QUARANTINE APPLICATION OF THE NEW V-HF SYSTEM TO CONTROL THE LARGE NARCISSUS FLY

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Abstract

The large narcissus fly *Merodon eques* F. is a quarantine insect species that attack narcissus bulbs as well as bulbs of other geophytes. Fumigation with methyl bromide is the only rapid treatment available for handling infested bulbs. However, under the terms of the Montreal Protocol, ending the use of methyl bromide and due to the phytotoxic effect of methyl bromide and other fumigants there was a need to develop a new treatment method.

In laboratory work, we exposed infested bulbs with maggots of the large narcissus fly to treatments of vacuum, CO_2 and hermetic conditions. The LT_{99} values for exposure to 50 mm Hg vacuum, to hermetic conditions and to 90% CO_2 were 24, 34, and 24 h, respectively. Respiration of the bulbs under hermetic conditions caused increase in CO_2 concentration to 24% within 34 h.

Here we report on three semi-commercial experiments that were conducted in Israel on July 2002. In these experiments, we used a prototype of the newly developed V-HF (vacuum hermetic fumigation) system to demonstrate its effectiveness to control the large narcissus fly under hermetic conditions. The bulbs were placed in the V-HF system on the their original shipping pallets using a forklift. Each pallet consisted of 920 kg of narcissus bulbs stored in 40 crates stacked in 8 rows. In each experiment, 3 pallets of the commodity were arranged inside the V-HF system. At start of the experiment, a slight vacuum of 100 Pa was applied to adhere the V-HF liner to the crates, thus minimizing the free space within the V-HF system. To achieve the desired modified atmosphere we used the respiration of the narcissus bulbs, which under hermetic sealed condition obtained by the V-HF system, resulted in a rapid O_2 depletion. In all of the three experiments the O_2 concentration was decreased to levels of 0.1% within 18 h, while the CO_2 concentration increased up to 21% at the opening of the system, all at 30ºC. During the narcissus bulbs harvest season (July-August) the natural temperature of the bulbs remain almost constant at 30ºC. Therefore, artificial heating of the bulbs to reach 30ºC is not required. The demonstration quarantine application was carried in the packing house of a narcissus bulbs grower. Although, according to our laboratory work an exposure time of 34 h was needed to obtain 99% mortality of the pest, the system was kept sealed for 45 h to insure the successes of the treatment and to meet the grower demand for unpacking of the bulbs from the V-HF system.

Infested narcissus bulbs were inserted prior each experiment in mesh bags at the top layer, middle layer and at the bottom of layer each V-HF system. These infested bulbs were examined and no live larvae of were found at the end of the three treatment tests. These preliminary experiments gave promising results to the possibility of quarantine treatment of narcissus bulbs without the use of MB.

Acknowledgement: This research was partially funded by a grant from the United States-Israel Science and Technology Foundation (USISTF), ARO Project No. 417-0384-01.