australia.

It is as much in the interest of plant breeding institutions as it is for AQIS to ensure the integrity of the post-entry quarantine regime. The skills and frequency of observations by specialist staff of the institutions and the necessity to maintain their professional credibility (whether in the public or private sector) ensures a complementarity of interest with the role of AQIS.

Plant breeders are very aware of any abnormality that occurs in their breeding material and this provides an additional level of biosecurity. Breeders have assumed a high level of reliance on the quarantine system.

**Recommendation 10:** *It is recommended that linkages between winter cereal breeders and AQIS be developed and fostered to further enhance the biosecurity system.*

Plant breeders are increasingly contracting out aspects of their work, including growing-out of selections and multiplications of mother seeds. There are examples of locations (eg. at Esperance WA), where one contractor is servicing several discrete breeding programs. Such a development can represent a, very small but nevertheless real, risk that in the event of a quarantine incursion affecting one breeding program, the problem could readily spread to other programs, jeopardising much of Australia's cereal improvement.

**Recommendation 11:** *It is recommended that breeders make provision with any contracted service providers to ensure that their research material is maintained in a biologically isolated location, independent of that from other breeding programs.*

All quarantine facilities and plant breeding programs are encouraged to adopt Quality Assurance programs. It is envisaged that Compliance Agreements between AQIS and Post-Entry Quarantine facilities would encompass these. Alternatively all plant quarantine facilities and plant breeding institutes should have in place Quality Assurance schemes to participate in Post-Entry Quarantine or receive material straight from AQIS.

## 5. Preparedness for Plant Pest Incursions into Australia

### Surveillance and Monitoring

Surveillance and monitoring are essential components of a quarantine system for early detection of incursions beyond the primary quarantine barrier. AQIS coordinates targeted monitoring and surveillance for pests and diseases of quarantine importance in high-risk areas, including in northern Australia and at major ports of entry, however the primary responsibility for monitoring arrangements and surveillance resides with the States/Territories, and informally, with the breeders and scientists engaged in using imported materials.

## Incursion Preparedness

It has been recognised that Australia is less well prepared for plant pest incursions than for animal disease incursions (Nairn *et al.* 1996 and Australian National Audit Office 2003). It can be expected that the amount of genetic material entering Australia will increase over time due to increasing globalisation of plant breeding. This could lead to more incursions into Australia. This risk is further exacerbated by the increasing level of international travel and trade.

Exotic pests and diseases can only be defined by knowing accurately what is actually present in Australia. Databases of potential plant threats from known significant pests not yet recorded in Australia and existing pests and diseases within Australia, including known previous incursions, are being developed by Plant Health Australia (PHA). This should assist the development of consistent biosecurity plans for incursion management of exotic pests threatening Australia's plant industries. PHA is also preparing *PlantPlan*, which is intended to be a nationally agreed response guideline for the plant industries to assist stakeholders in the implementation of emergency management plans. PHA is also developing a nationally coordinated, risk prioritised and consistent surveillance system that maximises return on investment and is delivered primarily by State/Territory agencies in partnership with industries. A great dependence is being placed on PHA to deliver these projects and it is essential that it does so. For example the desirability of expensive indexing of plants in quarantine against seed-borne exotic viruses cannot be decided without a thorough assessment of the actual threats posed by this pathway.

**Recommendation 12:** *It is recommended that PlantPlan and the projects relating to the databases of potential plant threats from significant pests not yet recorded in Australia and existing pests and diseases within Australia, be expedited and completed within the current financial year.*

The capacity to effectively diagnose exotic pests and diseases is hampered by the lack of specific Australian diagnostic expertise in certain areas. There was concern about the continuing availability of high-level pathology and entomology diagnostic skills, noting that a proportion of current advisers will soon retire, and that there is a significant dependence on others who are already formally retired.

**Recommendation 13:** *It is recommended that a comprehensive strategy be developed to ensure that an effective diagnostic capacity for the identification of plant pests and diseases is available to Australia.*

## Incursion Management

Primary responsibility for management of incursions of exotic pests rests with the Primary Industries Ministerial Council, comprising the Ministers for Primary Industries/Agriculture of the Commonwealth, States and Territories and implemented through its subordinate bodies. These include the Primary Industries Standing Committee, the Consultative Committee on Exotic Pest Plants and Diseases (CCEPPD) and its Technical Working Group.

Operational responsibility for managing plant affecting incursions lies with the CCEPPD, chaired by the Chief Plant Protection Officer. This body makes a technical recommendation on the biological feasibility of eradication or otherwise to the National Management Group (NMG). The Group comprises the Chief Executive Officers of the Commonwealth, State and Territory departments responsible for agriculture and the Presidents of the relevant industry organisations. The NMG makes a decision on the appropriate response to the incursion.

## 6. Observations from the Wheat Streak Mosaic Virus Incident

The WSMV incident demonstrated that while Australia has in place very efficient and effective mechanisms for handling exotic animal pest incursions, in the plant area these mechanisms are not well developed nor sufficiently well managed and in some specific areas mentioned below are currently non-existent. For example, databases on exotic plant threats, importance to Australia of these pests, methods of containment, eradication or other alternatives, cost-benefits of these approaches etc. are in some instances not up-to-date or may not even be available in Australia. They are currently being developed, but unfortunately there does not seem to be a sense of urgency to complete them. Without them, the decision making process in regard to an exotic plant pest incursion will be very difficult. As mentioned previously the projects being undertaken by PHA are vital to the plant biosecurity of Australia and must be completed as soon as possible.

### Participants and Responsibilities

The formal membership of each of the various committees has been specified by Primary Industries Standing Committee or its precursors. However, the number of observers who participated in the committee deliberations was extraordinary. For example, although the CCEPPD is limited to nominated representatives from Plant Health Committee/Interstate Plant Health Regulatory Working Group, representatives of industries at risk and appropriate technical experts, up to 66 people participated in some of the CCEPPD teleconferences on the WSMV incident.

**Recommendation 14:** *It is recommended that to maintain an effective and efficient management and decision-making process, participation on management and decision-making committees be restricted to nominated members and technical experts required for the specific incursion.*

### Background Knowledge

Securing background knowledge on WSMV took a considerable time and depended on personal linkages with overseas experts. This reinforces recommendation 13 relating to diagnostic capacity.

Information about a previous suspect incursion of WSMV dealt with by Plant Health Committee in 1996 was not immediately available and lack of it may have influenced the action taken in initially responding to the incident. This experience reinforces recommendation 12.

### Diagnostics

Although initial ELISA-based diagnostic tests conducted in North America were equivocal, the Review Team was impressed with the rapidity with which CSIRO developed an effective DNA-based diagnostic tool. It is also noted that soon after the notification of the WSMV incident, the Department of Agriculture of Western Australia acquired an effective ELISA-based tool from Europe.

### The Issue of Containment Versus Eradication

Whilst the decision by CSIRO to voluntarily destroy cereal breeding material was rational at the then current state of knowledge, had information that was subsequently available been more widely known, an alternative course of action may have been taken. However, it was recognised that action had to be taken. In such incidents, as information becomes more readily available the decision making process will become clearer and more efficient. As well, it is essential to ensure that there are no disincentives to reporting incursions.

**Recommendation 15:** *It is recommended that wherever possible, after initial responses for containment of an incursion, rapid delimiting surveys should be conducted to determine the costs and benefits of eradication or any alternative action prior to final decision-making.*

## Communication

The adopted communications strategy was less than completely effective and as a result there was misinformation published by the media which raised undue concerns with stakeholders in affected industries.

**Recommendation 16:** *It is recommended that all emergency response plans contain an effective information/media communication strategy.*

## Targeted Survey

A targeted survey for WSMV has been planned to occur across Australia in spring 2003. Since that decision was taken, the extent of the distribution of WSMV and its likely economic significance has become clearer.

**Recommendation 17:** *It is recommended that the need for, and dimension of, the Spring 2003 targeted survey for wheat streak mosaic virus, should be revisited.*

During the WSMV incident, there was concern within industry that reporting possible disease symptoms would lead to quarantine action and subsequent loss of income on individual farms. This problem needs to be addressed in any incursion management plans.

## 7. Biological Control Agent Importations

One of the recent incursions was associated with plant host material that accompanied biological control agents imported into Australia. The breach appears to have involved a participant with limited familiarity with the research facility and its protocols. There is a possibility that a similar pathway (plant host material accompanying biological control agents) was the method of incursion of the second plant pest. These incidents highlight the risks associated with, and the extra care needed in handling host materials as carriers of pests and diseases. As an additional precaution, whenever possible, plant host material should be excluded from consignments of imported biological control agents.

The Review Team noted that it was (correctly) precluded from entering several entomology quarantine facilities. However, the Review Team was advised of an incident where an individual visiting a facility was only requested to divest his hat prior to being given entry, and his backpack, clothing and other equipment was neither covered on entry nor decontaminated on exit.

**Recommendation 18:** *It is recommended that biosecurity protocols for all facilities working with biological control agents address all possible risks and that the quarantine protocols be well documented, widely understood and fully implemented.*

## 8. Conclusion

The framework for biosecurity arrangements for plant health in Australia is generally satisfactory. However, there are issues that need to be addressed to ensure the maintenance of Australia's unique plant health status.

The maintenance of Australia's continuing freedom from many pests and diseases depends ultimately on the commitment from all stakeholders in the continuum of quarantine and the effective management of biosecurity arrangements. Of particular concern is Australia's preparedness for exotic plant pest incursions.

## **Acknowledgements**

Appreciation is expressed to the many people who met with the Review Team to discuss their work and the influence of quarantine protocols upon it. Thanks are also expressed to staff within AFFA and several external correspondents, who prepared written material for consideration. Finally, we express our appreciation to the officers from the Office of the Chief Plant Protection Officer, Product Integrity Animal and Plant Health within the Department of Agriculture, Fisheries and Forestry Australia, and in particular, to Rebecca Griffin and Glynn Maynard, who provided the review secretariat.

## **List of Acronyms**

ACIAR	Australian Centre for International Agricultural Research
ACT	Australian Capital Territory
AFFA	Department of Agriculture, Fisheries and Forestry - Australia
AGT	Australian Grain Technologies
AIMS	AQIS Import Management System
AQIS	The Australian Quarantine and Inspection Service
CCEPPD	Consultative Committee on Plant Pests and Diseases
CEO	Chief Executive Officer
CIMMYT	Centro Internacional de Mejoramiento de Maiz y Trigo
CLIMA	Centre for Legumes in Mediterranean Climates
CPPO	Chief Plant Protection Officer
CRC	Cooperative Research Centre
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DPIQ	Department of Primary Industries, Queensland
GRDC	Grains Research and Development Corporation
NSW	New South Wales
OCPPPO	Office of the Chief Plant Protection Officer
PEQ	Post-Entry Quarantine
PHA	Plant Health Australia
PIRSA	Primary Industries and Resources, South Australia
SA	South Australia
SACT	South African citrus thrips
SARDI	South Australian Research and Development Institute
SBRF	Scotch broom rust fungus
TCCI	Tamworth Centre for Crop Improvement
UA	University of Adelaide
Vic	Victoria
WA	Western Australia
WSMV	Wheat streak mosaic virus

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Australian National Audit Office (2003). Pest and Disease Emergency Management Follow-up audit. Department of Agriculture, Fisheries and Forestry-Australia. Audit Report No. 34, 2002-2003 Performance Audit Report. Australian National Audit Office.

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## Appendix A: Import conditions for Wheat (*Triticum* spp. other and *Triticum tauschii*)

**Commodity:** Triticum spp. - other than *Triticum tauschii*

**Scientific name:** *Triticum* spp. - other than *Triticum tauschii*

**Country:** All countries

**End use:** Seeds for sowing

**Date printed:** Jun 27 2003

*The information here covers AQIS quarantine requirements only and is current on the date of transmission but may change without notice. Importers must satisfy quarantine concerns and comply with quarantine conditions applicable at the time of entry. The Commonwealth through AQIS is not liable for any costs arising from or associated with decisions to import based on conditions presented here which are not current at time of importation.*

*It is the importer's responsibility to be aware of and to ensure compliance with the requirements of all other regulatory and advisory bodies prior to and after importation. eg. [Australian Customs Service](#), State Departments of Agriculture, Imported Foods Program, [Therapeutic Goods Administration](#), [National Registration Authority for Agricultural and Veterinary Chemicals](#).*

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### Condition C7112

**Import conditions for Wheatgrass (*Agropyron* spp. – other than *A. semicostatum* & *A. tsukushiense*), Oats (*Avena* spp), Barley (*Hordeum* spp. – other than *H. jubatum*), Rye (*Secale cereale*), Wheat (*Triticum* spp. – other than *T. tauschii*) & Triticale (x *Triticosecale*) - seed for sowing**

#### Importer's Responsibilities

1. Importer must possess a valid Import Permit prior to the seed arriving in Australia.
2. The issuance of this permit does not imply compliance with the requirements of any other government organisation.
3. The importer is responsible for payment of all AQIS fees and charges.
4. A Quarantine Entry must be lodged for all consignments.
5. Seed must be free of soil, live insects, prohibited seeds, weed seeds, plant and animal material (eg leaf, stem, fruit pulp, pod material, animal faeces, feathers etc) and any other extraneous contamination of quarantine concern.
6. Seed must be packed in new containers, which are clearly labelled with botanical names.

7. Airfreight or mail shipments should have all documentation (eg. permit or permit number, invoice, manufacturer's declarations and certification where applicable) securely attached to the outside of the package and clearly marked "Attention Quarantine". Alternatively, necessary documentation will need to be presented to AQIS at the time of clearance.
8. The importer must confirm all arrangements with AQIS for the arrival inspections and treatments.
9. All consignments are subject to inspection on arrival and treatment if necessary.

Quarantine Procedures

1. Seed must be inspected by AQIS for freedom from live insects, soil, prohibited seeds and other plant material (eg leaf, stem, fruit pulp or pod material). Treat if necessary.
2. All seed must be treated under AQIS supervision at a quarantine-approved premise in accordance with **one** of the following methods:
  - i) Seed must be pre-soaked in water at ambient temperature for 4 - 5 hours on arrival. The seed must then be immersed in hot water at 54°C for 10 minutes and then dried. Seed must then be dusted with Thiram<sup>®</sup> seed fungicide. Thiram must be applied as per the label instructions. All safety precautions must be followed as per the label instructions.;

**OR**

- ii) The seed must be treated with Vitavax<sup>®</sup> 200 Flowable Fungicide, used for the control of regulated pests (particularly bunts and smuts) of the nominated cereal seeds. Fungicide must be applied as per the label instructions. All safety precautions must be followed as per the label instructions.
3. Seed must then be forwarded for growth in closed quarantine at either:
  - i) a government post-entry quarantine facility; or
  - ii) a private post-entry quarantine facility approved for the growth of these seeds. (Note: All seed lines grown in a private facility are also subject to the conditions listed below under Requirements for Seed lines Grown in AQIS-approved Private Post-Entry Quarantine Facilities).
4. During growth in quarantine plants must be inspected by AQIS at the following stages of growth:
  - a) Seedling emergence;
  - b) Halfway through the growing period;
  - c) Heading and flowering; and
  - d) A final inspection of the harvested seed.

5. Requirements for Seed lines Grown in AQIS-approved Private Post-Entry Quarantine Facilities

- a) It is the importers responsibility to:
  - i) confirm all arrangements with AQIS for on the arrival inspections and treatments; and
  - ii) notify AQIS when the seed lines have reached the four compulsory inspection stages as listed in point 4 above.
- b) All seed lines grown in an AQIS-approved private post-entry quarantine facility must be inspected by a Plant Pathologist or other person suitably trained in the recognition of plant pests and diseases associated with the imported species at regular intervals during the growing period for any symptoms of pests and/or diseases.
- c) A logbook must be maintained which details the date and nature of these inspections; and
- d) This logbook must be made available to the AQIS Officer during the four compulsory AQIS inspections for verification (see Point 4 above).
- e) The AQIS officer undertaking the inspections must validate the logbook to verify that the plants growing in the AQIS-approved private post-entry quarantine facility have been adequately monitored.

6. In the event that an exotic pest or disease is detected, AQIS Plant Programs Canberra must be contacted immediately for further advice.
7. Seed from plants screened and found to be free of disease may be released from quarantine by Quarantine Officer.
8. Detailed records of all plant material / seed held and used in the AQIS-approved quarantine premises must be maintained. These records may be subject to audit by AQIS.

9. Once seed has been harvested, all plants; all residues, all derivatives and all materials that have been in contact with the imported material must be subjected to one of the following treatments:

- a) Autoclaving at 121°C for 30 minutes.
- b) Heat treatment at 160°C for 2 hours.
- c) High temperature incineration.
- d) Irradiation at 25kGray (2.5 Mrad).
- e) Any other treatment approved by AQIS (A written application detailing the proposed treatment must be forwarded to AQIS for consideration).

10. If the importer intends to continue to use the quarantine material after the expiry of the Import Permit, they must contact AQIS, Plant Programs Canberra for further direction.

11. AQIS reserves the right, at any time, to (a) apply further controls on the use of prohibited material; and (b) rescind the right of individuals / institutions to grow prohibited seed.

## Condition C7100

### **Import Conditions and Requirements for Seeds for Sowing - All Species**

#### **1. General Conditions for Seeds for Sowing**

##### Importer's Responsibilities

- a) It is the importers' responsibility to check State government/Local government requirements to ensure that the seed is permitted entry into that State.
- b) The importation of all Genetically Modified seeds is prohibited unless accompanied by a valid import permit issued by the Canberra office.
- c) Seed must be free of soil. Seed contaminated with soil discernible to the naked eye must be cleaned, re-exported or destroyed. Soil is not always readily visible, but 0.1% has been adopted as the standard maximum tolerance.
- d) Seed must be free of live insects, plant material (eg fruit pulp, straw, leaf or stem material) and animal material (eg faeces, feathers, droppings, animal remains).
- e) Contamination with other restricted seeds must not exceed the tolerances (for details see AQIS website). There is a nil tolerance for prohibited seeds (for details see AQIS website: [www.AQIS.gov.au](http://www.AQIS.gov.au)).
- f) Seed must be packed in new containers which are clearly labelled with botanical names.
- g) Seed is to be presented for quarantine inspection on arrival in Australia.

##### Quarantine Procedures

- i) Seed is to be inspected on arrival and treated if necessary.
- ii) Consignments may require ISTA sampling and analysis. It is not possible to provide comprehensive instructions that will cover every situation which may arise in dealing with the quarantine inspection and sampling of consignments of seeds, but the following may be used as a general guide:
  - a) Samples are to be drawn in accordance with ISTA procedures.
  - b) Individual lines or lots of seed with a combined weight of **10 kgs or less**, should be visually inspected for any contaminants. If contaminants are detected or suspected a sample is to be drawn in accordance with ISTA procedures and submitted to an AQIS-approved seed-testing laboratory for analysis. Consignment must be held under quarantine pending results of the analysis.
  - c) Individual lines or lots of seed with a combined weight **over 10 kgs** (ie 22 x 500 gm packets or 3 x 5 kg bags) should be sampled in accordance with ISTA procedures and the samples submitted to an AQIS-approved seed-testing laboratory for analysis. Consignment must be held under quarantine pending results of the analysis.

**NOTE:** There are exceptions to this rule. In the case of large seeds (ie seeds greater than 8mm in size eg bean seed, pea seed, pumpkin, watermelon, etc), Inspectors should draw samples and visually inspect them for contaminants. Samples need only be drawn and submitted to an AQIS-approved seed laboratory if contaminants are detected or suspected. Consignment must be held under quarantine pending results of the

analysis.

d) Seed from New Zealand that is accompanied by acceptable seed analysis certificates do not require ISTA sampling and analysis. See Condition C7179 for further details.

There is a **NIL TOLERANCE** for *Triticum* spp. and *x Triticosecale* spp. seed found as a contaminant in consignments of seed exported from the above Karnal Bunt affected countries. Consignments found contaminated with *Triticum* spp. and *x Triticosecale* spp. must be either **re-exported** or **destroyed**.

**CLEANING** is **NOT** an option as Karnal Bunt spores may be transmitted by the contaminant seed host to other seed in the consignment. Cleaning the seed to remove the contaminant will not remove potential Karnal Bunt spores from the consignment.

## 2. Mixed Seeds

Packets of mixed seeds are not permitted entry due to the difficulties of inspecting them for contaminants. Importers wishing to import mixed seed packets must obtain prior approval from AQIS. All applications should be forwarded to Plant Programs Section, Canberra Office for assessment.

## 3. Genetically Modified Seeds

The importation of Genetically Modified seeds is prohibited under section 63(2) of the Quarantine Proclamation 1998, whether or not they are of a kind of seed as set out in Schedule 5, unless accompanied by a valid import permit issued by the Canberra office. All permit applications must be forwarded to the Plant Programs Section, Canberra office, along with detailed information regarding the mode of genetic modification, to allow for a quarantine assessment of the species prior to importation.

## 4. Pelleted Seed

All consignments of permissible (ie not restricted by quarantine legislation) flower, vegetable, herb and pasture/forage seeds in pelleted form may be permitted entry provided that the pelleted seed was commercially produced and packaged and pelleting was carried out using inert material only.

In addition to the requirements specified above under General Conditions for Seeds for Sowing all consignments of pelleted seed are also subject to the following:

### a) Pelleted Flower Seeds

- i) All consignments are subject to inspection on arrival.
- ii) A sample containing of up to a maximum of 50 seeds should be drawn from one container/tin/package selected at random from each line or lot of seed in the consignment.
- iii) The sample should be de-pelleted and visually inspected for freedom from contaminants.
- iv) If contaminants are detected or suspected, the consignment should be sampled in accordance with ISTA procedures and submitted to an AQIS-approved seed testing laboratory for analysis. Consignment must be held under quarantine pending results of the analysis.

### b) Pelleted Vegetable, Herb and Pasture/Forage Seeds

#### **For consignments with seed analysis certificates:**

i) Each consignment should be accompanied by an acceptable seed analysis certificate covering the particular lots of seed or the line from which the line of seed originated and indicating purity and freedom from contaminants.

The following certificates would be acceptable: an ISTA International Orange or Blue certificate or a seed analysis certificate issued by a seed testing laboratory that conforms with the requirements outlined below.

All seed analysis certificates must:

- be endorsed that the sample has been officially drawn in accordance with ISTA rules from an identified seed lot;
  - be endorsed that sample was analysed in accordance with ISTA rules;
  - give the actual weight of the bulk sample and the working sample examined;
  - give the botanical name and the number of each identified species of seed found in the sample (any identified genera or species are to be recorded as such); and
  - give the percentage of soil particles found in the sample.
- ii) A sample containing of up to a maximum of 50 seeds should be drawn from one container/tin/package selected at random from the consignment.

iii) The sample should be de-pelleted and visually inspected for freedom from contaminants.

iv) If any contaminants are detected or suspected a sample is to be drawn in accordance with ISTA procedures and submitted to an AQIS-approved seed laboratory for analysis. Consignment must be held under quarantine pending results of the analysis.

**For consignments without acceptable seed analysis certificates or no certificates:**

i) For individual lines or lots with a combined weight **not exceeding 10 kgs** - samples(s) must be drawn in accordance with ISTA procedures and de-pelleted and visually inspected for freedom from contaminants. If any contaminants are detected or suspected another sample is to be drawn in accordance with ISTA procedures and submitted to an AQIS-approved seed laboratory for analysis. Consignment must be held under quarantine pending results of the analysis.

ii) For individual lines or lots with a combined weight of **more than 10 kgs** - sample(s) must be drawn in accordance with ISTA procedures and submitted to an AQIS-approved seed laboratory for analysis. Consignment must be held under quarantine pending results of the analysis.

**NOTE TO ALL INSPECTORS:**

(i) Inspectors are to ensure that any packets that are opened for inspection are opened in such a manner that enables them to be re-sealed to prevent any further spillage of seed.

(ii) Inspectors are to ensure that all packets that have been opened are re-sealed.

(iii) Inspectors should not return any seed that has been de-pelleted to the packets from which they originated.

## Condition C7180

**Seed ex USA - Endorsement Required**

All commercial seed shipments ex USA over 100g must be accompanied by Federal or State Phytosanitary certificates endorsed that:

"The seeds in the shipment have been inspected and found apparently free from all species of the genus *Trogoderma*".

Phytosanitary certificates without this endorsement should be forwarded to Canberra with details of the shipment. When a consignment of seed arrives without certification, a more intensive inspection of the seed and packaging material is to be undertaken. Fumigation of non-certified seed should only be undertaken after careful consideration of the quarantine risks involved and the effect of the fumigant on the viability of the seed. Where appropriate, consultation should be made with the Quarantine Entomologist.

## Treatment T9965

**Vitavax® 200 Flowable Fungicide**

Use Vitavax® 200 FF in accordance with label instructions.

Vitavax 200FF Seed Treatment is a suspension concentrate (flowable) seed dressing used for the treatment of various crops. The product contains carboxin, a systemic fungicide that is effective against a number of commonly occurring diseases of cereals and other crops, and thiram, a broad-spectrum surface contact fungicide. This combination increases the spectrum of diseases controlled than either fungicide used alone.

## Treatment T9044

**Methyl bromide:**

48g/m<sup>3</sup> for 2½ hours at 21°C at Normal Atmospheric Pressure (NAP).

Add 8g/m<sup>3</sup> for each 5°C the temperature is expected to fall below 21°C or subtract the 8g/m<sup>3</sup> for each 5°C the temperature increases above 21°C during the fumigation. It is the minimum temperature during the course of the fumigation that is to be used for the calculation of the dose.

## Treatment T9056

**Methyl bromide: Khapra beetle rate**

80g/m<sup>3</sup> for 48 hours at 21°C with a minimum concentration of 32g/m<sup>3</sup> for 24 hours at Normal Atmospheric Pressure (NAP).

Add 8g/m<sup>3</sup> for each 5°C the temperature is expected to fall below 21°C or subtract the 8g/m<sup>3</sup> for each 5°C the temperature increases above 21°C during the fumigation. It is the minimum temperature during the course of the fumigation that is to be used for the calculation of the dose.

## Treatment T9072

### **Methyl bromide:**

48g/m<sup>3</sup> for 2½ hours at 21°C with a minimum concentration of 32g/m<sup>3</sup> under vacuum (660mm vacuum).

Add 8g/m<sup>3</sup> for each 5°C the temperature is expected to fall below 21°C or subtract the 8g/m<sup>3</sup> for each 5°C the temperature increases above 21°C during the fumigation. It is the minimum temperature during the course of the fumigation that is to be used for the calculation of the dose.

## Treatment T9086

### **Phosphine:**

1.0 - 1.5 g/m<sup>3</sup> for 10 days at temperatures between 15°C - 25°C.

1.0 - 1.5 g/m<sup>3</sup> for 7 days at temperatures above 25°C.

At the completion of the fumigation, the phosphine concentration must be at least 0.1 g/m<sup>3</sup>.

Phosphine should not be used at 15°C, or below.

Aluminium phosphide is available as tablets, pellets or sachets.

1g of phosphine = 1 tablet = 5 pellets = 1/11 sachet.

Commercial formulations include Phostoxin<sup>®</sup> and Gastoxin<sup>®</sup>.

## Treatment T9556

### **Soak and hot water:**

Soak in water at ambient (surrounding) temperature for 4 - 5 hours and then immerse in hot water. Treat at 54°C for not less than 10 minutes, then dry.

A reasonably large volume of water should be heated to the required temperature with a heating unit capable of maintaining the temperature required. The seed should be tied loosely in open mesh cloth bags (such as cheesecloth) and suspended in the water for the treatment. The water should be constantly circulated throughout the duration of the treatment. The amount of seed treated at one time should not be such as to cause the temperature in the water bath to go more than one degree below the treatment temperature.

After treatment the seed should be immediately plunged into a cold water bath or cold running water and dried as quickly as possible.

When the seed is dry, a protective fungicidal dust treatment is desirable.

## Treatment T9420

### **Thiram:**

Dust to excess.

Thiram<sup>®</sup> contains 50 to 80% tetramethylthiuram disulphide.

## Appendix B: Conditions for the importation through open quarantine of selected breeding lines of cereal seeds from New Zealand

Seeds of barley (*Hordeum vulgare*), oat (*Avena sativa*), rye (*Secale cereale*), triticale (X *Triticosecale*) and wheat (*Triticum aestivum*) may be imported from New Zealand into Australia for the purpose of field sowing subject to the following conditions.

### Importer's Responsibilities

1. Prior to importing any seed, the importer must contact the AQIS Office in the port of entry to obtain AQIS approval and confirm all arrangements for inspections and treatments with the AQIS Senior Import Inspector.
2. A Quarantine Entry must be lodged for each consignment.
3. A maximum of 600 seed lines, containing no more than 20 grams of seed per line may be imported, unless prior written approval is obtained from AQIS Plant Programs, Canberra.
4. Every consignment must be accompanied by an official International Phytosanitary Certificate issued by the New Zealand Ministry of Agriculture and Forestry and endorsed with the following additional declarations:
  - (i) "Seed in the consignment was grown in New Zealand"
  - (ii) "The seed originated from a crop, which was inspected and found free from the symptoms of *Pyrenophora teres*."
  - (iii) "Alternaria leaf blight (*Alternaria triticina* Prasad & Prabhu), stripe (*Hymenula cerealis* Ell. & Ev., synonym *Cephalosporium gramineum* Nis. & Ika), dwarf bunt (*Tilletia contraversa* Kuhn) and Karnal bunt (*Neovossia indica* (Mitra) Mundk., synonym *Tilletia indica* Mitra) are known not to occur in NZ."
5. Seed must be free of live insects, soil, restricted and prohibited seeds and other plant material (eg leaf or stem material).
6. Seed must be packed in new containers that are clearly labelled with botanical names.
7. Seed must be presented for quarantine inspection on arrival.
8. The importer is responsible for payment of all AQIS charges associated with inspection, testing and treatment of seed.

### Quarantine Procedures

9. All documentation must be examined by AQIS on arrival to ensure that it complies with the above requirements.
10. On arrival, the seed must be sampled by AQIS in accordance with ISTA rules. Sample is to be inspected by the AQIS Officer for the presence of arthropod pests, weed seeds and other regulated objects, including soil and plant debris, etc. Seed must be treated if necessary.
11. Seed must be securely stored in an AQIS-approved premise pending treatment and sowing.
12. Seed lines must be clearly labelled with the species name; line/lot number and the relevant import permit number throughout the entire quarantine process, until released from quarantine.
13. Prior to sowing, all seed must be treated under AQIS supervision in accordance with the following:

#### **a) Wheat (*Triticum aestivum*), Oat (*Avena sativa*), Rye (*Secale cereale*), and Triticale (X *Triticosecale*).**

### Hot water treatment.

- i) Prior to hot water treatment, seed must be placed in AQIS approved containers/bags/sachets made of an open mesh material that allows the free flow of water into and out of the containers/bags/sachets. Flyscreen or wire netting are examples of mesh that would be acceptable to AQIS.
- ii) Seed must be pre-soaked for 4-5 hours in water at ambient temperature. Seed must be agitated every hour during pre-soaking.
- iii) Immediately following the pre-soaking, the seed must be subjected to hot water treatment at 54°C for 10 minutes and dried. (Treatment time commences once the core water temperature has reached 54°C).
- iv) Pre-soaked water must be tested for quarantine fungal spores (eg. smut and rust spores) by an AQIS Plant Pathologist or an AQIS-approved laboratory.  
- A minimum 5% of the pre-soak water must be collected and centrifuged at 2,500 rpm for 10 minutes. The pellet should be resuspended in 1-2ml of water in an eppendorf tube and examined under a compound microscope for quarantine fungal spores.
- v) All seed lines must be held under quarantine pending results of this test.
- vi) If the test results are negative, the seed must then be dressed with Vitavax 200FF seed fungicide. (Note: While handling Vitavax all safety precautions must be followed as per the label instructions.) Following treatment, seed must be securely packaged under AQIS supervision to prevent any spillage during transit to the AQIS-approved open quarantine site.
- vii) If the test results indicate that pathogens of quarantine concern are present, AQIS Plant Programs Section, Canberra must be contacted for advice on the action to be taken.

**b) Barley (*Hordeum vulgare*)**

The importer may be given the options of:

- i) Hot water treatment (as per point 13(a) above)

**OR**

- ii) A wash test to check for the presence of quarantine fungal pathogens. Wash test must be performed in accordance with the following:

The AQIS Officer will draw a sample of 600 seeds from a maximum of 30 seed lines. If more than 30 seed lines are present then for each subsequent 30 seed lines or parts thereof a separate test must be performed. Sample(s) must then be forwarded to the AQIS Plant Pathologist or an AQIS-approved laboratory for testing. Tests must be performed in accordance with the following:

- The entire 600 seed sample must be washed and the "wash-water" retained for examination for quarantine fungal pathogens (refer above).
- On completion of the wash test, 100 seeds are to be plated onto agar plates (5 seeds per plate) and 250 seeds are to be tested using embryo testing technique.

The importer is to be advised that testing may take at least 12 days to complete.

- iii) All seed lines must be held under quarantine pending results of the audit testing.

iv) If the test results are negative, the barley seed must then be dressed with Vitavax 200FF seed fungicide. (Note: While handling Vitavax, all safety precautions must be followed as per the label instructions.) Following treatment, seed must be securely packaged under AQIS supervision to prevent any spillage during transit to the AQIS-approved open quarantine site.

v) If the test results indicate that pathogens of quarantine concern are present, AQIS Plant Programs Section, Canberra must be contacted for advice on the action to be taken. At the discretion of AQIS Plant Programs the seed may either be:

(i) destroyed;

(ii) re-exported; or

(iii) hot water treated (as per point 10(a) above).

14. Seed must be grown at the AQIS-approved open quarantine site at «name of QAP» and shall not be removed from this site without prior approval from AQIS. No material is to be grown outside of the open quarantine area.

15. Plants must be inspected by an AQIS Officer for freedom from quarantine diseases at the following stages of plant growth:

- i) tillering - pseudo-stem (formed by sheaths of leaves) strongly erected;
- ii) stem extension - sheath of last leaf completely grown out, ear swollen but not yet visible;
- iii) heading - all ears out of sheath and flowering; and
- iv) a final inspection of harvested seed.

«Name of applicant» will be responsible for advising the local AQIS Office of when the crop reaches the above stages.

16. In the event that an exotic pest or disease is suspected or detected the AQIS Regional Manager and AQIS Plant Programs, Canberra must be contacted immediately. Plants exhibiting disease symptoms must be submitted to the AQIS Plant Pathologist for identification and advice on the action to be taken.

17. In the event that a quarantinable disease or pest is confirmed and at the discretion of AQIS Plant Programs Canberra, the crop may be destroyed. The affected field will not be used for growing plant species known to be hosts of the pest for a period specified by AQIS.

18. If no quarantinable diseases or pests are detected, the crop may be released from quarantine.

**Open Quarantine Requirements**

19. Each open quarantine site must be approved by AQIS for the purpose of growing the nominated cereal seeds imported from NZ and must not exceed more than 2 hectares unless prior written approval is obtained from AQIS Plant Programs, Canberra.

Applicants must supply:

- (i) a detailed history of the cropping rotations including any soil treatments and stubble management practices applied to the proposed quarantine site(s); and
- (ii) details of cereal pathogens that are endemic or recorded in the area/district (eg Department of Agriculture/Extension Officer surveys).

**NOTE:** It is preferable that any proposed quarantine site(s) have not been used previously for growing cereal crops. This requirement is aimed at reducing the risk of 'local' cereal pathogens expressing themselves on imported lines, which may delay the release of imported lines.

20. The open quarantine site must be isolated by at least 1 kilometre from other cereal fields. No other cereal lines other than imported lines undergoing growth in quarantine may be grown on the approved quarantine site.

21. All imported seed must be held in a secure manner approved by AQIS. Any seed that is not required or sown and all empty bags/packages must be disposed of by an AQIS-approved method.

22. The imported seed must be planted in rows sufficiently spaced to allow easy access to plants to enable inspection for diseases and pests.

23. The crop must be maintained practically free from endemic pests so that inspection is not impeded. Fungicides must not be applied to the crop without written approval from AQIS Plant Programs, Canberra.

24. All equipment/machinery that is to be used on the quarantine site where crops are undergoing growth in quarantine must be inspected prior to its use on the site, by an AQIS officer, to ensure freedom from soil and crop residues.

25. All equipment/machinery must be cleaned free from soil or crop residues and re-inspected by an AQIS officer prior to its removal from the quarantine site. Any residues removed from the equipment/machinery must either remain on the quarantine site or be destroyed by an AQIS-approved method.

26. Any equipment/machinery found to be contaminated with soil or crop residues must be cleaned prior to its movement onto or from the quarantine site.

(NOTE: There are no restrictions on the movement of equipment/machinery onto or from quarantine sites containing crops that have been released from quarantine. However, importers are encouraged to ensure that all precautions are taken to prevent the introduction of any 'local' or endemic cereal pathogens onto quarantine sites, particularly if the importer plans to re-use the site as an 'Quarantine Area' for growing imported seed lines.)

27. AQIS reserves the right, at any time, to (a) apply further controls on the use of prohibited seeds; and (b) rescind the right of individuals to grow prohibited seeds.

## **Appendix C: List of dates, locations and people whom the Review Team met during the conduct of the Review.**

### ***Locations and dates of meetings:***

Adelaide: 11 June 2003; Brisbane: 18, 19 June 2003; Canberra: 2, 25 June 2003; Melbourne: 24 June 2003; Sydney: 2 July 2003; Tamworth: 19 June 2003; Toowoomba: 19 June 2003.

### ***People Interviewed:***

Adrian Harris (Market Access and Biosecurity [MAB], Department of Agriculture, Fisheries and Forestry Australia [AFFA]); Andrew Inglis (Chairman, Plant Health Australia [PHA]); Andrew Carroll (Australian Quarantine and Inspection Service [AQIS], AFFA); Anthony Wicks (AQIS, AFFA); Bill Crowe (AQIS, AFFA); Bill Palmer (Alan Fletcher Research Station, Department of Natural Resources and Mines, Queensland [NRM]); Bob Eismann (Leslie Research Centre, Department of Primary Industries, Queensland [LRC, DPIQ]); Brian Flegler (Pacific Seeds); Brian Stynes (MAB, AFFA); Bryan Whan (Director, CRC for Molecular Plant Breeding); Catriona Woods (AQIS, AFFA); Chris Andriaansen (Department of Primary Industries, Queensland); David Cartwright (Primary Industries and Resources, South Australia [PIRSA]); David Letham (MAB, AFFA); Dennis Hopkins (South Australian Research and Development Institute [SARDI]); Don Banfield (Deputy Secretary, AFFA); Emma Coulson (LRC, DPIQ); Fiona Macbeth (Office of the Chief Plant Protection Officer [OCPPO], AFFA); Geoff Auricht (SARDI); Geoff Cooper (SARDI); Graeme Hamilton (Chief Plant Protection Officer, AFFA); Graeme Smith (Pacific Seeds); Graham Wildermuth (LRC, DPIQ); Greg Grimes (Tamworth Centre for Crop Improvement, New South Wales Agriculture [TCCI]); Heather Lawrie (PIRSA); Howard Conkey (Product Integrity, Animal and Plant Health Communications Manager, AFFA); Jason Eglinton (University of Adelaide); Jenni Gordon (AQIS, AFFA); Jim Peacock (Plant Industries, Commonwealth Scientific and Industrial Research Organisation [CSIRO]); John Curran (Entomology, CSIRO); John Field (AQIS, AFFA); John Sheppard (LRC, DPIQ); John Thomas (LRC, DPIQ); Jon Lamb (Journalist); Joop van Leur (TCCI); Kathryn Sparks (AQIS, AFFA); Kathy Ophel-Keller (SARDI); Kevin Louey (AQIS, AFFA); Laurence Mound (Honorary Fellow CSIRO); Mark Ramsey (Animal and Plant Control Commission, SA); Mark Whattam (AQIS, AFFA); Michael Mackay (TCCI); Michelle White (UA); Mick Cox (AQIS, AFFA); Mike Keller (SARDI); Mike Robbins (AQIS, AFFA); Neil Fisher (PHA); Neil Grant (SARDI); Pamela Zwer (SARDI); Pat Sharkey (Department of Agriculture, Victoria); Peter Gibson (SARDI); Peter Mackey (NRM); Peter Neville (AQIS, AFFA); Peter Whittle (DPIQ); Peter Williamson (LRC, DPIQ); Peter Wilson (SunPrime Seeds); Phil Hynd (UA); Rachel Stuart (MAB, AFFA); Ray Blackman (AQIS, AFFA); Rob Allen (DPIQ); Rob Delane (Executive Director, Plant Industry, Western Australian Department of Agriculture); Rob Lewis (Executive Director, SARDI); Rob Wheeler (SARDI); Robin Eichner (AQIS, AFFA); Rod Turner (PHA); Simon McKirdy (PHA); Steve Jefferies (Chief Executive, Officer Australian Grain Technologies [AGT]); Tamara Brown (AQIS, AFFA); Ted Knights (TCCI); T.J. Higgins (Plant Industries, CSIRO); Tony Rathjen (UA); Vivienne Klemke-Stuart (AQIS, AFFA).