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European and Mediterranean Plant Protection Organization
Organisation Européenne et Méditerranéenne pour la Protection des Plantes

PM 10/20 (1)

Phytosanitary treatments
Traitments phytosanitaires

Phosphine fumigation of grapevine to control *Viteus vitifoliae*

Specific scope

This Standard describes the phosphine and phosphine-with-carbon dioxide fumigation of grapevine to control *Viteus vitifoliae*. It replaces PM 3/19(1) *Fumigation of grapevine to control* Viteus vitifoliae, which was a methyl bromide fumigation. An alternative treatment is presented in PM 10/16 *Hot water treatment of grapevine to control* Viteus vitifoliae.

Specific approval and amendment

First approved in 2012–09.

Introduction

Viteus vitifoliae (Homiptera: Phylloxeridae – EPPO A2 list) (grapevine phylloxera) is native to North America and was introduced into Europe at the end of the 19th century. It is the most destructive pest of grapes (EPPO/CABI, 1997). It is a quarantine pest for all grapevine-growing European countries, and its further spread to some of these areas is prevented by phytosanitary measures.

Phosphine fumigation of grapevine is still a new treatment against *V. vitifoliae*, but this method can be used as an alternative to the fumigation with methyl bromide, which was described in PM 3/19(1). The schedule to be used depends on the temperature and the stage of the pest (see Tables 1 and 2). At temperatures below 13°C, *V. vitifoliae* enters a diapausing stage.

Commodities/regulated articles

Plants of grapevine for planting (grafted plants).

Pests

Viteus vitifoliae (VITEVI)

Treatment schedule

Treatment name: phosphine fumigation.
Treatment type: chemical, controlled modified atmosphere.
Formulation: fumigant, packed as a bag, plate, or tablets.
Active substance: magnesium phosphine 56% and carbon dioxide; or magnesium phosphine 56% alone.

Treatment conditions

Mode of action: fumigation at atmospheric pressure.
Growth stage: grapevine for planting (grafted plants) during dormant stage.
Number of applications a year: once a year.

Post-treatment

After treatment, grapevine should be removed from the fumigation chamber, watered and planted temporarily in the soil until planting in the field.

Waiting period

Product (phosphine) must be completely dissipated from fumigation chamber.

Efficacy of treatment

Management of *V. vitifoliae* includes the disinfestation of infected plants. Phosphine fumigation of grapevine has been

Table 1 Application rate per treatment (gas dose) to control active larvae

Stage of pest	Dose (g PH_3 m^{-3})	Minimum temperature (°C)	Minimum exposure (h)	Efficacy (%)
Active larvae	4	13	48	100

Table 2 Application rate per treatment (gas dose) to control diapausing larvae

Stage of pest	Dose (g PH_3 m^{-3}: g CO_2 m^{-3})	Minimum temperature (°C)	Minimum exposure (h)	Efficacy (%)
Diapausing larvae	3:120	10	96	100

proposed by Chernei *et al.* (1984) to treat dormant woody plant material against *V. vitifoliae*. Further research confirmed the effectiveness of the treatment against this pest, although some other experiments indicated that use of phosphine-with-carbon dioxide was more effective for eradication (Mordkovich & Chernei, 1993).

An improved method of cabinet fumigation of grapevine planting material is described using phosphine alone, or in a mixture with carbon dioxide, by Klechkovskii & Chernei (1996).

Recent experiences carried out in the All-Russian Plant Quarantine Centre (Shamilov & Mordkovich, 2012) confirmed the reliability of phosphine treatment and showed that phosphine fumigation with carbon dioxide is also effective in eliminating diapausing larvae of *V. vitifoliae*, but only at longer exposure times (see Table 2).

However, phosphine fumigation of grapevine, affects the survival of plants. In an experiment by Shamilov & Mordkovich (2012), 88.4% of infested plants survived when phosphine was used alone, but 96.0% survived with a mixture of phosphine and carbon dioxide (without infestation and without treatment the survival of plants was 98.8%). Moreover, the growth of shoots in the following year is decreased to an average of 70.1 cm when only phosphine is used, and an average of 82.5 cm with a mixture of phosphine and carbon dioxide (without infestation, growth the following year was an average 88.4 cm). The effects on survival and growth are one of the main reasons why carbon dioxide is added during fumigation (Litvinov, 1982; Mordkovich & Chernei, 1993).

The effect of phosphine-with-carbon dioxide on dormant vine tissue is not fully understood, but experiments show that using carbon dioxide allows the reduction of the dose of phosphine and decreases the phytotoxic effects (Chernei *et al.*, 1984).

Such disinfection does not prevent reinfestation if the treated material is planted in infected soil.

Notes

- As a general rule, representative data for the fumigation with hydrogen phosphine corresponds to a humidity of 60% and a temperature of 20°C. Fumigation should not be performed below a temperature of 10°C.
- To avoid impairment of germination ability, humidity should not exceed 20–22%.
- Formulation as pellets should be avoided as they release ammonia, which is phytotoxic. Other formulations, such as tablets, should be preferred.
- The schedule to be used depends on the temperature: at temperatures lower than 13°C, the pest enters its diapausing stage.
- To prevent phosphine penetration into the roots, all cuts on the roots should be coated with wax.

References

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Enquiries

Further information may be obtained from the national authorities responsible for the registration of this fumigant for this purpose.

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