Department of
Primary Industries and
Regional Development

GOVERNMENT OF
WESTERN AUSTRALIA

Department of Primary Industries and Regional Development, Western Australia

Submission:

Draft Review of Import Conditions for Cucurbitaceous Crop Seeds for Sowing into Australia

12 February 2018

Department of
Primary Industries and Regional Development

GOVERNMENT OF WESTERN AUSTRALIA

Contents

Introduction

Western Australia is naturally free from many quarantine pests that are present in other parts of Australia or other countries. Western Australia's geographical isolation in conjunction with its robust plant biosecurity system—including border quarantine checkpoints, inter and intrastate regulatory controls, industry and public awareness campaigns and surveillance programs—help maintain this status.

Plants and plant products may be imported into Western Australia subject to specified import conditions. This includes general import conditions and specific import conditions where appropriate for various commodities or pests. Underpinning these general and specific import conditions is the legislative requirement for potential carriers to be presented for inspection upon entry into Western Australia. The detection of any quarantine pests during an inspection results in remedial action.

Ongoing surveillance systems are also in operation within Western Australia. Operating alongside targeted surveillance is an effective passive surveillance program. Biosecurity concerns are communicated via a variety of platforms to growers and the wider community, ensuring public awareness of current issues and results in suspect samples and reports regularly submitted by the public for identification via the Department of Primary Industries and Regional Development (DPIRD) Diagnostic Laboratory Services (DDLS), MyPestGuide Reporter, or the Pest and Disease Information Service. Industry awareness and participation is achieved via programs such as HortGuard and GrainGuard, and includes the development of industry biosecurity plans and other extension material.

In maintaining Western Australia’s freedom from quarantine pests the Division of Agriculture and Food of DPIRD continues to take a strong interest in all biosecurity risk analyses and related documents and decisions made by the Australian Department of Agriculture and Water Resources.

Pathology comments regarding pest risk assessments

General comment

Comment 1: DPIRD notes the deviation in methodology from past pest risk assessments in that the pest risk assessments have been approached as a single group assessment encompassing all quarantine pests identified for the assessment of the probability of entry, establishment and spread with the assessment of economic consequences being made for each individual pathogen. DPIRD acknowledges that this approach is appropriate given the nature of the crop seed pathway however, where any particular pathogen differs from the group assessment this should be highlighted.

Pathology comments regarding the pest categorisation

Erwinia ananatis Corrig. Serrano 1928 [Enterobacteriales: Enterobacteriaceae] (synonym: *Erwinia ananas* Serrano 1928)

Comment 1: *Erwinia ananatis* is listed as present in Australia, however, it is absent from Western Australia and regulated as a prohibited organism under s. 12 of the BAM Act 2007; and its entry into Western Australia is restricted under s. 15(1).
Comment 2: To date there is no available evidence demonstrating that *Erwinia ananatis* is seed-borne in cucurbits.
Recommendation 1: As *E. ananatis* is a regulated pest for Western Australia, DPIRD requests that it is recognised as a regional pest for Western Australia.
Recommendation 2: Add the following statement to "Potential to be on the pathway" in the Categorisation table:

> *"No: To date there is no available evidence demonstrating that this bacterium is seed-borne in this host."*

Xanthomonas campestris pv. *cucurbitae* (Bryan 1926) Dye 1978 [Xanthomonadales: Xanthomonadaceae] (synonym: *Xanthomonas cucurbitae* (ex. Bryan 1926) Vauterin et al. 1995)

Comment 1: *Xanthomonas campestris* pv. *cucurbitae* is an unlisted organism (s. 14) and its entry into Western Australia is restricted under s. 15(2) of the BAM Act 2007. The reference provided for presence in Australia (Persley et al. 2010) provides no specific Australian states/territories, and no records for *X. campestris pv. cucurbitae* could be found for Western Australia.
Comment 2: *Xanthomonas campestris* is reported as seed-borne in *Cucurbita pepo* (Babadoost & Zitter 2009) indicating that it has potential to be on the seed pathway.

Comment 3: *Xanthomonas campestris* pv*. cucurbitae* causes bacterial leaf spot (Babadoost & Zitter 2009) indicating that it has the potential for economic consequences.

Recommendation 1: As *X. campestris* pv*. cucurbitae* is considered absent from Western Australia and has been recommended to be regulated as a prohibited organism under s. 12 of the BAM Act 2007, DPIRD requests that *X. campestris* pv*. cucurbitae* be considered a regional pest for Western Australia.

Recommendation 2: *Xanthomonas campestris* pv*. cucurbitae* has potential to be on the pathway (Babadoost & Zitter 2009). To be consistent with ISPM 11 and the methodology outlined in the draft report, the potential for *X. campestris* pv*. cucurbitae* to be on the pathway should be assessed as "Yes".

Recommendation 3: DPIRD requests that *X. campestris* pv*. cucurbitae* be considered further in the pest categorisation process to establish its quarantine pest status for this pathway; and, where appropriate, a risk assessment conducted to determine an unrestricted risk estimate.

Recommendation 4: DPIRD requests the opportunity to review and provide comments on any changes relating to Western Australia prior to the release of the provisional final policy review.

Acremonium strictum Gams [Hypocreales: Incertae sedis] (synonyms: *Cephalosporium acremonium* Corda; *Sarocladium strictum* (Gams) Summerb.)

Comment 1: *Acremonium strictum* is listed as present in Australia and recognised by the Commonwealth as a regional pest for Western Australia.

Comment 2: Although potential pathway association for *A. strictum* is recognised, further assessment has not been carried out and no justification has been provided.

Comment 3: *Acremonium strictum* causes black bundle disease (White 1999) and kernel rot in corn (Richardson 1990), Acremonium wilt in sorghum (Frederiksen 2000), and localised, disseminated and invasive infections in human (Sharma et al. 2013).

Comment 4: *Acremonium strictum* is a fungus. There is a typo in the following statement in "Potential to be on pathway".

> "------ *The* ***bacterium*** *also occurs naturally on other Lagenaria and Luffa species (Avinash & R ------"*

Recommendation 1: The potential for this pathogen to be on the pathway is assessed as "Yes" and *A. strictum* should be considered further in the draft review.

Recommendation 2: The typo "bacterium" in the statement in "Potential to be on pathway" be changed to "fungus".

Recommendation 3: DPIRD requests the opportunity to review and provide comments on any changes relating to Western Australia prior to the release of the provisional final policy review.

Alternaria alternata (Fr.) Keissl. [Pleosporales: Pleosporaceae] (synonym: *Alternaria tenuis* Nees)

Comment 1: *Alternaria alternata* is listed as present in Australia including Western Australia, however, its subspecies *A. alternata* f.sp. *cucurbitae* and pv *citri* are absent from Western Australia and are regulated as prohibited organisms under s. 12 of the BAM Act 2007; and their entry into Western Australia are restricted under s. 15(1).

Comment 2: *Alternaria alternata* may be carried on cucurbit seed (Zitter et al. 1996) indicating it has potential to be on the seed pathway.

Comment 3: *Alternaria alternata* f.sp*. cucurbitae* causes Alternaria leaf spot and *A. alternata* causes Alternaria rot in some cucurbitaceous crops such as cucumber indicating that it has potential for economic consequences (Zitter et al. 1996).

Recommendation 1: As *A. alternata* f.sp. *cucurbitae* and pv *citri* are regulated pests for Western Australia, DPIRD requests that they are recognised as regional pests for Western Australia.

Recommendation 2: *Alternaria alternata* f.sp*. cucurbitae* has potential to be on the pathway (Zitter et al. 1996). To be consistent with ISPM 11 and the methodology outlined in the draft report, the potential for *A. alternata* f.sp*. cucurbitae* to be on the pathway should be assessed as “Yes”.

Recommendation 3: DPIRD requests that *A. alternata* f.sp. *cucurbitae* and pv *citri* be considered further in the pest categorisation process to establish its quarantine pest status for this pathway; and, where appropriate, a risk assessment conducted to determine an unrestricted risk estimate.

Recommendation 4: DPIRD requests the opportunity to review and provide comments on any changes relating to Western Australia prior to the release of the provisional final policy review.

Ascochyta cucumeris Fautrey & Roum. [Pleosporales: Didymellaceae]

Comment 1: The listed reference (Shivas 1989) to justify presence of *Ascochyta cucumeris* in Australia doesn’t show presence of this fungus in Australia.

Comment 2: *Ascochyta cucumeris* has the following teleomorph synonyms (Robert et al. 2005):

- *Didymella bryoniae* (Fuckel) Rehm, Berichte des Naturhistorischen Vereins Augsburg 26: 27 (1881) [MB#224305] (Syn: *Sphaeria bryoniae* Fuckel, Jahrbücher des Nassauischen Vereins für Naturkunde 23-24: 112 (1870) [MB#169089])
- *Laestadia cucurbitacearum* (Fr.) Sacc., Sylloge Fungorum 2: XXXIII (1883) [MB#164840]
- *Phoma cucurbitacearum* (Fr.) Sacc., Sylloge Fungorum 3: 148 (1884) [MB#229527]
- *Sphaerella cucurbitacearum* (Fr.) Cooke, Journal of Botany, British and Foreign 21: 71 (1883) [MB#171330]
- *Sphaeria cucurbitacearum* Fr., Systema Mycologicum 2: 502 (1823) [MB#152645]

- *Stagonosporopsis cucurbitacearum* (Fr.) Aveskamp, Gruyter & Verkley, Studies in Mycology 65: 45 (2010) [MB#515660]

Recommendation 1: Change reference from (Shivas 1989) to (APPD 2018) for "Present in Australia".
Recommendation 2: Add teleomorph synonyms of *Ascochyta cucumeris* to "Scientific name(s)".

Cladosporium cucumerinum Ellis & Arthur [Capnodiales: Cladosporiaceae]

Comment 1: *Cladosporium cucumerinum* is listed as present in Australia and recognised by the Commonwealth as a regional pest for Western Australia.
Comment 2: Although a potential pathway association for *C. cucumerinum* is recognised, further assessment has not been carried out and no justification has been provided.
Comment 3: *Cladosporium cucumerinum* causes scab in cucumber, winter squash, pumpkin, melon and watermelon (Zitter et al. 1996).
Recommendation 1: The potential for this pathogen to be on the pathway is assessed as "Yes" and *C. cucumerinum* be considered further in the draft review.
Recommendation 2: DPIRD requests the opportunity to review and provide comments on any changes relating to Western Australia prior to the release of the provisional final policy review.

Chaetomium murorum Corda [Sordariales: Chaetomiaceae]

Comment 1: *Chaetomium murorum* is an unlisted organism (s. 14) and its entry into Western Australia is restricted under s. 15(2) of the BAM Act 2007. The reference provided for presence in Australia (Cribb 1999) provides a record for South Australia, and no records for *C. murorum* could be found for Western Australia.
Comment 2: *Chaetomium murorum* is isolated from some cucurbitaceous crop seeds (Abushaala et al. 2016) indicating that it has potential to be on the seed pathway.
Comment 3: *Chaetomium murorum* may cause human and animal health problems (Reeb et al. 2010) indicating that it has the potential for economic consequences.
Recommendation 1: As *C. murorum* is considered absent from Western Australia and has been recommended to be regulated as a prohibited organism under s. 12 of the BAM Act 2007, DPIRD requests that it be considered a regional pest for Western Australia.
Recommendation 2: *Chaetomium murorum* has potential to be on the pathway (Abushaala et al. 2016). To be consistent with ISPM 11 and the methodology outlined in the draft report, the potential for *C. murorum* to be on the pathway should be assessed as "Yes".
Recommendation 3: DPIRD requests that *C. murorum* be considered further in the pest categorisation process to establish its quarantine pest status for this pathway; and,

where appropriate, a risk assessment conducted to determine an unrestricted risk estimate.

Recommendation 4: DPIRD requests the opportunity to review and provide comments on any changes relating to Western Australia prior to the release of the provisional final policy review.

Cochliobolus nodulosus Luttr. [Pleosporales: Pleosporaceae]

Comment 1: *Cochliobolus nodulosus* is an unlisted organism (s. 14) and its entry into Western Australia is restricted under s. 15(2) of the BAM Act 2007. The reference provided for presence in Australia (Manamgoda et al. 2012) doesn't list *C. nodulosus*, but Manamgoda et al. (2011) does. No records for *C. nodulosus* could be found for Western Australia.

Comment 2: To date there is no available evidence demonstrating that *C. nodulosus* is seed-borne in these hosts.

Recommendation 1: In "Present in Australia" change reference (Manamgoda et al. 2012) to Manamgoda et al. (2011).

Recommendation 2: As *C. nodulosus* is considered absent from Western Australia and has been recommended to be regulated as a prohibited organism under s. 12 of the BAM Act 2007, DPIRD requests that it be considered a regional pest for Western Australia.

Recommendation 3: Add the following statement to "Potential to be on the pathway" in the Categorisation table:

> *"No: To date there is no available evidence demonstrating that this fungus is seed-borne in this host."*

Recommendation 4: DPIRD requests the opportunity to review and provide comments on any changes relating to Western Australia prior to the release of the provisional final policy review.

Corynespora cassiicola (Berk. & Curtis) Wei [Pleosporales: Corynesporacscaceae] (synonyms: *Cercospora melonis* Cooke; *Corynespora melonis* (Cooke) Lindau)

Comment 1: *Corynespora cassiicola* is listed as present in Australia and recognised by the Commonwealth as a regional pest for Western Australia.

Comment 2: Although potential pathway association for *C. cassiicola* is recognised, further assessment has not been considered without any justification provided.

Comment 3: *Corynespora cassiicola* causes Target leaf spot, aka Corynespora blight, in many cucurbits (Zitter et al. 1996).

Recommendation 1: The potential for this pathogen to be on the pathway is assessed as "Yes" and *C. cassiicola* should be considered further in the draft review.

Recommendation 2: DPIRD requests the opportunity to review and provide comments on any changes relating to Western Australia prior to the release of the provisional final policy review.

Curvularia tuberculata Jain [Pleosporales: Pleosporaceae]

Comment 1: *Curvularia tuberculata* is listed as present in Australia, however, it is absent from Western Australia and regulated as a prohibited organism under s. 12 of the BAM Act 2007; and its entry into Western Australia is restricted under s. 15(1).

Comment 2: *Curvularia tuberculata* has been isolated from bottle gourd seeds (Sultana & Ghaffar 2009) indicating it has potential to be on the seed pathway.

Comment 3: *C. tuberculata* causes die-back disease of citrus in India (Lele et al. 1968) indicating that it has potential for economic consequences.

Recommendation 1: As *C tuberculata* is a regulated pest for Western Australia, DPIRD requests that it is recognised as a regional pest for Western Australia.

Recommendation 2: *Curvularia tuberculata* has potential to be on the pathway (Sultana & Ghaffar 2009). To be consistent with ISPM 11 and the methodology outlined in the draft report, the potential for *C. tuberculata* to be on the pathway should be assessed as "Yes".

Recommendation 3: DPIRD requests that *C. tuberculata* be considered further in the pest categorisation process to establish its quarantine pest status for this pathway; and, where appropriate, a risk assessment conducted to determine an unrestricted risk estimate.

Recommendation 4: DPIRD requests the opportunity to review and provide comments on any changes relating to Western Australia prior to the release of the provisional final policy review.

Fusarium oxysporum f. sp. *cucumerinum* Owen [Hypocreales: Nectriaceae]

Comment 1: *Fusarium oxysporum f. sp. cucumerinum* is listed as present in Australia and recognised by the Commonwealth as a regional pest for Western Australia.

Comment 2: Although potential pathway association for *Fusarium oxysporum f. sp. cucumerinum* is recognised, further assessment has not been carried out and no justification has been provided.

Comment 3: *Fusarium oxysporum f. sp. cucumerinum* causes Fusarium wilt of cucumber (Zitter et al. 1996) indicating that it has potential for economic consequences.

Comment 4: *Fusarium oxysporum f. sp. cucumerinum* is a fungus. There is a typo in the following statement in "Potential to be on pathway".

> "Yes: Seeds provide a pathway for this **bacterium** which has been reported naturally ------"

Recommendation 1: The potential for this pathogen to be on the pathway is assessed as "Yes" and *Fusarium oxysporum f. sp. cucumerinum* should be considered further in the draft review.

Recommendation 2: The typo “bacterium” in the statement in “Potential to be on pathway” be changed to “fungus”.

Recommendation 3: DPIRD requests the opportunity to review and provide comments on any changes relating to Western Australia prior to the release of the provisional final policy review.

Memnoniella echinata (Rivolta) Galloway [Hypocreales: Incertae sedis] (synonym: *Stachybotrys echinata* (Rivolta) Sm.)

Comment 1: *Memnoniella echinata* is an unlisted organism (s. 14) and its entry into Western Australia is restricted under s. 15(2) of the BAM Act 2007. The reference provided for presence in Australia (Plant Health Australia 2017) provides a record for Queensland, and no records for *Memnoniella echinata* could be found for Western Australia.

Comment 2: *Memnoniella echinata* has been isolated from bottle gourd seeds (Sultana & Ghaffar 2009) and detected from cucumber seeds (Abdelwehab et al. 2014) indicating that it has potential to be on the seed pathway.

Comment 3: *Memnoniella echinata* may have human and animal health concerns (Miller & McMullin 2014) indicating that it has the potential for economic consequences.

Recommendation 1: As this pathogen is considered absent from Western Australia and has been recommended to be regulated as a prohibited organism under s. 12 of the BAM Act 2007, DPIRD requests that *Memnoniella echinata* be considered a regional pest for Western Australia.

Recommendation 2: *Memnoniella echinata* has potential to be on the pathway (Sultana & Ghaffar 2009; Abdelwehab et al. 2014). To be consistent with ISPM 11 and the methodology outlined in the draft report, the potential for *Memnoniella echinata* to be on the pathway should be assessed as “Yes”.

Recommendation 3: DPIRD requests that *Memnoniella echinata* be considered further in the pest categorisation process to establish its quarantine pest status for this pathway; and, where appropriate, a risk assessment conducted to determine an unrestricted risk estimate.

Recommendation 4: DPIRD requests the opportunity to review and provide comments on any changes relating to Western Australia prior to the release of the provisional final policy review.

Neofusicoccum ribis (Slippers et al.) Crous et al. [Botryosphaeriales: Botryosphaeriaceae] (synonym: *Botryosphaeria ribis* Grossenb. & Duggar)

Comment 1: DPIRD now considers this pathogen an exotic to Australia, as no historical or new isolates have been re-identified as *N. ribis* since Crous et al. (2006) first reported that *B. ribis* and *B. dothidea* were phylogenetically and morphologically distinct species. DPIRD (formerly DAFWA) previously commented in “SUBMISSION ATT 1 - ITV mango specific comments” 20 July 2016 responding to “Draft report for the non-regulated

analysis of existing policy for fresh mango fruit from Indonesia, Thailand and Vietnam - July 2015":

> **"**Given the recent taxonomic revision of the Botryosphaeriaceae, records of these pathogens in Australia, especially prior to 2004, should be treated with caution and likely require re-identification where possible. For example, with regard to *Botryosphaeria ribis*, Phillips et al. (2013) state that "More than 250 hosts are listed for *N. ribis* (Farr et al. 2012). However, many of the reports were published before the concept of *N. ribis* (as *Botryosphaeria ribis*) was clarified by Slippers et al. (2004) and thus the identifications are not reliable." and that "Although this species has been considered to be distributed worldwide on numerous hosts this is based on reports published prior to the establishment of a stable concept for *N. ribis* (Slippers et al. 2004) . Thus far it has been verified only on *Ribis* sp. in New York state, USA (Slippers et al. 2004)." Synonymy of *B. ribis* and *B. dothidea* has been a protracted debate that has been recently settled when Slippers et al. (2004) and Crous et al. (2006) demonstrated that the two were phylogenetically and morphologically distinct. *Neofusicoccum ribis* is part of a group of cryptic species that are hard to distinguish based on morphological features alone (Phillips et al. 2013)."

Recommendation 1: Records of *Neofusicoccum ribis* and its related Botryosphaeria species be clarified where possible.

Recommendation 2: *Neofusicoccum ribis* be considered further in the pest categorisation table.

Recommendation 3: DPIRD requests the opportunity to review and provide comments on any changes relating to Western Australia prior to the release of the provisional final policy review.

Olpidium brassicae (Woronin) Dang [Olpidiales: Olpidiaceae] (synonym: *Olpidiaster brassicae* (Woronin) Doweld)

Comment 1: *Olpidium brassicae* is an unlisted organism (s. 14) and its entry into Western Australia is restricted under s. 15(2) of the BAM Act 2007. Although it was recorded as present in Western Australia based on records in 1989 (ALA 2018), *Olpidium brassicae* is considered absent from Western Australia. *Olpidium virulentus* has been identified from lettuce samples from Western Australia by sequencing of its ITS region. *Olpidium brassicae* was not found amongst the sequenced samples and is apparently not reported from its brassica hosts in Western Australia so is not known to occur here (R Jones 2018, pers. comm. 9 Feb.) (Maccarone et al. 2010).

Comment 2: *Olpidium brassicae* can spread internationally via dormant resting spores in soil or in dust sticking to the surface of seeds (R. Jones 2018, pers. comm. 9 Feb.) indicating that it has potential to be on the seed pathway.

Comment 3: *Olpidium brassicae* is a vector of Lettuce big-vein associated virus (LBVaV) and Mirafiori lettuce big-vein virus (MLBVV), which damage lettuce plant and decrease yield (Maccarone et al. 2010) indicating that it has the potential for economic consequences.

Recommendation 1: As this pathogen is considered absent from Western Australia and has been recommended to be regulated as a prohibited organism under s. 12 of the BAM Act 2007, DPIRD requests that *Olpidium brassicae* be considered a regional pest for Western Australia.

Recommendation 2: *Olpidium brassicae* has potential to be on the pathway. To be consistent with ISPM 11 and the methodology outlined in the draft report, the potential for *Olpidium brassicae* to be on the pathway should be assessed as "Yes".

Recommendation 3: DPIRD requests that *Olpidium brassicae* be considered further in the pest categorisation process to establish its quarantine pest status for this pathway; and, where appropriate, a risk assessment conducted to determine an unrestricted risk estimate.

Recommendation 4: DPIRD requests the opportunity to review and provide comments on any changes relating to Western Australia prior to the release of the provisional final policy review.

Verticillium albo-atrum sensu lato Reinke & Berthold [Incertae sedis: Plectosphaerellaceae]

Comment 1: *Verticillium albo-atrum* is listed as present in Australia including Western Australia, however, DPIRD considers it to be absent from Western Australia and it is regulated as a prohibited organism under s. 12 of the BAM Act 2007; with entry into Western Australia restricted under s. 15(1). Walker (1990) examined all reports and records of *Verticillium albo-atrum* from Australia and concluded that the only reports authenticated by specimens and cultures were on potato from South Australia, Tasmania and Victoria, demonstrating that the record of presence of *Verticillium albo-atrum* in Western Australia (Shivas 1989) was invalid or unreliable.

Comment 2: To date there is no available evidence demonstrating that *Verticillium albo-atrum* is seed-borne in cucurbits.

Recommendation 1: As it is considered absent from Western Australia, DPIRD requests that *Verticillium albo-atrum* be recognised as a regional pest for Western Australia.

Recommendation 2: Add the following statement to "Potential to be on the pathway" in the Categorisation table:

> *"No: To date there is no available evidence demonstrating that this fungus is seed-borne in this host."*

Ditylenchus dipsaci (Kühn 1857) Filipjev 1936 [Panagrolaimida: Anguinidae]

Comment 1: *Ditylenchus dipsaci* is a regional pest (a prohibited organism (s. 12) under the BAM Act 2007) in Western Australia. References have been provided for its presence in Australia (Ophel-Keller et al. 2008) including Western Australia (Stirling & Stanton 1997). As there is a record for Western Australia, further assessment has not been considered. This has been justified by the statement that:

"*Yes (Ophel-Keller et al. 2008); This species is listed as a declared organism in Western Australia; however, it is not considered further as it is reported to be present in Western Australia (Stirling & Stanton 1997) and not under official control*."

However, although McLeod et al. (1994) and Khair (1986) indicated that *Ditylenchus dipsaci* was detected on potato in Western Australia, no specimens have been retained and these records are considered unreliable (V Vanstone 2010, pers. comm. 2 June). Crop damage from *D. dipsaci* has not been recorded in any crop in Western Australia (Vanstone & Russell 2013) in spite of extension and awareness-raising material circulated as part of DPIRDs extension activities. The distinctive symptoms caused by this nematode, if present, would have been detected by general surveillance. Regular diagnostic examination of oat and pea seeds has not detected *D. dipsaci* in the last 20 years. *Ditylenchus dipsaci is* listed as a biosecurity threat in the MyPestGuide Diseases application, and is a notifiable pest in Western Australia.

Comment 2: *Ditylenchus dipsaci* is potentially associated with seeds (Stirling & Stanton 1997) indicating it has potential to be on the seed pathway.

Comment 3: It deforms leaves and bulbs, causing plant stunting or even death of host plants (Stirling & Stanton 1997) indicating it has potential for economic consequences.

Recommendation 1: As it is considered absent from Western Australia, DPIRD requests that *Ditylenchus dipsaci* be recognised a regional pest for Western Australia.

Recommendation 2: *Ditylenchus dipsaci* has potential to be on the pathway (Stirling & Stanton 1997). To be consistent with ISPM 11 and the methodology outlined in the draft report, the potential for *Ditylenchus dipsaci* to be on the pathway should be assessed as "Yes".

Recommendation 3: DPIRD requests that *Ditylenchus dipsaci* be considered further in the pest categorisation process to establish its quarantine pest status for this pathway; and, where appropriate, a risk assessment conducted to determine an unrestricted risk estimate.

Recommendation 4: DPIRD requests the opportunity to review and provide comments on any changes relating to Western Australia prior to the release of the provisional final policy review.

Arabis mosaic virus (ArMV) [Secoviridae: Nepovirus]

Comment 1: *Arabis mosaic virus (ArMV)* is listed as present in Australia and recognised by the Commonwealth as a regional pest for Western Australia.

Comment 2: Although potential pathway association for *Arabis mosaic virus (ArMV)* is recognised, further assessment has not been carried out and no justification has been provided.

Comment 3: A strain of *Arabis mosaic virus (ArMV)* causes severe disease and complete loss of crop in cucumbers under glass (Hollings 1963) indicating it has potential economic consequences.

Recommendation 1: The potential for this pathogen to be on the pathway is assessed as "Yes" and *Arabis mosaic virus (ArMV)* be considered further in the draft review.

Recommendation 2: DPIRD requests the opportunity to review and provide comments on any changes relating to Western Australia prior to the release of the provisional final policy review.

Hop stunt viroid (HSVd) [Pospiviroidae: Hostuviroid]

Comment 1: HSVd is listed as present in Australia, however, it is absent from Western Australia and regulated as a prohibited organism under s. 12 of the BAM Act 2007; and its entry into Western Australia is restricted under s. 15(1).
Comment 2: HSVd is poorly transmitted through seeds, although this way of transmission may play a role for survival of the viroid in certain hosts such as grapevine (Hataya et al. 2017). To date there is no available evidence demonstrating that HSVd is seed-borne in cucurbits.
Recommendation 1: As HSVd *is a regulated pest for* Western Australia, DPIRD requests that HSVd be recognised as a regional pest for Western Australia.
Recommendation 2: Add the following statement to "Potential to be on the pathway" in the Categorisation table:

> *"No: To date there is no available evidence demonstrating that this viroid is seed-borne in this host."*

Cherry rasp leaf virus (CRLV) [Secoviridae: Cheravirus]

Comment 1: CRLV is listed as present in Australia in this draft and supported by (Büchen-Osmond et al. 1988), however, it has been concluded as absent from Australia (FAO 2016). Consistently DWAR considered it as absent from Australia in its categorisation in the "Final report for the non-regulated analysis of existing policy for fresh nectarine fruit from China" (Department of Agriculture and Water Resources 2016), which was justified as:

> *"No. It was listed as present in Australia (ICTVdB Management 2002). However these specimens are believed to be based on symptoms that may have been caused by other viruses (Büchen-Osmond et al. 1988). There is doubt that this virus is correctly reported from Australia and the Australian Government Department of Agriculture and Water Resources considers it absent."*

Comment 2: Although there has been no report available on its pathway association with cucurbitaceous crop seeds, a lack of published evidence for CRLV on cucurbitaceous crop seeds does not constitute a lack of potential for this species to be associated with the seed pathway. The virus is readily transmitted through seeds of infected *Chenopodium quinoa* and *Taraxacum officinale* (Hansen et al. 1974). The exclusion of the possibility of pathway association of CRLV with cucurbitaceous crop seed cannot be justified.
Comment 3: CRLV causes cherry rasp leaf disease and mild symptoms in cucumber (Hansen et al. 1974) indicating it has potential economic consequences.
Recommendation 1: Change "Present in Australia" status as "No" as this pathogen is considered absent from Australia.

Recommendation 2: CRLV should be considered further in the pest categorisation process; and, where appropriate, a risk assessment conducted to determine an unrestricted risk estimate.

Recommendation 3: DPIRD requests the opportunity to review and provide comments on any changes relating to Western Australia prior to the release of the provisional final policy review.

Tobacco ringspot virus (TRSV) [Secoviridae: Nepovirus]

Comment 1: TRSV is an unlisted organism (s. 14) and its entry into Western Australia is restricted under s. 15(2) of the BAM Act 2007. The reference provided for presence in Australia (Büchen-Osmond et al. 1988) provides records for Queensland and South Australia, and no records for TRSV*)* could be found for Western Australia.

Comment 2: TRSV is seed-transmitted in melon and cucumber (Lecoq et al. 1998) indicating that it has potential to be on the seed pathway.

Comment 3: TRSV causes bud blight in soybean and ringspot disease in cucurbits (Stace-Smith 1985) indicating that it has the potential for economic consequences.

Recommendation 1: As this pathogen is considered absent from Western Australia and has been recommended to be regulated as a prohibited organism under s. 12 of the BAM Act 2007, DPIRD requests that TRSV be considered a regional pest for Western Australia.

Recommendation 2: TRSV has potential to be on the pathway (Lecoq et al. 1998). To be consistent with ISPM 11 and the methodology outlined in the draft report, the potential for TRSV to be on the pathway should be assessed as “Yes”.

Recommendation 3: DPIRD requests that TRSV be considered further in the pest categorisation process to establish its quarantine pest status for this pathway; and, where appropriate, a risk assessment conducted to determine an unrestricted risk estimate.

Recommendation 4: DPIRD requests the opportunity to review and provide comments on any changes relating to Western Australia prior to the release of the provisional final policy review.

References

Abdelwehab SA, El-Nagerabi SA & Elshafie AE 2014, Mycobiota associated with imported seeds of vegetable crops in Sudan. *Open Mycol J*, **8**: 156-173.

Abushaala FA, Ashour AO, Ramadan ARB & Alkeskas AA 2016, Investigation of seed-borne fungi associated with cucurbit seeds in two different regions of Libya.

ALA 2018, *Atlas of Living Australia (ALA)* [online database]. <http://www.ala.org.au> [2017].

APPD 2018, Australian Plant Pest Database (APPD), *Australian Plant Pest Database (APPD)* [online database]. Plant Health Australia. <http://appd.ala.org.au/appd-hub/index> [2017].

Babadoost M & Zitter TA 2009, Fruit rots of pumpkin: A serious threat to the pumpkin industry. *Plant Disease*, **93**: 772-782.

Büchen-Osmond C, Crabtree K, Gibbs A & McLean G (eds). 1988, *Viruses of plants in Australia*. The Australian National University, Canberra.

Cribb AB 1999, The fungus Chaetomium murorum on Wombat dung. *Queensland naturalist*, **37**: 22-26.

Crous PW, Slippers B, Wingfield MJ, Rheeder J, Marasas WFO, Philips AJL, Alves A, Burgess T, Barber P & Groenewald JZ 2006, Phylogenetic lineages in the Botryosphaeriaceae. *Studies in Mycology*, **55**: 235-253.

Department of Agriculture and Water Resources 2016: *Final report for the non-regulated analysis of existing policy for fresh nectarine fruit from China*. Australian Government Department of Agriculture and Water Resources, Canberra.

FAO 2016: *Absence of Cherry rasp leaf virus from Australia*. Food and Agriculture Organisation of the United Nations [Feb 2018].

Frederiksen RA 2000, 'Acremonium wilt', in RA Frederiksen, GN Odvody (eds.), *Compendium of sorghum diseases,* 2nd edition. The American Phytopathological Society, St. Paul, Minnesota.

Hansen AJ, Nyland G, McElroy F & Stace-Smith R 1974, Cherry Rasp Leaf Disease in North America. *Phytopathology*, **64**: 721-727.

Hataya T, Tsushima T & Sano T 2017, 'Hop Stunt Viroid', *Viroids and Satellites*. Elsevier, pp. 199-210.

Hollings M 1963, Cucumber stunt mottle, a disease caused by a strain of Arabis mosaic virus. *Journal of Horticultural Science*, **38**: 138-149.

Khair GT 1986: *List of plant parasitic nematodes of Australia*, 3rd Edition. Australian Government Publishing Service, Canberra, Australia.

Lecoq H, Wisler G & Pitrat M 1998, Cucurbitaceae.

Lele V, Raychaudhuri S, Bhalla R & Ram A 1968, Curvularia tuberculata, a new fungus causing die-back disease of Citrus in India. *Indian Phytopathol*, **21**: 66-72.

Maccarone L, Barbetti M, Sivasithamparam K & Jones R 2010, Molecular genetic characterization of Olpidium virulentus isolates associated with big-vein diseased lettuce plants. *Plant Disease*, **94**: 563-569.

Manamgoda DS, Cai L, Bahkali AH, Chukeatirote E & Hyde KD 2011, Cochliobolus: an overview and current status of species. *Fungal Diversity*, **51**: 3-42.

Manamgoda DS, Cai L, McKenzie EH, Crous PW, Madrid H, Chukeatirote E, Shivas RG, Tan YP & Hyde KD 2012, A phylogenetic and taxonomic re-evaluation of the Bipolaris-Cochliobolus-Curvularia complex. *Fungal Diversity*, **56**: 131-144.

McLeod R, Reay F & Smyth J 1994, *Plant nematodes of Australia listed by plant and by genus*. Department of Agriculture, New South Wales, Rydalmere, NSW.

Miller JD & McMullin DR 2014, Fungal secondary metabolites as harmful indoor air contaminants: 10 years on. *Applied microbiology and biotechnology*, **98**: 9953-9966.

Ophel-Keller K, McKay A, Hartley D, Herdina & Curran J 2008, Development of a routine DNA-based testing service for soilborne diseases in Australia. *Australasian Plant Pathology*, **37**: 243–253.

Persley D, Cooke T & House S 2010, *Diseases of vegetable crops in Australia*. CSIRO Publishing, Collingwood, Victoria.

Phillips A, Alves A, Abdollahzadeh J, Slippers B, Wingfield M, Groenewald J & Crous P 2013, The Botryosphaeriaceae: genera and species known from culture. *Studies in Mycology*, **76**: 51-167.

Reeb D, Best PB, Botha A, Cloete KJ, Thornton M & Mouton M 2010, Fungi associated with the skin of a southern right whale (Eubalaena australis) from South Africa. *Mycology*, **1**: 155-162.

Richardson MJ 1990, *An annotated list of seed-borne diseases*, 4th.

Robert V, Stegehuis G & Stalpers J 2005, The MycoBank engine and related databases, *The MycoBank engine and related databases* [online database]. <http://www.mycobank.org/> [2016].

Sharma A, Hazarika NK, Barua P, Shivaprakash MR & Chakrabarti A 2013, *Acremonium strictum*: Report of a rare emerging agent of cutaneous hyalohyphomycosis with review of literatures. *Mycopathologia*, **176**: 435–441.

Shivas RG 1989, Fungal and bacterial diseases of plants in Western Australia. *Journal of the Royal Society of Western Australia*, **72**: 1–62.

Slippers B, Crous P, Denman S, Coutinho T, BD W & Wingfield M 2004, Combined multiple gene genealogies and phenotypic characters differentiate several species previously identified as Botryosphaeria dothidea. *Mycologia*, **96**: 83-101.

Stace-Smith R 1985, Tobacco ringspot virus, *Descriptions of Plant Viruses* [online database]. Association of Applied Biologists. <http://www.dpvweb.net/dpv/showdpv.php?dpvno=309> [2015].

Stirling G & Stanton J 1997, Nematode diseases and their control. *Plant pathogens and plant diseases*: 505-517.

Sultana N & Ghaffar A 2009, Seed-borne fungi associated with bottle gourd [Lagenaria siceraria (Mol.) Standl]. *Pak J Bot*, **41**: 435-442.

Vanstone V & Russell J 2013: *Stem nematode*. Plant Health Australia. <http://www.planthealthaustralia.com.au/wp-content/uploads/2013/01/Stem-nematode-FS.pdf> [25/08/2017].

Walker J 1990, *Verticillium albo-atrum* in Australia: a case study of information confusion in plant pathology. *Australasian Plant Pathology*, **19**: 57-67.

White DG (ed). 1999, *Compendium of corn diseases*, Third edn. The American Phytopathological Society, St. Paul, Minnesota.

Zitter TA, Hopkins DL & Thomas CE (eds). 1996, *Compendium of cucurbit diseases*. The American Phytopathological Society Press, St Paul, Minnesota.