

# Soybean Pod, Seed Coat and Embryo Colonization by Fungi

Fall of 2018 saw considerable field weathering of pods in soybean fields which were nearing Harvest Maturity (14% seed moisture). The rainy weather caused delays in harvest from one to several weeks in the Midwest. Fungal colonization of soybean seeds can complicate routine seed testing, due to aggressive fungal growth

and seedling decay. One solution to control fungal growth in germination testing is to apply a chemical seed protectant. The purpose of this study was to compare raw seed (untreated) with four chemical seed treatments for normal seedling growth using the sand germination method.



**FIGURE 1.** Soybean pods showing dark fungal colonies.



**FIGURE 2.** Fungal colonization of seed coats and embryo tissue.

## POD TISSUE COLONIZATION

The signs of fungal colonization on pods occurs when soybeans are nearing maturity, from R6 (full seed) through R8 (full maturity) (Mueller, et. al. 2015). *Fusarium*, *Phomopsis*, *Cercospera* and other fungi species are some of the fungi commonly noted in seed testing laboratories. *Cercospera kikuchii* (purple seed stain) stains the seed, but often does not negatively affect germination. When field weathering occurs due to warm and rainy conditions, seed moisture can increase, if seed moisture exceeds 19% seed infection and colonization can resume (Mueller, et. al, 2015).

## SEED COAT COLONIZATION (SLIGHT)

Field weathering can lead to fungal colonization of seed coats and embryo tissue. Upon imbibition in germination testing, fungi can negatively affect seedling germination and development. Often cotyledons may be decayed by fungal infection from the seed coat. Seed Technologists utilizing the Association of Official Seed Analysts "Rules for Testing Seeds" must classify a seedling abnormal if more than 50% of the cotyledon tissue is decayed. Figure 2. shows a seedling with 100% green cotyledons (a) and (b) shows a decayed seedling with less than half cotyledon tissue free from decay (AOSA Rules 2018. Vol. 4 page 53). Seedling (a) would be classified as normal, while seedling (b) would be classed as an abnormal seedling. Testing in sand or application of a chemical seed treatments has been shown to be effective in controlling seed coat infections (AOSA Rules 2018, section 6.5 & 6.6). Often with time in seed storage fungi infecting seed coats die off and the seedling may germinate normally.



**FIGURE 3.** Severe fungal colonization of soybean embryo.

## EMBRYO TISSUE COLONIZATION (SEVERE)

When embryos are colonized by the fungal invasion (severe infection), often the result is a dead seed. These severe colonized “dead seeds” will not respond to chemical seed treatments. Often the aggressive growth of mycelium from these severely infected seeds can cause adjacent seedlings to appear decayed. This is considered a secondary infection in seed testing and retesting in sand or use of a seed treatment is recommended.

## STUDY METHODS AND FINDINGS

Ten soybean seed lots were selected, five treatments (raw seed and four commercially available chemical treatments) were compared in replicated 400 seed sand germination tests. Response variables included normal seedling percentages at 7, 9 and 11 days. Data from these ten soybean seed lots showed a 6–8% improvement (Table 1.) in normal seedling percentages when comparing any chemical seed treatment with the untreated raw seed.

TREATMENTS	MEAN NORMAL SEEDLING PERCENTAGES			
	7 day	9 day	11 day	TOTAL
Untreated (Raw Seed)	82	1	0	83
Thiram 42-S 2oz/cwt*	89	1	0	90
Mertec 340F 0.16oz/cwt*	89	1	1	91
Rancona CPro 4.2oz/cwt*	88	1	2	91
Acceleron A1 4.25oz/cwt*	87	2	0	89

**TABLE 1.** Mean sand germination percentages of raw seed and four fungicide treatments averaged across 10 soybean seed lots with varying levels of fungal seed colonization (Phomopsis and Fusarium species) and field weathering from the 2018 production year.

\*SoDak Labs, Inc is making no endorsement or claim regarding any of the seed treatment products used in this study. SoDak Labs, Inc. made no effort to conduct an extensive search of products nor application rates for the chemicals used in this study, there may be other seed treatment benefits not evaluated within the scope of this limited study. SoDak Labs Inc. received no compensation from any source in conducting this study.

### LITERATURE CITED:

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