Australian Seed Federation
SOWING SEEDS

ABN 66 003 160 638

19 April 2018

Australian Government Department of Agriculture and Water Resources

Via email; plantstakeholders@agriculture.gov.au

Re: A review of import conditions for Brassicaceous crop seeds for sowing

I am pleased to provide the following submission on behalf of the Australian Seed Federation which provides views a review of import conditions for Brassicaceous crop seeds for sowing.

The Australian Seed Federation is also pleased to confirm that it is interested in receiving any updates about this consultation.

All correspondence regarding this submission and the consultation process can be addressed to:

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If you have any questions do not hesitate to contact me.

Yours sincerely

Bill Fuller
Chief Executive Officer
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Introduction

The Australian Seed Federation (ASF) is the peak national body representing the interests of Australia's sowing seed industry. The membership of ASF comprises stakeholders from all sectors of the seed supply chain including; plant breeders, seed growers, seed processors and seed marketers, all of whom were consulted in the preparation of this submission.

We welcome the opportunity to comment on the Department's *Draft review of import conditions for Brassicaceous crop seeds for sowing into Australia*. We note that this draft Review identifies two new fungal pathogens that it is proposed meet the criteria for a quarantine pest associated with the seeds of several brassicaceous crops. The identified quarantine pests are *Colletotrichum higginsianum* and *Fusarium oxysporum* f. sp. *raphani*. The Review then concludes that the unrestricted risks associated with these quarantine pests do not achieve the appropriate level of protection (ALOP) for Australia.

The Review also evaluated the effectiveness of existing phytosanitary risk management measures for these newly identified quarantine pests, and proposes an additional mandatory fungicidal treatment (off-shore or on-shore) for all imported seeds of *Brassica oleracea, Brassica rapa, Eruca vesicaria* and *Raphanus sativus* in order to reduce the risk of introduction of these pests into Australia.

General comments

The ASF submits that the information provided by Australia to support the conclusion that *C. higginsianum* and *F. oxysporum f.sp. raphani* are associated with seeds from radish, rocket or brassica is poor and cannot be verified. From what the international seed community has been able to establish, the information is either not publicly available on the internet, very outdated, lacking crucial information, or not relevant. For example, the article of Garibaldi contains misleading information since no Fusarium was detected on seeds of Eruca. It would also appear that some references (e.g.: Annotated list, Compendium) are cited without complete checking of the original scientific references.

The thesis of Bomberger is the most impressing reference, and based on this thesis the potential role of naturally contaminated seeds in the introduction of Fusarium cannot be ignored. But also in this publication, transmission from seed to seedling is not shown. It can therefore be argued that while contaminated seed might introduce this organism into the soil, there is no information demonstrating survival of the organism and subsequent potential infection of a host (i.e.: establishment and spread).

The ASF also believes that phytosanitary options other than a mandatory fungicide treatment could be used to address a phytosanitary risk, if there is one. We believe heat treatment, country freedom, lab testing or field inspections will provide greater flexibility for Australian importers to meet a greater proportion of Australian market demands, including the organic and sprouting markets that will be severely affected by the current proposal.

Colletotrichum higginsianum

The ASF has questions and concerns in relation to the suporting evidence used to conclude that this pathogen is a quarantine pest associated with imported seed of certain brassicacaeus crops.

The reference Chinese Vegetable Network 2017, 'Vegnet', Chinese Vegetable Network, Zhejiang, available at www.vegnet.com.cn, accessed 2017, is used as supporting evidence for regulating this pathogen on imported seed. The ASF notes that this reference leads to a Chinese language website, so the validity of the information cannot be checked. Since this reference is used by the Department to prove that *C.higginsianum* is seed-borne in *Brassica olearcae, B. rapa* and *Raphanus sativus*, it seems a relevant

website and we would ask if it was possible for the Department to provide us with an appropriate translation of this information.

Richardson, MJ 1990, *An annotated list of seed-borne diseases*, The International Seed Testing Association, Zurich, is also used as a supporting reference. The annotated list refers to: Neergaard, Aarsberetning – Annual reports of the Phytopathological laboratory of Ohlensens Enke, Copenhagen 1936-1951, and to Scheffer (30:132) in Review of Plant Pathology (Year of publication unknown). The ASF cannot find these publications and would again ask whether it is possible for the Department to share these references with us for review.

In Rimmer, SR, Shattuck, VI & Buchwaldt, L 2007, *Compendium of Brassica diseases*, The American Phytopathological Society, St. Paul, Minnesota, USA, it is written that "*C. higginsianum* has been found in seeds of radish and may be disseminated with seeds of other hosts". It also notes that "hot water treatments may be useful to control the seedborne fungus". There are three references supporting these statements, but we believe only two seem to be relevant: Scheffer R.P. Anthracnose leafspot of crucifers 1950. Technical Bulletin. North Carolina Agricultural Experiment Station Vol. 9:26; and Sumner D.R. 1971. Effect of leafspots on quality of turnip greens grown for processing. Plant Disease Reporter 55:540-543. The first of these appears to be a book that is not available and therefore cannot be checked, although the abstract states that the host range for this fungus was determined. In the second article (which was difficult to access), we would like to point out that we can find no mention of seed as a pathway - C. higginsianum was found as a "leaf spot" in a turnip crop and it was suggested that a nearby crop was the source of inoculum. There is no mention of seed.

We have reviewed Caesar, AJ, Lartey, RT & Caesar-TonThat, T 2010, 'First report of anthracnose stem canker of the invasive perennial weed *Lepidium draba* caused by *Colletotrichum higginsianum* in Europe', *Plant disease*, vol. 94, p. 1166, and would comment that the only relevant information in this First report is that *C.higginsianum* was found on a wild Brassicaceae species and that several disease symptoms developed on radish, turnip, Chinese cabbage, broccoli, kale and mustard greens after artificial inoculation with the fungus. No information is provided to support the role of seed as a pathway for the pathogen.

Farr, DF & Rossman, AY 2017, 'Fungal Databases, Systematic Mycology and Microbiology Laboratory, ARS, USDA', available at https://nt.ars-grin.gov/fungaldatabases/, accessed 2017, appears to be a general Fungal database, with no information about seed as a pathway for the disease.

Zhuang, WY 2005, *Fungi of Northwestern China*, Mycotaxon Limited, Ithaca, New York appears to be a book that is not available. Based on the title it seems a general book with information of fungi in NW China, but it is not clear if this books will contain information about the role of seed as a pathway.

Fusarium oxysporum* f.sp. *raphani

Likewise, the ASF does have questions about the supporting evidence for this pathogen listed in the draft Pest Risk Analysis.

The reference Bomberger, RA 2013, 'Presence and pathogenicity of *Fusarium* and *Verticillium* species in commercial red radish (*Raphanus sativus*) seed production in the Willamette Valley of Oregon'. MSc thesis, Oregon State University, is a study that confirms the presence of pathogenic *V. dahliae* and *F. oxysporum* in commercial radish seed fields in the Willamette Valley of Oregon. The paper also confirms that *F. oxysporum* can be associated with red radish seed and can be vertically transmitted (from plant to seeds). However, it also states that "since pathogenicity tests were not conducted on non-host species for

F.oxysporum f. sp. *raphani*, it is possible that other formae specialis, such as *F.oxysporum* f.sp. *conglutinans,* were recovered from inbred red radish stock seed. The exact formae specialis of the *F.oxysporum* strains are unknown". As such, we would propose that it seems that a diversity of Fusarium species is associated with red radish seeds, and that transmission of *F.oxysporum* from contaminated radish seeds to plants has not been confirmed. These experiments were not part of the thesis. We understand that the role of contaminated radish seeds specifically as a *pathway* for introduction cannot be ignored based on this thesis, but a treatment with 0.6% NaOCl was shown to be effective in reducing the load of *F.oxysporum* on the seeds. Based on the industry's experience a hot water treatment or heat/steam treatment will be effective in reducing to very low or zero level.

We would like to point out that only the abstract for Garibaldi, A, Gilardi, G & Gullino, ML 2006, 'Evidence for an expanded host range of *Fusarium oxysporum* f. sp. *raphani*', *Phytoparasitica*, vol. 34, pp. 115-21 is available. The reference is cited in the draft Pest Risk Analysis to demonstrate the pathogenicity of *F.oxysporum* obtained from infected cultivated rocket (*Eruca vesicaria*) and wild (sand) rocket (*Diplotaxis tenuifolia*) on several cruciferous hosts. The results indicated that isolates of *F.oxysporum* from cultivated and wild rocket belong to the forma specialis raphani. The isolates from rocket were pathogenic on cabbage, Brussels sprouts, broccoli, turnip, radish and stock. However, we would suggest that there is NO information that we can find about the role of seed acting as a pathway in the disease.

Similarly, we believe that Garibaldi, A, Gilardi, G, Pasquali, M, Kejji, S & Gullino, ML 2004, 'Seed transmission of *Fusarium oxysporum* of *Eruca vesicaria* and *Diplotaxis muralis*', *Zeitschrift für Pflanzenkrankheiten und Pflanzenschutz (Journal of Plant Diseases and Protection)*, vol. 111, pp. 345-50 provides no evidence that *F.oxysporum* is transmitted from contaminated seeds to the plant and causes disease. It would appear that no transmission experiments were performed. In total, seven seed samples of rocket seeds were tested (one sample of cultivated rocket Eruca and 6 samples of wild rocket Diplotaxis). Fusarium was detected on 5 of the 7 tested Diplotaxis seed samples and was NOT detected on the Eruca seed sample. Moreover, based on the pathogenicity results, most of the isolated Fusarium from the seed samples did not cause disease on Diplotaxis or Eruca, and pathogenic Fusarium was isolated from two Diplotaxis seed samples (0.2% and 0.1% contaminated). Based on this article, there is no evidence that Eruca seed can serve as a pathway for introduction of Fusarium. In addition, we would note that a treatment with 1% NaOCl was effective in total reduction of the load of *F.oxysporum* on the seeds. Similarly, as mentioned above, based on our experience, a hot water treatment or steam/heat treatment will also be effective in reducing to very low or zero level.

The draft Pest Risk Assessment also references Rimmer, SR, Shattuck, VI & Buchwaldt, L 2007, *Compendium of Brassica diseases*, The American Phytopathological Society, St. Paul, Minnesota, USA. On p.57 of this compendium, it is written that "*F.oxysporum* is soilborne. In rare instances, seeds may become infected and possibly transmit the disease". However, from what we can determine, a clear reference supporting the last part of this statement is missing. There are 6 other references, but none of them seems to refer to the role of seeds as a possible pathway. We would conclude from this that sound scientific evidence is missing in this compendium to support the statement that seeds can become infected and transmit the disease.

ISF Pest List

The International Seed Federation has also completed a review of scientific literature specifically relating to *Brassica oleracea* seed as a pathway. We would encourage the Department to further consider the conclusions of this review in respect of the two pathogens of interest here.

For *Colletotrichum higginsianum* it was concluded that *B.oleracea* seed is not a pathway for this pathogen. No references were found indicating seed as a pathway for *C. higginsianum* in *B. oleracea*. Dated references only make suggestions to seed maybe being a pathway in radish, but as referenced above no data is provided.

For *Fusarium oxysporum* f sp *raphani* it was concluded that *B.oleracea* seed is not even a host for this pathogen. *F.o. raphani* is normally found on radish and daikon. Only one report indicates infection on *B. oleracea* when experimentally inoculated. No other references were found indicating *B. oleracea* as a host of *F.o. raphani*.

Based on this, we would propose that *B.oleracea* be removed from the list of Brassicaceous crops covered by this Pest Risk Analysis.

Alternative measures
Should Australia continue to regulate these organisms, then the ASF would ask, with reference to ISPM38, that additional alternative phytosanitary measures be made available to seed importers. We would make the following points in support of this for your consideration:

- Mandatory fungicidal treatment will prohibit the import of seeds needed for organic farming. Organic standards in Australia require certified operators to use untreated organic seed for the production of organic crops. This is a significant market in Australia that could be lost as a result of the current proposal.
- A major philosophy of cover crop growers is also to reduce chemical inputs – even if it is not specifically certified as organic. The experience of ASF members is that cover crop and biofumigation crop users seem to all prefer bare seed.
- Australia imports a reasonable quantity of radish from NZ. Given that ASF members are marketing into broadacre cropping, where users are price sensitive, having a requirement for a mandatory fungicide treatment will add cost and reduce demand for the seed.
- Seed treatment costs can start from around 0.60c per kilo. One ASF member has calculated, based on an assumption of importing similar quantities as last year, that treatment costs could therefore be in excess of $3,000 a shipment. This would make about 25 seed lines in the organic market non-viable going forward, as well as leading to losses in the sprouting and microgreen trade of above $250,000. Such losses could lead to significant implications for the business. And that is one member.
- A hot water treatment or heat/steam treatment is generally effective for sanitation of seeds (e.g. Mebalds et al., 1996; Hermansen et al., 1999; Nega et al., 2003; Mancini and Romanazzi, 2014). We would therefore ask the Australian government to accept heat treatment as an alternative phytosanitary measure.
- The diseases caused by *F. oxysporum* and *Colletotrichum higginsianum* show visible symptoms on plants. We therefore believe it would be possible to offer a field inspection as an alternative phytosanitary measure.
- We also note that laboratory testing of seed for these pathogens is possible. For *C. higginsianum,* a validated laboratory test is already available, however a test for F. oxysporum f.sp. raphani would need to be developed. But we believe such an option should be offered as an alternative.
- Governments should also be able to offer country freedom for these pathogens, based on ISPM principles.

Conclusion

The comments above indicate that there is no information to support the role of radish, rocket or brassica seed acting as a pathway for *Colletotrichum higginsianum.* We also believe there is no evidence that *Eruca vesicaria* seed serves as a pathway for introduction of *F. oxysporum* f. sp. *raphani*.

The role of contaminated radish seeds as a pathway for introduction of *F.oxysporum* f. sp. *raphani* cannot be ignored. However, the importance of seed being a pathway compared to other sources of inoculum dispersal might be disproportional, as the pathogen might enter the country with plantlets, fresh produce and ornamentals. Transmission from seed to seedling is not shown. We would like the Department to consider our arguments that the references cited in the draft Pest Risk Analysis do not provide evidence to support the role of brassica seed acting as a pathway for the introduction of this pathogen.

The ASF is therefore of the view that these organisms do not qualify to be regulated and ask the Australian government to reconsider the inclusion of *Colletotrichum higginsianum* and *F. oxysporum* f. sp. *raphan*i as regulated quarantine pests of imported seed of Brassicaceous crop seeds for sowing.

Additional literature references

Hermansen, A., Brodal, G. & Balvoll, G. 1999. Hot water treatments of carrot seeds: effects on seed-borne fungi, germination, emergence and yield. Seed Science & Technology 27; 599-613.

Mancini V., Romanazzi, G., 2014. Seed treatments to control seedborne fungi. Pest Manag Sci 70: 860–868.

Mebalds et al, 1996. Development of steam air treatments for the control of seedborne diseases of flower seeds. HRDC report NY 209.

Nega, Eva; Ulrich, Roswitha; Werner, Sigrid und Jahn, Dr. Marga (2003) Hot water treatment of vegetable seed – an alternative seed treatment method to control seed borne pathogens in organic farming. Journal of Plant Diseases and Protection 110(3):pp. 220-234.