

SYNERGISTIC TOXICITY OF ATRAZINE AND ORGANOPHOSPHATE INSECTICIDES CONTRAVENES THE RESPONSE ADDITION MIXTURE MODEL

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Abstract—A toxic unit (TU) approach was used to test the response addition model for mixtures of pesticides with differing modes of action. Atrazine was tested in binary and ternary combinations with the organochlorine insecticide methoxychlor and organophosphate insecticide methyl-parathion. Atrazine was also tested in binary combinations with additional organophosphates. The TU for atrazine was set slightly below its water solubility limits (TU = 20 ppm), which is well below its 96-h 50% effective concentration for the fourth instar of the midge, *Chironomus tentans*. In 96-h acute toxicity tests using *C. tentans*, atrazine was found to produce synergistic (greater than additive) toxicity in a binary mixture with methyl-parathion. Less than additive toxicity was found for the combination of atrazine with methoxychlor (likely due to the low TU assigned to atrazine). The ternary combination of atrazine + methyl-parathion + methoxychlor was found to be marginally synergistic. Results of toxicity tests with atrazine in binary combinations with other organophosphates indicate more than additive toxicity for all compounds except mevinophos. Possible hypotheses are presented in an attempt to explain the noted synergistic relationship between atrazine and various organophosphorous insecticides. These results suggest that the response addition model does not always accurately predict mixture toxicity for chemicals with differing modes of action.

Keywords—Response addition model Synergism Atrazine Organophosphates Mixtures