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College of Agricultural, Consumer and Environmental Sciences

report on
PLANT
DISEASE

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SOYBEAN SEED QUALITY AND FUNGICIDE SEED TREATMENT

Planting high quality seed is important to an efficient soybean production system. Early planting, reduced seeding rates, and drill planting all require high quality, vigorous seed to obtain optimum stands and yields. Strong seedlings grow faster than less vigorous ones, are more tolerant to adverse conditions in the seedbed, and are better able to resist diseases.

Figure 1. Seedling blight: (Left) healthy seedling; (Right) seedlings attacked by seedborne or soilborne fungi.

Diseases affecting seed quality and yield differ in severity among cultivars, years, and locations, but the pathogens responsible are well established in most production areas. Soybean seed produced in warm, wet seasons or where rain has delayed the harvest is often of poor quality. Using fungicide seed treatments provides cheap insurance against seedborne and soilborne seed rots and against seedling blights (Figure 1). Although fungicide seed treatments generally increase the stand, such treatments do not always insure higher yields.

Seed Quality

Many factors affect seed quality. Seedborne fungi, insect damage, adverse weather (such as frost), improper storage, and physiological aging all reduce seed vigor and viability. Any rough or excessive handling of dry or moist seeds at harvest or planting can cause cracked seedcoats and kill seed embryos. These cracks may be microscopic, but they still can increase seed rot by allowing nutrients to escape and by providing an entry for soil-inhabiting and/or seed-rotting fungi.

Pod and stem blight and seed decay, both caused by fungi of the *Diaporthe/Phomopsis* complex, are the major problems of soybean seed grown in Illinois and elsewhere in the Midwest (Figure 2). Decayed seeds are elongated, shriveled, discolored, and often covered with white mold growth (Figure 3). Healthy appearing, symptomless seeds also may be infected and can develop into blighted or infected seedlings. Seed decay is most severe when the crop has matured under high rainfall and humidity and when harvest has been delayed by wet weather. Seedlots with 20 to 40 percent of the seeds decayed by *Phomopsis* spp. are not uncommon in years when weather has favored an epidemic.

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Seed transmission of other fungi that cause such diseases as purple seed stain, stem canker, anthracnose, and downy mildew also is common. In general, the incidence of these seedborne diseases also increases during prolonged wet periods from bloom to harvest and when the harvest is delayed. Insect damage to pods and seeds may reduce seed quality directly and can contribute to seed decay by providing wounds for the entry of other, weaker pathogens, such as those causing yeast spot and Alternaria seed decay.

In summary, poor field emergence is a result of physiological, pathological, and environmental stresses–often acting in combination.

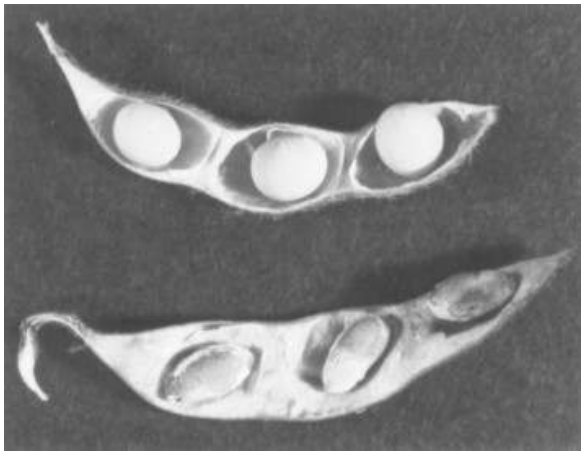

Figure 2. Pod and stem blight: (Top) healthy pod and seed; (Bottom) pod and seed infected with the pod- and stem-blight fungus.

Storing and Handling Soybean Seed

The storage and handling of soybean seed is very important. Moisture levels above 13 percent encourage the growth of fungi that can reduce viability. Extremely dry seed (9 to 10 percent moisture) can be cracked and damaged easily. Seed should be handled as little as possible and kept cool and dry. Seed that is easily broken or cracked (a moisture content of less than 9 or 10 percent) should not be treated other than in the planter box. The extra handling can cause excessive mechanical damage. The condition of soybean seed can be determined roughly by putting samples in a container of cool, clear water for about 2 minutes, then sorting out the sounds, hard seeds from the soft, puffy ones. Soft, puffy seeds would indicate cracked seed coats and the possibility of poor germination caused by mechanical damage; such seed should be properly tested before planting.

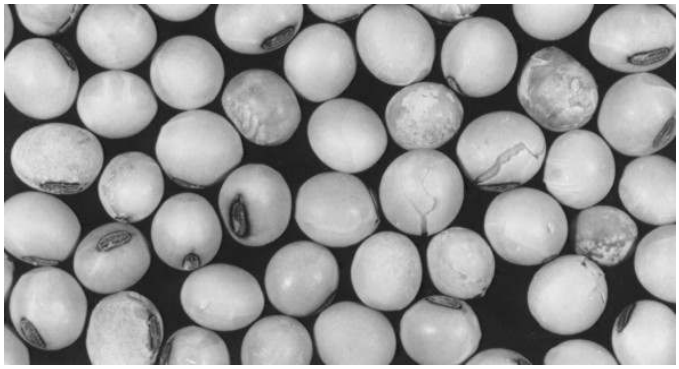

Figure 3. Poor quality seed showing cracking, discoloration, and mold growth. Some 70 percent of this seedlot germinated in a warm test. Such soybean seed should not be planted.

Tests for Seed Quality

The Illinois Crop Improvement Association (3105 Research Drive, Champaign, IL 61821) will perform several inexpensive tests to determine seed quality. All certified seed grown in Illinois is tested for warm germination, vigor (strong seedlings), and percent diseased seed, primarily *Phomopsis.* Other tests, such as percent cold germination, are available on request.

Ratings of seed quality are useful in determining planting rates and the situations in which seed treatment may be advantageous. Planting high quality, certified seed is strongly recommended whenever possible. Such seed usually do not need a fungicide treatment, but the necessity of treatment depends not only on the seed quality but also on the field conditions at planting time. The following guidelines can be used to determine relative seed health and whether a fungicide seed treatment would be beneficial.

Healthy Vigorous Seed Rating (%)		Average-to-Poor Untreated Seed Rating (%)	
Warm germination	85 or more	Warm germination	75 to 85
Cold germination	70 or more	Cold germination	60 to 70
Vigor	74 or more	Vigor	55 to 75
Diseased seed	10 or below	Diseased seed	10 to 20, or more

1. **Healthy, vigorous seed**. Seed treatment would be of **little or no value** unless: (1) adverse conditions, such as cool soil, in the seedbed at planting time make a delay in germination likely, (2) a reduced seeding rate is used, or (3) the field is used for seed production.

2. **Seed that is below average to poor in quality**. A fungicide seed treatment should increase the stand and perhaps the yield. However, it is always best to obtain high quality seed if possible.

3. **Seed lots with a rating lower than those above should not be planted if at all possible**.

Fungicide Seed Treatment

Proper seed treatment with a fungicide will increase the germination of poor quality seed if the low quality is the result of fungal infection (Figure 4). A fungicide treatment also protects the seeds and young seedlings from many seedborne and soilborne pathogens. Seeds infected with fungi, or planted where there is likely to be a delay in emergence, benefit the most from a fungicide treatment. Poor germination caused by mechanical damage, physiological aging, or other nonpathological factors will **not** be affected by fungicide seed treatments.

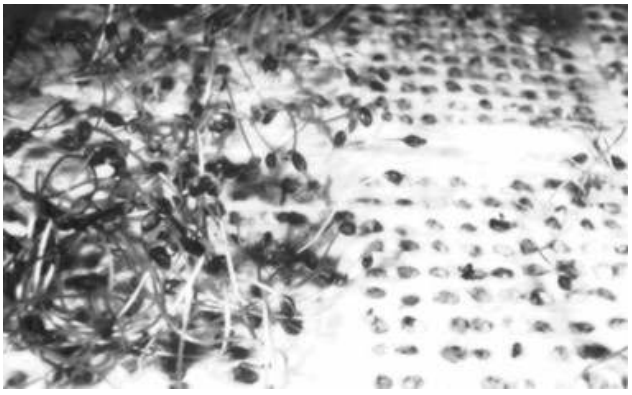

Figure 4. Warm germination test performed by the Illinois Crop Improvement Association showing seedlings from (Left) good quality seed and (Right) low germination from poor quality seed.

Table 1 shows the results of two trials at the University of Illinois at Urbana-Champaign. In field No. 1, the stand and yield were increased by seed treatment because diseases had significantly reduced the untreated stand. Although the stand with treated seeds was increased in field No. 2, the stand from sowing untreated seeds was adequate to produce a high yield. Studies in various Midwestern states have shown that stands from treated seeds may vary considerably without consistently influencing yields. Increased yields from seed treatment occur **only** where the stands from untreated seeds are poor–numerous skips of more than 6 inches, or 14 centimeters. Each planting situation is different, requiring the consideration of seed quality, planting rate, seedbed conditions, and the likelihood of rapid emergence.

Chemicals Used for Seed Treatment

Seed treatment products are available in several formulations–wettable powders, flowables, dusts, or liquids. These products can be custom-applied in slurry, ready-mix, or mist-type treaters or can be mixed directly as a dust in the planter or drill box. Many people are sensitive to certain seed-treatment chemicals and should not handle them. Numerous seed dealers and elevators offer custom service on fungicide seed treatments. **Treated seed should be stored safely and should never be used for food, feed, or oil purposes.**

A number of different fungicides and fungicide combinations (sold under a wide variety of trade names) have been registered with the federal Environmental Protection Agency for use on soybeans. The fungicides suggested for treating soybean seed are given in the Illinois Agronomy Handbook 2001, available in your nearest Extension office or at University of Illinois Ag Services P345, 1917 S. Wright St., Champaign, IL 61820.

Table 1. Effect of Captan Seed Treatment on Soybean Stands and Yield[a]

Treatment	Plants per acre	Yield (bushels per acre
FIELD 1		
No treatment	93,200	41.3
Treated with captan	131,600	45.7
FIELD 2		
No treatment	134,800	55.4
Treated with captan	148,100	55.5

[a]University of Illinois data.

Seed Treatment and Nodulation

Fungicide seed treatments have no serious effect on nodulation where nodulated soybeans have been grown previously. The inoculation of soybean seed with *Rhizobium* is not necessary in Illinois if a well-nodulated crop has been grown within the past 5 years. If inoculation does become necessary, a fungicidal seed treatment can still be used. Most available chemicals show little or no adverse effect on the *Rhizobium* bacterium if exposure before planting time is minimized, that is, if the seed is planted within 2 hours after being treated with a fungicide. If *Rhizobium* and a fungicide are applied simultaneously in the planter box, do the mixing just before planting.

Summary

A fungicide seed treatment is recommended when:

1. **Seed is grown for seed production**. Research has shown that seed of higher quality with a lower percentage of fungal infection are produced when the seed is treated with a fungicide before planting.

2. **Planting at a reduced seeding rate**.

3. **Germination is delayed because of unfavorable soil or weather conditions**, such as early planting in cool or cold soil (below about 55°F or 13°C) or planting in dry soil.

4. **Poor quality seed must be used and fungal infection is the reason for poor germination.**