

Table 21. Common Names of Registered Herbicides¹ (continued)

Common Name	Trade Name	Producer	HRAC Group ²	Formulation
paraquat	Firestorm [®] , Gramoxone Inteon [®] , Parazone [®]	Chemtura, Syngenta, Makteshim Agan NA	D	3L, 2L, 3L
pelargonic acid	Scythe [®]	Dow Agrosciences	Z	4.2L
pendimethalin	Prowl [®] , Pendimax [®]	BASF, Dow Agrosciences	K1	3.3E, 3.8ACS
phenmedipham	Spin-Aid [®]	Bayer Cropscience	C1	1.3E
pronamide	Kerb [®]	Dow Agrosciences	K3	50W
pyrazon	Pyramin [®]	BASF	C1	65DF, 4.5SC
quizalofop	Assure II [®] , Targa [®]	DuPont, Gowan	A	0.88E
rimsulfuron	Matrix [®]	DuPont	B	25DF
sethoxydim	Poast [®] , Ultima 160 [®]	BASF	A	1.5E
sulfentrazone	Spartan [®]	FMC	E	75DF
tembotrione	Laudis [®]	Bayer Cropscience	F2	3.5SC
terbacil	Sinbar [®]	DuPont	C2	80W
topramezone	Impact [®]	Amvac	F2	2.8EC
trifluralin	Treflan HFP [®] , Trilin [®] , Trifluralin [®]	Dow Agrosciences, Griffin, Gowan, Drexel, UAP, and others	K1	4E, 10G

¹ See inside front cover for abbreviations. ² Herbicide Resistance Action Committee Groups: Herbicides in the same HRAC group have similar modes of action for killing weeds. To reduce the risk of herbicide resistance, do not rely on herbicides in a single HRAC group year after year.

Disease Management Strategies

Disease Diagnosis

Before making any management decisions, always make sure to get the right diagnosis of your problem first.

Accurate diagnoses can save time and money because some diseases look alike but have very different management strategies. Moreover, there are several plant health issues (nutritional problems, herbicide injuries, and others) that mimic plant diseases. Unwittingly treating a nutrient deficiency with pesticides wastes time and money, and does not solve the underlying condition.

Submitting samples to a diagnostic laboratory is the best way to ensure the correct diagnosis. For a list of labs, see Page 12.

Healthy Plant Material

Contaminated seed or transplants can introduce diseases, so saving vegetable seeds for next year's crop is not recommended. Table 22 lists some diseases that may be transmitted by seed to transplants.

Whether you are purchasing transplants or producing them yourself (see Transplant Production, page 8, be certain to inspect seedlings regularly.

Disease-Resistant Varieties

Whenever possible, use varieties resistant to diseases. Some varieties may not be completely resistant to particular diseases, however, incomplete or partial resistance may be available. Some seed catalogs may refer to tolerance. Table 22 presents information about the availability of resistant varieties.

Tillage and Crop Rotation

In most situations, crop rotation and fall tillage are the biggest factors in disease management. This is because most pathogens overwinter in crop residues and are unable to survive once the residue decomposes. Tillage (especially fall tillage) helps control diseases by reducing the amount of inoculum (pathogen structures) that survives the winter.

Rotating fields to different crops each year also helps control diseases by preventing the build-up of certain plant pathogens in the soil. Table 22 provides tillage and crop rotation recommendations. A general rule states that crops should not be rotated to others in the same botanical family. Table 15 identifies botanically related crops.

There are three kinds of soilborne diseases that are unaffected by rotation.

Disease Management Strategies (continued)

The first group of these diseases is caused by pathogens that produce resilient survival structures that can withstand the effects of time and nonhost crops. Examples include Fusarium wilt, and root knot nematode.

The next group of these diseases has a broad host range, so they can survive indefinitely on many host crop and weed species. Examples include Sclerotinia, Rhizoctonia, and Verticillium diseases.

The third group of these diseases overwinters in Gulf Coast states, and then spread north by wind during the growing season. Examples include sweet corn rust and downy mildew of cucurbits.

Consider all options before making management decisions. Rotation is a good general practice that improves or maintains good soil tilth. Tillage (especially fall tillage) often is not in accord with recommended soil management and conservation practices.

Other Cultural Practices

Other practices, such as altering planting times, modifying irrigation methods or schedules, using raised beds, or altering plant density, also can make conditions less favorable for disease. Some of these practices are listed under comments in Table 22.

Chemical Control: Fungicides, Bactericides, Nematicides, Fumigants

Fungicides can be classified as either contact or systemic.

Contact fungicides, also called protectant fungicides, provide a “coat” of protection on the plant’s surface when applied properly. These fungicides are designed to

kill fungi on the surface of plants on contact — hence, the name.

Systemic fungicides, sometimes called eradicant or curative fungicides, don’t merely coat the surface, they also enter into the plant. They can sometimes eradicate or cure a portion of existing infections.

Both contact and systemic fungicides are most effective if they are applied before disease develops. Some worry that using fungicides may lead to pathogens becoming resistant to the chemical. Most contact fungicides have multiple modes of action, so fungal pathogens are unlikely to develop resistance to all of these different modes of action at the same time. For this reason, alternating contact fungicides is unnecessary. Most systemic fungicides have a single mode of action, so the risk of pathogens developing resistance to these products is greater. Always read and follow label directions that list how to alternate systemic fungicides and minimize the resistance development. Table 25 lists several fungicides and their modes of action to help in resistance management.

Bactericides (copper and antibiotic compounds) can help reduce the risk of early-season bacterial disease epidemics, but are most effective when used with other control methods. Copper compounds also are mediocre fungicides and are handled similar to protectant fungicides. Antibiotics serve a similar purpose in certain crops.

Nematicides and fumigants are designed to reduce nematode and soilborne fungus populations before crops are planted. Like other disease-control chemicals, they are most effective when combined with cultural control options such as extended crop rotations and resistant varieties.



Growers should schedule overhead irrigation so that the time when leaves are wet does not overlap with the dew period.

Table 22. Summary of Cultural Management Strategies for Disease

This table describes several diseases listed by crop. This list is not exhaustive, but represents important Midwest diseases. Also listed are the cultural management options available for each disease. The management options are described in more detail in the text. Note that some pathogens have races. The reaction of a particular race of fungus or bacterium will depend on the cultivar or variety grown. Rotation refers to the number of years that the field should be planted to a different crop.

Crop	Disease	Tillage ¹	Seedborne	Rotation	Resistance	Comments
Cabbage	Alternaria Leaf Spot	3	Yes	3-4	No	
	Black Rot	3	Yes	2-3	No	
	Yellows	2	Yes	>6	Yes	Fusarium fungus is soilborne.
Carrot	Alternaria Leaf Blight	3	Yes	2	Yes	
	Bacterial Blight	3	Yes	2-3	No	
Cucumber	Angular Leaf Spot	3	Yes	2	Yes	
	Anthracnose	3	Yes	2	Yes	
	Bacterial Wilt	1	No	NE ²	No	Spread by cucumber beetles.
	Phytophthora Blight	2	No	>3	No	Water management is important. Avoid rotations with solanaceous crops.
	Scab	3	Yes	3	Yes	Favored by cool (<70°F), wet weather.
Muskmelon	Alternaria Leaf Blight	3	No	2	No	
	Anthracnose	3	Yes	2	No	
	Bacterial Wilt	1	No	NE ²	No	Spread by cucumber beetles.
	Gummy Stem Blight	3	Yes	3	No	Also affects pumpkin, watermelon.
	Phytophthora Blight	2	No	>3	No	Water management is important. Avoid rotations with solanaceous crops.
	Powdery Mildew	2	No	2	Yes	
	Root Knot	2	No	>6	No	Wide host range.
Pepper	Anthracnose	3	Yes	3	No	
	Bacterial Spot	3	Yes	2	Yes	Races.
	Phytophthora	2	Yes	3	Yes	Races.
	PVY	1	No	2	Yes	Aphid transmission (reflective mulch).
	TEV	1	No	2	Yes	Aphid transmission (reflective mulch).
	TMV	1	No	2	Yes	Mechanical transmission.
Potato	Early Blight	3	No	3-4	Partial	More disease on early maturing cultivars.
	Late Blight	3	Yes	2-3	Partial	Survives on cull piles and volunteers.
Pumpkin	Bacterial Fruit Spot	3	Yes	2	No	Also affects squash.
	Black Rot	3	Yes	2	No	Same as gummy stem blight on muskmelon, watermelon.
	Downy Mildew	1	No	NE ²	No	The causal fungus must blow into the Midwest from the southern United States.
	Fusarium Fruit Rot	2	Yes	>4	No	See comments in cucurbit section.
	Phytophthora Blight	2	No	>3	No	Water management is an important tool. Avoid rotations with Solanaceous crops.

¹ 1=tillage is not effective, 2=tillage is of limited help, 3=tillage is an important control

² NE=not effective

Disease Management Strategies (continued)

Table 22. Summary of Cultural Management Strategies for Disease (continued)

Crop	Disease	Tillage ¹	Seedborne	Rotation	Resistance	Comments
Pumpkin (continued)	Plectosporium Blight	3	No	3-4	No	May be managed like black rot.
	Powdery Mildew	2	No	2	Partial	
	Virus Diseases (several)	1	No	NE ²	No	Aphids spread virus. All cucurbits affected. Pumpkins planted by June 20 (southern Indiana) set fruit before disease becomes severe.
Snap Bean	Rhizoctonia Root Rot	3	No	NE ²	No	Deep plow residue.
Sweet Corn	Stewart's Wilt	1	Yes	NE ²	Partial	Spreads and survives in flea beetles.
Tomato	Anthracnose	3	Yes	2-3	No	Stake and mulch.
	Bacterial Spot	3	Yes	2-3	No	
	Canker	3	Yes	3-4	No	
	Early Blight	3	Yes	3-4	Partial	Some resistance to stem canker.
	Fusarium Crown Rot	2	No	>6	No	
	Fusarium Wilt	2	Yes	>6	Yes	Three races exist.
	Powdery Mildew	2	No	2	No	
	Root Knot	2	No	>6	Yes	Wide host range.
	Septoria Leaf Spot	3	No	2-3	No	
	Speck	3	Yes	2	Yes	
	TMV	1	No	2	Yes	Can be spread by contact.
Verticillium	2	No	>6	Yes		
Vegetables (all)	Damping Off	1	No	NE ²	No	Warm soils, greenhouse sanitation.
Watermelon	Anthracnose	3	Yes	3	No	
	Bacterial Fruit Blotch	3	Yes	2	No	Volunteer watermelon and cucurbit weeds can spread disease next season.
	Fusarium Wilt	2	Yes	>6	Partial	Three races exist.
	Gummy Stem Blight	3	Yes	3	No	Also affects muskmelon, pumpkin, and squash.
	Phytophthora Blight	2	No	>3	No	Water management is important. Avoid rotations with solanaceous crops.
Root Knot	2	No	>6	No	Wide host range.	
Broadleaf Vegetables	Sclerotinia	2	No	With grasses 3-4	No	Flood. 23-45 days.

¹ 1=tillage has limited effect, 2=tillage is of limited help, 3=tillage is an important control

² NE=not effective