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Seed Academy

Cereal Testing

POST HARVEST DORMANCY

Primary dormancy is common in cereal grain seed lots immediately after harvest. Aeration of grain with cool/dry air and storage time assists with the after-ripening process (dormant seeds moving to non-dormant), usually taking a month or more. Growers have often used the phrase "the grain needs time to sweat", this moisture migration process is moisture equilibration. The entire seed lot and the individual seed/seed embryo moisture content will equilibrate with the ambient air or forced air Relative Humidity (RH%). Other factors also influence post-harvest dormancy, such as growth inhibitors and membrane permeability (to water and oxygen). Storage time and aeration also help these factors dissipate. Commonly, the laboratory utilizes a 5–7 day 10°C prechill treatment to promote after-ripening. This cool moisture stratification is believed to stimulate the production of gibberellic acid and overcome any inhibitors of germination. Prechilling normally has no negative effect on seed (except sorghum where it can act like a vigor test) whether dormant or nondormant and can help the seed prepare for faster germination once warmer temperatures are introduced. We do not recommend prechilling sorghum seed.

GERMINATION AND TETRAZOLIUM (TZ) TESTING

Testing on the dry-side is best for all cereals and sorghum except rice, as rice can tolerate more moisture. We routinely test cereals in sand tests on the "dry side" for moisture level. Sand and reduced light penetration to the seed suppresses seed coat fungal growth and provides for uniform water uptake and emergence (Figure 1). Sand testing also allows for uniformity rating of all species and average coleoptile length measurements in wheat. TZ testing is a great and quick estimate of germination for cereals, the only complicating factor is fungal infection of seed coats.

VIGOR TESTING METHODS

Cereals which are considered cool-season crops are quite tolerant of cold tests, so normally an accelerated aging test is utilized. Sorghum as a warm-season crop is best evaluated using the tray cold test.

FIGURE 1. Wheat seedlings emerging from sand 7 days after planting.

FIGURE 2. *Fusarium* mycelium growth after 7 days.

FUNGAL SPORES AND MYCELIUM

Fungal spores and mycelium fragments are commonly loosely attached to the seed coat surface and/or on residue in the seed lot. During seed development, fungal colonization of the seed coat of embryo and wheat (*Fusarium* species) can influence seed test results and seed lot quality. *Fusarium* colonization of the seed can be categorized into two groups 1) Severe, when the mycelium has invaded embryo tissues causing death of the embryo and 2) Superficial, when the mycelium growth is confined to the seed coat. When *Fusarium* spp. colonization exists and the seed laboratory does not take precautions, low germination results can occur due to decay of seedlings (Figure 2). Precautions

FUNGAL SPORES AND MYCELIUM, *CONT.*

include: 1) Use of prechilling to help the seed embryo start growth at low temperatures less favored for fungal growth, 2) early counts to remove normal seedlings and innoculum sources, such as severely infected dead seeds, 3) performing a treated germination test using a fungicide to control superficial seed coat mycelium growth and "somewhat" suppress mycelium growth from severely infected seeds, or 4) sand germination testing to suppress both superficial and severely infect seed mycelium growth. Oats, Rye and Barley rarely have issues with *Fusarium*. If at harvest maturity, warm and rainy weather exists, field weathering can cause *Alternaria* species colonization resulting in seed coat discoloration or a weathered appearance of all cereal crops.

RESEARCH

To better understand seed coat infection by *Fusarium* species and germination, a study was designed comparing media methods and dates of testing.

METHODS

Ten file sample seed lots of Soft Red Winter (SRW) wheat seed with *Fusarium* species colonization and with 80–90% initial germination were selected. Seed was stored at 10°C after initial testing. Initial germination tests in July use CCP and seed was either treated or untreated. Seed was tested six months later as untreated seed using these methods: 1) Crepe Cellulose Paper (CCP), 2) CCP covered with 1/2 inch of sand (TCS) and 3) Top of blue blotter (TBB).

RESULTS

July 2015 CCP germination was 9% lower than January 2016 CCP germination and July treated germination on CCP when averaged across ten seed lots. January CCP germination was significantly higher than January TCS germination. *Fusarium* seed coat infections appear to be controlled by seed treatment in July and apparently "died off" during six months of storage at 10°C.

TABLE 1. Mean germination percentages from 10 SRW seed lots with *Fusarium* infection tested using 3 media methods and two dates.

Treatment	# of Observations	Sum	Germination Average %	LSD (0.05)
CCP (1/2016)	40	3658	91	a
TCS (1/2016)	40	3522	88	b
TBB (1/2016)	40	3576	89	ab
Initial CCP (7/2015)	40	3288	82	c
Initial CCP (7/2015) - Treated	40	3640	91	a