12th Annual International Research Conference on Methyl Bromide Alternatives and Emissions Reduction, San Diego, California, Doubletree Hotel [San Diego – Mission Valley Hotel], 30 October – 3 November, 2005.

DISINFESTATION OF FOOD PROCESSING EQUIPMENT

M. Keenes[1], R.Ryan[2], J. Falco[2], J.Nicolson[2], N. Haines[2], D. Beven[2], A.Harvey[2].*
[1]SUNRICE, Deniliquin, NSW Australia; [2]BOC Limited: robert.ryan@boc.com

Key points

- A naturally occurring GRAS food additive, ethyl formate has been further developed as a fumigant.
- BOC VAPORMATE™ is a non-flammable mixture of 16.7wt% ethyl formate in carbon dioxide [11 vol% ethyl formate in gaseous carbon dioxide].
- VAPORMATE resulted from CSIRO Research, GRDC funding and BOC product development.
- The Australian Pesticide & Veterinary Medicines Authority [APVMA] approved pesticide has a rapid action and requires "No Withholding Period"
- A post harvest fumigant for the control of insects in stored grains, fresh produce & equipment.
- Successfully applied as a "fog" to treat RICE MILL processing equipment.
- Best dispensed as a hot (~60^{o}C) gas mixture to assist the uniform distribution in silo storage, 1 tonne bags and consumer packs.

Background

The cleaning of the intricate internals of food equipment is not always perfect and pockets of food are frequently left behind. This residual food is an attractive breeding place for stored product insects. Pest Control of internal spaces is difficult as treatment with conventional liquid pesticides is not acceptable because of high pesticide residuals levels in any food or on the internal surfaces.

The rediscovery & reformulation of the highly volatile GRAS food additive, ethyl formate, makes possible the disinfestation of enclosed food equipment spaces. ***In addition the formulation of ethyl formate in liquid carbon dioxide also can be used as a Modified Atmosphere Package [MAP] treatment for packaged food.*** The key is that VAPORMATE has "No Withholding Period" as the ethyl formate breaks down to naturally occurring levels found in foods [ethyl formate is a naturally occurring substance found in fruit & vegetables eg green apples and cabbages].

Five years ago CSIRO Entomology started focusing on using the naturally occurring ethyl formate found in green apples and cabbages as a replacement for methyl bromide and phosphine. For the past three years the GRDC-funded project has worked in collaboration with private enterprise to develop a commercial product for the disinfestation of grain storages which also has post harvest application with fresh produce.

After disinfestation of grain storages trials in WA, Queensland, the ACT and Walla Walla, CSIRO researchers have developed a standard concentration for a

50-tonne silo of grain which takes 12 minutes to apply, three hours to fumigate and two hours to air out with no withholding period (typical CSIRO insect bioassay is given in Figure 3).

VAPORMATE has recently been approved by registration authorities in Australia and is attracting global interest as a niche alternative for methyl bromide which has been severely restricted from January 2005 because it is an ozone depletor.

Food Processing

Recently SUNRICE, Deniliquin conducted a successful VAPORMATE trial on the internal equipment of a RICE MILL The VAPORMATE was sprayed via a manual hand gun through 3mm holes in the equipment for the calculated time and the resultant "fog" permeated the spaces quickly being propelled by the high cylinder pressure [50 bar = 800psi]. Plan is to streamline the application with the VAPORMATE piped to a number of locations throughout the multi-level mill.

The treatment of grain storage will requires VAPORMATE be dispensed via a vaporiser delivering a hot (~60 C) gas mixture to assist the uniform distribution throughout the storage. SUNRICE are interested in using this vaporised gas to treat packaged rice in 1 tonne bags and consumer “pillow” packs.

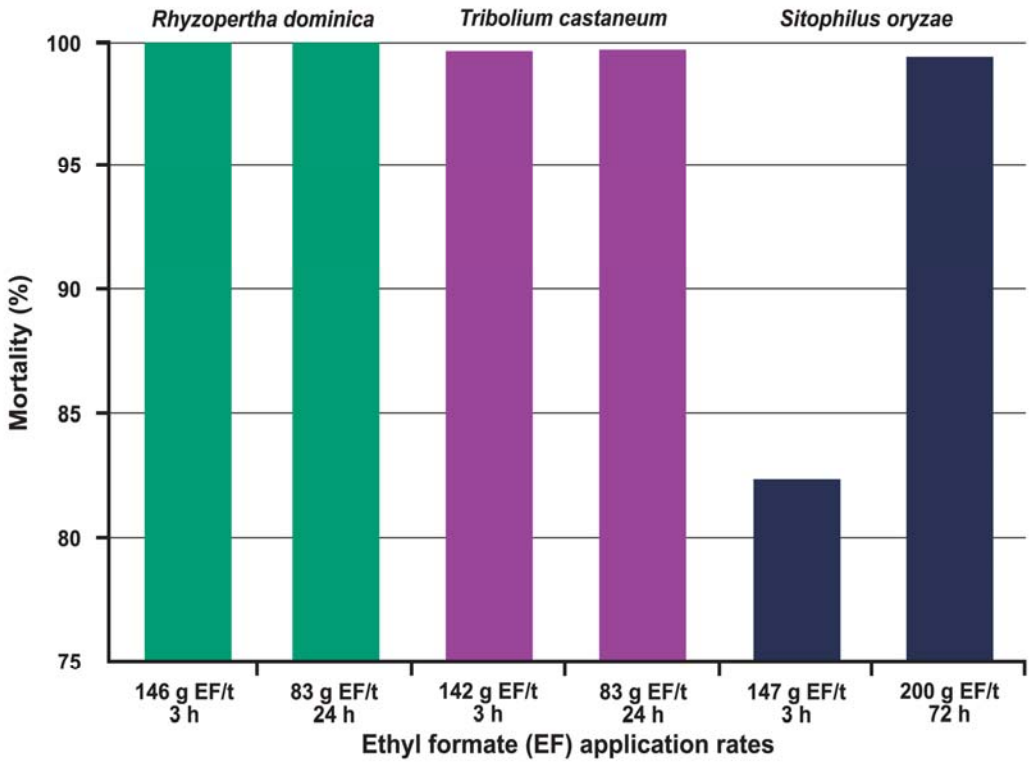

Fig. 3. Mortality of mixed age cultures containing 5-25,000 insects, of the most tolerant stored grain insects exposed to **3 and 24 hour** VAPORMATE™ fumigations of wheat.