

Section 3: Pesticides and the Environment

Learning Objectives

When you have completed this section, you should be able to:

- indicate the relative residual activity of pesticides used for mosquito and black fly control
- identify the pesticides with the least impact on nontarget species

Environmental Impact

In general, the products available for the control of larval mosquitoes and black flies are more environmentally acceptable than the products used for the control of the adult stage. Larvicides are generally more specific and are applied to a limited area thus minimizing effects on nontarget species. The adulticides are less specific and are applied in a fashion that may result in significant drift to areas that should not be treated. **Thus, whenever possible, use larvicides rather than adulticides.**

Bacteria

Bacillus thuringiensis israelensis (Bti) poses little threat to human health through either handling products directly or being exposed to them indirectly. To activate Bti toxins, alkaline conditions that exist only in certain insects' digestive systems must be present. The acidic stomachs of humans and animals do not activate Bti toxins. There have been no documented cases involving toxicity or endocrine

disruption potential to humans or other mammals over the many years of use in Canada and around the world. Studies have shown that even if Bti spores are ingested or inhaled, they are eliminated without any adverse health effects. Bti also poses little threat to other vertebrates, beneficial insects, and most non-target aquatic organisms. It may adversely affect chironomids and some related insects in the Order Diptera that are in the larval stage in the few days following treatment. It has no effective residual activity. It is one of the most selective and environmentally benign control agents available for mosquito or black fly control.

Insect Growth Regulators

Methoprene has minimal toxicity to mammals and birds. It will affect only other insects that are in their larval stage at the time of treatment. It is somewhat toxic to shrimp, crabs and fish, but only at rates well above those expected from mosquito control. Methoprene is easily metabolized by vertebrates.

Methoprene has a very short half life (hours) and must be formulated in a fashion that will increase its residual activity (slow release or briquette). In the slow release formulation, residual activity of several days may be expected while the briquette releases methoprene over several weeks.

Botanical and Synthetic Botanical

Pyrethrum is used for the control of many insect pests in Canada, including larval and adult mosquitoes. Outdoors, pyrethrum is quickly broken-down by light and air and has a short residual life. Pyrethrum has a low mammalian toxicity, but is toxic to fish.

Resmethrin is an example of a synthetic pyrethroid used for the control of adult mosquitoes and other biting flies. It is similar to pyrethrum but is generally more effective and has a longer residual activity. More stable than pyrethrins, resmethrin still has a relatively short residual life when exposed to air or light.

Chlorinated Hydrocarbon

Methoxychlor has a relatively long residual activity (days to several weeks) and acts as both a contact and stomach insecticide. It shows little or no tendency to be stored in body fat and is readily metabolized and excreted from the body. It may be used as a residual spray to control adult mosquitoes in yards and recreational areas. It has a low toxicity to warm-blooded animals, including humans. Rarely phytotoxic, it is used on a very wide variety of crops as a seed treatment or foliar application.

Organophosphates and Carbamates

A variety of organophosphate and carbamate insecticides, are used to control larval and adult mosquitoes. Most of these insecticides have little residual activity (several days) although **chlorpyrifos** may show residual activity for several weeks in larval habitats.

Because **chlorpyrifos** is toxic to crustacea and fish, care must be used when it is applied to aquatic habitats.

Propoxur is a carbamate insecticide that may be toxic to bees at rates used for mosquito adulticiding.

Review Questions

1. What insecticide may show harmful effects against bees at rates used for mosquito adulticiding?
2. What organophosphate larvicide should not be used in areas with fish and crustacea?
3. Which larvicide must be formulated in a fashion to increase its residual life?
4. Which chlorinated hydrocarbon insecticide is used as a residual spray to control adult mosquitoes?
5. Bacillus thuringiensis israelensis (BT H14) may have harmful effects against which other insects?

