

New fumigants for stored products

Under a programme funded by the United States-Israel Science and Technology Foundation, various alternatives to the use of methyl bromide (MeBr) for eliminating pests in stored products have been studied. A study on the use of propylene oxide (PPO), by Mr. A.A. Isikber and colleagues, has shown that a combination of PPO with low pressure or carbon dioxide (CO₂) could be a potential alternative to MeBr. The team studied the relative effectiveness of PPO alone and in combination with low pressure (100 mm Hg) or 92 per cent CO₂ against all life stages of *Tribolium castaneum* (Herbst) during an exposure time of 4 h. Tests were carried out in desiccators at 30°C and 70 per cent relative humidity. Sorption of PPO alone by wheat, cacao bean and corn was observed at regular intervals for a 4 h period when an initial concentration of 82 mg/l was applied. Results suggest that low pressure or CO₂ has a synergistic effect on the tested insects when exposed to PPO. Sorption of PPO by corn, wheat and cacao beans after 4 h exposure time varied from 57-79 per cent of initial concentration.

Mr. Isikber and team also investigated the toxicity of PPO, in combination with vacuum or CO₂, to *T. castaneum*. Preliminary tests have shown that PPO exhibits insecticidal properties under vacuum conditions. PPO also demonstrated its fumigant properties by killing all stages of the confused flour beetle, the Indian meal moth and the warehouse beetle. Results suggest that a combination of PPO with CO₂ or vacuum can be a potential MeBr replacement in some critical applications. However, further research is needed to obtain data on its absorption by different commodities and its penetration through the mass of commodities.

A team led by Mr. S. Navarro examined integrated storage pest control methods using vacuum or CO₂ in transportable systems. The influence of CO₂ at 45°C on reducing the exposure time expressed as LT99 values for diapausing larvae of *Trogoderma granarium* showed that by raising CO₂ concentration to 90 per cent the exposure time decreased to about 9.5 h, whereas at 35°C the LT99 value was 29.1 h. Tests with *Ephestia cautella* showed that the pupae was the most resistant stage to the same treatment with an LT99 value of only 3.4 h, and for *Oryzaephilus surinamensis* under similar conditions it was less than 2 h for the most resistant larval stage. Laboratory studies with *Lasioderma serricornis* exposed to low pressures at 30°C, LT99 values for adults was 15.3 h when exposed to 25 mm Hg. *T. granarium* larvae were the most resistant species, for which under the same conditions 172 h exposure was necessary.

Mr. S. Finkelman and team applied vacuum to sealed containers as a viable MeBr alternative for disinfesting durable commodities. Lab-scale trials have shown that the eggs of *E. cautella* and *T. castaneum* were the most resistant stage to storage under a low air pressure of 50±10 mm Hg at the two studied temperatures of 18°C and 30°C. Mortality of 99 per cent was recorded for *T. castaneum* at 96 h and 53 h, and for *E. cautella* at 149 h and 41 h. *Contact: Storage Technologies Group, Dept. of Food Science, Agricultural Research Organization, P.O. Box 6, Bet Dagan 50250, Israel.* (Website: www.agri.gov.il)