Ministry for Primary Industries
Manatū Ahu Matua

Risk Management Proposal:

New Import Health Standard (IHS) for Phase 3 Mushroom Growing Medium
MPI.STD.PHASE3

14 December 2016

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Submissions

The Ministry for Primary Industries (MPI) invites comment from interested parties on the proposed issuance of a new import health standard (IHS) for Phase 3 mushroom growing medium, which is supported by this risk management proposal (RMP).

The purpose of an IHS is defined as follows in section 22(1) of the Biosecurity Act 1993 (the Act): "An import health standard specifies requirements that must be met to effectively manage risks associated with importing risk goods, including risks arising because importing the goods involves or might involve an incidentally imported new organism".

MPI must consult with interested parties in accordance with section 23 of the Act and MPI's consultation policy before issuing or amending an import health standard under section 24A of the Act.

MPI therefore seeks formal comment on the requirements (including phytosanitary measures) that are proposed for the import of phase 3 mushroom growing medium, that is mushroom growing medium inoculated with spawn of common mushroom (*Agaricus bisporus*). These requirements are set out in the draft IHS for Phase 3 mushroom growing medium.

MPI has developed this RMP based on the best available technical evidence and assessment of this evidence. If you disagree with the measures proposed to manage the risks, please provide either data or published references to support your comments. Similarly, if you support the proposed measures, or consider that additional measures are required to manage the risks, please provide appropriate evidence to support your comments. This will enable MPI to consider additional evidence which may change how risks are proposed to be managed.

The following points may be of assistance in preparing comments:

- Wherever possible, comments should be specific to a particular section/requirement of the standard;
- Where possible, reasons, data and supporting published references to support comments are requested;
- The use of examples to illustrate particular points is encouraged.

MPI encourages respondents to forward comments electronically. Please include the following in your submission:

- The title of the consultation document in the subject line of your email;
- Your name and title (if applicable);
- Your organisation's name (if applicable); and
- Your address.

Send submissions to: plantimports@mpi.govt.nz .

If you wish to forward submissions in writing, please send them to the following address:

Plant Imports
Plants, Food & Environment
Ministry for Primary Industries
PO Box 2526
Wellington 6140
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All submissions must arrive by close of business on 18 January 2017. Submissions received by the closure date will be considered during the development of the final standard. Submissions received after the closure date may be held on file for consideration when the issued standard is next revised/reviewed.

Official Information Act 1982

Please note that your submission is public information and it is MPI policy to publish submissions and the review of submissions on the MPI website. Submissions may also be the subject of requests for information under the Official Information Act 1982 (OIA). The OIA specifies that information is to be made available to requesters unless there are sufficient grounds for withholding it, as set out in the OIA. Submitters may wish to indicate grounds for withholding specific information contained in their submission, such as the information is commercially sensitive or they wish personal information to be withheld.

Any decision to withhold information requested under the OIA is reviewable by the Ombudsman.

Contents

Objective and purpose

(1) MPI's objective is to ensure that the known biosecurity risks associated with phase 3 mushroom growing medium are managed appropriately and in a way which is consistent with New Zealand's domestic legislation and international obligations.

(2) The purpose of this RMP is to:

a) summarise the known phytosanitary risks that may be associated with the import of phase 3 mushroom growing medium into New Zealand;

b) show how the measures proposed in the draft IHS schedule effectively manage known biosecurity risks and are consistent with New Zealand's domestic legislation and international obligations.

(3) The draft IHS is the subject of consultation under section 23(3) of the Act. The RMP provides information to support the consultation on the draft IHS, but is not itself the subject of consultation. However MPI will accept comments and suggestions on the RMP in order to improve future IHS consultations.

Commodity description

(4) Phase 3 mushroom growing medium described in this RMP is used to grow common mushroom (*Agaricus bisporus*).

(5) The medium is produced using a mixture of horse manure, chicken manure, straw, gypsum and water. The raw ingredients are mixed and composted at high temperatures (around 80°C) for several days; the temperature and duration of composting depends on the individual manufacturer. The composted product is known as 'phase 1 medium'. Phase 1 medium is then pasteurised (for example at 57-60°C for 8-10 hours) and conditioned at a lower temperature (for example 48°C for a further 2-3 days). The conditioned product is called 'phase 2 medium'.

(6) Phase 2 medium is inoculated with mushroom spawn and incubated at around 25°C for approximately two weeks. During this time the mushroom mycelium spreads throughout the growing medium. The colonised product is known as phase 3 growing medium.

(7) Mushrooms can be grown directly from phase 3 medium after a peat-based casing is added to induce production of fruiting bodies (mushrooms). Alternatively, phase 3 medium can be chilled to around -2°C and held until required; it is the chilled product that is being assessed under this RMP.

Background

(8) In 2015 MPI received an application to import into New Zealand phase 3 mushroom growing medium manufactured in the Netherlands. As part of the regular process for assessing import requests MPI reviewed the information provided in the import permit application. This included assessing the ingredients and processes used to manufacture the product. Based on this review an import permit was issued under the IHS for *Fertilisers and Growing Media of Plant Origin*. The permit included specific conditions to manage known biosecurity risks associated with this product.

(9) After the permit was issued MPI became aware that some of the raw ingredients used to manufacture the product were of animal origin. This had not been specified in the import permit application. These ingredients were horse and chicken manure.

(10) Based on the new information MPI revoked the import permit.

(11) Since issuing the original import permit MPI has also become more aware of the risks posed by two serious diseases of mushroom that are not known to be present in New Zealand, namely *Trichoderma aggressivum* and Mushroom virus X. Both of these diseases can be transmitted in phase 3 medium.

(12) No further import permits for this product will be granted until after the biosecurity risks associated with the product are re-assessed and an IHS has been issued that specifically covers the ingredients of animal origin in the goods, and the two mushroom diseases of concern.

(13) MPI officials visited the production facility in the Netherlands in June 2016 to review the pathway and to gather more information about the biosecurity risks that may be associated with the product.

(14) MPI has now completed its assessment and has prepared new import health standards that set out risk management measures that are specific to phase 3 mushroom growing medium.

(15) This RMP discusses the biosecurity risk associated with the plant-based components of phase 3 mushroom growing medium and describes the measures that are proposed to manage this risk under the new IHS for *Phase 3 mushroom growing medium*.

(16) As part of this process, MPI has also released for consultation a draft generic IHS for Processed Animal Manure Products (ANMANURE.GEN) which is available on the MPI website as part of this consultation. The generic IHS will include processed horse and chicken manure as a commodity type.

(17) Because horse and chicken manure are components of the product, all phase 3 growing medium imported under the IHS for *Phase 3 mushroom growing medium* must also meet all relevant requirements set out in the animal products IHS.

Part 1: Context

Domestic

(18) New Zealand operates a biosecurity system for which the phytosanitary aspect (covering plant health) is a key part.

(19) The biosecurity system is regulated through the Biosecurity Act 1993. Section 22 of the Act describes an import health standard (IHS) and outlines the types of matters for risk goods that an IHS can cover.

(20) MPI is the government authority responsible for maintaining biosecurity standards for the effective management of risks associated with the importation of risk goods into New Zealand (Part 3, Biosecurity Act 1993).

(21) The biosecurity system in New Zealand operates a series of components or layers (pre-border, border and post border) that together provide a high level of assurance that pests are unlikely to establish in New Zealand. No one part of the system is able to achieve the necessary assurance on its own.

(22) No biosecurity system is capable of reducing risk to zero. The objective of the system is to reduce to an acceptable level the likelihood of entry and establishment of regulated organisms (including pests, diseases and weeds).

(23) An organism is 'regulated' by MPI if it could cause unacceptable consequences (i.e. likely to cause unacceptable economic, environmental, socio-cultural or human health impacts in New Zealand) if it were to enter and establish in New Zealand, provided the organism is:

a) not present in New Zealand, or if present in New Zealand is under official control;

b) able to establish and spread in New Zealand.

For plant-based organisms, entry and establishment is defined as 'introduction' by the International Plant Protection Convention (IPPC).

(24) The New Zealand phytosanitary system focuses on ensuring that the most significant pests, for example economically important fruit flies, are unlikely to ever establish in New Zealand. The system also manages risk associated with all other regulated pests.

(25) The focus of an IHS for plant-based goods is to manage unacceptable phytosanitary risks identified as being associated with the goods before they arrive at the New Zealand border. The expectation is that, to the greatest extent possible, commercial consignments of plants and plant products meet New Zealand's phytosanitary import requirements on arrival (risk is managed off-shore).

(26) MPI monitors the pathway performance related to each IHS to ensure it provides the expected level of protection. This is achieved through verification and inspection activities at the border and, where necessary, audits of offshore production systems through MPI's 'Pathway Assurance' programme.

(27) MPI is committed to the principles of transparency and evidence-based technical justification for all phytosanitary measures, new and amended, imposed on importing pathways.

International

(28) Where possible, phytosanitary import requirements are aligned with international standards, guidelines, and recommendations as per New Zealand's obligations under Article 3.1 of the World Trade Organisation (WTO) Agreement on the Application of Sanitary and Phytosanitary Measures; WTO, 1995 (SPS Agreement).

(29) The SPS Agreement sets in place rules that protect each country's sovereign right to take the measures necessary to protect the life or health of its people, animals, and plants while at the same time facilitating trade. It embodies and promotes the use of science-based risk assessments to manage the risks associated with the international movement of goods.

(30) In keeping with New Zealand's obligations under the SPS Agreement and the IPPC, phytosanitary measures must:

a) be justified and can only be for regulated pests. The strength of any phytosanitary measure will depend on the assessment of risk, with an emphasis on the consequences of the pest establishing in New Zealand;

b) not discriminate unfairly between countries or between imported and domestically produced goods;

c) be based on international standards wherever possible, but WTO members can adopt a measure that is more stringent than an international standard, provided the measure is scientifically justified.

(31) Note that international standards, guidelines or recommendations referred to in the WTO agreement are those of Codex, OIE (World Organisation for Animal Health) and the IPPC, including regional standards developed by Asia Pacific Plant Protection Commission.

Strength of measures

(32) Measures are required for regulated pests where the 'probability of introduction and spread' on a pathway is unacceptable (i.e. if a regulated organism is able to enter through the pathway, find a suitable host, and establish and spread in New Zealand).

(33) The required strength of a measure depends on the risk posed by a particular regulated organism on the pathway. This risk is determined by a combination of the consequences the pest may cause if it was introduced into New Zealand and the likelihood that the pest will enter and establish from a pathway.

(34) The greater the risk or consequence a pest can cause, the greater the level of assurance MPI requires that the pest is not present in a consignment.

(35) The strength of the measure required should be no more than necessary to manage the risk the organism poses. MPI has classified measures into three categories of increasing strength: *Basic Measures*, *Targeted Measures* or *MPI-Specified Measures*.

(36) The proposed requirements for phase 3 growing medium include all measures accepted for regulated pests assessed as being possibly associated with the commodity.

Part 2: Approach

Source information

(37) In developing this RMP the following information was used to identify risk organisms and to develop appropriate measures to prevent their entry and establishment in New Zealand:

a) MPI Import Risk Analysis: Phytosanitary risks of importing phase III *Agaricus bisporus* mushroom compost from northern Europe (available on the MPI website as part of this consultation);

b) MPI Discussion Document for the Importation of Fertilisers and Growing Media containing Plant Material (available on the MPI website as part of this consultation);

c) relevant literature (scientific journals, webpages, books, databases etc.);

d) information provided by stakeholders and manufacturers of phase 3 mushroom growing medium.

e) information obtained during the MPI visit to a phase 3 production facility in the Netherlands and during discussions with the NPPO of the Netherlands.

Assessment

(38) The above information sources were used to assess the potential for an organism to enter New Zealand in association with phase 3 growing medium, and to establish and spread in New Zealand.

(39) Factors considered as part of the assessment were:

a) presence or absence of an organism in the exporting country;

b) presence or absence of an organism in New Zealand (or under official control if present in New Zealand);

c) regulatory status of an organism in New Zealand;

d) association of an organism with the commodity and pathway;

e) potential for an organism to establish and spread in New Zealand;

f) potential for an organism to cause economic, environmental and/or human health consequences in New Zealand.

(40) All organisms identified as 'pests of concern' were assessed by MPI to determine the 'probability of introduction and spread' (entry, exposure to suitable hosts, establishment and spread) in New Zealand (following part 2.2 of ISPM 11).

Description of measures

(41) In the context of developing requirements for the import into New Zealand of phase 3 growing medium, the categories of measure described below were considered.

Basic measures

(42) Basic measures are required to manage all organisms that could enter or establish in New Zealand, and consist of the following components:

Commercial production

(43) Standard commercial production measures will act to reduce or eliminate some of the biosecurity risk associated with the product.

(44) For the purposes of this RMP, commercial production of phase 3 growing medium is considered to include:

a) phase 1 composting and phase 2 pasteurising and conditioning completed in enclosed bunkers at a temperature appropriate to manage biosecurity risk.

b) Stringent hygiene measures throughout the production process including:

i) using dedicated equipment and machinery for different stages of production;

ii) preventing contamination between different areas of a production facility;

iii) rigorous cleaning of all equipment between each batch;

iv) using heat treatment and/or disinfectants between each batch;

v) packaging phase 3 medium in impermeable material after spawning.

Quality system production

(45) A quality production system aims to provide a consistent quality of product by setting standards for each stage of manufacturing or processing. This is particularly suitable for managing the risk of hitchhiker organisms associated with contamination during processing and storage, and can have a general focus where the exact pests likely to be associated with a product are uncertain.

(46) An awareness of the necessity for cleanliness and regular monitoring and product checks is required. Importers and suppliers will need to provide suitable evidence that measures are in place to avoid contamination and monitor sites in the production process.

(47) Manufacturers of phase 3 medium are expected to be subjected to regular audits by an official accreditation body to ensure all relevant procedures continue to be followed.

Targeted measures

(48) Targeted measures are used in addition to basic measures to manage the risk of entry and establishment of regulated organisms that pose a higher level of risk and may not be

sufficiently managed by basic measures, or where a greater level of assurance is needed that appropriate risk management actions have been taken.

(49) Targeted measures may have a more general mode of action and are often not fully prescribed in the IHS, allowing the exporting NPPO to select an appropriate method, based on availability in the exporting country, expert judgement and experience.

(50) MPI will assess whether the proposed targeted measures are appropriate for the management of a particular regulated organism before imports are allowed.

(51) The Export Plan will document the means by which all Targeted Measures set out in the IHS will be achieved.

(52) The application of a targeted measure may also be effective against non-target organisms.

(53) Targeted measures include a wide range of options and provide MPI with the assurance that regulated organisms that may be associated with a product are eliminated or reduced to a level that will not enable the organism to establish in New Zealand.

(54) The following measures are some that may be considered for managing pests requiring targeted measures:

a) pest free area; requirements for pest free areas are described in the International Standard for Phytosanitary Measures (ISPM) 4: *Requirements for the establishment of pest free areas.* A pest free area may include an entire country ('country freedom'), or uninfested parts of a country. Additional measures are not required for pests where pest free area status is recognised for the exporting country for that pest;

b) systems approaches; a systems approach is composed of two or more independent measures and will be assessed by MPI before imports are allowed.

(55) Targeted measures are subject to pathway assurance audit by MPI.

MPI-specified measures

(56) MPI-specified measures are used in addition to basic measures when the likelihood of entry and establishment or consequence of a regulated organism is very high. MPI-specified measures are reserved for regulated organisms that will have a very high consequence to New Zealand (for example Queensland fruit fly).

(57) MPI specified measures include end-point treatments such as temperature treatments, irradiation or fumigation, and laboratory testing where the test method is specified.

(58) Requiring a permit to import also allows MPI to check that an importer will be able to comply with any post clearance conditions that are imposed on the imported goods before imports commence.

Certification and verification

Permit to import

(59) A permit to import allows MPI to verify that an Export Plan is in place for production facility(s) before imports can commence.

(60) Where an Export Plan is not required, a permit to import allows MPI to verify that appropriate Basic Measures are being used and that appropriate phytosanitary certification (e.g. pest free area declarations) can be provided by the NPPO of the exporting country prior to export.

Pre-export inspection and phytosanitary certification

(61) Pre-export inspection and phytosanitary certification of the product by the National Plant Protection Organisation (NPPO) of the exporting country ensures that the requirements of the relevant IHS have been met by the exporting country.

(62) A phytosanitary certificate can provide verification that a consignment is free from visually detectable contaminants such as viable seed, soil, contaminant animal or plant material or other extraneous matter.

(63) The certificate can also be used to provide additional verification for other steps of the production process if the NPPO has sufficient oversight over the process. For example, a manufacturer may apply targeted measures (see below) to manage the risk associated with a particular disease organism. In such cases, the NPPO could provide verification that the targeted measures notified to MPI have been undertaken as stated by the manufacturer.

Verification on arrival in New Zealand

(64) MPI will inspect documentation prior to each consignment arriving in New Zealand. Upon arrival, a consignment will normally have a representative sample taken and inspected for the absence of regulated pests. Any reduction in the level of inspection from current on-arrival levels is based on sound evidence of the compliance of a pathway. In a few cases where a pathway is highly compliant inspections will be conducted on an audit basis to ensure ongoing compliance.

(65) When a consignment is found to be infested with live regulated pests on arrival in New Zealand, one of the following risk management activities will be applied:

a) reshipment of the consignment;

b) destruction of the consignment; or

c) treatment of the consignment.

Post-clearance conditions

(66) Post clearance conditions may be applied under either section 22 or 27 of the Act.

(67) Under section 22 of the Act, post clearance conditions may specify the following:

a) the class or description of persons to whom the requirements apply;

b) the use to which the goods must be put;

c) the restrictions or conditions on the use of the goods;

d) the duration of the requirements;

e) any other matters reasonably necessary for the effective implementation of the requirements.

(68) Under section 27A of the Act, an inspector who gives a biosecurity clearance under section 26 of the Act may impose post-clearance conditions on the goods if the post clearance conditions are approved by a Chief Technical Officer. The conditions may:

a) specify the use to which the goods must be put:

b) specify the restrictions or conditions on the use of the goods:

c) specify how long a restriction or condition lasts by reference to a period of time, a date, or an event:

d) specify how the goods must be managed or disposed of:

e) specify the place or area within which the goods must be kept, managed, or used:

f) require notification of a change in circumstances that affects the goods:

g) require reporting to an inspector or another specified person in specified circumstances on specified matters:

h) deal with any other matters reasonably necessary for the effective management of the risks associated with the goods.

(69) Post clearance conditions can be included as a requirement of an applicable IHS.

Part 3: Risk assessment and management

(70) The purpose of this section is to:

a) identify known hazards associated with phase 3 mushroom growing medium that have been identified as being a potential biosecurity risk to New Zealand;

b) identify ways in which each type of hazard can be managed.

(71) The following have been identified as potential biosecurity risks that may be associated with phase 3 growing medium:

a) viable seeds;

b) plant pest and disease organisms in raw ingredients;

c) pests or disease organisms of *A. bisporus* excluding *Trichoderma aggressivum* and Mushroom virus X disease (which are considered separately below);

d) hitchhiker organisms;

e) regulated organisms that may be present within mushroom spawn;

f) regulated organisms that may be present in animal manure;

g) *Trichoderma aggressivum*;

h) Mushroom virus X (MVX) disease.

3.1 Viable seeds and pest or disease organisms of plants and *A. bisporus*

(72) Basic measures as described in this section are justified and sufficient to manage the following hazards that may be associated with the raw ingredients (plant material and animal manure):

a) viable seeds;

b) plant pest or disease organisms (for example insects or microorganisms);

c) pest or disease organisms of *A. bisporus*, as identified in the MPI import risk analysis, apart from *T. aggressivum* and MVX, which are considered separately below.

(73) The following attributes of commercial mushroom cultivation and growing medium production reduce the biosecurity risk associated with hazard organisms considered in this section of the RMP:

a) common mushroom (*A. bisporus*) is a secondary decomposer. This means that it will only grow on a substrate that is already partially decomposed. The primary decomposition that occurs during phase 1 composting and phase 2 pasteurising and conditioning will devitalise the types of hazard organism considered in this section of the RMP.

b) to produce phase 3 growing medium, all raw ingredients are composted at high temperatures (a maximum of around 80°C) for a minimum of 48 hours at high humidity (around 70%). Product is then pasteurised (for example at 57-60°C for 8-10 hours) to eradicate any disease organisms that may remain, and then conditioned at a lower temperature (for example 46-49°C for 48-72 hours) to remove free ammonia. This processing will reduce biosecurity risk associated with viable seeds, insects or plant disease organisms that may be present in the raw ingredients, especially when high temperatures are taken in combination with the primary decomposition that occurs during phase 1 and phase 2 production, and microbial antagonism or release of toxic products, as described in the MPI import risk analysis.

(74) The recommended temperatures to manage *T. aggressivum* and MVX (either 60°C for at least 12 hours, or 65 °C for at least 8 hours) are also considered sufficient to manage risk associated with hazard organisms considered in this section of the RMP.

(75) Paragraphs (76) to (78) identify Basic measures (commercial production, quality systems production and visual inspection) which, in combination with post clearance conditions and factors summarised in paragraph (73), will reduce to an acceptable level, or eliminate the biosecurity risk, associated with hazards identified in section 2.1 of this RMP:

(76) The following attributes of commercial production are considered relevant to managing the biosecurity risk associated with hazards identified in section 2.1 of this RMP:

a) A requirement to use enclosed bunkers for phase 1 composting allows better moderation of temperatures than if composting is done in windrows or partially enclosed bunkers. This means that even temperatures are achieved more effectively across the compost heap, and helps to ensure that the minimum required temperature is attained throughout the heap.

b) A requirement to use the following hygiene measures will reduce the likelihood of hazard organisms contaminating phase 1 compost after processing:

i) removing compost debris from areas used to hold raw ingredients, and from phase 1 tunnels after composting, will prevent hazard organisms accumulating in phase 1 production areas;

ii) segregating equipment and machinery used to process raw ingredients from other parts of the production process, and cleaning this equipment between each batch will prevent phase 1 compost from being contaminated with hazard organisms from unprocessed material;

iii) thoroughly cleaning winches and conveyors used to transport phase 1 medium to phase 2 tunnels will prevent hazard organisms accumulating on this equipment and/or being dispersed to other parts of a production facility;

iv) transporting phase 1 medium in closed conveyors will prevent contamination between composting and pasteurisation.

(77) Quality system production, including independent auditing by an official accreditation body, will to ensure that processes and procedures (such as hygiene procedures listed above) continue to be followed as described in standard operating procedures.

(78) Visual inspection is expected to identify any insects or viable seeds present in the composted product.

a) phytosanitary inspections in the country of origin will verify that the product is free of contaminant plant material, or organisms such as insects;

b) MPI inspections of previously imported consignments did not detect any insects or viable seeds. When seeds were recognisable within the product these were decomposed and non-viable.

(79) It is considered that the likelihood of viable seeds and plant pests and diseases being introduced (entering and establishing) in New Zealand, is negligible because:

a) The measures described above, including commercial production and visual inspections, will reduce the risk of viable seeds and other plant material being present in the growing medium.

b) Growing medium when imported into New Zealand is unlikely to contain viable seeds and plant pests & diseases after production which will lead to establishment of these organisms in the New Zealand environment.

Export eligibility:

(80) If MPI considers that the proposed composting parameters, operating procedures, and/or quality production system at a particular facility will not manage the risk, material from that facility will not be eligible for import.

(81) If viable seeds are detected during a product inspection (pre-export or on-arrival in New Zealand) material from that batch will not be eligible for import. This is because presence of viable seeds will be seen as evidence of a systems failure indicating that the composting conditions for that batch were not sufficient to manage all biosecurity risk.

3.2 Hitchhiker organisms

(82) Hitchhiker organisms are organisms such as insects that may contaminate a consignment during processing, handling or storage, but do not infest the product.

(83) Basic measures are justified and sufficient to manage any biosecurity risk associated with hitchhiker organisms that may contaminate the product during processing.

(84) The hygiene measures used in commercial production as described in paragraph (44)b) of this RMP, will reduce to an acceptable level, or eliminate the biosecurity risk, associated with hitchhiker organisms.

(85) Quality system production, including independent auditing by an official accreditation body, will ensure that processes and procedures (such as hygiene procedures listed above) continue to be followed as described in standard operating procedures.

(86) Visual inspection is expected to detect viable hitchhiker organisms that were introduced during or after processing.

Export eligibility:

(87) If regulated hitchhiker organisms are detected during a product inspection (pre-export or on-arrival in New Zealand) material from that batch will not be eligible for import, or will require treatment before being given a biosecurity clearance.

3.3 Regulated organisms within mushroom spawn

(88) Basic measures are considered justified and sufficient to manage any biosecurity risk associated with disease organisms that may be present within mushroom spawn.

(89) Phase 3 mushroom growing medium is inoculated with common mushroom (*Agaricus bisporus*) spawn prior to export.

(90) Spawn is produced by a specialist third party producer. Spawn consists of mushroom mycelium that is usually inoculated onto a sterile grain-based substrate, although other substrates may be used.

(91) It is known that mushroom viruses could potentially be present within spawn and that a small number of benign viruses are present in modern hybrid strains, Spawn production companies have strict processes to ensure freedom from pathogenic viruses, including hygienic preparation of the substrate and testing of starter cultures for diseases.

3.4 Regulated organisms within animal manure

(92) As noted in the background to this document, an integral component of phase 3 medium is horse and chicken manure.

(93) MPI's Animal Imports team has recently developed a draft IHS for processed animal manure products for import into New Zealand. The draft IHS and RMP for this type of product have been made available as part of this consultation process and can be viewed on the MPI consultations page.

(94) All phase 3 growing medium will be expected to meet all relevant requirements set out in the animal products IHS to ensure that any risk associated with disease organisms of animals is appropriately managed.

3.5 Trichoderma aggressivum

Pest biology, impact and control

(95) *Trichoderma aggressivum* is a fungal competitor of mushroom that causes a disease commonly known as green mould disease. *T. aggressivum* was originally detected in Ireland in the 1980s (at that stage it was known as '*Trichoderma harzianum* Th 2').

(96) *T. aggressivum* has been recorded as being present in Australia, Canada, China, England, mainland Europe (including Croatia, France, Hungary, the Netherlands, Poland and Spain), Scotland, South Africa and the USA (O'Brien, 2012; Kredics, 2010; Baars, 2013; Anon, 2010). The disease is not known to be present in New Zealand, and is a regulated organism.

(97) Although *T. aggressivum* has been recorded as being present in Australia (Anon, 2010; Baars, 2013) and China (Baars, 2013), there are no records of the organism causing

major losses in these countries. It is not clear why the disease is not recorded as having an impact in these countries. However, MPI are aware of anecdotal evidence that only a single isolate of *T. aggressivum* was found in Australia, and that whilst it caused significant problems at the site where it was collected, it seems that it may have been confined to that site, and/or eradicated.

(98) *T. aggressivum* is primarily transmitted by mechanical means (for example on contaminated equipment and machinery, or on people and clothing), via contaminated airborne dust and debris, and by mixing operations associated with handling phase 3 compost (O'Brien et al. 2015). Transport of contaminated phase 3 growing medium is one means by which the disease organism has been spread in Europe (Lemmers, 2010).

(99) *T. aggressivum* has a much higher impact on the mushroom industry than other species of *Trichoderma* (Krupke et al., 2003). If present, *T. aggressivum* aggressively colonises the growing medium, usually early in the growing cycle during spawn run. Small pockets of *T. aggressivum* in a phase 3 batch can be further spread throughout clean phase 3 during emptying of tunnels at production facilities and emptying of transportation containers at grower facilities. Symptoms initially become visible as large green patches on the compost and/or the casing (due to production of spores by *T. aggressivum*). Mushrooms generally do not develop in medium that is colonised by *T. aggressivum*. In areas where mushrooms do develop there will often be spotting and deformation of the fruiting bodies.

(100) There are two distinct biotypes of *T. aggressivum.*

a) *T. aggressivum f. europaeum* (formerly *T harzianum* Th 2) is the cause of green mould disease in Europe;

b) *T. aggressivum f. aggressivum* (formerly *T harzianum* Th 4) is the cause of the disease in North America.

(101) The disease has caused serious losses, costing millions of euro, to the European mushroom industry (Kredics, 2010) and can result in complete crop loss. Similar losses have been recorded in the USA (Castle, 1998).

(102) Disease outbreaks are sporadic, but when they do occur they tend to be severe. The presence of the pathogen incurs additional costs and changes to facilities and production processes.

(103) *T. aggressivum* spores are heat tolerant up to temperatures of around 60°C. It is recommended that compost pasteurisation conditions of 60°C for 12 hours are needed to eradicate *Trichoderma aggressivum* (Anon 2011).

(104) Stringent hygiene measures are known to be effective at decontaminating equipment and facilities (Kilpatrick, 2015). If *T. aggressivum* is present in a growing facility, it is recommended that at crop termination spent mushroom compost should be heated to at least 65°C for a minimum of 8 hours to eradicate the disease organism. The same heat treatment should be applied again once the spent medium has been removed from the growing room (Kilpatrick, 2015).

(105) *T. aggressivum* has never been found in the natural environment (Kredics, 2010). This means that the likelihood of the disease organism being present in raw ingredients is negligible.

(106) Growing medium can be contaminated with *T. aggressivum* if spores or mycelium are present in the production facility (for example on machinery used to process the composted product).

(107) Spores are not readily airborne (Kilpatrick, 2015), however studies have shown that handling contaminated phase 3 medium can spread spores and/or infected compost fragments throughout a facility. If *T. aggressivum* is present in a production facility, product could be contaminated during the following stages of production:

a) before composting. In this case the disease organism may not be killed if the phase 1 compost heap (or parts of it) do not reach the minimum temperature for the time period necessary to kill spores;

b) between phase 1 composting and pasteurisation. In this case the disease organism may not be killed during pasteurisation if:

i) there are zones in the pasteurisation tunnel which do not reach the required temperature;

ii) the time/temperature combination used for pasteurisation is insufficient to kill all spores (for example if pasteurisation temperatures are less than 60°C or the pasteurisation period is too short).

c) after pasteurisation, during inoculation with mushroom spawn (spawning);

d) during processing of phase 3 medium after spawning (for example during tunnel emptying, mixing, loading of trucks or packing for export).

Proposed measures

(108) Targeted measures are required in addition to basic measures to manage *T. aggressivum*.

(109) Targeted measures will effectively manage risk from *T. aggressivum* by ensuring that production facilities and the end product are free from the disease organism.

(110) Targeted measures considered to manage the risk associated with *T. aggressivum* include any of the following:

a) country freedom;

b) pest free area;

c) systems approaches, composed of two or more independent measures.

Country freedom and pest free areas

(111) If the NPPO of an exporting country can provide a 'country freedom' declaration according to requirements set out in ISPM 4, specific phytosanitary measures will not be required for *T. aggressivum*.

(112) If the NPPO of an exporting country can verify that growing medium is produced in an uninfested part of a country in which a limited infested area is present, specific phytosanitary measures will not be required for *T. aggressivum*. In this case, an official control programme must be being undertaken to manage *T. aggressivum* according to

requirements set out in ISPM 4. Other relevant requirements of ISPM 4 must also be met.

(113) In both of the above cases, the NPPO of the exporting country will be required to endorse the phytosanitary certificate with an additional declaration verifying that the growing medium was produced either in a country free from *T. aggressivum*, or in a pest free area.

Systems approaches

(114) The likelihood of *T. aggressivum* being present in phase 3 medium can be minimised using an effective systems approach. A systems approach consists of two or more independent measures. The following are considered suitable options as independent measures:

a) stringent hygiene measures to ensure production facilities remain free of the disease organism. This may include the following (Fleming-Archibald, 2015a; Kilpatrick, 2015):

   i) heat treatment of phase 3 incubation tunnels between batches, or alternate use of tunnels for phase 2 (pasteurising) and phase 3 (incubation), assuming that pasteurisation conditions are of sufficient temperature and/or duration to manage risk associated with *T. aggressivum*[1]. Minimum temperature requirements are either 60°C for at least 12 hours, or 65°C for at least 8 hours;

   ii) maintaining positive air pressure during spawning;

   iii) HEPA filtration of spawning areas;

   iv) isolating spawning from other stages of production;

   v) restricting entry to production tunnels;

   vi) rigorous cleaning procedures for tunnels, winches, conveyors and equipment to remove all traces of compost debris;

   vii) using heat treatment and disinfectants;

   viii) using clean clothing and footwear when entering production areas;

   ix) using dedicated equipment for different stages of production.

b) testing to ensure freedom from *T. aggressivum*, with confirmation of species identity using PCR or DNA sequencing if any species of *Trichoderma* are detected:

   i) testing samples of phase 3 medium for *T. aggressivum* when tunnels are being emptied;

   ii) testing debris on production equipment (conveyors, winches, mixers, ground, trucks, dispatch area etc.) for the presence of *T. aggressivum*;

   iii) testing air plates positioned throughout the facility (for example beneath tunnels that are being emptied, on winches, in dispatch halls etc.) for *T. aggressivum*.

[1] The heating in phase 1 composting and phase 2 pasteurising and conditioning is achieved through biological activity, rather than through direct heating. As such, even though temperatures are controlled by forcing air through spigots in tunnel floors, there may be variation in temperatures within production tunnels during phase 1 and phase 2 processing.

c) post production monitoring in the country of export to verify freedom from *T. aggressivum* (at mushroom production facilities who receive material for the same batch of compost as will be exported to New Zealand). This monitoring will be done whilst growing medium is in transit to New Zealand, so signs or symptoms of *T. aggressivum* would be expected to become evident before product arrives in New Zealand;

d) routine audit of production facilities by an independent accreditation body to verify that all processes and procedures are being carried out as described.

(115) In addition to the measures identified above, post clearance conditions will be imposed on any imported phase 3 medium to manage any residual risk that could be associated with the product. This will include managing residual risk that could be associated with *T. aggressivum*. Proposed post clearance conditions are described in paragraphs (146) to (149) of this RMP.

Export eligibility:

(116) If an additional declaration is provided on a phytosanitary certificate verifying that growing medium was produced in a country recognised by MPI as being free from *T. aggressivum,* no additional measures will be required for *T. aggressivum*.

(117) If an additional declaration is provided on a phytosanitary certificate verifying that growing medium was produced in a pest free area free from *T. aggressivum*, MPI will audit the management of the pest free area for compliance with ISPM 4. Imports will not be allowed unless all relevant requirements of ISPM 4 are met.

(118) A systems approach will be evaluated when an Export Plan is negotiated. If MPI consider that the proposed independent measures used in a systems approach (i.e. the Export Plan) will not manage the risk, or if an independent audit of a production facility shows system failures, material from that facility will not be eligible for import.

(119) If *T. aggressivum* is detected either during routine testing of a phase 3 growing medium production facility, or within a batch of phase 3 medium for export to New Zealand, material from that facility will no longer be eligible for import. Exports will not be able to resume until any weaknesses in the production system have been identified and repeat testing has demonstrated that the facility is free from *T. aggressivum*.

(120) MPI will require evidence that an importer can comply with all post clearance conditions before an import permit is issued.

3.6 Mushroom virus X

Pest biology, impact and control

(121) Mushroom virus X disease (MVX) was first detected in the United Kingdom in the 1990s. MVX disease causes a range of symptoms affecting yield and/or quality.

(122) A number of viruses are believed to make up the MVX complex (Burton, 2011). Brown mushroom symptoms and poor mushroom quality are believed to be caused by *Agaricus bisporus* Virus 16 (AbV16). AbV16 is usually found in association with other viruses, however it is not clear what effect (if any) other viruses in the MVX complex have on mushroom quality, or if these viruses interact with AbV16 (H Grogan, pers. comm.).

However, Fleming-Archibald et al. (2016) note that two other viruses, *Agaricus bisporus* Virus 6 (AbV6) and Mushroom bacilliform virus (MBV) may also contribute to symptoms.

(123) MVX has been reported from Belgium, Ireland, Italy, the Netherlands, New Zealand, Poland and South Africa (Eastwood, 2015; Kaur, 2002; Pudelko, 2010;).

(124) The report of the disease being present in New Zealand (Kaur, 2002) stated that MVX symptoms had been seen in New Zealand mushrooms, and that testing of symptomatic samples detected virus sequences associated with the disease. However this unpublished report is not considered sufficient evidence to verify the presence of the disease in New Zealand, and there are no records of MVX being detected subsequently, or of symptoms of MVX being observed in New Zealand. As such, MVX is a regulated organism that is considered to be absent from New Zealand.

(125) MVX only occurs in association with infected mushroom spores or mycelium fragments (Grogan, 2003) and is known to be associated with phase 3 medium (Fleming-Archibald, 2015a).

(126) The disease causes yield losses, delayed cropping and reduced mushroom quality. Disease symptoms may be transient and variable (for example Fleming-Archibald, 2015a,b).

(127) When MVX first emerged in the UK it had a large impact on the industry, and affected around 80% of growers. By 2003 losses had amounted to around £50 million (Anon, 2003).

(128) Grogan (2007) noted that UK growers have now been able to significantly reduce or eliminate the effects of MVX, and that disease is decreasing in terms of its significance to the British mushroom industry. Similarly, Grogan (2011) noted that reviewing the hygiene procedures and weaknesses on sites where MVX is present has resulted in most affected farms in Britain becoming clear of the problem. However, it is still recommended that producers of phase 3 medium should routinely test for the presence of viruses (Fleming-Archibald et al., 2016).

(129) MVX is only transmitted in association with mushroom mycelium, usually within infected growing medium. This means that the virus can be controlled if all material containing mushroom mycelium is removed or destroyed.

(130) The likelihood of the disease organism being present in the raw ingredients is negligible.

(131) It is recommended that host material should be heated to a minimum of 65°C for at least 8 hours to eradicate the virus (Fleming-Archibald, 2015a).

Proposed measures

(132) Targeted measures are required in addition to basic measures to manage MVX.

(133) Targeted measures will effectively manage risk from MVX by ensuring that production facilities and the end product are free from the disease organism.

(134) Targeted measures considered to manage the risk associated with MVX include the following:

a) country freedom;

b) pest free area;

c) systems approaches, composed of two or more independent measures.

Country freedom and pest free areas

(135) If the NPPO of an exporting country can provide a 'country freedom' declaration according to requirements set out in ISPM 4, specific phytosanitary measures will not be required for MVX.

(136) If the NPPO of an exporting country can verify that growing medium is produced in an uninfested part of a country in which a limited infested area is present specific phytosanitary measures will not be required for MVX. In this case, an official control programme must be being undertaken to manage MVX according to requirements set out in ISPM 4. Other relevant requirements of ISPM 4 must also be met.

(137) In both of the above cases, the NPPO of the exporting country will be required to endorse the phytosanitary certificate with an additional declaration verifying that the growing medium was produced either in a country free from MVX, or in a pest free area.

Systems approaches

(138) The likelihood of MVX being present in phase 3 medium can be minimised using an effective systems approach. A systems approach consists of two or more independent measures. The following are considered suitable options as independent measures:

a) stringent hygiene measures to ensure production facilities remain free of the disease organism. This may include the following (Fleming-Archibald, 2015a; Kilpatrick, 2015):

i) heat treatment of phase 3 incubation tunnels between batches, or alternate use of tunnels for phase 2 (pasteurising) and phase 3 (incubation), assuming that pasteurisation conditions are of sufficient temperature and/or duration to manage risk associated with MVX[2]. Minimum temperature requirements are either 60°C for at least 12 hours, or 65°C for at least 8 hours;

ii) maintaining positive air pressure during spawning;

iii) HEPA filtration of spawning areas;

iv) isolating spawning from other stages of production;

v) restricting entry to production tunnels;

vi) rigorous cleaning procedures for tunnels, winches, conveyors and equipment to remove all traces of compost debris;

vii) using heat treatment and disinfectants;

viii) using clean clothing and footwear when entering production areas;

[2] The heating in phase 1 composting and phase 2 pasteurising and conditioning is achieved through biological activity, rather than through direct heating. As such, even though temperatures are controlled by forcing air through spigots in tunnel floors, there may be variation in temperatures within production tunnels during phase 1 and phase 2 processing.

ix) using dedicated equipment for different stages of production.

b) testing phase 3 growing medium for MVX, or post production monitoring (for example at mushroom production facilities) in the country of export to verify freedom from symptoms of MVX;

c) routine audit of production facilities by an independent accreditation body to verify that all processes and procedures are being carried out as described.

(139) In addition to the measures identified above, post clearance conditions will be imposed on any imported phase 3 medium to manage any residual risk that could be associated with the product. This will include managing residual risk that could be associated with MVX. Proposed post clearance conditions are described in paragraphs (146) to (149) of this RMP.

Export eligibility:

(140) If an additional declaration is provided on a phytosanitary certificate verifying that growing medium was produced in a country recognised by MPI as being free from MVX, no additional measures will be required for MVX.

(141) If an additional declaration is provided on a phytosanitary certificate verifying that growing medium was produced in a pest free area free from MVX, MPI will audit the management of the pest free area for compliance with ISPM 4. Imports will not be allowed unless all relevant requirements of ISPM 4 are met.

(142) Independent measures will be evaluated when an Export Plan is negotiated. If MPI considers that the proposed independent measures used in a systems approach will not manage the risk, or if an independent audit of a production facility shows system failures, material from that facility will not be eligible for import.

(143) If MVX is detected at a production facility during production of a particular batch of growing medium, material from that production run will not be eligible for import.

(144) If MVX is detected in a batch of phase 3 medium produced at a particular facility, material from that batch will not be eligible for import.

(145) MPI will require evidence that an importer can comply with all post clearance conditions before an import permit is issued.

Post clearance conditions

(146) As noted in part 2 of this RMP, post-clearance conditions can be included as part of an applicable IHS.

(147) In this case, it is proposed to include post clearance conditions as a requirement of this IHS for the following reasons:

a) new evidence (O'Brien et al., 2016) indicates that very low levels of infection with *T. aggressivum* may be below the detection threshold of current diagnostic tests. In addition, the same researchers illustrated that it is possible that the characteristic symptoms of infection may not be readily apparent during the first two flushes of mushroom production if there are very low levels *T. aggressivum*.

As noted in this RMP, MPI will require specific testing of offshore production facilities for the presence of *T. aggressivum*, along with testing of samples from each batch of compost, and post-production monitoring at mushroom producing facilities in the country of export (who receive growing medium from the same batch as will be exported to New Zealand). However, based on the findings of O'Brien et al (2016), a very low level of residual risk may remain;

b) Mushroom virus X disease is believed to be caused by a number of different viruses, of which one (AbV16) is known to cause brown mushroom symptoms and poor quality mushrooms. It is not yet known what effect, if any, the other viruses within the disease complex have, or if they interact with AbV16. However, given that not all of these viruses have been fully characterised, and possible interactions between viruses are not yet fully understood, a very low level of residual risk may remain.

(148) Based on the above, post clearance conditions are proposed to manage any residual risk that could be associated with the following hazards:

a) *Trichoderma aggressivum*;

b) Mushroom virus X disease (MVX).

(149) Proposed post clearance conditions are summarised as follows:

a) after it has received a biosecurity clearance, all phase 3 mushroom growing medium must be held in a transitional facility approved to the MPI facility standard for Transitional Facilities for General Uncleared Risk Goods (MPI-STD-TFGEN). Transitional facilities are approved by MPI, and will be used to ensure the post-clearance conditions are met.

b) all spent growing medium will be required to undergo heat treatment at a minimum temperature of 65°C for at least 8 hours prior to removal from growing rooms. This is considered sufficient to manage residual risk associated with all hazards listed above;

c) specific measures will be required to manage any residual risk associated with *T. aggressivum* and/or MVX as follows:

i) specific hygiene measures must be implemented to minimise the likelihood of either disease organism spreading beyond an importing facility;

ii) daily crop inspections will be required to verify freedom from both disease organisms;

iii) representative samples of any *Trichoderma* infections observed in imported growing medium must be sent for diagnostic testing to confirm that *T. aggressivum* is not present within an imported consignment;

iv) contingency plans are identified which must be followed in the event that either disease organism is identified within an imported consignment.

d) the location at which imported medium must be retained is specified in order to ensure traceability of all product until it is disposed of following heat treatment;

e) MPI must be informed if an importer becomes aware of a change in circumstances associated with imported growing medium. Examples of when this may apply include:

i) if *T. aggressivum* or MVX is detected at an offshore mushroom growing facility using growing medium from a batch that is in transit to New Zealand;

ii) if *T. aggressivum* or MVX is detected within a phase 3 growing medium production facility that is eligible to export medium to New Zealand;

iii) if *T. aggressivum* or MVX is detected in a pest free area that is considered free from these organisms.

Feasibility and practicality of measures

(150) Most of the proposed requirements reflect good management practices that must be followed to produce a high quality product. As such, reputable manufacturers producing growing medium using a quality production system should be able to meet these requirements.

(151) Before an import permit is issued, MPI will require assurance that critical control points, including those required as part of either Basic Measures or Targeted Measures, are being appropriately managed. This assurance will either be achieved:

a) during negotiation of an Export Plan (at which time Basic and Targeted Measures will be assessed against the requirements set out in the IHS);

b) as part of the import permit application process. This will only apply when an Export Plan is not required (i.e. in cases where product is obtained from a pest free area, or country free from organisms for which targeted measures are required). In this case, Basic Measures will be assessed against the requirements set out in the IHS.

In either of the above cases, MPI may need to conduct audits (either on-site or desktop) of production facilities. The type of audit will depend on existing audit regimes already in use at the facility and on the level of oversight provided by the NPPO of the exporting country.

(152) An important critical control point is the initial composting process reaching the temperatures required to devitalise all seeds and disease organisms. To ensure that this does happen, MPI will assess the processes and procedures used during composting at each facility before an import permit is issued. As part of this assessment, MPI may require the manufacturer to provide additional information to verify that the composting process is sufficient to manage all biosecurity risk and that robust systems are in place to verify that the processing temperatures and times described to MPI are attained during each production run.

(153) Managing imports by means of a negotiated Export Plan, is considered the best way to ensure that all biosecurity risk is being appropriately managed because:

a) production processes and procedures vary between manufacturers. This means that the risk profile of phase 3 compost may differ between facilities;

b) the risk management measures used at each production facility will be assessed on a case-by-case basis. This will enable MPI to verify that the desired biosecurity outcome can be achieved by each manufacturer of phase 3 medium;

c) each production facility can be re-assessed on an annual basis (at the time of import permit renewal) to ensure that risk continues to be managed appropriately;

d) the import permit will identify specific risk management measures that must be used at each production facility, based on the MPI assessment of that facility;

e) the importer and manufacturer will have a clear understanding of all requirements that must be met prior to the product being imported because:

   i) requirements identified in the import permit will be based on production protocols used at each individual facility;

   ii) MPI will notify the manufacturer and importer once a facility has been approved;

   iii) the notification from MPI will describe any risk management measures additional to those identified in the production protocol that must be met in order for product to be eligible for import into New Zealand;

   iv) any additional measures will be agreed upon by both MPI and the manufacturer before exports can commence.

f) MPI will be able to audit each production facility against set criteria agreed upon by all parties.

(154) Where an Export Plan is not required, Basic Measures will still be assessed before imports commence as part of the import permit application process.

(155) The proposed post clearance conditions are consistent with good industry practice, and MPI anticipate that commercial mushroom producers in New Zealand should be able to meet these requirements.

Summary of proposed measures

(156) MPI considers that the risk associated with the import of phase 3 growing medium will be effectively managed by applying a combination of risk management measures. These measures are summarised in Table 1.

(157) Activities undertaken to meet the requirements of the IHS at each individual phase 3 production facility will be assessed by MPI before an import permit is issued. This assessment will occur when an Export Plan is negotiated between MPI and either the NPPO of the exporting country, or between MPI and a particular production facility. Where an Export Plan is not required, Basic Measures will be assessed before an import permit is issued.

(158) Once MPI has verified that a particular country or facility can comply with all requirements set out in the IHS, as described in a negotiated Export Plan, details will be included on a list of recognised production facilities. This list will be made available on the MPI website; the link to the website will be included as guidance information in the IHS.

(159) The production system, as documented in the Export Plan, will form the basis for any audits of phase 3 growing medium production facilities that are undertaken by MPI.

(160) Where an Export Plan is not required, MPI will include a particular facility on a list of recognised production facilities once Basic Measures have been assessed and an import permit has been issued.

(161) The measures contained in the IHS will be subject to review based on pathway compliance, emerging risk assessment, and any new information/intelligence received by MPI.

(162) MPI will monitor any interceptions of regulated organisms (and hitchhiker organisms) and the appropriateness/effectiveness of phytosanitary measures during trade.

Table 1. Measures required to manage the risk associated with phase 3 growing medium

Type of measure	Hazard*	Notes
Basic	Viable seeds Plant pest or disease organisms in raw ingredients Pest or disease organisms of *A. bisporus* Hitchhiker organisms Mushroom spawn *Trichoderma aggressivum* Mushroom virus X disease	Commercial production procedures will effectively manage these hazards (with the exception of *T. aggressivum* and MVX, which also require targeted measures as described below). All raw ingredients must be subjected to a minimum temperature of either 60°C for at least 12 hours, or 65°C for at least 8 hours. Only facilities that are subject to a negotiated Export Plan will be eligible to export material to New Zealand. If an Export Plan is not required, Basic Measures will be assessed as part of the permit application process. Production facilities and/or countries eligible to export to New Zealand will be listed on the MPI website. An import permit will be required. A manufacturer's declaration along with phytosanitary certification by the NPPO of the exporting country will be required for each consignment. This will provide a means of verifying that the production process has been completed as described to MPI. Product inspections (pre-export and on-arrival) will be used as a verification step.
Targeted measures	*Trichoderma aggressivum* Mushroom virus X disease	As well as the basic measures noted above, targeted measures will be required to effectively manage risk from *T. aggressivum* and MVX. These measures will ensure that production facilities and the end product are free from these disease organisms. Targeted measures may consist either of country freedom, production in a pest free area, or a systems approach consisting of two or more independent measures. An Export Plan will not be required where 'country freedom' status is recognised for the exporting country, or where growing medium is produced in a pest free area. All targeted measures used in a systems approach will be agreed upon as part of a negotiated Export Plan before a facility is recognised as eligible for export by MPI. As a minimum, the targeted measures identified in paragraphs (114) and (138) of this RMP will be required to manage risk associated with *T. aggressivum* and MVX, respectively, as part of a systems approach.

Post clearance conditions	*Trichoderma aggressivum* Mushroom virus X disease	All phase 3 mushroom growing medium must be held in a transitional facility approved to the MPI facility standard MPI-STD-TFGEN. Heat treatment (65°C for a minimum of 8 hours) will be required prior to disposal of growing medium to manage any residual risk. Specific hygiene measures must be implemented at all importing facilities. Daily crop inspections as a verification step. All *Trichoderma* infections on imported medium must be sent for testing to confirm absence of *T. aggressivum*. Contingency plans must be followed if either disease organism is detected. Growing medium must be used at a specified location. MPI must be informed of any change in circumstances related to imported growing medium.

*Risk management measures for the animal-based ingredients of phase 3 growing medium are identified in the IHS for Processed Animal Manure Products.

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