Agriculture Victoria

Department of Jobs, Precincts and Regions

Agriculture Victoria Comments on "Draft report for the review of biosecurity import requirements for fresh pomegranate whole fruit and processed 'ready-to-eat' arils from India".

Agriculture Victoria staff thank the Department of Agriculture for the opportunity to provide comment on the "Draft report for the review of biosecurity import requirements for fresh pomegranate whole fruit and processed 'ready-to-eat' arils from India".

Please note that Victoria commented against the Draft Report as received, and in addition have proposed three invertebrate pests (not otherwise listed in the report) as worthy of consideration (see final pages of this document).

CHAPTER 3

3.4.3 Pest management p 24-25

Re: Fungicides. There is no mention of the spraying of pomegranates with antibiotics for *Xanthomonas axonopodis* pv. *punicae* control in India, yet evidence is that this may occur.

- Please confirm that antibiotics are not used for *X. axonopodis* pv. *punicae* control on pomegranate fruit destined for export to Australia. The attached 'YouTube' video suggests an antibiotic is used for *X. axonopodis* control in India, https://www.youtube.com/watch?v=xt4mi0i5PCU, from about the 3.28 time-mark. Consequently, antibiotic residues could be present on product exported to Australia. Agriculture Victoria staff note that antibiotics are not permitted on plant material in Australia.

3.5 Harvesting and handling procedures

Agriculture Victoria highlights the importance that the action item "picking of fruit from the ground is not permitted". Explicit controls and instructions for pomegranate producers not to use fruit that has dropped to the ground for export or even local consumption are justified. This is based on Figure 4 that shows remnant calyces after the trimming of the pomegranates. Fruit that has dropped to the soil, could have their calyces readily contaminated with soilborne bacteria, which could be transferred to the interior and arils *via* the cutting action of a knife. Of concern in this scenario are human pathogens and *X. axonopodis* pv. *punicae*, the latter is identified in the draft as requiring risk management measures. The plant pathogen has been reported to survive in soil or fallen leaves for weeks (Arora & Arora, 2016). It is important to note that bacteria cannot be totally removed from plant tissues even with sanitisers (Harapas et al, 2015). Also, bacteria are more likely to survive in the calyces compared to the surface of the fruit because they would be protected from desiccation, sanitisers and UV light. Supporting this idea is the finding that *Salmonella enterica* in calyces versus the surface of apples are better protected from sanitisers (Liao & Sapers, 2000).

Arora A & Arora A (2016) An overview of bacterial blight disease: a serious threat to pomegranate production. International Journal of Agriculture, Environment and Biotechnology 9(4): 629-636.

Harapas D, Premier R, Tomkins B, Hepworth G & Ajlouni S (2015) Shoot injury increases the level of persistence of *Salmonella enterica* serovar Sofia and *Listeria innocua* on cos lettuce and of *Salmonella enterica* serovar Sofia on chive. Journal of Food Protection 78 (12): 2150-2155.

Liao C-H & Sapers G (2000) Attachment and growth of *Salmonella* Chester on apple fruits and in vivo response of attached bacteria to sanitizer treatments. Journal of Food Protection 63 (7): 876-883.

3.6 Post-harvest p 26

Re: 'Some packing houses may also be accredited under the Global GAP (the Worldwide Standard for Good Agriculture Practices) program'.

- Is there an opportunity to selectively accept the GAP produce? Reducing risk via greater documentation? Certification? Batch records? Independent inspection?

Re: Figure 8. 'Summary of orchard and post-harvest steps for pomegranate commodities produced in India for export', p34. It appears that product, either for whole fruit or for aril production receive the same checking on arrival (removal of damaged fruit by visual inspection on tables) and then either enter processing or aril production.

- Agriculture Victoria staff suggest that the report could be enhanced by removing the repetition.
- Related to the action item "consider whether there is justification for the requirement of unblemished fruit only for both aril and whole fruit export", Agriculture Victoria staff suggest sorting for damaged fruit should be over rollers to ensure all sides of every fruit can be inspected. If just on a table then some fruit may not be completely inspected. Incomplete inspection would expose risks such as the pathway for *Ercheia diversipennis* Walker 1857 (p167), *Eudocima cajeta* Cramer 1775 (p168), *Stathmopoda auriferella* Walker 1864 (p173).

3.6.1 Packing house processing: whole fruit p27

Re: Cleaning. Are there any reports of the efficacy of the 'cleaning' process?

- Have the tunnels (section of the fruit from the pistil to the lower loculus) of the fruit been tested pre and post 'cleaning' for the presence of fungal contaminants and the efficacy of the cleaning treatment? Ezra et al (2015) reports *Alternaria alternata* and *Penicillium adametziodes* were found in the 'tunnel from the pistil to the lower loculus' in asymptomatic pomegranate fruit grown in Israel and Koch's postulates were confirmed. Although, Farr and Rossman (2019) report *P. adametziodes* has only been recorded in Italy and Japan. It cannot be assumed viable fungi are not present in the 'tunnel' after cleaning unless there are scientific reports to that effect.

Ezra D, Kirshner B, Hershcovich M, Shitenberg D, & Kostos I (2015) Heart rot of pomegranate: Disease etiology and the events leading to development of symptoms. Plant Disease 99(4):496-501.

Farr D F & Rossman A Y (2019) Fungal Databases, U.S. National Fungus Collections, ARS, USDA. Retrieved December 8, 2019, from https://nt.ars-grin.gov/fungaldatabases/

3.6.2 Packing house processing: arils p27

Please see comments given for Section 3.5 about not using fruit that has been dropped to the ground.

Re: Cleaning.

- Figure 4 shows cleaned pomegranate whole fruits prior to aril extraction, which clearly have spots on the skins. Although the Department of Agriculture (teleconference 13/11/2019) suggested this was mechanical damage, it would be impossible to confirm, based on visual symptoms.
  - ➢ It is suggested that these fruits are removed from aril extraction due to the potential to contaminate arils.
  - ➢ It is suggested the fruits for aril extraction are in the same condition as those for whole fruits, as is indicated by Figure 8.
  - ➢ It also suggests that visual inspection or checking of fruit on tables at arrival may not be picking up potential disease symptoms.
- See 3.6.1 re comments on the efficacy of the cleaning process.

CHAPTER 4

4.10 Bacterial blight of pomegranate. P90-104

Please see comments about the pathogen that were given for Section 3.5.

4.12 Ripe rot *Coleophoma empetri*

Agriculture Victoria staff suggest:

- 'Establishment' should be rated HIGH rather than MODERATE because of the pathogen's wide host range, which includes *Eucalyptus* (page 107 of the draft).
- This fungus should be considered for the arils pathway, because it has been reported from the ovaries of cranberry (page 107 of draft), which may also apply to the ovaries of pomegranate that become part of the arils.

Re: asymptomatic infections

The draft report states several fungi can be associated with asymptomatic infections, and could escape the packing house process for e.g.

- 4.11 Cercospora fruit spot/blotch *Pseudocercospora punicae* (Henn.) Deighton p97
- 4.12 Ripe rot *Coleophoma empetri* (Rostr.) Petr., p106, Appendix A-2 p215.

- 4.13 Pomeganate scab *Elsinoë punicae* (Bitanc. & Jenkins) Rossman & Allen (Synonym: *Sphaceloma punicae*) p111

Has there been any systematic study made of the frequency of asymptomatic fruit passing through the packing shed process?

CHAPTER 5

5.2.7 Pre-export phytosanitary inspection and certification by DAC p 135

The inspection rate for all consignments is set at 600 units per phytosanitary certificate. This may not be a statistically sound number for the detection of disease or pests, depending on how many units are included in each phytosanitary certificate. Consider a scaled sampling approach according to, or sampling methodology to ensure appropriate sampling.

Appendix A-1.

Invertebrates

Deudorix epijarbas Moore 1858, p166. Clarification that all subspecies are included? The qualified scope of the Pest risk assessment entry appears to preclude assessment of entry for other jurisdictions. Given our prior query, a broader PRA is worthy of consideration.

Pathogens

Colletotrichum gloeosporioides (Penz.) Penz. & Sacc. [*Glomerella cingulate*] p184, although reported in Australia has a number of forma specialies (CABI www.cabi.org/cpc/datasheet/25356, last accessed 11/12/2019). Although none have been specifically identified for pomegranate, it does not mean they do not exist.

Xanthomonas axonopodis **pv.** ***Punicae*** (p177). Inconsistent 'potential pathway' between A-1 and A-2. The entry for this disease in A-2 (Aril production risks) describes the symptoms as very easy to detect visually and that it would exclude these fruit from entering the aril production process, yet it doesn't seem to be so clear cut here.

Economic losses

Economic losses have not been documented for the following pathogens, however that does not preclude them from causing actual losses. Of particular concern are pathogens that induce spots on fruit or cause fruit rot. Fruit rots, by definition, will cause loss of the fruit, thus loss of crop. Customers are likely to reject fruit that is not visually appealing or has rot and so cause loss at the retail level: -

- *Beltraniella humicola* p 181 - causes spots on fruit (p 181 of draft)
- *Chaetomella raphigera* p 183 - causes fruit rot (Gajbhiye et al, 2016)
- *Penicillium herquei* p 189 - causes fruit rot (Thomidis, 2014)

- *Penicillium purpurogenum* p 190 - causes fruit rot (Quaglia et al, 2016)
- *Penicillium sclerotiorum* p 190 - caused post-harvest fruits rots in Spain (Palou et al, 2010)
- *Phoma punicae* p 191 – associated with fruit rots (Chandra et al, 2010).
- *Phomopsis aucubicola* p 192 - causes fruit rot (Khosla & Bhardwaj, 2013)
- *Phomopsis versoniana* p 193 - affects pomegranate fruit (p 193 of draft)

Chandra, R, Jadhav, V T & Sharma J (2010) Global scenario of pomegranate (*Punica granatum* L.) culture with special reference to India. Fruit, Vegetable and Cereal Science and Biotechnology 4 (special issue 2): 7-18.

Gajbhiye M, Sathe S, Shinde V & Kapadnis B (2016) Morphological and molecular characterization of pomegranate fruit rot pathogen, *Chaetomella raphigera*, and its virulence factors. Indian Journal of Microbiology 56 (1): 99-102.

Khosla K & Bhardwaj S S (2013) Occurrence and incidence of important diseases of pomegranate in Himachal Pradesh. Plant Disease Research 28 (1):5-10.

Palou L, Guardado A & Montesinos-Herrero C (2010) First report of *Penicillium* spp. and *Pilidiella granati* causing postharvest fruit rot of pomegranate in Spain. New Disease Reports (22) 21. [http://dx.doi.org/10.5197/j.2044-0588.2010.022.021]

Quaglia M, Moretti C, Cerri M, Linoci G, Cappelletti G, Urbani S & Taticchi A (2016) Effect of extracts of wastewater from olive milling in postharvest treatments of pomegranate fruit decay caused by *Penicillium adametzioides*. Postharvest Biology and Technology 118: 26-34.

Thomidis T (2014) Fruit rots of pomegranate (cv. Wonderful) in Greece. Australasian Plant Pathology 43 (5): 583-8.

Appendix A-2.

Invertebrates

Cenopalpus pulcher Canestrini & Fanzago 1876 (p200). Potential pathway is reliant upon packing house process QA. Assurance that inspection and calyx removal is adequate to manage risk is desirable.

Planococcus ficus Signoret 1875 (p209). Associated with fruit commodity pathway. Australian Government Department of Agriculture and Water Resources 2016, *Draft group pest risk analysis for mealybugs and the viruses they transmit on fresh fruit, vegetable, cut-flower and foliage imports*. On Victorian exotic pest list

Cryptoblabes gnidiella Millière 1867 (p209). Potential pathway statements assume QA processes of packing house are good and managed well. Image in Fig 4 (p29) does not provide confidence in this detection of all infested fruit – especially mildly symptomatic fruit.

Pathology

***Xanthomonas axonopodis* pv. *punicae*, *Coleophoma empetri*, *Elsinoë punicae* and *Pseudocercospora punicae* P 214 -217**

- A bacterium and several fungi are reported as being present on pomegranate fruit skin/rind/peel – why are different words used?
- The preceding pathogens are described as having symptoms confined to the rind, peel or skin and as such, arils do not provide a pathway for them.
    - Whilst 'there is no reported evidence that these pathogens are associated with the internal parts of the fruit or arils' and 'Packing house processes will …. minimise the likelihood of the fungi contaminating the arils'. These statements assume that the packing house process will not remove all infected and asymptomatic fruit? If the fungus is located subcuticular, inter or intra cellularly within the skin/rind/peel, then washing may not remove it.
    - Additionally, it should be noted that microbes on the surface of the fruit can readily be transferred to the arils *via* the action of a knife, even if the fruit has been washed in a sanitiser. Sanitisers may not remove all the bacteria, and presumably fungi, on the plant tissue (Harapas et al, 2015). Also, calyces are another source of microbes for the contamination of the arils *via* slicing, and this has been explained in the comments for Section 3.5.

Harapas D, Premier R, Tomkins B, Hepworth G & Ajlouni S (2015) Shoot injury increases the level of persistence of *Salmonella enterica* serovar Sofia and *Listeria innocua* on cos lettuce and of *Salmonella enterica* serovar Sofia on chive. Journal of Food Protection 78 (12): 2150-2155.

Pests suggested for consideration as current or near-future pests with viable import pathways via whole or processed pomegranate fruit.

Table 1. Pest for assessment as a current import risk.

Pest	Pest under official control?	Reference for presence in (relevant) country	Reference for association with the fruit commodity pathway	Additional information
Rhipiphorothrips cruentatus	No	Gentry JW, 1965. Crop Insects of northeast Africa-southwest Asia. Agriculture Handbook No. 273. USA: Agricultural Research Service, United States Department of Agriculture. R.A. Balikai, Y.K. Kotikal and P.M. Prasanna (2011). Status of pomegranate pests and their management strategies in India. Acta Hortic. 890, 569-583		Widespread in India and Sri Lanka. Pomegranate is a main host. If they get into Australia, they are a major grapevine pest. The leaves shrivel under heavy attack, and fruit develops a rough surface. (CABI)

Table 2. Pests for which a near future extension of range from Sri Lanka to India would raise an import risk to Australia. These pests may be worthy of monitoring by DAWR as an active and changeable risk for this import pathway.

Pest	Pest under official control?	Reference for presence in (relevant) country	Reference for association with the fruit commodity pathway	Additional information
Pseudococcus comstocki	No	Ben-Dov Y, 1994. A systematic catalogue of the mealybugs of the world (Insecta: Homoptera: Coccoidea: Pseudococcidae and Putoidae) with data on geographical distribution, host plants, biology and economic importance. Andover, UK; Intercept Limited, 686 pp.	Australian Government Department of Agriculture and Water Resources 2016, *Draft group pest risk analysis for mealybugs and the viruses they transmit on fresh fruit, vegetable, cut-flower and foliage imports*. CC BY 3.0	Not present in India but are present in Sri Lanka. It damages the fruit by spotting and producing a change in the fruit skin texture in pears Pomegranate listed as a main host (CABI). *P. comstocki* is known to damage several agricultural crops including banana, peach, pears, lemon, apricot, cherry, catalpa and mulberry.

Pest	Pest under official control?	Reference for presence in (relevant) country	Reference for association with the fruit commodity pathway	Additional information
Pseudococcus lilacinus	No	Sirisena, U. G. A. I.; Watson, G. W.; Hemachandra, K. S.; Wijayagunasekara, H. N. P. 2013 Mealybugs (Hemiptera: Pseudococcidae) species on economically important fruit crops in Sri Lanka. R.A. Balikai, Y.K. Kotikal and P.M. Prasanna (2011). Status of pomegranate pests and their management strategies in India. Acta Hortic. 890, 569-583	Honeydew excreted by mealybugs coats the outside of fruit and promotes the growth of sooty mold fungus that inhibits photosynthesis, weakens the plant, and makes fruit unattractive. Weeks, J.A., Martin, KW Hodges, AC and N.C. Leppla (2012) Citrus Pest Coffee Mealybug Fact Sheet USDA Australian Government Department of Agriculture and Water Resources 2016, Draft group pest risk analysis for mealybugs and the viruses they transmit on fresh fruit, vegetable, cut-flower and foliage imports. CC BY 3.0	High infestation rate of pomegranates in Sri Lanka. The most abundant mealybug species attacking Sri Lankan fruit crops and has a high host range. Prominent pest of Citrus • May retard or delay ripening. • Can become abnormally shaped and drop prematurely. • Honeydew excreted by mealybugs coats the outside of fruit and promotes the growth of sooty mold fungus that inhibits photosynthesis, weakens the plant, and makes fruit unattractive.