VAPORMATE™: DISINFESTATION OF PHILIPPINE EXPORT BANANAS

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Abstract
Fresh produce exported from Asian markets poses a Biosecurity threat to importing countries through the unwanted introduction of pests and disease which could be devastating to local agricultural production. The detection of regulated quarantine pests in imported bananas requires fumigation before the produce is released into the market. Frequent interceptions leads to increase cost of fumigation reducing margins and quality (fumigation need to be conducted at elevated temperature). Moreover it is generally agreed that the country of origin of the fresh produce have the responsibility to minimise this Biosecurity risk. Low risk quarantine pre-shipment treatment of bananas for export allows for the effective management of these unwanted pests. A feasibility study in the Philippines identified VAPORMATE, containing the low human risk active compound ethyl formate formulated in liquid carbon dioxide, as potential candidate to elimination pests when applied as a pre-shipment in the pack house. Laboratory and field trials showed the regulated pests like mealybugs, mites and scale can be eliminated when applied into the plastic liner prior to stacking and export. Consignment trials demonstrated that complete mortality can be achieved and that no survivors were found indicated that viability of eggs (mites) were also affected during shipment. The effect on banana quality from a single exposure of VAPORMATE is dependent on application rate. A single application rate without compromising produce quality and efficacy has been identified.

It is recommended that:

- VAPORMATE™ can be applied at 27% [equivalent to 80g/m^3 of ethyl formate or ~0.5kg/m^3 of VAPORMATE] in an air mixture to eliminate regulated pests when filled and sealed into an air evacuated box of bananas and shipped for 10 days to New Zealand or other potential markets.

Background

Export quality 'Cavendish' dessert bananas are regularly shipped from the Philippines to markets in Japan, China, Korea, Taiwan, China, Singapore, Middle East and New Zealand. In 2003, about 2 million tonnes of bananas were exported from the Philippines. Fresh commodity exports poses potential Biosecurity risks to importing countries and quarantine arthropods like mealybugs, mites and scale have been intercepted in shipments.

VAPORMATE contains 16.7wt% ethyl formate in liquid carbon dioxide. Ethyl formate is being evaluated as a replacement for methyl bromide in grain and in horticultural produce. VAPORMATE has been shown to be effective against a wide spectrum of arthropod pests, safe for operators and consumers, and tolerated by fresh produce.

Ethyl formate occurs naturally in orange juice, honey, apples and pears and distilled liquors such as rum. It is used as a synthetic flavouring agent especially in lemonade and rum, and fragrances. It decomposes slowly in water releasing formic acid and ethanol. It is a rapid killing broad spectrum fumigant known to affect different life-stages of arthropods. Its flammability has been eliminated by formulating in liquid carbon dioxide. VAPORMATE is a registered pesticide [APVMA # 56186] in Australia for use in grain and horticultural produce.

Philippine trials conducted at Stanfilco's R&D Unit StarTech, in Panabo, Philippines show that VAPORMATE has the potential for use as a pre-shipment disinfestation treatment of bananas for export. Initial commercial pre-shipment evaluation of the product when applied in boxes of bananas for export has:

- generated pest mortality data for the commonly intercepted quarantine pests especially mites, mealybugs and scales when exposed to VAPORMATE under tropical conditions,
- demonstrated the feasibility of sending commercial pre-shipment treatment shipment to New Zealand,
- Assessed the effect of VAPORMATE on the quality of shipped bananas.

Table 1. Efficacy of different concentrations of VAPORMATE

% concentration VAPORMATE in air	*% mortality of mites*		*% mortality of mealybugs with bananas*	*% mortality of soft scale and its eggs*
	With bananas	*Without bananas (in plastic bag only)*		
0	*0.0a**	*18.9a*	*0.3a*	*12.4*
8	*26.9b*	*100.0b*	*82.1b*	*100*
27	*96.5c*	*100.0b*	*100.0c*	*100*
41	*99.4cd*	*100.0b*	*100.0c*	*100*
50	*100.0d*	*100.0b*	*100.0c*	*NA*

**** Means with the same letter after them are not significantly different***