

# **Insect, Nematode, and Disease Control in Michigan Field Crops**

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\*\*This bulletin contains information on the management of field crops insects, nematodes, and diseases, including recommendations for pesticide use. Every attempt is made to verify product names, formulations, use rates, and other important information, but products and labels may change before the field season begins. Always read the label of a product to reconfirm rates, precautions, PPE, and other important information before use.

## **DISEASE MANAGEMENT IN FIELD CROPS**

The disease management section of the Michigan field crops bulletin is new this year. We have included sections on management for some of the most important diseases of corn, small grains, dry beans, soybeans, and sugar beets. In future years, these sections will be expanded to include additional diseases. In some cases, there are not any fungicides labeled for control of a particular disease. We have provided information on the cause of the disease, symptoms, disease cycle, conditions favoring development of the disease, and management techniques, included fungicides registered for use in Michigan. There are tables for seed treatments registered for soybeans, corn, small grains, and dry beans. We hope you find this information helpful and easy to use. We welcome your comments and suggestions for improvements and additions.

## FUNGICIDE RESISTANCE MANAGEMENT

### WHAT IS FUNGICIDE RESISTANCE?

- Resistance is an inherited change in a plant pathogen's susceptibility to a fungicide.
- Resistance usually develops due to a change by the fungal pathogen at the site where the fungicide is active (mode of action).
- Strains of pathogens develop reduced sensitivity to fungicides causing complete or partial loss of fungicide efficacy.
- Intensive use, overuse or misuse of certain fungicides can result in the development of resistance.

### RECOGNIZING RESISTANCE

- Resistance may gradually increase over time resulting in partial loss of control
- Resistance may appear suddenly with significant loss of control.

### STRATEGIES FOR MANAGING RESISTANCE

The risk of resistance varies within chemical classes. Pathogens may become cross resistant to fungicides with the same mode of action even though they are in different chemical classes. It is important to rotate fungicides based on different modes of action, instead of rotating based on chemical classes. An international organization, the Fungicide Resistance Action Committee (FRAC), has grouped fungicides by mode of action and given each mode of action a code number. You can select fungicides for rotation by looking at the group code and choosing a registered fungicide with a different code than the one used previously. The fungicide group code will soon be added to all fungicide labels.

#### Avoid resistance:

- Use disease predictive models for effective timing of fungicide applications.
- Scout fields frequently for the appearance of disease symptoms.
- Increase crop rotation intervals to avoid the buildup of soil-borne pathogens.
- Use varieties that are less susceptible to disease.
- Use formulated mixtures or tank-mixes of effective fungicides having different modes of action. For effective resistance management, both mixing partners must be active against the target pathogen.
- Use effective multi-site fungicides, less prone to fungicide resistance, as mixing partners (group code begins with M).
- Watch for and report control failures and difficulties so that the possibility of resistance can be monitored and evaluated.
- Read fungicide labels carefully for additional resistance management recommendations.

Group code (mode of action)	Common name	Trade names	Field crops on label Foliar or soil application only (no seed treatments)	Resistance Risk Low-Med-Hi
1	thiophanate, thiophanate methyl	Topsin, Topsin-M	Dry beans, soybeans, sugar beets, wheat	H
2	iprodione	Rovral	Dry beans	M-H
3	propiconazole	Tilt, Bumper, Propimax	Corn, small grains, soybeans*	M
3	tebuconazole myclobutanil	Domark, Folicur Laredo	Soybeans*, wheat (head scab) Soybeans*	M
4	metalaxyl, mefenoxam	Ridomil Gold	Dry beans, soybeans, sugar beets	H
7	boscalid	Endura	Dry beans	M
11	azoxystrobin	Amistar	Dry beans, sugar beets	H
11	azoxystrobin	Quadris	Barley, corn, dry beans, soybeans, sugar beets, wheat	H
11	pyraclostrobin	Headline	Barley, oats, rye, wheat, sugar beets, soybeans*	H
11	trifloxystrobin	Gem	Sugar beets	H
11/3	pyraclostrobin + tebuconazole	Headline SBR	Soybeans*	
11/3	azoxystrobin + propiconazole	Quilt	Barley, wheat, corn, soybeans*	
14	quintozene (PCNB)	Blocker	Dry beans	L-M
30	triphenyltin hydroxide	Super Tin	Sugar beets	L-M
M1	copper hydroxide	Kocide	Barley, oats, wheat, dry beans, sugar beets	L
M1/M3	copper hydroxide + mancozeb	ManKocide	Barley, oats, wheat, sugar beets	L
M3	ethylene bisdithiocarbamates (EBDC)	Penncozeb	Barley, oats, rye, wheat, sugar beets	L
		Dithane	Corn, barley oats, rye, wheat, sugar beets	
		Manzate	Barley, oat, wheat, rye, sugar beets	
		Maneb	Dry beans, sugar beets	
M 5	chlorothalonil	Bravo, Echo	Soybeans	L

\* soybean rust only