

Comparison of toxicity between ethanedinitrile (EDN) and methyl bromide (MB) to five species of stored product insects

Ren, Y.L.*^{1,2}, Agarwal, M.^{1,2}, Lee, B.H.³, Thalavaisundaram, S.⁴

¹School of Veterinary and life Sciences, Murdoch University, WA, 6150, Australia

²Cooperative Research Centre for National Plant Biosecurity, GPO Box 5012, Bruce, ACT 2617, Australia

³Dongbu ARI, Dongbu Farm Hannong Co. Ltd., Nonsan, Republic of Korea

⁴BOC limited, 10 Julius Avenue, North Ryde NSW 2113, Australia

*Corresponding author, Email: y.ren@murdoch.edu.au

#Presenting author, Email: y.ren@murdoch.edu.au

DOI: xx.xxxx/xxx.2014.xxx.xxx.xxx

Abstract

The fumigation was conducted in 250 mL Erlenmeyer flasks containing 50 g mixed-age cultures (containing more than 100 countable adult insects and uncountable immature stages of eggs, larvae and pupae) at 25°C and 65% RH. Ethanedinitrile (EDN) and methyl bromide (MB) concentrations were monitored to calculate the Ct product. The control was maintained in a sealed bottle without fumigant until completion of exposure. Each treatment was at 6-9 levels of fumigant and in 5 replicates and 3 controls. At the end of the fumigation period of 6 and 24 hours, the treated and control bottles were opened for 1 hour of aeration. The insects were transferred to new bottles (50 mL), 25% full of fresh media, and then incubated at 25°C and 70-75% RH. Comparison of toxicity between EDN and MB to five species of insects showed that complete mortality was obtained in all mixed-age cultures of *Tribolium castaneum*, *Rhyzopertha dominica*, *Sitophilus oryzae*, *Trogoderma variabile* and *Lasioderma serricorne*. Both MB and EDN were efficacious for all the life stages of five tested insect species. However, the observed Concentration × time (Ct) products of EDN to completely kill all life stages of the five insect species were substantially lower than that for MB for both 6 and 24 hours fumigation. That is, toxicity of EDN was substantially greater than that of MB. In particular, EDN was highly toxic to all the life stages of *T. castaneum* (4-5 times > methyl bromide), *R. dominica* and *T. variabile* (about 2 times > MB), adult stages of *S. oryzae* and all immature stages of *L. serricorne* (about 2 times > MB). The emergence of immature stages in the control was very high in comparison with the number of initially added adults. The EDN has great potential to replace methyl bromide for fumigation of timber or log.

Keywords: fumigant, fumigation, ethanedinitrile, methyl bromide, stored product insect