

Fumigant Alternatives

Chloropicrin (Pic)

- On average, Pic has produced 14% lower runner yields than MB/Pic over 12 years of research in the runner industry, and can cause phytotoxicity in runners and plant losses of up to 38% [AUS02 CUN16, A19].
- Not technically feasible on its own because it does not control pathogens and weeds to the same level as MB/Pic (see Part C 8a). Runners produced in soils treated with Pic produced lower fruit yields with higher levels of root disease than runners produced in soils treated with MB/Pic (see Part C 8a).
- Not approved for use by the runner Certification authority.

1,3-D/Pic Products

- Previous research on 1,3-D/Pic products with high concentrations of 1,3-D (e.g. Telone C-35® (65:35) and TF-60® (40:60)) has demonstrated an unacceptable risk of phytotoxicity in runner crops, with up to 40% plant losses [AUS02 CUN16, A19].
- On average, 1,3-D/Pic has produced 13% lower runner yields than MB/Pic over 12 years of research in the runner industry [AUS02 CUN16, A19].
- Recent research shows that formulations of 1,3-D/Pic with lower concentrations of 1,3-D (e.g. TF-80® (20:80)) may reduce the risk of crop phytotoxicity (see Part C 8b for details).
- TF-80® is not technically feasible on its own because it does not control pathogens and weeds to the same level as MB/Pic (see Part C 8b)
- TF-80® is not registered and not available to Victorian runner growers, but current research is supporting its possible registration. A registration application for TF-80® has been submitted to the APVMA.
- Not approved for use by the runner Certification authority.

Pic or 1,3-D co-applied with MITC

- A metham spading rig was imported into Australia from Europe in 2013 for application of MITC in trials, but has proved an ineffective application method on clay soils.
- Not technically feasible because co-application of MITC (as spade injected metham sodium or incorporated dazomet) with Pic and 1,3-D/Pic has caused significant phytotoxicity in runner crops (see Part C 8a & b for details).
- Not approved for use by the runner Certification authority.

Pic or 1,3-D co-applied with herbicides

- Recent research has shown that the pre-emergent herbicide isoxaben with Pic or 1,3-D/Pic can improve weed control without causing phytotoxicity in runner crops (Part C 8a & b).
- Not technically feasible because these combinations do not control pathogens to the same level as MB/Pic (Part C 8a & b).
- Isoxaben is not yet registered for use in strawberries, but current research is supporting its possible registration. A minor-use permit application for isoxaben is being prepared to submit to the APVMA.
- Not approved for use by the runner Certification authority.
- Other pre-emergent herbicides co-applied with Pic or 1,3-D/Pic, including pinene, chlorothal dimethyl, metolachlor, napropamide, oxyfluorfen and terbacil caused phytotoxicity or lower yields in runners compared with MB/Pic, and are not technically feasible (Part C 8a & b).

Ethanedinitrile (EDN)

- Trials with EDN recommenced in the runner industry in 2014/15.
- Not yet technically feasible because of inadequate pathogen control compared with MB/Pic, particularly at greater soil depths (Part C 8c).
- Not registered and not available to Victorian runner growers, but research in the industry is supporting its possible registration. A registration application for EDN has been submitted to the APVMA.

Dimethyl Disulphide (DMDS)

- DMDS and DMDS/Pic were imported into Australia in 2014.
- Not technically feasible due to inadequate pathogen and weed control compared with MB/Pic (Part C 8d).
- Not registered and not available to Victorian runner growers, but current research is supporting its possible registration. A registration application for DMDS will be prepared at the end of 2016, when two years of efficacy data are available.
- Long way from registration because DMDS is a new chemistry in Australia.

Propylene oxide

- PPO and PPO/Pic are being imported into Australia for trials in the runner industry in 2016/17.
- Not registered and not available to Victorian runner growers. Registration applications for PPO and PPO/Pic can only be prepared when two years of efficacy trials are completed in 2018.

Methyl iodide

- Withdrawn from registration and not available to Victorian runner growers.

Recaptured Methyl Bromide from Quarantine Applications

- Registration is required as the properties of recaptured methyl bromide need to be reviewed, as opposed to the known properties of virgin methyl bromide.

- Long way from commercial availability because there is no commitment from chemical companies to improve the consistency of formulation to support registration.
- Not registered and not available to Victorian runner growers.

Non-Fumigant Alternatives

Soil-less Systems

- Already adopted for commercial production of the early generations of runners (Nucleus and Foundation stock) in the multiplication Scheme.
- Partial budget analysis shows that soil-less systems are currently not economically feasible for production of later generations of runners (Mother and Certified stock) (see Section E for details).
- Not technically feasible because fruit yields from plants produced in soil-less systems are too variable (Part C 8g).

Biofumigation

- Biofumigant crops do not release the same concentration of isothiocyanates into soil as commercial fumigants. Consequently, biofumigants have not produced the same level of pathogen and weed control as commercial fumigants (Mattner et al., 2008).
- Current trials (2015/16) are evaluating the integrated use of biofumigants and alternative fumigants.

Anaerobic Soil Disinfestation

- Pot trials with this method have commenced, but so far have delivered inconsistent pathogen control.
- Component of a new proposed research program to manage *Macrophomina* in the strawberry fruit industry [AUS02 CUN17 A24].
- Long way from commercial trials due to practical difficulties with implementation on steep slopes.

Emission Reduction Strategies

Lower Dose Methyl Bromide

- Research from three consecutive years of trials do not support bioequivalency and registration of rates below 25 g MB.m⁻² (see AUS02 CUN15).
- Rates below 25 g MB.m⁻² not registered and not available to Victorian runner growers.

Rotation of MB with alternative fumigants

- Not currently technically feasible because of lower pathogen control and failure to control volunteer strawberries (see Part C 8i for details).

Impermeable Barrier Films

- Previous trials demonstrated that impermeable barrier films do not retain MB for longer periods in the high organic soils at Toolangi than standard LDPE films (AUS02 CUN16).
- Currently impermeable barrier films do not offer a reliable mechanism for reducing application rates of MB because they do not remain in place for long enough in the runner industry (due to high winds).
- Rates below 25 g MB.m⁻² are not registered and not available to Victorian runner growers under impermeable barrier films or standard LDPE films.