

Insecticide aerosols in storage IPM: biological efficacy and residues in air and food

Stejskal, V.*¹, Kocourek, V.², Aulicky, R.¹, Hajslova, J.²

¹Crop research Institute, Drnovska 507, 161 06, Prague Czech Republic

²Institute of Chemical Technology Prague, Technicka 5, 16628 Prague, Czech Republic

*Corresponding author, Email: stejskal@vurv.cz

#Presenting author, Email: stejskal@vurv.cz

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Abstract

Any storage IPM program should take into consideration not only pest risks (economic or medical) but also any possible side effects of chemical residues on environment and food. After phase-out of the fumigant methyl bromide, insecticide aerosols are a frequent interest of research as alternatives. Past studies were mainly focused on efficacy on pests but less attention is paid to spatio-temporal dynamics of aerosols in terms of safe “re-entry” into facility or insecticide residues in food and other agrocommodities after aerosol space-treatment. Current work brings new results on the effect of two insecticides, the pyrethroid cypermethrin and the organophosphate pyrimiphos-methyl, in smoke or ULV formulations. The study examined mortality of four stored pests (*Cryptolestes ferrugineus*, *Oryzaephilus surinamensis*, *Sitophilus granarius*, *Tribolium castaneum*) and also on dynamics of aerosol residues in air, and agrocommodities such as flour, pea, oat flakes, rice, wheat, sunflower seed and rape seeds. The air sampling was performed for 12 hr in 3 hr intervals in two methods one in well-sealed experimental chamber and other in a real-world big store. For both formulations and active ingredients evaluated, of the tested species, *C. ferrugineus* and *O. surinamensis* were most susceptible. We found that the biological efficacy of smoke-aerosol decreased over time more rapidly in the well-sealed chamber (low or zero mortality after 3 hours) than in the unsealed big stores (mortality even 6-12 hrs after application). This phenomenon was in agreement with GC airborne residues measurements: the time-weighted concentration of both active ingredients in the air decreased much quickly in chamber than in the store. Residues in food commodities sprayed by ULV formulations were detected mostly in the surface layers. Residues of pyrimiphos-methyl and cypermethrin in wheat sampled in 0-1 cm depth ranged between 5–15 mg.kg⁻¹ and 0.3–0.8 mg.kg⁻¹ respectively. Significantly lower residues of both insecticides in food were recorded for smoke generator than for ULV treatment.

Keywords: insecticides, aerosols, biological efficacy, residues in air, residues in food