

## IMPACT OF ATRAZINE ON ORGANOPHOSPHATE INSECTICIDE TOXICITY

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(Received 9 August 1999; Accepted 24 January 2000)

**Abstract**—Acute toxicity of selected organophosphorus insecticides (OPs; chlorpyrifos, methyl parathion, diazinon, and malathion) was determined for individual OPs and binary combinations of the OPs with atrazine to larvae of the midge *Chironomus tentans*. Atrazine individually was not acutely toxic even at high concentrations (10,000 g/L); however, the presence of atrazine at much lower concentrations (40–200 g/L) increased the toxicity of chlorpyrifos, methyl parathion, and diazinon. Atrazine did not increase the toxicity of malathion. Possible mechanisms for the synergistic toxicity found between atrazine and chlorpyrifos were investigated, including increased uptake rate and increased biotransformation into a more toxic metabolite. Although the uptake rate was increased by more than 40%, the resulting increase in toxicity would be minimal as compared to the 400% decrease estimated to occur in EC50 values for the same atrazine exposure (200 g/L). Body residue analysis of midges exposed *in vivo* to atrazine and chlorpyrifos mixtures for 96 h indicated that a larger amount of metabolites was generated in atrazine treatments as compared to controls. Additionally, *in vitro* assays of microsomal proteins obtained from treated and control midges indicated that an increase in toxic metabolite (chlorpyrifos-*O*-analog) was generated in atrazine-treated midges. Therefore, the increase in toxicity is thought to be due to an increase in biotransformation rates of the OPs, resulting in more *O*-analog within the organism.

**Keywords**—Atrazine Organophosphate insecticides Mixtures Synergism Biotransformation