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Ohio State University Extension Factsheet

Plant Pathology

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Using Fungicide Sprays Effectively

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Fungicides can be an important component of the disease management program. However, it is important to remember that their use should be integrated with the use of sound cultural practices, a knowledge of pathogen and disease biology, and disease resistance whenever possible.

Fungicides are only effective when infectious plant diseases that are caused by fungi are truly the cause of the problem. In many cases, pests and diseases follow other environmental imbalances and may not be the major problem. In cases such as these, a fungicide may help but is often not the total answer. Also, it is important to remember that fungicides are only effective if several rules are followed. First, the correct material must be selected. This depends on correct diagnosis and identification of the pathogen. Second, the chemical must be applied at the right time of year and frequently enough to protect plant material adequately. Third, fungicides must be applied properly over plant surfaces. These three rules depend on making correct decisions based on correct knowledge. Too many people simply "spray and pray," and are often disappointed with the results.

Correct Diagnosis

You must be sure of what the problem is before proceeding. The most effective fungicides in use today have been developed for specific situations and specific diseases. To use these chemicals, you must spend time making a correct diagnosis.

Your state Extension specialists, plant disease diagnostic clinic, and county Extension agents can assist you with the proper diagnosis.

Selecting the Proper Material

Diagnosis leads to selection of the right material to do the job. Usually, several materials are effective against the type of disease you are dealing with. For instance, triforine, sulfur or triadimefon all control powdery mildews. Before selecting any chemical, read the label. Can you carry out the instructions? Is the plant type listed on the label? If so, the chemical is registered for use on the plant, and should be effective in providing disease control if used properly. If not, it is illegal to use that particular pesticide.

Use the Correct Method of Application

Foliar application fungicide sprays usually work in controlling infectious diseases because they act as a chemical barrier on leaf, stem or flower surfaces. When the pathogen arrives on the plant surface, it encounters this barrier and is unable to infect the plant. Effective fungicide use requires that this barrier be as complete as possible. A spray method must provide the best combination of practical usefulness and good coverage. For many diseases, special attention must be given to undersurfaces of leaves, especially on the lower leaves of the plant.

The completeness of the barrier depends on how well the spray spreads and sticks to the plant surfaces. For this reason, spreader-stickers or spray adjuvants can be added to many sprays. Sometimes the product label alerts the user to these problems. However, observing the spray deposit after you have finished some of the job may be the best way to decide if an adjuvant should be used. Hairy or waxy foliage is especially difficult to cover properly without a spreader-sticker.

Proper Timing of Fungicide Applications

Timing refers to when and how often the spray must be applied to effectively control a disease. The first application usually is made at a time close to but before the pathogen arrives on the plant surface. This information is often provided on the pesticide label or is available in Extension literature from your local county Extension agent. In most situations, fungicides are not effective in controlling the disease if the pathogen has already entered (infected) the plant tissues. In many cases, specific information about the disease cycle may be needed to time the first application correctly.

After the first application is made, the pesticide barrier is established on the plant surfaces. Effective use involves keeping this barrier active and complete throughout the time that the pathogen can arrive on and infect the plant. Modern fungicides are developed so that they do not persist in the environment for long periods of time. Rainwater, sunlight, microbial action and oxidation decrease effectiveness of the fungicide. Reapplication of the spray is needed in many cases to keep the fungicide barrier active.

Plant growth also affects the completeness of the barrier. As new leaves and shoots appear, they are unprotected and may be subject to infection. If so, they must be recovered with the barrier.

The fungicide label gives reapplication guidelines, usually in ranges of 7-14 day intervals. If excessive rainfall or rapid growth of the plant occurs, the shorter interval between sprays should be used. If not, use the longer interval.

Table 1. Conversion Factors and "Rules-of-Thumb" for Fungicide Applications

This information was prepared by Charles C. Powell, Extension Plant Pathologist (retired), The Ohio State University.	
1) Surface	1 square inch = 6.5 square centimeters
	1 square inch = 929 square centimeters (0.0929 sq.m.)
	1 square yard = 0.84 square meters
	43,560 square feet = 1 acre
	2.5 acres = 1 hectare = 10,000 square meters
	1 quart per 100 square feet = 100 gallons per acre
2)	Dry Weight 1 ounce = 28.35 grams
	1 pound = 454 grams = 16 ounces
	1 pound of most fungicides per 100 gallons is often equivalent to
	1 tablespoon per gallon.
	1 tablespoon = 3 teaspoons
	1 ounce active per 100 gallons = 75 ppm
	1 ppm = 1 mg per 100 gms or 0.001 ml per liter
	1 gram per 1000 square feet = 1 pound per acre
3) Liquid	1 ounce = 29.6 mls = 2 tablespoons
	1 tablespoon = 3 teaspoons
	8 ounces = 1 cup; 2 cups = 1 pint = 16 ounces
	2 pints = 1 quart; 4 quarts = 1 gallon
	10 liters = 2.64 gallons
	1 gallon = 128 ounces = 3800 ml = 8.34 lbs of water
	1 pint = 1 pound of water

Dilution Tables - A Guide to Accurate Measures

Equivalent Quantities of Solid Pesticides*

100 gallons	10 gallons	1 gallon
4 ounces	2 1/2 tbsp.	3/4 tsp. (1.1 gms.)
8 ounces	5 tbsp.	1 1/2 tsp. (2.3 gms.)
1 pound	10 tbsp.	1 tbsp. (4.5 gms.)

* Use of spoonfuls: Solid insecticides vary so much in weight that it is not possible to give accurate measures in terms of level teaspoons or tablespoons. The figures given above are approximations.

Equivalent Quantities of Liquid Pesticides

4 ounces	2.5 tsp.	1/4 tsp. (1.2 mls.)
8 ounces	5 tsp.	1/2 tsp. (2.4 mls.)
1 pint	10 tsp.	1 tsp. (4.7 mls.)

gender, age, disability or Vietnam-era veteran status.

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