Fungicide Application

Foliar Fungicides

Foliar fungicides can be applied using ground, aerial, or irrigation (chemigation) application equipment:

- Ground applicators apply fungicides in a similar way as other foliar-applied chemicals (Fig. 11).
- Aerially applied fungicides are applied at a reduced volume per acre and may require an adjuvant to force the chemical down into the canopy of the crop (Fig. 12). Several types of aircraft can apply fungicides, and farmers should work with aerial applicators to ensure that adequate coverage of the target crop is achieved.

- Irrigation distribution systems generally have the capability of applying fungicides—especially systems that are highly sophisticated. Center-pivot and linear systems are the most common irrigation systems used for chemigation.

In general, the basic factors involved in applying foliar fungicides are similar to those for applying other foliar pesticides (such as insecticides). Application method, droplet size, nozzle type, operating pressure, volume of water, and formulation can all influence fungicide efficacy.

Fig. 11. Ground application of fungicides is similar to that of other foliar-applied chemicals. (Courtesy Greg Shaner)

Fig. 12. Aerial application of foliar fungicide. (Courtesy Scott Bretthauer)
Key Factors in Applying Foliar Fungicides

1. Fungicide nozzles and spray pressures should be selected to produce a droplet size of 200–300 microns (Fig. 13). This is typically a smaller droplet than what is recommended for herbicide application.

2. Fungicide mobility is generally limited in plants, so adequate carrier volume is important for spray coverage. Higher volumes may be necessary as crops grow and plant density increases.

3. Some plant surfaces have a waxy or hairy coating that will cause fungicides to collect in large droplets, which run off the plant surface and thus reduce fungicide coverage (Fig. 14). Using a wetting agent, such as an adjuvant or surfactant, will improve coverage. However, some surfactants can cause plant damage if applied incorrectly or at the wrong stage of plant growth. Information on the correct use of surfactants can usually be found on products’ labels or in supplemental brochures. Adjuvants are usually included in flowable-type fungicide formulations, so adding an adjuvant to a fungicide in this form is not necessary and may in fact be detrimental to the fungicide’s performance.

4. Fungicide penetration in the lower canopy may be necessary to achieve optimal performance. Using a special nozzle, such as a drop nozzle or angled nozzle, can improve coverage.

5. Fungicide efficacy is maximized when application is made under ideal environmental conditions. Individual and systemwide spray capacity limitations may make it necessary to spray some fields under less than ideal conditions.

6. Preharvest intervals may limit choices of fungicides later in the season.
Seed Treatments

Fungicide seed treatments for field crops are used primarily for three reasons:

1. to manage soilborne pathogens that cause seed rots, damping-off, seedling blights, and root rot
2. to manage pathogens that are surface borne on the seed, such as those that cause covered smuts of barley and oats, common bunt of wheat, seedborne safflower rust, and downy mildew of soybean
3. to internally manage seedborne pathogens, such as the loose smut fungi of cereals (McMullen and Lamey, 2000)

Seed treatment recommendations, usage, and availability are extremely crop specific (Fig. 15). For example, almost all commercial hybrid corn, sugar beet, and canola seed is pretreated with at least one fungicide mode of action. Treating seed is not always economical in other field crops, such as wheat and soybean, although seed treatment is beneficial in specific areas and conditions. Seed treatment efficacy will depend on the choice of product, application method, application rate, planting method, soil type, soil conditions (both at and immediately after planting), and field history and level of disease.

Economic factors should also be considered, since treating seed with fungicide will add to the production cost.

Seed may be treated commercially or on the farm (Fig. 16). Commercial seed treatment is becoming a standard practice for many field crops, including wheat and soybean, because of the precision required to treat each seed with the appropriate formulation of active ingredients. Commercial facilities may also have the ability to use direct-injection methods to coat or pellet the seed with the treatment, which is more efficient than the simple seed-dressing process done on the farm or with slurry seed treatment equipment. The key advantage of direct-injection methods is that they optimize the amount of active ingredient on each seed. Coating or pelleting the seed can improve seed treatment adherence and seed uniformity, which aids in planting. In addition, commercial seed treatment eliminates many of the health and handling risks of on-farm treatment. This practice is also becoming more common as many fungicide seed treatments are packaged as combination products with insecticides and nematicides that are restricted use products (RUPs). An RUP can be handled only by a certified pesticide applicator or under the supervision of a certified pesticide applicator. Fungicide seed treatments can be detrimental to seed inoculants (nitrogen-fixing bacteria),

Fig. 15. Alfalfa seed with a seed treatment. (Courtesy Adam Sisson)

Fig. 16. Treating peanut seed before planting. (Courtesy Nicholas S. Dufault)
so care should be exercised when both are being used. Farmers should refer to product labels for precautions and mixing instructions.

Although less common than commercial seed treatment, on-farm seed dressing is still possible with the use of drill-box seed treaters and slurry mixers. Another common on-farm method is to add a liquid fungicide seed treatment into the base of the auger used to fill the drill box. These methods are easy and convenient but may not ensure accurate coverage of the seed. They may also require additional worker protection, such as gloves and a chemical respirator, depending on the product and formulation. Many logistical considerations are also involved with these applications, and it is important to avoid mechanical damage to the seed.

Other Types of Application

Other types of application may be available for certain fungicides, including banding and in-furrow applications. These types may require special equipment or modifications to current equipment. The product label for a given fungicide should be checked carefully to see whether these application options are available.