Forest Health: Insecticides

Forest Health Fact Sheet

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National Park Service

Carbaryl spray for bark beetle prevention

The best tool for management of forest insect pests is prevention.

Maintaining tree resiliency allows trees to defend themselves from attack or tolerate and regrow after attack. Resiliency is dependent on planting appropriate tree species and cultivars in suitable locations, where trees have access to resources required for growth. As an example, dry, sun-exposed areas at lower elevations in the Willamette Valley are best suited for Valley pine and white oak rather than Douglas-fir.

There are some cases in which chemical application is appropriate for prevention or control of some insect pests. Here we list a few of the most common pesticides used in Oregon forests and how they should be used.

Information provided is not an endorsement of products or pesticide application. EPA, ODA, ODF forest practice and OSHA rules also apply

Pesticides come in many forms, including both synthetic chemicals and biopesticides derived from plants, microorganisms or elements found in the environment.

Pesticides may be applied as external sprays, repellants or baits, soil drenches, trunk injections, etc. In some cases aerial application is necessary to cover a larger area.

Synthetic chemicals
Sprays with active ingredients such as carbaryl, bifenthrin, etc. can be applied to the entirety of a tree trunk until run-off wet to prevent entry by insects such as bark beetles. Although if these insects have already infested trees, these products are not effective. This treatment is laborious and expensive and only advised for high value trees at a small scale.

There are also preventative systemic trunk injections and soil drenches such as emamectin benzoate and azadirachtin for bark beetles and acephate or imidacloprid for sap-sucking insects. Systemics are hard for a tree to uptake and transport throughout all tissues, especially if applied during dry seasons, droughts or when trees are dormant. Broad-spectrum external sprays or even systemics may come into contact with and harm beneficial or non-target insects. Again, these products are expensive, time-consuming to apply and may require an applicator certified to use application systems. Visit the PICOL website for a current list of pesticides registered in Oregon: http://cru66.cahe.wsu.edu/labels/Labels.php

Risks

Pesticides (including biopesticides) have the potential to cause risks to the health of humans and wildlife as well as have cascading ecological impacts that we may not anticipate. Product drift and long residence time in plant or animal tissues, soils, water, etc. of some products may have impacts on non-target organisms that provide ecosystem services such as pollinators and natural enemies.

Apply products that are selective and use only as needed and directed. An overreliance on pesticides with only one mode of action, or application at dosages higher than necessary can result in pest resistance or lowered product efficacy. Pesticides can be a costly form of control. To reduce costs, other components of an integrated pesticide management program (IPM) should also be utilized.

When using pesticides, always read and follow the label and follow applicable regulations.

Biopesticides

Insects such as bark beetles and moths use pheromones to communicate. Pheromones help insects find mates, attract individuals to overwhelm tree defenses, or repel individuals to prevent overcrowding. Some of these pheromones have been isolated and replicated for use as repellants or attractants. These products may be applied as pouches stapled to trees, lures attached to traps, by hand or aerial equipment to dispense flakes or pellets over a larger area.

Christine Buhl, ODF

MCH pouch for prevention of Doug-fir beetle

Specific pheromone-based products include the repellants MCH, for Douglas-fir beetle and spruce bark beetle, or verbenone, for mountain and western pine beetles, which are applied in a grid layout to provide a 'cloud' of protection around individual or multiple trees. Target beetles will avoid attacking trees in a treated area and will instead search for unprotected trees. In this search they may die of exhaustion or their populations will get more dispersed on the landscape for a less concentrated attack. A variety of other pheromones are used for monitoring or trapping nursery, seed orchard and invasive insect pests.

Bacillus thuringiensis (Bt) is a naturally occurring soil bacteria used to control moth (Btk, Bta), fly (Bti) and beetle (Btg, Btt) larval stages. These products are sprayed on host foliage when larvae are actively feeding, when ingested they are activated by the alkaline environment of an insect's gut. Although Bt strains are highly selective in terms of targeting only certain insect groups, they may impact non-targets *within* that group. For example Btk only works against moth and butterfly larvae, but many moth and butterfly species feeding at the time of application may be affected.

Another bacteria-derived product is Spinosad, which was first isolated from bacteria found in sugarcane, and can be used against a wide variety of insect pests.

More information:

Oregon Dept. of Forestry, Forest Health
http://tinyurl.com/odf-foresthealth
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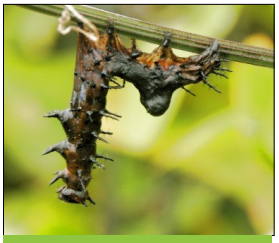
Useful products

- Preventative barrier sprays (e.g., carbaryl or bifenthrin sprays for bark beetles)
- Emamectin benzoate or azadirachtin systemics for some wood-infesting beetles
- Acephate or imidacloprid systemics for sapsucking insects
- MCH or verbenone pheromone repellants for some bark beetle species
- *Bacillus thuringiensis* (Bt) strains for specific insect groups
- Spinosaid, neem, pyrethrins have broad use across many types of insects

Neem and pyrethrins are products synthesized from plants (neem trees and chrysanthemums, respectively). Both products have broad application for insect pests.

Insect growth regulators and hormone mimics may be used to prevent pests from developing properly. One type of hormone mimic used in forestry is tebufenozide, which is used to control moth larvae.



Edith Smith

Caterpillar with NPV

Nucleopolyhedrosis virus (NPV) is a virus that naturally occurs in some moth and sawfly larvae populations. It tends to increase when populations are dense and for this reason it often appears during outbreaks and results in their collapse. Larvae that have NPV are often found hanging upside down, may exude dark liquid and are highly infectious to other larvae. Transmission or toxicity of NPV has not been shown in mammals. Selective strains have been isolated and mass-produced by some entities such as the U.S. Forest Service, although these products are in extremely limited supply.

Nematodes are microorganisms that can be harmful for plants but some are beneficial predators of insects. One of these includes nematodes used for the treatment of carpenterworm, a moth caterpillar that bores into hardwood trees.

Fungal pathogen sprays such as beauvaria, cordyceps, verticillium, etc. that parasitize and kill insects have shown potential and are in development for use.

Other references:

ODA Pesticides Division
https://www.oregon.gov/ODA/programs/Pesticides/Pages/AboutPesticides.aspx