

Interpretation of Recommendations for Fungicide and Bactericide Usage, Plant Protection Pointers No. 26 ¹

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The purpose of this publication is to present some general principles on foliar fungicide and bactericide usage. It is done in a question-answer format. Further details on fungicide usage and crop protection for specific diseases are available on the label of the fungicide and publications are available at your county extension office.

1. What Fungicide Should I Use?

This is probably the most often asked question and sometimes the only question. Some fungicides are broad spectrum and will control numerous foliage diseases on numerous plant species while some fungicides will control certain diseases but not others. Thus, your selection of a fungicide is dependant on what is legal and what your county agent recommends. A recommendation from your county agent means that the fungicide has been tested and is effective for the purpose recommended.

Where numerous fungicides are recommended for a specific disease, it is reasonable to assume that some fungicides are better than others. This is true especially when disease is severe either because you waited too long to begin a spray program or the

disease is one that spreads rapidly (downy mildews, late blight of potato, bacterial diseases and others). However, where a spray program is initiated before disease becomes severe, a so called "less effective" fungicide may perform as well as "the most effective" fungicide. **Remember, control measures such as crop rotation, resistant varieties, sanitation, healthy transplants and others reduce disease inoculum which, in turn, improve the effectiveness of fungicides simply because "disease pressure" is less.**

2. What Rate of Fungicide Should I Use?

Use only those rates listed on the label. Label rates are often listed as a range such as 1-3 pounds/acre, 4-6 ounces/1000 square feet, or 1 - 1 1/2 tablespoon/gallon. Generally, the lower range is used early in the season or when plants are small and the higher range is used when plants are full grown or when disease has become severe. Unless the label specifies otherwise, you can use the higher rates earlier to minimize disease early, making disease control more effective later in the season, and thereby

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1. This document is PP/PPP26, one of a series of the Plant Pathology Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida. Revised January 1985. Reviewed April 2003. Visit the EDIS Web Site at <http://edis.ifas.ufl.edu>.
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reducing the need for more frequent and less effective sprays when disease is "out of control".

3. When Should I Begin Spraying For Disease Control?

Because most fungicides control plant diseases by protecting the plant against infection, **like a coat of paint**, spraying prior to infection will allow you to get the most for your money. Symptoms are the result of infection which occurred at an earlier time.

For most leaf spots and blights, the first symptom of a spot or blight indicates that infection occurred 3-14 days earlier. Greasy spot on citrus is an exception as its incubation period (period of time from infection to symptom expression) can be as long as several months. Bacterial leaf spots and downy mildews generally express symptoms 3-10 days after infection. Thus they tend to appear as if they occurred "almost overnight." Actually there were at least a few spots present before the "sudden explosion" occurred. Many other leaf diseases have incubation periods that range from 7-10 days or 10-14 days or longer. Weather conditions alter the length of the incubation period. Generally speaking, the longer the incubation period, the slower the disease develops into an epidemic. Obviously then, diseases with short incubation periods are more difficult to control. Variables such as fungicide toxicity, cultural controls, weather, spray application technique and others all interact with your attempt to control foliar plant diseases. **There is one variable, however, which has an overriding influence over most other variables - the time you begin your spray program**. The earlier you begin your spray program in relation to the amount of disease, the more successful you will be in controlling plant disease. You will be more satisfied with your efforts if you begin spraying at first sign of disease or before (assuming you know from past experience that some disease will occur). Then continue spraying at intervals suggested on the label of the fungicide. One of the most distressing occurrences to this author is when someone states that a fungicide is "no-good" when in fact it is, if used early enough. It is true that some fungicides will not control certain diseases.

4. Will a Fungicide Eradicate Existing Disease Symptoms?

The answer is no. Symptoms already present will remain until the plant or plant part dies or is removed. With the initiation of a spray program and proper plant maintenance, a plant may be revived by putting on new growth. This is more apt to be successful with perennials (trees, shrubs, turf) than with annuals (vegetables, field crops).

Some fungicides have what is often referred to as "kickback action." That is, they may intercept the life cycle of the organism (fungus or bacterium) by reducing inoculum (spore) production on a lesion. In some cases, a fungicide may delay or inhibit growth of the organism in the plant after infection (penetration) of plant tissue prior to symptoms occurrence. Such kickback activity by fungicides should not be relied upon for effective plant disease control, except for greasy spot of citrus.

During the last decade, numerous new chemical control compounds have been developed that are remarkably effective in "stopping or containing" further disease progress within host tissue. Included in this group are Ridomil (Subdue), Bayleton, Alliette, and others. However, even with these newer "somewhat therapeutic" fungicides, you should **use them as protectants not salvage treatments**. This last statement can not be a generalization, however, as certain new fungicides being developed are in fact more effective when used after infection occurs.

5. Why Did the Disease Appear to Get Worse after I Have Sprayed?

Remember, most fungicides prevent infection. After you spray, new symptoms may occur because infections prior to spraying will continue to develop into disease. If the disease you are concerned about takes 10 days from infection to symptom expression, it will take about 10 days for you to notice a slowing down in disease progress after spraying as infections occurring the night prior to spraying will continue to develop into disease. With some of the newer chemicals mentioned in question 4, sudden suppression of disease spread can occur.

6. If You Begin Spraying after Disease Has Become Abundant What Are the Alternatives?

First, shorten your spray intervals to the shortest interval between sprays allowed on the label. Second, use the highest rate allowable on the label. Third, water only when necessary. Fourth, use the fungicide(s) that is known to be most effective. Finally, be optimistic. **Often, intensive control efforts late in the development of disease is useless.**

7. Why Are Repeat Applications Necessary?

Fungicides are not stable. They break down when exposed to light, organic matter, water and other factors. Also rain, especially heavy or acid rains, wash fungicides off of leaves and stems. Spray intervals recommended on the label account for such factors. The label usually suggests a range such as: spray every 7 to 14 days or 4 to 7 days, etc. Longer intervals are used when disease severity is low, where rains or irrigation have not washed off the fungicides or where weather conditions are not favorable for disease. Growers often extend intervals too long when disease is still not severe. Then when severity of disease has increased, they shorten intervals. Shorter intervals when disease is severe is often useless.

8. Are the Above Mentioned Principles Applicable to Both Annual and Perennial Crops?

The answer is yes. However, with perennial crops the time frame is extended over years rather than weeks or months. With trees, shrubs, turf and other perennials you can expect better control of leaf diseases this year if you controlled disease last year. This is because diseased leaves, branches etc. fall to the ground or remain on the plant where the pathogen (fungus or bacterium) can still grow and produce more inoculum (spores, cells etc.) Wind currents disperse such inoculum to new growth. Older perennial groves or plantings tend to have more leaf diseases as time has allowed for disease build up.

9. With Annual Crops Does Last Year's Disease Situation Influence This Year's Situation?

The answer is yes. Disease causing organisms such as fungi and bacteria can live in the soil on organic debris, thus providing inoculum for next years crop. That is why we recommend crop rotation for disease control. Although most people consider crop rotation as an excellent control for root rot, wilts, stem rots and other soil-borne diseases, leaf spots and blights are reduced also by this method. In relation to your spray program, you may need to spray earlier and with the highest rate on the label when you do not use crop rotation or other cultural controls as such cultural controls delay the onset of disease by reducing available inoculum.

10. Is Fungicide Spraying on Diseased Plants Effective for Controlling Soil Borne Diseases Such as Root Rots, Lower Stem Rots, Crown Rots and Seedling Blights?

For most situations the answer is no. After a plant is infected internally with one of these diseases, not much can be done except to maintain a plant in as vigorous a condition as possible with adequate watering and fertilization. Most fungicides do not enter a plant and eradicate disease. They act as outer protectants, (**like a coat of paint**). Some fungicides such as Benlate (Tersan 1991) are systemic but they will not eradicate established disease. But will suppress *Fusarium* and *Rhizoctonia* root rots if applied to the soil as a drench. Ridomil (Subdue) and Alliette will control *Pythium* and *Phytophthora* root rots when applied to the soil. Uses of such applications are limited; therefore consult the label, first.

Soil borne diseases such as seedling blights, root rots, wilts, lower stem rots, and crown rots must be prevented by using techniques such as seed treatments, crop rotation, soil fumigation, proper water drainage, healthy transplants, resistant varieties, burial of old plant debris and other control measures. Such diseases begin at or below the soil surface, becoming internal within roots and growing

internally up into the stem. Systemic or nonsystemic fungicides will not eradicate such deep seated infections. Specifics relevant to your disease situation are available through your county extension office.

Some stem and branch diseases are caused by the same organisms that cause leaf and fruit diseases and the infection process begins on the outside of the stem or branch. With such diseases, fungicides are effective when used in the same manner as for foliar diseases. With experience you will be able to identify such diseases and distinguish them from the symptoms caused by previously mentioned soil borne diseases. Examples of stem and branch diseases that can be controlled with fungicides are: *Sclerotinia* diseases on vegetables, *Rhizoctonia* stalk rot of celery and numerous leaf spots diseases such as early blight of potato and tomato, peanut leaf spot, gummy stem blight of cucurbits, anthracnose of many crop species, and citrus scab.

11. Are Generically Equivalent Products Equal In Effectiveness?

The answer is yes if the rate of active ingredients are equal or if the applied rate of the active ingredients are equal.

12. Are Spray Adjuvants, Surfactants or Additives Beneficial?

This information is available in Extension Plant Pathology Report No. 37. Because so many variables can influence adjuvants, a yes or no answer is not appropriate. Spray adjuvants can be beneficial or deleterious depending on the situation.

How Should Fungicides Be Applied?

For a detailed discussion on this subject see Extension Plant Pathology Report No. 20., Guidelines for Effective Chemical Control of Plant Diseases. It is available from your county agent.