# Grains Industry Biosecurity Plan
# Threat Specific Contingency Plan

## Barley Stripe Mosaic Virus

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# 1 Purpose of this Contingency Plan

This Contingency Plan provides background information on the pest biology and available control measures to assist with preparedness for an incursion into Australia of Barley Stripe Mosaic Virus. It provides guidelines for steps to be undertaken and considered when developing a Response Plan to this pest. Any Response Plan developed using information in whole or in part from this Contingency Plan must follow procedures as set out in PLANTPLAN and be endorsed by the National Management Group prior to implementation. (Note, Barley Stripe Mosaic Virus has previously been detected in Australia and on several occasions the virus has been identified on lines maintained in germplasm collections (section 2.2.2 this document)).

# 2 Pest information/status

## 2.1 Pest Details

### 2.1.1 General information

Taxonomic position – Viruses; Genus: *Hordevirus*; Species: Barley Stripe Mosaic Virus

Common name – Barley stripe mosaic hordeivirus; Barley false stripe virus; Barley mosaic virus; Barley mild stripe virus; Oat stripe mosaic virus (Crop Protection Compendium 2008; www.nappfast.org).

Barley stripe mosaic virus (BSMV) is a virus with a narrow host range, predominantly affecting *Hordeum vulgare* (barley) but it can also infect *Triticum aestivum* (wheat). The virus is transmitted by mechanical inoculation, by seed and by pollen to the pollinated plant.

BSMV has worldwide distribution, occurs in North America, Europe, Japan, the former Soviet Union, China and Australia (Weise 1987; Bragg and Jackson 2004), but is not considered an economically important disease of wheat (Henry and Plumb 2002). In Australia it has been introduced and eradicated several times (Greber 1971). On wheat BSMV causes yellow to white mottling, spotting and streaking in leaves, severe mosaic, dwarfing, excessive tillering and necrosis. Plants grown from BSMV infected seeds may show symptoms as early as the second or third leaf stage (Henry and Plumb 2002).

### 2.1.2 Life cycle

There are no known natural vectors of Barley stripe mosaic virus (BSMV). The virus multiplies in all plant tissues. It has been found in the cytoplasm of mesophyll and epidermal cells (Shalla 1966). It has been reported that virus particles attach to the surface of chloroplasts (Carroll 1970) or occur in nuclei (Gardner 1967). The virus is present in seed (McKinney and Greeley 1965) and in pollen (Gold et al 1954) and has also been detected in ovules (Carroll and Mayhew 1976a, 1976b).

Seed transmissibility (90-100%) depends on the virus strain (Timian 1974) as well as on the stage of development at which plants become infected, and is influenced by temperature (Singh et al 1960). The percentage of pollen and ovule transmission varies from 10 to 35% and 17 to 66% respectively (Carroll and Mayhew 1976a, 1976b).

### 2.1.3 Dispersal

The virus is transmitted by mechanical inoculation. The virus is also transmitted through seed to 90% (McKinney 1953) or even 100% (Gold et al 1954). It can be pollen-borne infecting the pollinated plants (Gold et al 1954; Gardner 1967).

Pollen transmission is unimportant in the epidemiology of BSMV in normal self-pollinated barley (Slack et al 1975). However, spread of BSMV in pollen many be a significant factor in the epidemiology of the virus when male-sterile plants are used to develop barley germplasm.

The virus can also be transmitted by mechanical transmission and from plant to plant when leaves rub together as a result of wind, hail or animals.

## 2.2 Affected Hosts

### 2.2.1 Host range

Barley is the principal host (Slack et al 1975) with wheat only occasionally found to be naturally infected (McKinney and Greeley 1965). Certain strains of the virus have been recorded on wild oats (Chiko 1975). BSMV has been mechanically transmitted to a range of *Poaceae* (Jackson and Lane 1981), including rye, maize, rice, sorghum and millet. Under experimental and artificial conditions some dicotyledonous plants may become infected, examples of which include spinach, beetroot, and tobacco.

### 2.2.2 Geographic distribution

Barley stripe mosaic virus has a world-wide distribution including the European and Mediterranean (EPPO) regions, Asia, Africa, North America, South America and Oceania. There have been introductions and eradication in some states of Australia. It was introduced into Australia and first intercepted in quarantine in 1962 and subsequently recorded in 1969 in Queensland barley crops (Greber 1971). The virus has also been detected in Tasmania, Victoria and Western Australia (Johnstone et al. 1983, Sward 1988, Shivas et al. 1989). In Western Australia, BSMV was detected by ELISA in a germplasm collection in accessions originally introduced from Mexico, New Zealand and the USA.

The current distribution of the virus in Australia is not accurately known. It has been identified on several occasions in the last five years from lines maintained in germplasm collections and it is likely that the virus is present at a low level in all barley germplasm collections in Australia.

### 2.2.3 Symptoms

The expression of symptoms on plants can vary depending on the virus strain, host cultivar and environmental conditions (McKinney and Greeley 1965). Symptom expression is enhanced by warm temperatures (24-30$^{o}$C) (McKinney 1954). Depending on the virus strain, symptoms vary from small streaks covering the whole leaf surface to elongated stripes. On different host cultivars symptoms may vary from light-green or chlorotic striping or streaking to chlorosis and necrosis. Plants grown from infected seed may be severely stunted. Seeds from plants infected by BSMV are small and shrivelled. The number of seeds per ear, number of heads per plant, and kernel weight decrease in infected plants.

Symptoms are also similar to the fungal disease, barley stripe disease (*Pyrenophora graminea*).

## 2.3 Entry, establishment and spread

**Entry potential: High**

May be brought in on seed as the virus's ability to transmit in this way is high and may not be detected by visual observation.

**Establishment potential: Medium**

Susceptible host genotypes and a suitable climate make the establishment of the pest likely. The virus can also survive in stored barley seed for at least several years.

**Spread potential: Medium**

There are no known vectors to transmit the virus. The virus is seed-borne and can also be transmitted mechanically. Pollen transmission is unimportant in the epidemiology of the BSMV in normal self-pollinated barley. However spread of BSMV in pollen may be a significant factor in the epidemiology of the virus when male-sterile plants are used to develop barley germplasm.

A study in the USA where barley was planted in different growing seasons showed a greater spread of the virus and higher percentage of seed transmission occurred in spring seeded barley than when the same cultivars were sown in autumn. Spread was affected by leaf contact transmission, but not by dispersal of infected pollen (Slack et al 1975).

**Economic impact: Medium**

In the USA, BSMV has been economically significant in Montana and North Dakota (Carroll 1983). Between 1953 and 1970 the total loss in barley caused by BSMV was reported to be more than US$30 million. Yield reductions in barley of 24-26% were recorded when BSMV was inoculated mechanically (Chiko and Barker 1978; Carroll 1980).

Some major importers of Australian grain require a declaration of freedom from BSMV and contamination of seedlots could jeopardise these valuable markets.

**Environmental impact: Negligible**

There is no potential for BSMV to degrade the environment or otherwise alter the ecosystems by affecting species composition or reducing the longevity or competitiveness of wild hosts. It has no effect on human or animal health.

**Overall risk: Medium**

It is likely that all major germplasm collections of barley within Australia contain a very low percentage of lines infected with BSMV. It is important that symptoms of the disease are recognized early and infected plants culled from suspect accessions. Good quarantine procedures should be followed to prevent transmission of the virus to commercial crops.

## 2.4 Diagnostic information

### 2.4.1 Diagnostic protocol

Detection of BSMV is not reliably performed by visual field inspections as the presence and severity of symptoms depend very much on temperature. Even when the virus is present symptoms may not be distinct and latent infection is common.

Seed testing by ELISA (Lister et al 1981; Huth 1988) is reliable and results are received within 24hrs. Inspection and test methods for barley seeds protocol (EPPO Standards 1991). These techniques can also be successfully used with leaf tissue.

**Field inspection**

As plants grown from infected seed may show leaf symptoms, inspection should take place whilst the plants are green and in some cases, can be done as early as the 2-3 leaf stage. Even so symptoms may be indistinct or easily confused with other biotic or abiotic symptoms.

**Seed test**

*Sampling*

Testing may be carried out prior to export in connection with the issue of a phytosanitary certificate for a seed-production field. In this case, 10-20 seed lots of 50 g each (one lot comprising about 1000 seeds) are randomly taken from each field for testing by the procedure below. Alternatively, testing may be carried out on a seed consignment at any stage in export and import. In this case, 1 kg seed is taken from every 20 t of each consignment and subdivided into 50 g lots to be tested.

*ELISA test*

Homogenize the seeds for 1 min in an electric mill (e.g. IKA type A-10-S or M 20) connected with a cooling device. Suspend the seed powder in 10 ml phosphate-buffered NaCl solution (16.0 g NaCl, 0.4 g $KH_2PO_4$, 2.88 g $Na_2HPO_4.2H_2O$, 0.4 g $NaN_3$, 1 ml Tween 20 in 2 litre $H_2O$, pH 7.4) and hold for 1 h, allowing the liquid phase to separate from the sediment.

Fill 2 x 200 µl per lot of the supernatant into two wells of micro-ELISA-plates coated with anti-BSMV gamma-globulin. Two further wells per plate are reserved for control supernatant, prepared in the same way from seeds free from BSMV, and two more for buffer only. If a positive control is used (one kernel or small parts of symptom-bearing leaves would be sufficient), the washing between the different steps during the ELISA test should be carried out very carefully to avoid other wells becoming contaminated by BSMV from the positive control.

Measure optical density (OD) at 405 nm using a normal micro-ELISA-reader, after storing the plates for 18-20h at room temperature. For highly infected lots, shorter incubation may be sufficient (e.g. 1 h). Samples are considered positive if the OD value is at least 3 times higher than the value measured for samples of healthy seed lots.

*Other tests*

The virus can also be detected by molecular assays, for example, nucleic acid hybridisation (Lawrence and Jackson 1998; YueHong et al 2008).

## 2.5 Response checklist

### 2.5.1 Checklist

Guidelines for Response Checklists are still to be developed. The following checklist provides a summary of generic requirements to be identified and implemented within a Response Plan:

- Destruction methods for plant material, soil and disposable items
- Disposal procedures
- Quarantine restrictions and movement controls
- Decontamination and farm cleanup procedures
- Diagnostic protocols and laboratories
- Trace back and trace forward procedures
- Protocols for delimiting, intensive and ongoing surveillance
- Zoning
- Reporting and communication strategy

Additional information is provided by Merriman and McKirdy (2005) in the Technical Guidelines for Development of Pest Specific Response Plans.

## 2.6 Delimiting survey and epidemiology study

Delimiting surveys should comprise local surveys around the area of initial detection concentrating on areas sown to the same seed lot / variety as the one of initial detection. Surveys for viruses in crops are conducted routinely in Australia and overseas surveys are regularly published. The normal procedure is to collect symptomatic plants and test them to confirm the presence of the virus, then to collect 100-200 random samples per crop for testing to enable an estimate to be made of the within- crop virus incidence. Surrounding crops would then be surveyed. The extent of the survey beyond the initial infected crop should be guided by the test results from surrounding crops.

### 2.6.1 Sampling method

BSMV is seedborne and can be transmitted mechanically. If it is assumed that the area of initial detection is the first site of introduction of the virus, it would follow that the virus has been introduced in seed. In this case the initial infected plants would be randomly distributed throughout the area where the seed was sown. Therefore the first step would be to determine the area sown with the seed. A representative selection of symptomatic plants from the field should first be collected and tested to establish the presence of BSMV. One hundred plants collected randomly, preferably in a W pattern which covers the whole field, should then be tested for BSMV to establish the percentage of infected plants.

A second possibility is that the initial site where the virus is detected is not the original introduction site or year. In this case, infected seed may have been introduced in a previous year and/or site and the virus carried through to the current year in infected seed. Therefore it is important to undertake both a

trace-back and trace-forward of the seed source and test seed or crops from this source. Alternatively, the virus may have been spread to this site by mechanical transmission. In this case the survey approach outlined above would be used in conjunction with seed trace-back and trace-forward.

### 2.6.2 Epidemiological study

The degree of spread of the virus is dependent on the amount of virus initially present in the seed, the quantity of seed sown, the susceptibility of the line or variety and the potential for subsequent spread by mechanical means.

If seed is available, a seed test should be undertaken on a minimum of 400 seeds, but preferably on 1000 seeds by germinating the seed and using the standard diagnostic protocol to determine the percentage of seed infection. The field survey (100 plants per crop) will give an estimate of the percentage of infected plants in the field. If the amount of virus in the crop is greater than in the seed, it would suggest that mechanical vectors have been spreading the virus. This would indicate the need to extend the survey out from the initial crop to surrounding crops. The extent of a delimiting survey will depend on test results.

Seed trace-back and trace-forward will determine how many seedlots and crops will need to be tested. If seed has been sown at several sites, delimiting crop surveys should be conducted as described above at each site.

It is also important to look at human, vehicle, stock and machinery movements in and out of the infected area as BSMV is a virus which can be spread mechanically.

### 2.6.3 Models of spread potential

No modelling data are available.

Spread may occur in the following ways:

- Movement of infected seed.
- Mechanical transmission through movement of people, animals, vehicles and machinery.

### 2.6.4 Pest Free Area (PFA) guidelines

Pest free guidelines relevant to this pest. Points to consider are:

- Design of a statistical delimiting field survey for BSMV based on virus-testing of host (See 2.6.1 for points to consider in the design).
- Plant sampling should be based on 100 random samples per crop.
- Assessment of plants requires appropriate diagnostic tests such as ELISA, TBIA or PCR as plants may be symptomless or have symptoms which may be confused with BSMV (nutrition, another virus, etc).
- Seed sampling should be based on a minimum of 400 randomly selected seeds, but preferably 1000 seeds should be tested.

Additional information is provided by the IPPC (1995) in Requirements for the Establishment of Pest Free Areas. This standard describes the requirements for the establishment and use of pest free areas as a risk management option for phytosanitary certification of plants and plant products. Establishment

and maintenance of a PFA can vary according to the biology of the pest, pest survival potential, means of dispersal, availability of host plants, restrictions on movement of produce, as well as PFA characteristics (size, degree of isolation and ecological conditions).

## 2.7 Availability of control methods

### 2.7.1 General procedures for control

- Keep traffic out of affected areas and minimize movement in adjacent areas.
- Adopt best-practice farm hygiene procedures to retard the spread of the pest between fields and adjacent farms. This is important as BSMV can be spread mechanically (eg vehicle and machinery movement, stock movement)
- Ensure that seed production does not take place on affected farms and do not use barley or wheat seed from affected areas to plant new crops as BSMV is seed borne in these plant species.
- After surveys etc are completed, destruction of the infected crop and any infected seed is the most effective control.

### 2.7.2 Control if small areas are affected

As above

### 2.7.3 Control if large areas are affected

A large area may be affected if a large source of seed has been widely distributed and in this case, seed movement may be difficult to track. If the disease has gone unnoticed for a number of years and has been spread through seed and mechanical means, control may also be difficult. Implementation of large area controls will depend on the ability to determine the source and track/trace the spread. If BSMV is found, it may be possible to eradicate the virus by surveying to determine distribution, then limiting animal and vehicle movement and ensuring that seed from infected crops is sold for consumption and not resown. Alternatively the crop could be destroyed before seed set. As much of the crop production area is under continuous cropping, these steps, followed by some monitoring may be adequate for eradication. Ongoing vigilance would be required to eliminate self sown plants either with an appropriate herbicide or cultivation.

### 2.7.4 Cultural control

Cultural control is possible by destruction of seed and infected crops. Crops may be destroyed by

1. herbicides to kill crops before seed set
2. ploughing in of the plant matter before seed set
3. removing crop by green manuring or for hay followed by method 1 or 2.

After crop destruction, it is important to prevent self-sown plants growing from seed as these are potentially infected with BSMV. Therefore, follow up monitoring and further spraying or ploughing may be required.

### 2.7.5 Host plant resistance

Barley genotypes clearly differ in their susceptibility to BSMV although resistance is believed to be strain specific and there are numerous strains of the virus. Historically, the disease has only been a commercial problem in Australia through the cultivation of susceptible varieties. The resistance status of current commercial varieties is not known.

Some barley cultivars from the USDA World Collection have been described as resistant to some strains of BSMV after mechanical inoculation (Timian and Sisler 1955, Inouye 1962).

### 2.7.6 Chemical control

The virus cannot be controlled by the use of chemicals on the crop. However, the crop itself can be destroyed with herbicides.

### 2.7.7 Mechanical control

The virus cannot be controlled by mechanical cultivation; however mechanical cultivation can be used to plough and destroy the crop.

### 2.7.8 Biological control

Biological control options are not known to exist for control of barley stripe mosaic virus.

# 3 Course of Action – Eradication Methods

Additional information is provided by the IPPC (1998) in Guidelines for Pest Eradication Programmes. This standard describes the components of a pest eradication programme which can lead to the establishment or re-establishment of pest absence in an area. A pest eradication programme may be developed as an emergency measure to prevent establishment and/or spread of a pest following its recent entry (re-establish a pest free area) or a measure to eliminate an established pest (establish a pest free area). The eradication process involves three main activities: surveillance, containment, and treatment and/or control measures.

## 3.1 Destruction strategy

### 3.1.1 Destruction protocols

- Disposable equipment, infected plant material should be disposed of by autoclaving, incineration or burial. Any equipment removed from the site for disposal should be double-bagged.
- Herbicides can be used to destroy the infected crops.
- Infected crops can be ploughed in to destroy the infected crops.
- Farm machinery used in destruction processes needs to be thoroughly washed, preferably using a detergent such as Decon 90.

### 3.1.2 Decontamination protocols

If containment, eradication and/or best practice hygiene measures are implemented, machinery, equipment, vehicles in contact with infected plant material or present within the Quarantine Area, should be washed to remove plant material using high pressure water or scrubbing with products such as a farm degreaser disinfectant or Decon 90, or a 1% bleach (available chlorine) solution in a designated wash down area. General guidelines for wash down areas are as follows:

- Located away from crops or sensitive vegetation
- Readily accessible with clear signage
- Access to fresh water and power
- Site, including entry and exit points should be mud free (e.g. gravel, concrete or rubber matting)
- Gently sloped to drain effluent away
- Effluent must not enter water courses or water bodies
- Allow adequate space to move larger vehicles
- Away from hazards such as power lines
- Waste water, soil or plant residues should be contained (see PLANTPLAN 2008 Appendix 18).
- All chemicals used according to label.

General guidelines for personnel and equipment are as follows:

- Disposable overalls and rubber boots should be worn when handling infected soil or plant material in the field. Boots, clothes and shoes in contact with infected soil or plant material should be disinfected at the site or double-bagged to remove for cleaning.
- Skin and hair in contact with infested plant material or soil should be washed.
- Decon 90 is a suitable detergent for using to decontaminate equipment or personnel.

### 3.1.3 Priorities

Specific priorities for eradication or decontamination

- Confirm the presence of the pathogen.
- Prevent movement of vehicles and equipment through affected areas.
- Priority of eradication/decontamination of infected host material.
- Inform all groups in the industry.
- Determine extent of infection through survey and seed trace-back and trace-forward.
- Destroy crop and any seed stocks.

### 3.1.4 Plants, by-products and waste processing

- Infected plant material should be destroyed by (enclosed) incineration, autoclaving or burial (in a non-cropping area).
- As the virus can be mechanically transmitted, entry into sprayed-out crops should be prohibited until all plants are dead.

### 3.1.5 Disposal issues

- BSMV can survive in seed for several years; therefore all contaminated seedlots must be identified and the value of the variety to industry assessed. If the variety is dispensable then all seed of that variety should be consumed or destroyed.
- Particular care must be taken to minimize the transfer of infected seed from the quarantine area.
- No particular issues with resistance of disease to chemicals or physical treatments are known to exist.

## 3.2 Quarantine and movement controls

### 3.2.1 Quarantine priorities

- Seed and green leaf material at the site of infection to be subject to movement restrictions.
- Machinery, equipment, vehicles and disposable equipment in contact with infected plant material or soil to be subject to movement restrictions.

- BSMV cannot be spread or transmitted in hay. Once the plant is dead or dried the virus cannot infect and for this reason hay or dry material can therefore be transported off site.

### 3.2.2 Movement control for people, plant material and machinery

Movement of people, vehicle and machinery, from and to affected farms, must be controlled to ensure that infected plant debris is not moved off-farm on clothing, footwear, vehicles or machinery.

Examples of movement controls include:

- Signage to indicate quarantine area and/or restricted movement in these zones.
- Fenced, barricaded or locked entry to quarantine areas.
- Movement of equipment, machinery and plant material by permit only.
- Clothing and footwear worn at the infected site should either be double-bagged prior to removal for decontamination or should not leave the farm until thoroughly disinfected, washed and cleaned.
- Seed from the affected site should not be used for the planting of new crops.
- There would be no problems feeding infected seed to stock or for human consumptions.

## 3.3 Zoning

The size of each quarantine area will be determined by a number of factors, including the location of the incursion, biology of the pest, climatic conditions and the proximity of the infected property to other infected properties.

### 3.3.1 Destruction zone

The entire crop should be destroyed after the level of infection has been established. The delimiting survey will determine whether or not neighbouring host crops are infected and need to be destroyed. The Destruction Zone may be defined as contiguous areas associated with the source of infection i.e. the entire trial, paddock or farm if spread to nearby plants or seed could have occurred prior to the infection being identified.

### 3.3.2 Quarantine zone

The Quarantine Zone is defined as the area where voluntary or compulsory restraints are in place for the affected property(ies). These restraints may include restrictions or movement control for removal of plants, people or contaminated equipment from an infected property.

### 3.3.3 Buffer zone

A Buffer Zone may or may not be required depending on the incident. It is defined as the area in which the pest does not occur but where movement controls or restrictions for removal of plants, people, soil or equipment from this area are still deemed necessary. The Buffer Zone may enclose an infested area (and is therefore part of the Control Area) or may be adjacent to an infested area.

### 3.3.4 Restricted Area

The Restricted Area is defined as the zone immediately around the infected premises and suspected infected premises. The Restricted Area is established following initial surveys that confirm the presence of the pest. The Restricted Area will be subject to intense surveillance and movement control with movement out of the Restricted Area to be prohibited and movement into the Restricted Area to occur by permit only. Multiple Restricted Areas may be required within a Control Area.

### 3.3.5 Control Area

The Control Area is defined as all areas affected within the incursion. The Control Area comprises the Restricted Area, all infected premises and all suspected infected premises and will be defined as the minimum area necessary to prevent spread of the pest from the Quarantine Zone. The Control Area will also be used to regulate movement of all susceptible plant species to allow trace back, trace forward and epidemiological studies to be completed.

## 3.4 Decontamination and farm clean up

Decontaminant practices are aimed at eliminating the pest thus preventing its spread to other areas.

### 3.4.1 Decontamination procedures

General guidelines for decontamination and clean up

- Refer to PLANTPLAN (Plant Health Australia 2008) for further information.
- Keep traffic out of affected area and minimize it in adjacent areas. Adopt best-practice farm hygiene procedures to confine the spread of the pest and potentially infected plant material between fields and adjacent farms.
- BSMV can be mechanically transmitted by plant injury, vehicles or stock movement and feeding.
- Machinery, equipment, vehicles in contact with infected plant material or soil or present within the Quarantine Area, should be washed to remove soil and plant material using high pressure water or scrubbing with products such as Decon 90 detergent, a farm degreaser or a 1% bleach solution in a designated wash down area as described in 3.1.2.
- Living plant material should be destroyed using herbicides. All chemicals should be applied according to the product label.
- A list of best-practice farm hygiene procedures should be developed to retard the spread of the pest between fields and adjacent farms.

### 3.4.2 Decontamination if disease is identified in a small area

Destruction of plant material by herbicide, removal or incorporation in the soil is described. The infected area should be monitored for one to two years to eradicate self sown plants.

### 3.4.3 Decontamination if disease is identified in large areas

The process described for small areas may be feasible for larger areas if alternate non-hosts are planted in these paddocks and self-sown barley (or wheat) is sprayed out each year. Sampling and testing of larger areas for BSMV would be feasible depending on the actual area affected.

### 3.4.4 General safety precautions

For any chemicals used in the decontamination, use as per label and follow all safety procedures listed within each MSDS.

## 3.5 Surveillance and tracing

### 3.5.1 Surveillance

Detection and delimiting surveys are required to delimit the extent of the outbreak, ensuring areas free of the pest retain market access requirements and appropriate quarantine zones are established.

Initial surveillance priorities include the following:

- Survey of all host crops and host growing properties in the pest quarantine area;
- Survey of all properties identified in trace-back and trace-forward analysis as being at risk;
- Survey of all host growing properties that are reliant on trade with interstate or international markets which are sensitive to Barley stripe mosaic virus presence.

### 3.5.2 Survey regions

Establish survey regions around the surveillance priorities identified above. These regions will be generated based on the zoning requirements (section 3.3), and prioritised based on their potential likelihood to currently have or receive an incursion of this pest. Surveillance activities within these regions will either allow for the area to be declared pest free and maintain market access requirements; or establish the impact and spread of the incursion to allow for effective control and containment measures to be carried out.

Steps outlined below form a basis for a survey plan. Although categorised in stages, some stages may be undertaken concurrently based on available skill sets and resources.

**Phase 1:**

Identify properties that fall within the buffer zone around the infested premise.

Complete preliminary surveillance to determine ownership, property details, production dynamics and tracings information (this may be an ongoing action).

**Phase 2:**

Preliminary survey of host crops in properties in buffer zone establishing points of pest detection.

**Phase 3:**

Surveillance of an intensive nature to support control and containment activities around points of pest detection.

**Phase 4:**

Surveillance of contact premises. A contact premise is a property containing susceptible host plants, which are known to have been in direct or indirect contact with an infested premises or infected plants. Contact premises may be determined through tracking movement of materials from the property that may provide a viable pathway for spread of the disease. Pathways to be considered are:

- Items of equipment and machinery which have been shared between properties including bins, containers, irrigation lines, vehicles and equipment;
- The producer and retailer of infected material if this is suspected to be the source of the outbreak;
- Labour and other personnel that have moved from infected, contact and suspect premises to unaffected properties (other growers, tradesmen, visitors, salesmen, crop scouts, harvesters and possibly beekeepers); and
- Movement of plant material and nursery stock from controlled and restricted areas.

**Phase 5:**

Surveillance of nurseries, backyards and native and weed hosts of BSMV.

**Phase 6:**

Agreed area freedom maintenance, post control and containment.

### 3.5.3 Post-eradication surveillance

Surveys comprising plant sampling for BSMV to be undertaken for a minimum of 12 months after eradication has been achieved. If BSMV has been found in an annual host, self-sowns should be eliminated within 12 months. If the virus was detected during the growing season it is not likely that there would be any seed set. Alternate non-host crops or pastures should be grown on the site, self-sown plants sampled (100 per paddock as per the initial survey) and then all self-sown plants should be sprayed out with herbicide. This procedure should not be onerous or expensive. If, for example, the farmer was growing a cereal or pulse crop, spraying for broad-leaf weeds would be normal practice however timing of sprays and sampling would need to be determined.

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# 5 Appendices

## Appendix 1. Standard diagnostic protocols

For a range of specifically designed procedures for the emergency response to a pest incursion refer to Plant Health Australia's PLANTPLAN, Appendices 2 and 3.

## Appendix 2 Experts, resources and facilities

The following table lists the experts who can be contacted for professional diagnostics and advisory services in the case of an incursion.

| Expert | State | Details |
|---|---|---|
| Mr Denis Persley | QLD | QDPI&F 80 Meiers Road, Indooroopilly QLD 4068 |
| Dr Brendan Rodoni | Vic | Department of Primary Industries Knoxfield Victoria |
| Dr Roger Jones | WA | Agricultural Research Western Australia Perth |
| Mr G Platz | QLD | QDPI&F, Hermitage Research Station, 604 Yangan Road, Warwick QLD 4370 |

The following table lists the facilities available for diagnostic services in Australia

| Facility | State | Details |
|---|---|---|
| DPI Victoria Knoxfield Centre | Vic | 621 Burwood Highway<br>Knoxfield VIC 3684<br>Ph: (03) 9210 9222<br>Fax: (03) 9800 3521 |
| DPI Victoria Horsham Centre | Vic | Natimuk Rd<br>Horsham VIC 3400<br>Ph: (03) 5362 2111<br>Fax: (03) 5362 2187 |
| DPI New South Wales Elizabeth Macarthur Agricultural Institute | NSW | Woodbridge Road<br>Menangle NSW 2568<br>PMB 8 Camden NSW 2570<br>Telephone: (02) 4640 6327<br>Fax: (02) 4640 6428 |
| DPI New South Wales Tamworth Agricultural Institute | NSW | 4 Marsden Park Road<br>Calala NSW 2340<br>Ph: (02) 6763 1100<br>Fax: (02) 6763 1222 |

| | | |
|---|---|---|
| DPI New South Wales<br>Wagga Wagga Agricultural Institute | NSW | PMB Wagga Wagga<br>NSW 2650<br>Ph: (02) 6938 1999<br>Fax: (02) 6938 1809 |
| SARDI - Plant Research Centre,<br>Waite Research Precinct | SA | Hartley Grove<br>Urrbrae 5064<br>South Australia<br>Ph: (08) 8303 9400<br>Fax: (08) 8303 9403 |
| Grow Help Australia<br>(Dept of Primary Industries & Fisheries, Queensland | QLD | Entomology Building<br>80 Meiers Road<br>Indooroopilly QLD 4068<br>Ph: (07) 3896 9668<br>Fax: (07) 3896 9446 |
| Department of Agriculture and Food, Western Australia (AGWEST) Plant Laboratories | WA | 3 Baron-Hay Court<br>South Perth WA 6151<br>Ph: (08) 9368 3721<br>Fax: (08) 9474 2658 |

## Appendix 3. Communications strategy

A general Communications Strategy is provided in PLANTPLAN.

## Appendix 4 Market access impacts

Within the AQIS PHYTO database, the following countries namely China, Indonesia, Mauritius, New Caledonia, Chile, Israel, Uruguay and Poland have a specific statement regarding area freedom from Barley Stripe Mosaic Virus (as at January 2009). Area freedom statements are required for barley, wheat, rye, triticale, oats or broom depending on the destination country. Required declarations, dependent on country, include “seed from a crop free of BSMV” or “inspected and tested in the laboratory and found free of BSMV” or “crop examined in the field and found free from BSMV”. For specific and most up-to-date information refer to the PHYTO database (www.aqis.gov.au/phyto). Searches should be carried out using an Advanced search “Search all text” for Barley Stripe Mosaic Virus.