

Title Plant products as fumigants for stored-product insect control
Author S. Rajendran and V. Sriranjini
Citation Journal of Stored Products Research, Volume 44, Issue 2, 2008, Pages 126-135
Keywords Plant products; Essential oils; Fumigant toxicity; Stored-product insects

Abstract

Research studies on plant essential oils and their constituents as fumigants, i.e., compounds acting on target insects in the vapour or gaseous phase, against stored-product insects have been reviewed. Fumigant toxicity tests conducted with essential oils of plants (mainly belonging to Apiaceae, Lamiaceae, Lauraceae and Myrtaceae) and their components (cyanohydrins, monoterpenoids, sulphur compounds, thiocyanates and others) have largely focused on beetle pests such as *Tribolium castaneum*, *Rhyzopertha dominica*, *Sitophilus oryzae* and *Sitophilus zeamais* but little or no attention has been paid towards moths such as *Corcyra cephalonica* and *Sitotroga cerealella*. Adults were generally susceptible, whereas, eggs were either tolerant or highly susceptible depending on insect species and the type of essential oil or component. The essential oils proved effective in mixture with CO₂ or ethyl formate. Mode of action studies on monoterpenoids indicate inhibition of acetylcholinesterase enzyme activity as the major site of action. Although, in laboratory tests with adult insects, some of the plant compounds have shown insect toxicity comparable to methyl bromide or chloropicrin, their physical properties such as high molecular weight as well as high boiling point and very low vapour pressure are barriers for application in large-scale fumigations. Plant products, therefore, have the potential for small-scale treatments, space fumigations and as adjuvants for conventional fumigants. The constraints including lack of data for single or multiple components of essential oils on sorption, tainting and residues in food commodities, and registration protocols have been highlighted. The use of egg and pupal stages or preferably mixed-age cultures of target insects in screening tests with any new plant essential oil/compound has also been stressed.