Tebufenozide FAQ

Maine Department of Agriculture, Conservation & Forestry
Forest Health & Monitoring

Spruce budworm (SBW) populations are currently building in northern Maine. To reduce SBW populations and prevent an outbreak, landowners in Maine successfully advocated for emergency funding and formed The Maine Budworm Response Coalition (MBRC), where they are collaborating with The Maine Forest Service (MFS) to implement management strategies. The Maine Forest Service is providing technical support and communications to landowners who may be impacted by SBW.

Part of the MBRC response will include aerial applications of insecticides with the active ingredient tebufenozide (product name Mimic 2LV) in areas with SBW populations at or above the outbreak level to prevent an outbreak.

What is tebufenozide?

Tebufenozide is an active ingredient in the product Mimic 2LV. Tebufenozide acts an insect growth regulator that mimics a hormone in the larval stage of moths and butterflies, causing the caterpillar to molt too early during its development and results in mortality.

How does tebufenozide kill insects?

Tebufenozide needs to be eaten by butterfly or moth larvae to have any effect. When a young larva consumes foliage treated with tebufenozide, the tebufenozide mimics an insect hormone secreted during natural insect molting. As a result, the larva stops eating and is forced to molt too early, eventually leading to its death.

Do humans need to take care not to be exposed to tebufenozide?

Tebufenozide has been well studied over the past 30 years and received the U.S. Environmental Protection Agency's (EPA) Green Chemistry award in 1998 for its low toxicity to most animals, low ability to persist in soils, and its specificity toward butterfly and moth larvae. Of the 200+ tests and research studies conducted to determine risks to humans from tebufenozide, results suggest that tebufenozide is not a carcinogen, mutagen, neurotoxin, or an endocrine disrupter. Due to this data, tebufenozide is deemed practically nontoxic at applied concentrations and causes no adverse effects to humans. Though research indicates that products with tebufenozide are practically nontoxic at applied concentrations, efforts are in place to prevent people from being on site during applications and for 4 hours afterward.

How long does tebufenozide stay active?

After aerial application, tebufenozide settles onto tree foliage in the treatment area where it affects butterfly or moth larvae for ~18-44 days. After this time, the effectiveness of tebufenozide decreases as it naturally breaks down, further aided by direct sunlight and microbial activity. This is a desired outcome as the primary impacts will occur during the period when young SBW larvae are feeding on the foliage; afterward, other Lepidopteran species that may be in the treatment areas are less likely to be affected from the reduced concentrations of tebufenozide.

How does tebufenozide affect other terrestrial organisms?

Tebufenozide will only impact butterfly and moth larvae that consume treated foliage due to its function as a mimic of an insect growth regulator; it does not affect other species of insects, including bees or other beneficial insects. Additionally, tebufenozide is practically nontoxic to mammals or birds. The small portion of tebufenozide that may reach the ground (not intercepted by the spruce-fir foliage) will not harm soil dwelling invertebrates or leach into groundwater as it only remains in the top 5cm of the ground before naturally breaking down.

Will Maine's waters and aquatic organisms be impacted from tebufenozide applications?

No, tebufenozide applications are not likely to cause adverse effects to fish or aquatic invertebrates under normal application conditions. While there are no negative impacts to fish, some species may bioaccumulate tebufenozide, resulting in trace amounts present in edible fish tissues – a concentration low enough that it would not cause adverse health effects on humans or wildlife if consumed. Water fleas and midges may be sensitive to tebufenozide, but only if significantly high concentrations are present (such as an accidental spill) – an amount that is not expected to occur during the aerial application.

As an additional precaution, bodies of water were buffered at four times the legal minimum to prevent accidental drift or runoff. It is worth noting that 90-95% of tebufenozide that settles on foliage is considered relatively "rainfast", where it is not easily washed off by rainfall, so runoff events into bodies of water or impacts to aquatic species would not be expected.

Are the natural enemies of SBW impacted by tebufenozide?

Natural enemies (birds, wasps, spiders, ants, etc.) present on the foliage during aerial tebufenozide applications will not be affected, as they do not have the specific hormone receptors responsible for larval molting found in butterfly and moth larvae. Because aerial applications do not directly impact SBW natural enemies, treatments can contribute to the mortality already caused by these organisms, further reducing populations.

Will birds and mammals that eat larvae treated with tebufenozide be affected?

No, tebufenozide does not impact birds and mammals as they do not have the hormone receptors responsible for larval molting found in butterfly and moth larvae. Therefore, larvae treated with tebufenozide will not be toxic toward any other orders of insects, mammals, or birds. There may be indirect impacts for birds or other organisms that readily feed on SBW larvae as a food source, however this is temporary and remedied by the animals adjusting their foraging habits.

How is tebufenozide different than the DDT (dichloro-diphenyl-trichloroethane) used during older outbreaks?

DDT was used widely to reduce insect populations in agriculture, forestry, and in urban settings to reduce insect-borne diseases and indoor pests. As a broad-spectrum contact insecticide, it killed all types of insects and negatively affected organisms that encountered it. Tebufenozide is narrow spectrum; only targeting the larval stage of butterflies and moths that consume it, with no adverse impacts on other organisms.

Tebufenozide naturally breaks down in the environment after a couple of months, whereas it takes years for DDT to break down – in some areas today, DDT is still present in the soils of forests and aquatic sediments where it was originally applied.

After 30+ years of DDT use, growing evidence suggested the negative environmental and health risks outweighed the benefits, leading to its ban in the U.S. in 1972. Meanwhile, tebufenozide is listed as a reduced risk insecticide and received the Green Chemistry award from the EPA and is a low-risk choice to manage SBW populations.

Where can I get more information?

For more information about tebufenozide or Mimic 2LV, contact the National Pesticide Information Center at 1-800-858-7378, or the Maine Board of Pesticide Control at 1-207-287-2731 or email pesticides@maine.gov.

For more information about SBW, visit the Maine Forest Service, Forest Health & Monitoring website http://www.maine.gov/sbw, call 207-287-2431, or email foreshealth@maine.gov.

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