Fungicides: Terminology

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Fungicides: Terminology

Abstract
Many growers have never used foliar-applied fungicide for management of field crop diseases, especially on soybean. At this time, foliar-applied fungicides are the only effective option for managing Asian soybean rust. In the following weeks, there will be a series of articles to help producers understand fungicides and how they affect their production practices. Some of the commonly used terms are defined below:

Keywords
Plant Pathology

Disciplines
Agricultural Science | Agriculture | Plant Pathology

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Consider an early-season insecticide
For managing bean pod mottle virus, which is the pathogen transmitted by bean leaf beetles, our studies indicate that an early-season, foliar insecticide is critical for suppressing virus incidence under high bean leaf beetle pressure. It is important to apply this insecticide as soon as beetles are present in your soybean field.

Consider a mid-season insecticide
Additionally, our studies indicate that although a mid-season insecticide by itself cannot prevent an increase in bean pod mottle virus, it seems necessary to improve seed quality. Furthermore, if combined with an early-season insecticide, the two treatments give an added positive effect on yield and seed quality.

Scout 1st generation beetles
Finally, continue to scout your field 1 week following the predicted 1st generation emergence (1212 degree days, base 46 °F) to determine if your field is at risk for 2nd generation beetle damage. More information will be published in Integrated Crop Management later this summer regarding these management recommendations. If you are already following a virus-management plan, bean leaf beetles may not rebound in your field and a third insecticide may not be necessary; however, scouting would be good insurance.

We will continue to keep you informed regarding the progress of the bean leaf beetle population this summer.

Jeffrey D. Bradshaw is a graduate student in the Department of Entomology. Marlin E. Rice is a professor of entomology with extension and research responsibilities in field and forage crops. David Dorhout is a graduate student in the Department of Entomology.

Plant Diseases
Fungicides: Terminology
by Daren Mueller, Department of Plant Pathology

Many growers have never used foliar-applied fungicide for management of field crop diseases, especially on soybean. At this time, foliar-applied fungicides are the only effective option for managing Asian soybean rust. In the following weeks, there will be a series of articles to help producers understand fungicides and how they affect their production practices. Some of the commonly used terms are defined below:

Fungicide: a chemical or physical agent that kills or inhibits the growth of fungi. Fungicides have at least three names, all of which can be found on the label:

Active ingredient (a.i.): the active component of a fungicide. A single active ingredient may be marketed under several different trade names.

Fungicide resistance: the reduction in sensitivity to a fungicide by an individual fungus. Fungicides with single-site modes of action are at relatively high risk for resistance development compared to those with multi-site mode of action.

Classification of fungicides
Fungicides can be classified a number of different ways, including (1) mobility in the plant, (2) role in protection of plants, (3) breadth of activity, (4) mode of action, and (5) chemical group.

(1) Mobility in the plant
Contact fungicide: a fungicide that remains on the surface where it is applied but does not go deeper; these fungicides have no after-infection activity. Repeated applications are needed to protect new growth of the plant and to replace material that has been washed off by rain or irrigation, or degraded by environmental factors such as sunlight.
**Systemic fungicide:** a fungicide that is absorbed into plant tissue and may offer some after-infection activity. Very few fungicides are truly systemic (i.e., move freely throughout the plant); however, some are upwardly systemic (i.e., move only upward in the plant through xylem tissue), and some are locally systemic (i.e., move into treated leaves and redistribute to some degree within the treated portion of the plant.

**Anti-sporulant activity:** the ability to prevent spores from being produced. In this case, disease continues to develop (e.g., lesions continue to expand), but spores are not produced or released, so the amount of inoculum available to infect surrounding plants is reduced.

(3) **Breadth of activity**

**Single-site fungicide:** fungicide active against only one point in one metabolic pathway in a fungus or against a single critical enzyme or protein needed by the fungus. These fungicides are less toxic to plants and tend to have systemic properties.

**Multi-site fungicide:** fungicide that affects a number of different metabolic sites within the fungus.

(4) **Mode of action**

**Mode of action:** how a fungicide acts on a target fungus, which is the specific process in the metabolism of the target fungus that is affected by a fungicide. Examples are damaging cell membranes, inactivating critical enzymes or proteins, or interfering with key processes such as energy production or respiration.

(5) **Chemical group or class**

**Chemical group or class:** the name given to a group of chemicals that share a common biochemical mode of action and may or may not have similar chemical structure. Fungicides approved for use on field crops in Iowa fall into a few different groups: QoI fungicides (which include strobilurins), triazoles, and a few miscellaneous others.

<table>
<thead>
<tr>
<th>Trade name</th>
<th>Quadris</th>
<th>Alto</th>
<th>Dithane</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active ingredient</td>
<td>azoxystrobin</td>
<td>cyproconazole</td>
<td>mancozeb</td>
</tr>
<tr>
<td>Mode of action</td>
<td>Qo Inhibitor (QoI)</td>
<td>DeMethylation Inhibitor (DMI)</td>
<td>Multi-site contact activity</td>
</tr>
<tr>
<td>Chemical group or class</td>
<td>Strobilurins</td>
<td>Triazoles</td>
<td>Dithiocarbamates</td>
</tr>
<tr>
<td>Mobility in plant</td>
<td>Locally systemic</td>
<td>Upwardly systemic</td>
<td>Contact</td>
</tr>
<tr>
<td>Role in protection</td>
<td>Protectant</td>
<td>Protectant Early infection Anti-sporulant</td>
<td>Protectant</td>
</tr>
<tr>
<td>Breadth of activity</td>
<td>Single-site</td>
<td>Single-site</td>
<td>Multi-site</td>
</tr>
</tbody>
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