Soybean Seed Health

More than 30 fungi are seed-borne on soybeans. Some, such as *Phomopsis* spp., the cause of pod and stem blight disease, can severely reduce seed viability (fig. 1). Others cause quality problems, such as purple seed stain, caused by *Cercospora kikuchii*, but have less severe effects on viability. However, most fungi that are associated with soybean seeds are not known to cause disease.

Soybean seed health can also be affected by seed-borne bacteria and viruses. Visual examination and blotter tests described here can be used to detect common fungi, bacteria, and viruses on soybean seeds. Information also is given on their importance to seed health.

Visual Examination of Dry Seed

Peronospora manshurica, the cause of downy mildew of soybeans, can be detected on dry seed by the presence of white encrustations on the seed coat (fig. 2). This may reduce seed germination and cause sytemically infected seedlings.

Fig. 1. Germination test. Seedlings grow from healthy seeds (right) and *Cercospora kikuchii* infected seeds (center) compared to poorly germinated seed infected by *Phomopsis* spp. (left).

Phomopsis spp. can be detected by presence of wrinkled, white, "moldy appearing" seed (fig. 3). *Cercospora kikuchii* causes a purple discoloration on seed (fig. 4). Soybean mosaic virus may cause a black discoloration in seed of some black hilum varieties (fig. 5). A brown discoloration may occur in white hilum varieties (fig. 6). Other tests are required to accurately estimate the amount of seed-borne infection by these organisms.

Fig. 2. Encrustation of downy mildew on soybean seed.

Fig. 3. Wrinkled, white, moldy-appearing seed infected by *Phomopsis* spp.

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Fig. 4. Purple discoloration caused by *Cercospora kikuchii*.

Fig. 5. Black discoloration of a black hilum soybean variety caused by soybean mosaic virus.

Fig. 6. Brown discoloration of a white hilum soybean variety caused by soybean mosaic virus.

Blotter Test

The blotter test is designed to determine seed infection by a range of fungi (including *Phomopsis*) on soybean seeds. Here's how to use it:

Place two sterilized blotters in each of two plastic boxes measuring approximately 25 cm (centimeters) x 15 cm wide x 4 cm deep. Moisten blotters in each box with 80 ml (milliliters) of sterile water containing 40 milligrams of 2,6 dichloro-6-nitroaniline (Botran 75W). Botran, a fungicide, is used in this test to selectively control the growth of Rhizopus, a common fungal contaminant. Surface sterilize 100 seeds in 1.0% sodium hypochlorite for 30 seconds. Rinse in sterile water. Aseptically place seeds on blotters, using 50 seeds per box. Incubate at 25 degrees C. in the dark for 10 days, then count the number of seeds from which each kind of fungus grows (fig. 7).

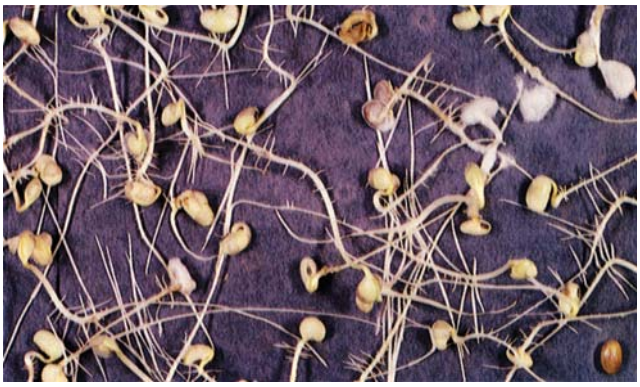

Fig. 7. Blotter test with fungi growing on nongerminated or germinated seed.

Fig. 8. *Phomopsis*. Note white mycelium with black fungal structures throughout.

Table. 1 presents dissecting microscope views of the fungi most commonly found growing on soybean seed in the blotter test. Included is information that will aid in interpreting test results.

Table 1. Nine fungi commonly found on soybean seed in blotter tests.

Fungus	Importance
Phomopsis (fig.8)	Causes pod and stem blight disease. Infection levels of 20% and above could indicate a serious effect on viability.
Cercospora (fig.9)	Causes purple seed stain disease. Discolors the seed and ruptures the seed coat. May cause a small reduction in germination but not as severe as *Phomopsis*.
Fusarium (fig. 10)	Some evidence suggests that *Fusarium* may reduce seed germination. However, the significance of seed infection is not well known.
Bacillus spp. (fig. 11)	Commonly associated with reduced seed viability.
Aspergillus (fig. 12)	Germination will be reduced if seed has been stored at too high a moisture content for several weeks.
Penicillium (fig. 13)	Germination will be reduced if seed has been stored at too high a moisture content for several weeks.
Alternaria (fig. 14)	There is no evidence to suggest a reduction in seed quality by these fungi.
Chaetomium (fig.15)	There is no evidence to suggest a reduction in seed quality by these fungi.
Cladosporium (fig. 16)	There is no evidence to suggest a reduction in seed quality by these fungi.

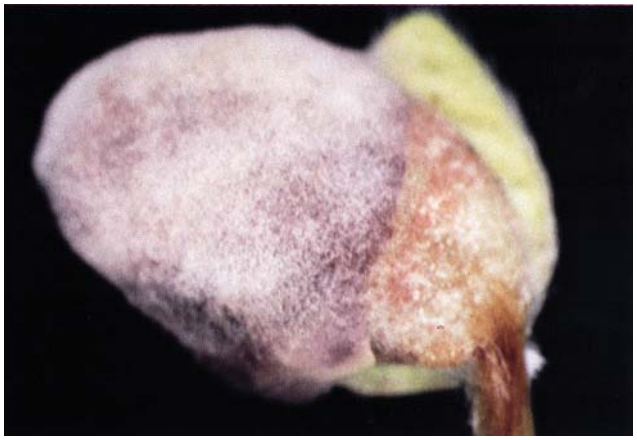

Fig. 9. *Cercospora*. Note mycelium growing on seed coat and cotyledon with purple staining produced.

Fig. 10. *Fusarium*. Note white to pinkish mycelium.

Fig. 11. *Bacillus* spp. Note wrinkled, "slimy" appearance.

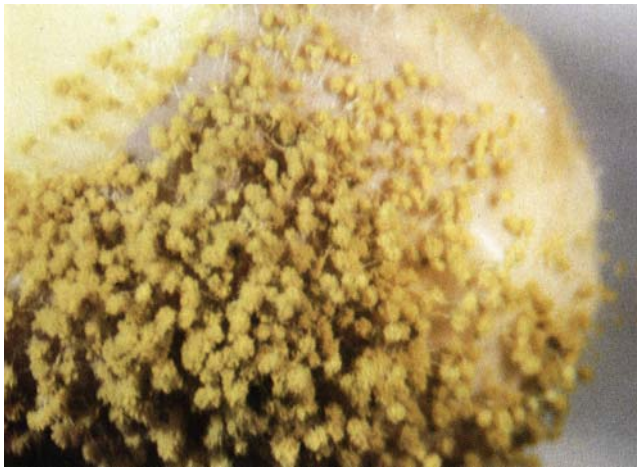

Fig. 12. *Aspergillus*. Note spore structures on "stalks." Yellow-green color indicates *A. flavus* but other *Aspergillus* spp. may have different colors.

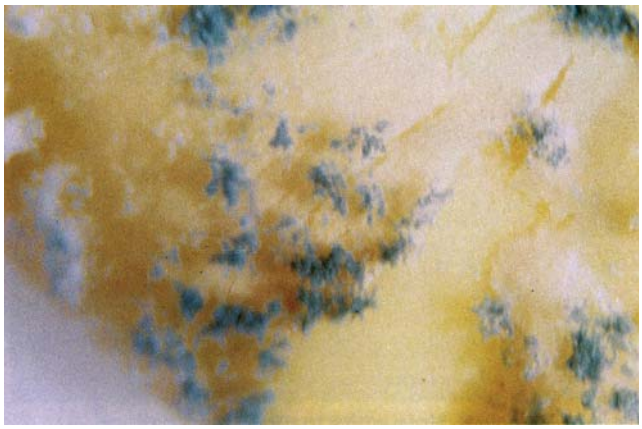

Fig. 13. *Penicillium*. Note bluish-green color.

Fig. 14. *Alternaria*. Note black fungal growth that is predominantly on seed coat.

Fig. 15. *Chaetomium*. Note dark-grayish "clumps" of fungal growth scattered over seed surface.

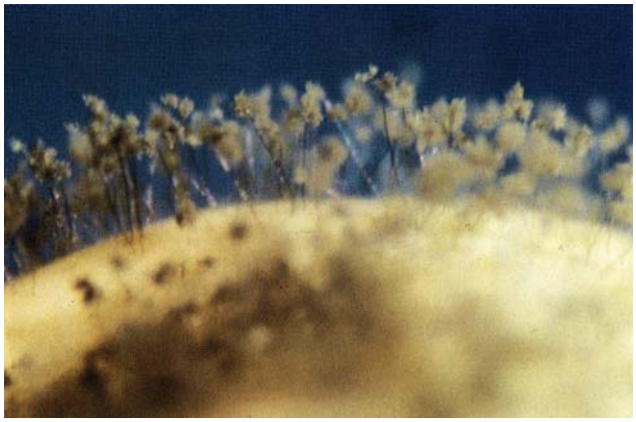

Fig. 16. *Cladosporium*. Note greenish-brown "clump-like" spore structures on stalks.

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