



Name and Description of Measure	
Name of Measure	Fumigation with Methyl Bromide
Measure Type	Chemical
Active Ingredient	Methyl Bromide
Schedule	Methyl Bromide fumigation (Adapted from T101-a-1, USDA-APHIS treatment manual) 63.0 g m ³ , 4.4 – 9.9 C 47.1 g m ³ , 10-15.5 C 39.2 g m ³ , 16.6 -21.0 C 31.4 g m ³ , 21.1 – 26.6 C 23.5g m ³ , >26.6 C Treatment times of 2 hours

Target Pest	<p>Eggs, larvae and puparia of the tephritid fruit flies:</p> <ol style="list-style-type: none"> 1. <i>Anastrepha fraterculus</i> 2. <i>Anastrepha serpentina</i> 3. <i>Bactrocera dorsalis</i> 4. <i>Bactrocera tryoni</i> 5. <i>Ceratitis rosa</i> 6. <i>Rhagoletis pomonella</i> 7. <i>Rhagoletis species</i> <p>AND</p> <p>Eggs, larvae and pupae of the moths:</p> <ol style="list-style-type: none"> 8. <i>Acleris senescens</i> 9. <i>Carposina sasakii</i> 10. <i>Choristoneura rosaceana</i> 11. <i>Grapholita inoptinata</i> 12. <i>Grapholita prunivora</i> 13. <i>Platynota stultana</i> <p>AND</p> <p>Adults and scales of:</p> <ol style="list-style-type: none"> 14. <i>Lepidosaphes ussuriensis</i> 15. <i>Lopholeucaspis japonica</i> <p>AND</p> <p>Adults and larvae of the curculionid beetles:</p> <ol style="list-style-type: none"> 15. <i>Anthonomus quadrigibbus</i> 16. <i>Naupactus xanthographus</i>
Included in ISPM 28	NO
Reference	USDA-APHIS Treatment Manual. ¹

Other information (Please complete as many fields as possible)

Is there quantitative or qualitative evidence to indicate the measure is effective?

The use of the above schedule for the disinfestation of tephritid fruit flies (members of the family Tephritidae) from a range of commodities, including fresh fruit, has been, until quite recently, very widespread and its efficacy is supported by a large quantity of basic research.²⁻⁸ The progressive

withdrawal of MB as a consequence of the molecule's ozone-depleting characteristics has meant that the number of countries that use this fumigant has reduced significantly over recent years although it does remain an important quarantine pre-shipment (QPS) tool for some states, particularly with respect to tephritid disinfestation.

Similarly, MB has been widely researched as a quarantine phytosanitary treatment against tortrix moths (members of the family Tortricidae) associated with fresh fruit and demonstrated to be highly efficacious.^{9–13} A number of jurisdictions (e.g. Australia) include MB fumigation as one of the measures approved for the phytosanitary treatment of fresh fruit consignments against, for example, tortricids in order to meet the import requirements of other countries.^{14–16} Pest/Import Risk Analyses (IRAs/PRAs) for a range of commodities imported into Australia include provisions for pre-export MB treatments.¹⁷

Methyl bromide has been extensively used against coleopteran pests, particularly those associated with stored commodities and timber.^{18,19} The specific use of MB as a QPS treatment against scale insects of the family Diaspidae is less well documented from a basic research perspective. However, MB fumigation is detailed as one of the measures available to ensure fresh fruit consignments imported into Australia are free from soft and hard scales.²⁰

The above schedule derives from the USDA-APHIS Treatment Manual and phytosanitary MB treatments applied to fresh fruit typically closely align with it in the majority of cases. As such, this schedule provides a general exposure regime for all insects associated with apple.¹

Examples of countries that include MB treatments as a QPS treatment option for fresh fruit include India, where a MB exposure of 32 g/m³ for 2 hours at 21 °C is listed as one of the available treatment regimes for apple.²¹ The Australian standard MB treatment for interstate movement of fresh produce (ICA-04)²² is listed as one of the treatments approved for fruit imported into Tasmania (32 g/m³ at 21+ °C) and uses include, example, the disinfestation of the Queensland fruit fly (*B. tryoni*).²³ The Australian state of Victoria similarly demands MB fumigation for consignments that are lacking an Area of Freedom Certificate (e.g. for Med fly, *Ceratitis capitata*), which are treated according to the above schedule.²⁴ One of the options indicated by Australia for fresh fruit imported from the Pacific Northwest of the USA comprises pre-export MB fumigation.¹⁵

The schedule detailed above is used as a treatment option for a range of fruit and vegetable imports, including apple into Canada.²⁵ Fresh fruit exported from Florida to Japan is similarly treated with MB at a dose that falls within the range of the above schedule (40g m³, 24-29 °C, 2 hours).²⁶ New Zealand schedules for grape imports, such as those deriving from Chile, provides a very similar MB fumigation option.²⁷

Does experience from use in international trade indicate that the measure is effective?

Fumigation using MB is most typically undertaken as a pre-shipment treatment and has been an extant phytosanitary tool for well over 60 years, having first been registered as a pesticide in the USA in 1961.^{28,29} Some jurisdictions, such as Australia, also allow fumigation as a post-shipment quarantine treatment for consignments on arrival, for example when consignments originate from countries where MB use has been phased-out (such as Europe).³⁰ Australia, similarly, fumigates exports with MB if such treatments are indicated/mandated by the receiving country.³¹

Other countries where MB is still used include Chile (e.g. for grapes to the USA),³² New Zealand and

the USA. Argentina, India and South Africa also employ MB QPS treatments under strict governmental supervision.³³ In the specific case of apples for export, MB fumigation comprises one of the treatment options that has to be completed for Australian fruit exports to access, for example, the markets of Canada, Indonesia, Papua New Guinea and the Solomon Islands.³⁴ As such, despite a relatively small number of states still actively using MB as a QPS treatment, or mandating/indicating it for imports, the quarantine use of the fumigant is still applicable to over two million tonnes of apple exports annually.

The efficacy of MB against pest insects is supported by a very large quantity of basic research. The utility of MB is further supported by the fact that this fumigant continues to be used as a phytosanitary treatment option for many commodity/pest combinations despite being progressively phased-out globally due to its ozone-depleting characteristics. An exemption under the Montreal Protocol allows the use of MB to remain extant as a quarantine and pre-shipment treatment under a provision for “Critical Uses” where no adequate alternatives are available.³⁵ Currently, phytosanitary fumigation of fresh fruit and vegetables account for around 8% of MB’s global QPS usage.³⁶

Has the measure been successfully used to manage non-compliant consignments?

Methyl bromide has historically been used as a quarantine or pre-shipment treatment for a wide range of perishable and non-perishable commodities, typically within 21 days of export, to meet the requirements of the importing country.³⁸ As such, MB fumigation is most often used as a means of ensuring compliance of a consignment as opposed to providing a mechanism for dealing with non-compliant shipments.

The above notwithstanding, the fumigant has, and continues to be, used by some jurisdictions to deal with non-compliant consignments at the point of entry.³⁷ Australia, for example, authorizes (under the direction of the appropriate competent bodies) the use of MB for a range of commodities that are infested with quarantine pests on arrival or if they are lacking acceptable phytosanitary certification.²⁹ MB fumigation can be used as part of the destruction process for non-complaint consignments, such as in New Zealand where fumigation is conducted prior to deep burial of, for example, fruit fly-infested consignments.³⁸

Has the measure been successfully used to effectively manage pest risk domestically?

Methyl bromide treatments, conducted according to the above schedule (as described in ICA-04), are used as phytosanitary treatments in Australia for the interstate movement of fresh produce.^{22,23} Fumigation of fresh produce with MB is similarly one of the phytosanitary options available for use on fresh fruit imported into Tasmania from mainland Australia.²³ Large quantities of research coupled with evidence for industry provide a very robust body of information that attests to the efficacy of MB QPS treatments. The stipulation of use of MB use by several countries similarly provides evidence with regards the phytosanitary utility of this fumigant.

Methyl bromide fumigation is of high utility as a QPS treatment and also, to a degree, as a post-entry means of dealing with non-compliant consignments. Its typical mode of use does not lend it to being of use in eradication programmes that typically require pre-harvest activities to be undertaken.

Has the measure been used successfully by the private sector or authorized entities?
<p>Fumigation, which can take various forms depending on commodity, is undertaken by a range of commercial operators. Such use is generally subject to strict oversight by a given country's relevant competent bodies (NPPO). Treatment schedules have been formalised by a number of countries, such as Australia,²² New Zealand,³⁸ the USA¹ and Canada.²⁵ In Australia (2016), for example, fourteen commercial companies primarily concerned with QPS commodity treatments used more than 10 tonnes of MB, of which fruit and vegetables for export comprised a major use category, whilst a larger number of companies used smaller amounts.</p> <p>Globally, a range of commercial companies offer phytosanitary fumigation services using MB within countries that still use the fumigant under a critical use exemption. Competent bodies of given countries typically provide accreditation and maintain lists of phytosanitary treatment service providers (domestic and offshore), including those that conduct fumigations.</p>
Has the measure has been identified as an effective pest risk management option based on a PRA or comparable technical evaluation?
<p>A number of extensive documents with import and pest risk analysis components detail MB fumigation as a QPS treatment option. Of particular value to the pest assemblages included here (fruit flies, moths, beetles and scale insects) are a number of technical documents from Australia and New Zealand. They apply to some the pests covered here, or related tephritid species.</p> <p><u>Australia:</u></p> <ul style="list-style-type: none"> • Final import risk analysis of the importation of fruit of Fuji apple (<i>Malus pumila</i> Miller var. domestica Schneider) from Aomori prefecture in Japan. https://www.agriculture.gov.au/sites/default/files/sitecollectiondocuments/ba/plant/ungrouppeddocs/fapplefira.doc¹⁸ • Final import risk analysis report for fresh apple from the People's Republic of China. https://www.agriculture.gov.au/sites/default/files/sitecollectiondocuments/ba/plant/jun10-dec10/Final_IRA_report_for_apples_from_the_Peoples_Republic_of_China.pdf¹⁷ <p><u>New Zealand:</u></p> <ul style="list-style-type: none"> • MAF Biosecurity New Zealand standard 152.02 importation and clearance of fresh fruit and vegetables into New Zealand. https://www.mpi.govt.nz/dmsdocument/1147-Importation-and-Clearance-of-Fresh-Fruit-and-Vegetables-into-New-Zealand-Import-Health-Standard³⁸ • Import Risk Analysis: Fresh stone fruit from Idaho, Oregon and Washington (2009). https://www.mpi.govt.nz/dmsdocument/2881/direct³⁹ • Risk Management Proposal: Additional phytosanitary treatments to manage <i>Drosophila suzukii</i>, <i>Guignardia bidwellii</i>, <i>Lobesia botrana</i>, and regulated spiders on fresh table grapes: https://www.mpi.govt.nz/dmsdocument/53767/direct²⁷ • Pest Risk Assessment: <i>Drosophila suzukii</i>: spotted wing drosophila (Diptera: Drosophilidae) on fresh fruit from the USA (2012). https://www.mpi.govt.nz/dmsdocument/2897-Drosophila-suzukii-spotted-wing-drosophila-Diptera-Drosophilidae-on-fresh-fruit-from-

[the-USA-Risk-Assessment-June-2012](#)⁴⁰

Is the measure, relevant to the pest, adopted in an ISPM or regional standard?

Methyl bromide fumigation is not included in an ISPM.

A number of regional standards exist, including:

- USDA-APHIS treatment manual.¹
- Treatment schedules for horticultural commodities (Canada).²⁵
- Protocol for the exportation of fresh fruits from Florida to Japan (Florida/USA).²⁶
- Interstate Certification Assurance: Fumigation with methyl bromide (ICA-04) (Australia).²²

References

1. Animal and Plant Health inspection Service. Treatment Manual. 940Pp (2016). https://www.aphis.usda.gov/import_export/plants/manuals/ports/downloads/treatment.pdf.
2. Hallman, G. J. & Thomas, D. B. Evaluation of the efficacy of the methyl bromide fumigation schedule against Mexican fruit fly (Diptera: Tephritidae) in *Citrus* fruit. *Journal of Economic Entomology* **104**, 63–68 (2011).
3. Ito, P. J. & Hamilton, R. A. Fumigation of avocado fruit with methyl bromide. *HortScience* **15**, 593 (1980).
4. Armstrong, J. W. & Couey, M. H. Methyl bromide fumigation treatments at 30°C for California Stonefruits infested with the Mediterranean fruit fly (Diptera: Tephritidae). *Journal of Economic Entomology* **77**, 1229–1232 (1984).
5. Benschoter, C. A. Methyl bromide fumigation and cold storage as treatments for California stone fruits and pears infested with the Caribbean Fruit Fly (Diptera: Tephritidae). *Journal of Economic Entomology* **81**, 1665–1667 (1988).
6. Armstrong, J. W., Schneider, E. L., Garcia, D. L. & Couey, H. M. Methyl bromide quarantine fumigation for strawberries infested with Mediterranean fruit fly (Diptera: Tephritidae). *Journal of Economic Entomology* **77**, 680–682 (1984).
7. Hallman, G. J. & King, J. R. Methyl bromide fumigation quarantine treatment for carambolas infested with Caribbean fruit fly (Diptera: Tephritidae). *Journal of Economic Entomology* **85**, 1231–1234 (1992).
8. Rahim, M., Sulaiman, Z. & Faridah, M. E. The effectiveness of methyl bromide fumigation as quarantine treatment against oriental fruit fly and melon fly in carambola. *Journal of Tropical Agriculture and Food Science* **33**, 155–162 (2005).
9. Yokoyama, V. Y., Miller, G. T. & Hartsell, P. L. A methyl bromide quarantine treatment to control codling moth (Lepidoptera: Tortricidae) on nectarines packed in shipping containers for export to Japan and effect on fruit attributes. *Journal of Economic Entomology* **83**, 2335–2339 (1990).

10. Yokoyama, V. Y., Miller, G. T. & Hartsell, P. L. Evaluation of a methyl bromide quarantine treatment to control codling moth (Lepidoptera: Tortricidae) on nectarine cultivars proposed for export to Japan. *Journal of Economic Entomology* **83**, 466–471 (1990).
11. Yokoyama, V. Y., Miller, G. T. & Hartsell, P. L. Methyl bromide fumigation to control the oriental fruit moth (Lepidoptera: Tortricidae) in nectarines. *Journal of Economic Entomology* **80**, 1226–1228 (1987).
12. Maindonald, J. H., Waddell, B. C. & Petry, R. J. Apple cultivar effects on codling moth (Lepidoptera: Tortricidae) egg mortality following fumigation with methyl bromide. *Postharvest Biology and Technology* **22**, 99–110 (2001).
13. Maindonald, J. H., Waddell, B. C. & Birtles, D. B. Response to Methyl bromide fumigation of codling moth (Lepidoptera: Tortricidae) Eggs on Cherries. *Journal of Economic Entomology* **85**, 1222–1230 (1992).
14. Australian Gov. Extension of nectarine import risk analysis to peaches, plums and apricots from China. 19 pp (2017).
15. Final report for the review of biosecurity import requirements for fresh apple fruit from the Pacific Northwest states of the United States of America, 380 pp (2022) .
16. Australian Quarantine and Inspection Service. Final import risk analysis of the importation of fruit of Fuji apple (*Malus pumila* Miller var. *domestica* Schneider) from Aomori prefecture in Japan. 58 pp (1998).
17. Australian Government. Final import risk analysis report for fresh apple fruit from the People's Republic of China. 370 pp(2010).
18. Hole, B. D. Variation in tolerance of seven species of stored product Coleoptera to methyl bromide and phosphine in strains from twenty-nine countries. *Bulletin of Entomological Research* **71**, 299–306 (1981).
19. Soderstrom, E. L., Brandl, D. G., Hartsell, P. L. & Mackey, B. Fumigants as treatments for harvested citrus fruits infested with *Asynonychus godmani* (Coleoptera: Curculionidae). *Journal of Economic Entomology* **84**, 936–941 (1991).
20. Department of Agriculture, Water and the Environment. Draft group pest risk analysis for soft and hard scale insects on fresh fruit, vegetable, cut-flower and foliage imports. 267 pp (2020).
21. Department of Agriculture, Cooperation and Farmers Welfare (India). Committee on Sanitary and Phytosanitary measures notification. https://www.researchgate.net/profile/Peter-Follett/publication/349174195_Postharvest_Quarantine_Treatments_for_Drosophila_suzukii_in_Fresh_Fruit/links/6283d09ca629047e3a9a92bd/Postharvest-Quarantine-Treatments-for-Drosophila-suzukii-in-Fresh-Fruit.pdf (2017)
22. ICA-04 Fumigation with Methyl Bromide. 29 pp (2021).
23. Plant Biosecurity Manual Tasmania 2023 Edition. 172 pp(2023).
24. Agriculture Victoria. Condition 16 - Mediterranean Fruit Fly: Fumigation - Agriculture. <https://agriculture.vic.gov.au/biosecurity/moving-plants-and-plant-products/plant-quarantine-manual/conditions/mediterranean-fruit-fly-fumigation> (2023).
25. Government of Canada. Treatment schedules for horticulture commodities. <https://inspection.canada.ca/plant-health/horticulture/treatment-schedules/eng/1501526269211/1501526560731> (2017).

26. Florida Department of Agriculture and Consumer Services. Protocol for the exportation of fresh fruits from Florida to Japan. (2012).
27. Ministry of Primary Industries. Risk Management Proposal: Additional phytosanitary treatments to manage *Drosophila suzukii*, *Guignardia bidwellii*, *Lobesia botrana*, and regulated spiders on fresh table grapes. 24 pp (2022).
28. National Pesticide Information Center. Methyl Bromide. <http://npic.orst.edu/factsheets/MBgen.pdf>
29. Ministry of Primary Industries. Methyl bromide information. <https://www.mpi.govt.nz/dmsdocument/14869-Methyl-bromide-information>
30. Department of Agriculture, Water and the Environment (Australia). Legal use of methyl bromide. 3 pp (2020)
31. Quarantine and pre-shipment use of methyl bromide - DCCEEW. <https://www.dcceew.gov.au/environment/protection/ozone/methyl-bromide/quarantine-pre-shipment-use>.
32. Witchalls, A. Chilean grape exports could no longer require fumigation prior to importing to the US. <https://www.mintecglobal.com/top-stories/chilean-grape-exports-could-no-longer-require-fumigation-prior-to-importing-to-the-us>.
33. Agriculture, land reform and rural development department. Compliance with new methyl bromide usage procedure in South Africa. <https://www.goglobal.group/wp-content/uploads/2022/02/DALRRD-Notice-Compliance-With-New-Methyl-Bromide-Usage-Procedure-In-South-Africa.pdf>
34. Cover, I., Adhikari, R., Bound, S., Nissen, R. & Tarbath, M. Australian apple export manual. 174 pp (2018)
35. US EPA. Methyl Bromide. <https://www.epa.gov/ods-phaseout/methyl-bromide> (2015).
36. UNEP. QPS uses of Methyl Bromide and their alternatives. https://wedocs.unep.org/bitstream/handle/20.500.11822/26564/QPS-Uses_EN.pdf?sequence=1&isAllowed=y.
37. FAO. Recommendation on: Replacement or reduction of the use of methyl bromide as a phytosanitary measure. 12 pp (2017).
38. MAF Biosecurity New Zealand. MAF biosecurity New Zealand standard 152.02 importation and clearance of fresh fruit and vegetables into New Zealand. 421 pp (2012).
39. Biosecurity New Zealand. Import Risk Analysis: Fresh stonefruit from Idaho, Oregon and Washington. 294 pp (2009).
40. Ministry of Primary Industries. Pest Risk Assessment: *Drosophila suzukii*: spotted wing drosophila (Diptera: Drosophilidae) on fresh fruit from the USA. 46 pp (2012).