Modification of the sex-pheromone communication system associated with organophosphorus-insecticide resistance in the obliquebanded leafroller

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The obliquebanded leafroller, *Choristoneura rosaceana* (Harris) (Lepidoptera: Tortricidae), is native to North America. The larvae are polyphagous, although members of the Rosaceae are considered its primary hosts. It has become a major pest in commercial apple orchards because it has developed resistance to organophosphorus, pyrethroid and carbamate insecticides. The pheromone communication system of azinphosmethyl-susceptible (susceptible) and azinphosmethyl-resistant (resistant) obliquebanded leafrollers from the Niagara Peninsula of Ontario was compared in the laboratory and field. The pheromone glands of resistant females contained approximately one-half as much (*Z*)-11-tetradecenyl acetate (Z11-14:Ac), (*Z*)-11-tetradecenol (Z11-14:OH) and (*Z*)-11-tetradecenal (Z11-14:Al) as the glands of susceptible females. A similar amount of (*E*)-11-tetradecenyl acetate (E11-14:Ac) was found in the glands of both types of females. The pheromone effluvium from resistant females contained approximately one-half as much of each of the four pheromone-gland compounds as the effluvium from susceptible females. The onset and duration of female calling and the effect of age on calling were similar in susceptible and resistant *C. rosaceana*. In a flight tunnel, pheromone gland extracts from susceptible and resistant females, and calling susceptible and resistant females were equally attractive to both susceptible and resistant males. In an apple orchard, traps baited with virgin resistant females captured approximately one-half as many marked and released susceptible and resistant males as traps baited with virgin susceptible females. There was no difference in the response of antennae from susceptible and resistant males to synthetic Z11-14:Ac and E11-14:Ac. The antennae of resistant males were less sensitive to Z11-14:OH and Z11-14:Al than the antennae of susceptible males. In an apple orchard, the rate of capture of marked and released susceptible males was greater than that of resistant males in traps baited with susceptible females, but not in traps baited with resistant females or in traps baited with synthetic pheromone.

Exposing susceptible females to a sublethal dose of azinphosmethyl resulted in a 30% reduction in the amount of Z11-14:Ac, E11-14:Ac and Z11-14:Al in their pheromone glands. The exposure of resistant females to insecticide residue did not affect the amount of pheromone in their glands. The glands of resistant females exposed to azinphosmethyl contained approximately 40% less Z11-14:Ac, E11-14:Ac and Z11-14:OH than the glands of susceptible females that had been exposed to this insecticide. The incidence of calling was reduced on average by 77% in azinphosmethyl-treated susceptible females. The incidence of calling by resistant females was not affected by exposure to azinphosmethyl. The average incidence of calling was 75% less in azinphosmethyl-treated susceptible females than in azinphosmethyl-treated resistant females. In a flight tunnel and an apple orchard, the attractiveness of susceptible and resistant females was significantly reduced by treatment with azinphosmethyl. In a flight tunnel, the percentage of susceptible and resistant males locating a source of pheromone-gland extract was not affected by treatment with azinphosmethyl. In an

apple orchard, the percentage of marked and released susceptible and resistant male moths locating a source of synthetic pheromone was also not affected by exposure to azinphosmethyl. The differences observed in the pheromone communication systems of susceptible and resistant *C. rosaceana* are likely pleotropic effects associated with the selection for insecticide resistance.