Kansas State University Extension Entomology Newsletter

For Agribusinesses, Applicators, Consultants, Extension Personnel & Homeowners

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Dormant Oils

Dormant oils are applied during winter to kill insect and mite pests that survive the winter (overwinter) as eggs or mature females. Instead of waiting until spring to initiate management strategies, dormant oil applications can help reduce costs associated with pesticide inputs (in this case, insecticides and miticides) later in the growing season (spring through fall). The advantages of applying dormant oils include: 1) wide range of activity against the life stages of mite and scale pests—even the eggs; 2) less direct and indirect harmful effects to beneficial insects and predatory mites due to the timing of application; and 3) relatively low toxicity to humans and other mammals. The disadvantages of dormant oils include potential phytotoxicity (plant injury) and minimal residual activity or persistence.

Fig 1. Volck oil is an example of a dormant oil product (Auth--Raymond Cloyd, KSU)

Dormant oils are typically derived from paraffinic crude oil, and are the heaviest of the petroleum-based oil sprays with a low unsulfonated residue (Figure 1). The unsulfonated residue is an assessment of the phytotoxic compounds remaining after distillation

and refining. An unsulfonated residue >92% indicates a highly refined product with less potential for phytotoxicity. Dormant oils generally have a unsulfonated residue value <92%.

Dormant oil applications are primarily directed at killing overwintering life stages of certain mites and scales (Figure 2), before they become active in the spring and feed on plants. Applications are made during winter to minimize phytotoxicity to ornamental plants. A 2% to 4% application rate is generally recommended in early winter to early spring. Dormant oils have contact activity and either suffocate by blocking the breathing pores (spiracles), or directly penetrate and disrupt cell membranes. However, dormant oils have minimal residual activity once residues dissipate, so thorough coverage of all plant parts is important.

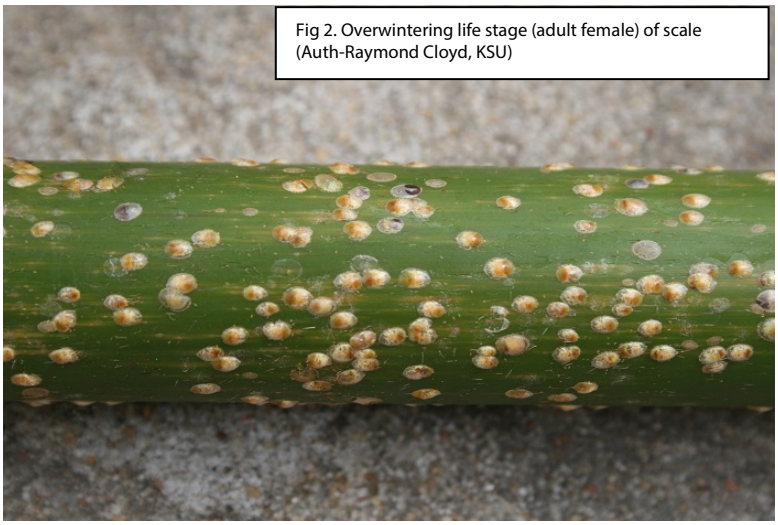

Fig 2. Overwintering life stage (adult female) of scale (Auth-Raymond Cloyd, KSU)

Since dormant oils are applied to all plant parts, the overwintering life stage of insect or mite pests must be located on the plant. However, not all insect and mite pests overwinter on plants. For example, dormant oil applications are not effective against the twospotted spider mite (*Tetranychus urticae*) because the mite overwinters as a female in plant debris, mulch, or other non-plant protected places. In contrast, the spruce spider mite (*Oligonychus ununguis*) overwinters as an egg on plants, primarily conifers, such as; arborvitae, hemlock, juniper, and pine. Therefore, the spruce spider mite is susceptible to dormant oil spray applications.

Dormant oils are effective in killing the overwintering stages of scales, especially first and second instars or nymphs (=crawlers). For example, euonymus scale (*Unaspis euonymi*) overwinters as second instar nymphs or mature females; both life stages are susceptible to dormant oil applications. However, certain scales that overwinter as eggs; such as, oystershell scale (*Lepidosaphes ulmi*) and pine needle scale (*Chionaspis pinifoliae*), are more tolerant of dormant oil applications because the eggs are generally stacked or piled on top of each other. Subsequently, dormant oils may not penetrate and contact the bottom layer. Consequently, supplemental insecticide applications are typically required after eggs hatch.

An issue when using dormant oils is the potential for phytotoxicity. Some plants, such as arborvitae, beech, redbud, and certain maples (Japanese, red, sugar, and amur), may be harmed by dormant oil sprays. Furthermore, the needles of Colorado blue spruce (*Picea pungens*) may be discolored or change from blue to green as a result of a dormant oil application. Phytotoxicity may be a problem when >4% application rates are used and/or when applications are conducted in early fall before dormancy or in late spring at bud-break. Problems associated with phytotoxicity are less likely to occur when applications are made in late November through February, which is when most plants are completely dormant. To avoid phytotoxicity, always ensure the spray solution is continually agitated.

Never apply dormant oils when ambient air temperatures are ≤40ºF (≤4.4°C). Dormant oils should be applied to deciduous plants (trees and shrubs) when the ambient air temperature remains above 40°F (4.4°C) for at least 24 hours. Conifers, in general, are more susceptible to damage than deciduous plants, so it is best to apply dormant oils when temperatures remain above 40ºF (4.4°C) over a 24-hour period although there is no quantitative evidence suggesting that applications made at ≤40°F (≤4.4°C) will damage dormant fruit trees. In addition, dormant oils should never be applied to plants that are stressed since stressed plants are more susceptible to phytotoxicity. For example, lack of moisture, extreme temperatures, sudden drastic changes in the ambient air temperatures after spraying, prolonged windy conditions, and disease or insect infestations may predispose plants to phytotoxicity. However, there is no direct evidence indicating that dormant oils are harmful to stressed trees.

There is a general misconception that insect and mite pest populations are unable to develop resistance to dormant oils. However, this is not true. For instance, a Christmas tree plantation of Scots pine (*Pinus sylvestris*) trees was sprayed with dormant oils for more than 10 years in succession to "control" pine needle scale. Eventually, the scale population became more and more difficult to "control." Why? Well, what was discovered was that the scale covers actually increased in thickness; making it difficult for the dormant oil to penetrate the outer covering and kill the eggs.

Dormant oil applications can alleviate dealing with insect and/or mite pest populations during the growing season. Therefore, inputs from insecticide and/or miticide applications can be reduced, thus preserving the natural enemies of mites and scales, including; predators and parasitoids that may naturally regulate populations of these pests.

Raymond Cloyd

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New Extension Publications Associated with Horticultural Entomology Developed in 2019

Aphid Management in Greenhouse Production Systems (MF3442)

https://www.bookstore.ksre.ksu.edu/pubs/MF3442.pdf

Oak Leaf Itch Mite (MF2806)

https://www.bookstore.ksre.ksu.edu/pubs/MF2806.pdf

Bagworm: Insect Pest of Trees and Shrubs (MF3474)

https://www.bookstore.ksre.ksu.edu/Item.aspx?catId=524&pubId=22339

Grub Management in Turfgrass Using Insecticides (MF3439)

https://www.bookstore.ksre.ksu.edu/Item.aspx?catId=524&pubId=21619

Scale Insect Pests (MF3457)

https://www.bookstore.ksre.ksu.edu/pubs/MF3457.pdf

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Biological Control for Greenhouse Growers

Enrollment is Now Open!

This 4-hour class consists of pre-recorded lectures and video demonstrations and is intended for greenhouse and ornamental plant growers and others interested in learning about the fundamental concepts of insect biological control methods. It provides introductory content to those growers new to biological control and introduces more advanced methods, including banker plants.

The course is instructed Michigan State University's online course learning management system, Desire 2 Learn by Heidi Lindberg, Greenhouse and Nursery Extension Educator with MSU Extension. Dr. Raymond Cloyd (Kansas State University Extension) co-authored the content. Participants enrolled in this self-paced course will take a pre-test and a final exam to gauge their learning of the topics. Self-assessment quizzes will engage students with the material throughout the course. The course also provides links to additional resources on pertinent biological control topics.

Course Content

The 4-hours of pre-recorded lecture and video demonstrations are divided into six units:

Unit 1: Introduction to Greenhouse Biological Control

Unit 2: Commercially Available Biological Control Agents

Unit 3: Using Banker Plants in Biological Control Programs

Unit 4: Implementing a Biological Control Program

Unit 5: Interactions of Pesticides and Biological Control Programs

Unit 6: Greenhouse Examples of Biological Control Systems: Application Strategy and Costs

The first unit is an overview of the challenges and opportunities of biological control, how biological control systems work, factors to consider when developing your program, and the importance and methodology of scouting in the greenhouse. The second unit of the course covers the commercially available biological control agents sold in the United States and provides benchmark release rates and facts useful to those releasing biological control agents in the greenhouse. Unit three discusses the four most common banker plant systems for green peach and melon aphids, greenhouse whitefly, and western flower thrips. The fourth unit covers important issues, such as, quality control of biological control agents. Unit five addresses integrating pesticides (including fungicides) with biological control agents. Unit 6 presents examples of biological control programs implemented by growers for wholesale spring bedding plants and greenhouse vegetable operations.

Below is the website to access information associated with the course:

https://www.canr.msu.edu/online-college-of-knowledge/biological-control

Cost: The cost is $129 per person.

Course offerings: This course is offered twice a year (summer and winter).

Summer Course:

Registration period: May

Course available to students: June-August

Winter Course:

Registration period: November

Course available to students: December-February

Win a $75 gift card: Individuals who paid for the course and completed the pre-test, final exam, and post-course evaluation will be entered into a raffle for one of three $75 gift cards!

Financial Need Scholarships:

There are three scholarships available for those that are interested in the course but do not currently have the financial means to take it. Greenhouse growers interested in the scholarship will be able to apply for it upon registering by writing a short paragraph about why you feel you should be awarded this scholarship and how you plan to use the information you learn in your business or professional endeavors. The applicants and winners will be kept confidential. The cost of the course will be $39.99 for scholarship winners. Scholarship winners will be notified after the enrollment period has passed.

Registration Instructions

To register for this course you will need to create an account, sign in with your email/password, and complete the registration process. Step-by-step instructions are below.

Create your MSU Guest Account/Community ID and Password: Create Your Account

Login to the registration system with your Community ID and Password: Biological Control for Greenhouse Growers

Follow the instructions to register for the course. Upon registration, you will receive a receipt and instructions for accessing the course.

Logging Into the Online Course

Once you have registered, follow the instructions below to login – you will use the same login credentials that you set during registration (your NetID is your email address used during registration and use the same password set during registration).

Go to the Michigan State University's Online Course System (known as Desire2Learn or D2L): https://d2l.msu.edu/.

Click on the Login button. In the MSU NETID field enter your email address (enter the same email used during registration).

Enter the password you set during registration.

You will be logged into D2L - click on the View All Courses link and you will see the course listed.

*Note: If you need to reset your password go to: https://community.idm.msu.edu/ and select the option for Forgot Password.

TECHNICAL ASSISTANCE

If you need technical assistance, please contact Michigan State University Discovery Services. They are available at reachout@msu.edu or 517-353-8700. Tell them you are logging into an MSU Extension online course with an MSU Community ID.

FREQUENTLY ASKED QUESTIONS (FAQ)

What is my username/NETID?

Your username (or NET ID) is the email address you used to create your account during registration (you use the same email address/password for registering and for taking the course).

What URL do I go to for logging into the course?

Go to: https://d2l.msu.edu/. You will see the Michigan State University at the top of the page.

I received a "not authenticated" response when trying to login – what do I do?

A "not authenticated" message is typically an issue with a password not being entered correctly. To reset your password at any time go to: https://community.idm.msu.edu/ and select the option for Forgot Password. You will receive an email from a sender called "Community ID" with a link to reset your password.

I forgot my password – where can I reset it?

To reset your password at any time go to: https://community.idm.msu.edu/ and select the option for Forgot Password. You will receive an email from a sender called "Community ID" with a link to reset your password.

Who can I call for technical support?

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Raymond Cloyd

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Bug Joke of the Week

Q: What Do Fireflies Eat?

A: Light Snacks

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Sincerely,

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Kansas State University Agricultural Experiment Station and Cooperative Extension Service

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