QUICK GUIDE SERIES ID 2010-1

Product Use to Prevent Mountain Pine Beetle

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Within a year after mountain pine beetles attack a tree, the tree will fade to red. Photo: CSFS

A number of chemical (i.e. insecticides, pheromones) and natural (i.e. biopesticides, organic disease control) products are available to protect trees against mountain pine beetles (MPB). When selecting products to protect trees against MPB, the Colorado State Forest Service advises choosing those that best meet individual management objectives and are part of an integrated pest management program. Making informed choices and following all label instructions and warnings offers trees the best chance to resist mountain pine beetle attack. This document provides an overview of several products currently on the market for use in preventing mountain pine beetle attacks. The products are divided into several categories, and the appropriate uses are described for each product. The products are only discussed relative to their use in preventing mountain pine beetle attack. Please note that this Quick Guide does not provide a comprehensive list of all preventive products.

Both chemical and natural products are most effective when the correct dosage is applied at the appropriate time using correct application mechanisms that provide adequate coverage. The efficacy of all products varies on individual trees versus stand or landscape-level treatments, and is impacted by the surrounding forested landscape, mountain pine beetle population pressure and other pest management practices.

Chemical Products

Currently, almost 100 chemical products are registered for use in preventing bark beetle attacks in Colorado. Chemical products used in the state require registration with the Environmental Protection Agency (EPA) and the Colorado Department of Agricultural (CDA). The EPA requires extensive product testing and labeling of active and inert ingredients, and a clear statement of potential health hazards. Chemical products are available in a variety of forms and are delivered or applied by different mechanisms, including sprays and ground application of granules or powders. No stem-injection measures are approved by the EPA for bark beetle prevention.

This Quick Guide was produced by the Colorado State Forest Service to promote knowledge transfer.

October 2010
www.csfs.colostate.edu

Before applying a product to your forest, make sure you are choosing the product that best meets the management objectives for your property.

Always follow all label instructions and safety recommendations when using a chemical product.

When using chemical products, it is important to **closely follow all label instructions and safety recommendations.** Some chemical products should only be applied by licensed pesticide applicators or with appropriate protective gear. The application of many chemical products is restricted near water and some are known to have negative impacts on non-target species.

Spraying trees can reduce the risk of bark beetle attacks. Photo: Mark McGregor, USDA Forest Service, forestryimages.org

Preventive Sprays

When applied appropriately, preventive sprays can reduce the risk of individual tree loss to mountain pine beetle. Preventive sprays require annual application prior to bark beetle flights. These sprays will not impact bark beetles already present in a tree, and will not protect untreated portions of trees. Examples of sprays include:

Carbaryl (Sevin ®), Permethrine (Astro ®) and Bifenthrin (Onyx ®)

Preventive sprays:

- Are applied on the outer bark of susceptible trees;
- Are neurotoxins that deter mountain pine beetles from host trees;
- May be up to 97 percent effective in lodgepole pines compared to survival rates for untreated trees;
- Are not appropriate for use near riparian areas; and
- Are only safe to apply while wearing protective gear.

Trees that are not growing vigorously due to old age, crowding, poor growing conditions, drought, fire or mechanical damage, root disease and other causes are more likely to be attacked by MPB, much like the trees in the above landscape. Photo: CSFS

Soil Treatments

Soil treatments or drenches are applied directly to the soil surrounding susceptible trees. The chemical product is absorbed through a tree's root system and is transferred through the xylem, the living tissue that transports organic nutrients, to the foliage. Soil treatments are known to be effective against foliage-feeding insects. Product efficacy for deterring mountain pine beetles depends on the level of product present in the tree phloem when bark beetles are feeding. The product will only be encountered by beetles currently present in the tree, which may have done significant damage to the tree prior to encountering toxic levels of the product. Presence of the product is highly variable based on tree respiration rates, and multiple applications may be required. Examples of soil treaments include:

Dinotefuran (Safari ®), Imidacloprid (Marathon ®)

Soil Treatments:

- Are applied at the base of the tree;
- Are toxins that cause a cessation of feeding after contact or ingestion, followed by paralysis and death;

- Have demonstrated toxicity to numerous insects based on laboratory feeding assays;
- Have not been directly tested for use on mountain pine beetles;
- Offer an undetermined longevity of product efficacy (product presence in the phloem) in lodgepole pines;
- Offer an undetermined impact on bark beetle feeding and fungal inoculation; and
- May not be approved for use on some conifers.

Pheromones

Mountain pine beetles produce pheromones which are chemicals produced by plants and animals that play various roles in communication. Introducing manufactured pheromones to a group of trees can deter mountain pine beetle by interfering with communication. Pheromones can be applied in capsule pouches or flakes in suspended solution. Manufactured pheromone efficacy is impacted by stand conditions and bark beetle population pressure. Pheromones must be used annually. Examples include:

Verbenone (Synergy Beetle Block ®,Contech Disrupt Micro-Flake®, VBN Pine Beetle Repellant ®)

This verbenone pouch is a synthetic phermone that sends a message to the beetle that the tree is not available. Photo: Brytten Steed, USDA Forest Service, www.forestryimages.org

Phermones:

- Are applied as a time-release capsule pouch or flakes, to a stand of trees or an individual tree;
- Are emitted into the stand of trees and send a message that trees are not available to mountain pine beetles;
- Have demonstrated success under low bark beetle population pressure in lodgepole pines; and
- Have demonstrated poor success under high bark beetle population pressure in lodgepole pines.

Natural/Organic Products

Natural or organic products are alternatives to chemical products. Most natural or organic MPB prevention products have not undergone extensive testing procedures, and may not be registered with the EPA or CDA for use and distribution in Colorado. Natural products include organic disease controls (ODCs), microbial sprays and many others. Natural products are available in a variety of forms and are delivered or applied by different mechanisms, including sprays and ground/foliar application of granules, flakes or powders. Some natural products have not undergone rigorous field trials, and when used have shown variable efficacy.

Organic Disease Control

ODC products may improve tree vigor and the health of susceptible host trees. Measures of tree vigor and health include increased growth rates and improved defense mechanisms, such as resin production. This may assist trees in repelling mountain pine beetle attacks. Resin production is only one part of a trees defense against MPB. ODCs may require multiple

Product Overview of Some Available MPB Treatments

MPB Treatment	Brand/ Common Name	Type	Pros	Cons
Carbaryl, Permethrine, Bifenthrin	*Sevin®, Astro®, Onyx®*	*Chemical-Insecticide, Spray*	*Up to 97 percent effective for protecting lodgepole pines; EPA -registered and extensively tested*	*Should not be used near riparian areas; best for use on select trees (as opposed to stand-level applications)*
Dinotefuran, Imidacloprid, Emamectin, Benzoate	*Safari®, Marathon®, Proclain®*	*Chemical-Insecticide, Soil Treatment or Trunk Injection*	*Powerful insecticides*	*Not tested directly on MPB; may require multiple applications; may kill other insect species; not approved for use on some conifers*
Verbenone	*Synergy Beetle Block®, VBN Pine Beetle Repellant®*	*Chemical-Pheromone*	*Effective for large stands and individual trees; demonstrated success in lodgepole pines with low MPB populations*	*Poor success in lodgepole pines with high MPB populations*
Microbial Sprays	*Nationwide Organics*	*Biopesticide*	*Microorganism-based*	*Not tested on MPB; little product information; ingredients not disclosed*
Colloidal Chitosan	*AgriHouse ODC™, YEA®*	*Organic Disease Control (ODC)*	*Improves tree vigor and defense mechanisms (i.e., resin production) in some pine species; natural*	*Not tested directly for impacts on MPB; not tested in lodgepole or ponderosa pines; may require multiple applications*

Please note that the treatments in this table do not save trees already infested by mountain pine beetles. This is not a comprehensive list of all preventive products.

product applications. Examples include:

AgriHouse and other ODCs

ODCs:

- Are applied as a soil treatment at the base of the tree;
- Have demonstrated an increase in tree-resin flow on treated trees, predominately loblolly pines;
- Have not been tested in lodgepole or ponderosa pines;
- May support overall tree vigor; and
- Have not been directly tested for impacts on adult or developing mountain pine beetles.

Microbial Sprays

Microbial sprays are microorganism-based sprays that may repel mountain pine beetles from susceptible host trees. To date, minimal product evaluation has been performed on these sprays, and the recommended application frequency is unknown. The Colorado State Forest Service in unaware of any testing of microbial spray products. Examples include:

Nationwide Organics and others

Microbial sprays:

- Are applied as a preventive spray on the outer bark of susceptible trees;
- Have undisclosed product ingredients;
- Have not been tested for toxicity to mountain pine beetles.
- Have not been tested directly for impacts on adult or developing mountain pine beetles.

Additional Information

For more information, please contact your local Colorado State Forest Service district office or refer to the CSFS website at: www.csfs.colostate.edu.

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