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Chemical Control of Cereal Leaf Diseases

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CHEMICAL CONTROL OF CEREAL LEAF DISEASES

North Dakota grows about 4,500,000 acres of wheat, 2,225,000 of durum and 2,500,000 acres of barley each year. The average yield in the last five years was about 24 bushels per acre for hard spring wheat, 27 for durum, and 35 for barley. In any given year the combined effects of Septoria blotch, Pyrenophora tan spot, Helminthosporium spot blotch and leaf rust can reduce potential yield of varieties of these three crops on the average of 10 bushels per acre. The more susceptible the variety the greater is the yield reduction.

Leaf diseases causing greatest yield losses in North Dakota are caused by fungi. These small plants (fungi) produce spores (seeds) that are carried by air currents either from the crop residue (Figure 1) as with Septoria, Pyrenophora and Helminthosporium or from succeeding crops grown to the south as with Puccinia (leaf rust). Spores of fungi germinate on the leaf surfaces, infect the leaves, and cause disease. Infection disrupts the food manufacturing process of leaves. In infected leaves, instead of proteins and carbohydrates (sugars) being translocated to the developing grain kernels from the leaf where they were made, the food flow to the kernels is reduced. Often a reverse flow of food occurs from other leaves and plant parts, to the infected leaf. Diseased leaves become tan colored (Septoria blotch and tan spot) or rusty (leaf rust) and eventually dried. Often this drying condition is blamed on drought even though ample water is available to the roots.



Figure 1. Fungi causing leaf diseases survive in residue such as this clump of straw in grain field.

The flag leaf contributes a major portion of the food that goes into developing grain kernels during the heading stage. Therefore to protect yield, control leaf diseases by preventing fungus spores from infecting the flag leaves. Spraying of lower leaves and plant parts has not proven economically feasible even though it will control the disease.

The flag leaf is fully extended just prior to heading. For wheat and durum, make the first fungicide application during the early heading stage or when the heads begin to emerge from the boot. With barley, make the first application as the boot is swelling i.e., the head is in the boot. Make second applications for all three crops 7 to 10 days after the first ones.

Timing of chemical applications is most important. Applications made after the plants are fully headed do little if any good. One application is presently not economically successful.

Use maneb + zinc ion complex or zineb to control leaf disease. They are protectant type fungicides so spray them on the leaves before infection occurs.

	Fungicides cleared for use on cereals		
	Dithane M-45	Manzate 200	Zineb
Wheat	X	X	X
Barley	X	X	—
Oats	X	X	—

Research shows that for uniform fungicide distribution on the leaf surface, you must use 1½ - 2 pounds of chemical and 5 gallons of water per acre per application.

FUNGICIDE APPLICATION

The applicator, the weather and the spraying equipment on the plane govern the quality of spraying. The equipment on the plane and application techniques can be adjusted. For a good job, use a fixed-wing airspeed of about 90 mph, an altitude of about 6 to 10 feet from the boom to the top of the crop, and nozzles angled either down or 20° into the wind. The swath width will be about equal to that of the boom length. To reduce wing tip and

prop wash vortices, group the nozzles at the tips of the boom and on the right side of the fuselage. Wing tip nozzles should not be placed closer than 2 to 3 feet from the wing tips. Before the spraying season begins, check planes for delivery rate, droplet size spray pattern, and swath width. (Figure 2)

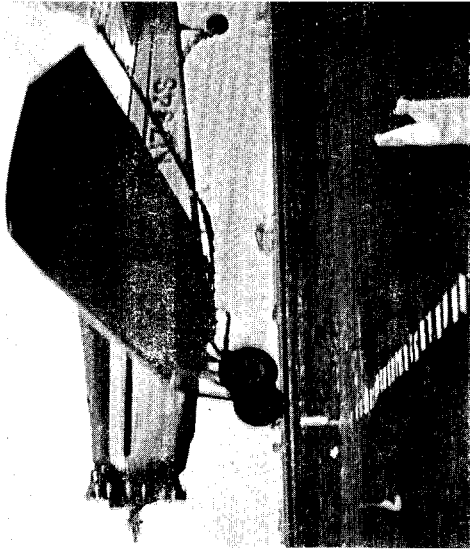


Figure 2. Checking plane for capacity to deliver proper amount of fungicide.

The droplet size affects the coverage of a spray. The angle of nozzle in relation to air stream, pressure, orifice diameter of nozzle, nozzle design, speed, and the surface tension and density of spray also affect droplet size. Spray droplets should be medium-fine in size, i.e., 200 to 400 microns (1/128"-1/64") in diameter. Coarse sprays of 3,000 microns (1/8") or greater are ineffective for leaf disease control. They also streak. Avoid fine sprays less than 200 microns because of drift and volatility. Add a spreader-sticker to improve coverage.

DISEASE DEVELOPMENT

When do these diseases first show up in your fields? How fast does a disease develop? How often do you really get out and look at your crop? Leaf diseases require about the same environmental conditions for development as do the wheat plants. With moderate temperatures (65° - 80°F), fungus disease may become established in 10 to 15 days. In other words, the disease symptoms you see today are the result of an infection that took place

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at least 10 days ago. Therefore, when you check your field and you see just a few disease symptoms (trace) on the leaves of your crop, you may already have a severe disease condition. If the weather has been ideal for disease development, many infections may have taken place already on the leaves and are not yet visible. These cereal leaf diseases are spread by fungus spores. And millions of these spores usually are available for infection if conditions are right. You will get the best results with protectant fungicides when you protect the plant with fungicide before a disease develops.

CONSIDERATIONS TO MAKE BEFORE SPRAYING

The value of the crop: What is the yield potential of the crop? Stand and general growing conditions will determine potential yield. A potential crop of 15 or 20 bushels does not warrant any additional fungicide expenses. However, a 30- or 40-bushel crop may be able to stand additional expense to prevent disease losses.

Variety grown: A variety that is susceptible to stem rust will not be worth protecting with the chemicals that we have today.

The durums have some resistance to leaf rust but are susceptible to *Septoria blotch* and *Pyrenophora tan spot*. The recommended spring wheat varieties have leaf rust resistance, but they are mostly susceptible to *Septoria* and *Pyrenophora*. For the present, the return for disease control on the newer spring wheat varieties may not be as great as that on other varieties such as Selkirk, Justin, Pembina, etc. For wise future planning you must know and observe the disease reaction of the various wheat varieties that you grow.

The recommended barley varieties are resistant to stem rust, and have responded very favorably to fungicide protection.

Follow through: You will not realize fully the successful control of crop diseases unless you harvest and handle the crop properly. Unsatisfactory results may occur because of any one or combination of the following factors.

1. Lack of potential yield.
2. Improper techniques of fungicide application.
3. Improper timing of the fungicide applications.
4. Harvesting the sprayed fields too soon, i.e., at the same time as unprotected fields.

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