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# Potential Wheat Disease Issues on Seed, Seedlings, and Heads During a Wet Year (2015)

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For many Texas wheat producers, 2013 and 2014 may not have been the best years for wheat production. This year, yields may be better, if potential yield increases due to extra moisture is not offset by diseases such as root and crown rots, stripe rust, leaf rust, wheat viruses, insect damage, and other abiotic and biotic factors. With extra moisture due to rains, especially after flowering and during seed formation, the wheat head can be susceptible to infection by several fungal pathogens and the diseases that they cause. Some of those diseases include Fusarium head blight, sooty molds, Stagonospora glume blotch, and even seed diseases such as black point.

Some of the fungi that can be found on the glumes and seed can later become a seedling issue when using harvested seed for next years's crop. Some fungi, such as those in the genus *Bipolaris*, *Fusarium*, *Pythium* and *Rhizoctonia* can later cause seedling damping off or seedling blights, root and crown rots, leaf spots, and diseases that affect the wheat head. Figure 1 shows the effect of the fungus *Rhizoctonia solani* on wheat stands by causing seedling damping off or seedling blight early in the season. This fungus causes a root rot which can reduce root size, cause stunting, or even kill younger plants. Rhizoctonia root rot is also known as Rhizoctonia bare patch.

**Figure 1.** Seedling blight and root rot (bare patch) caused by the fungus *Rhizoctonia solani*. Other fungi such as *Fusarium* sp. and *Bipolaris* sp. can be responsible for similar symptoms.

It is not uncommon for the Texas Plant Diagnostic Clinic (Texas high Plains Plant Diagnostic Laboratory) in Amarillo to receive samples from the wetter areas of the state with issues on the wheat head and leaf tissue. One wheat sample had glume discoloration typical of sooty molds. From this sample, the Clinic identified several potential fungal pathogens: Alternaria sp., *Fusarium* sp., *Bipolaris* sp., and *Cladosporium* sp. (Figure 2). The fungus *Bipolaris* sp. can cause diseases such as common root rot and spot blotch (leaf spot) but can also infect the glumes.

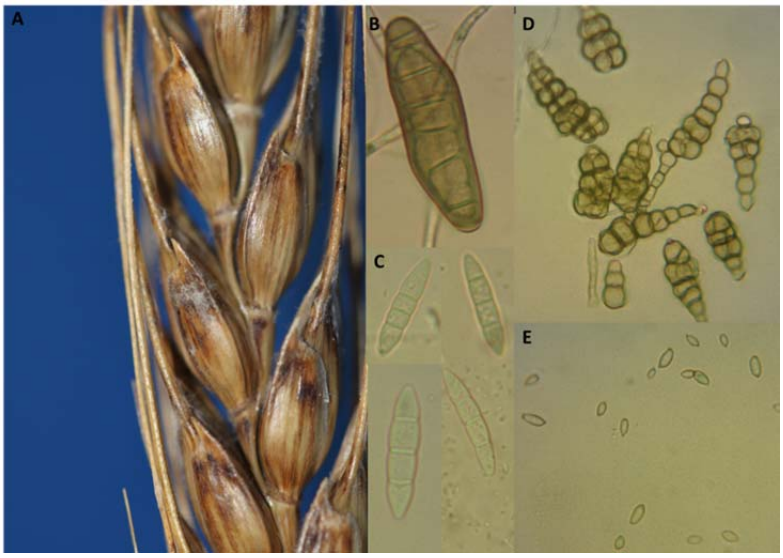


**Figure 2.** Symptoms and signs observed from the glume of wheat **A.** Glume discoloration and sooty mold growth. **B.** Conidium (asexual spore) of *Bipolaris* sp. **C.** Conidia of *Fusarium* sp. **D.** Conidia of *Alternaria* sp. **E.** Conidia of *Cladosporium* sp.

Species of *Fusarium* can cause diseases ranging from root and crown rot to head blight. Species of *Alternaria* and *Cladosporium* are secondary pathogens that may cause sooty head molds (black head molds). If these fungi can penetrate through and into the kernels (seed), the potential exists for the seeds to develop black point (kernel smudge). Black point is most common when relative humidity is high (>90%) and/or when seed moisture is greater than 20%. Symptoms of black point may include discolored seed, darkened seed coat and a shriveled embryo (Figure 3).

Besides affecting yield and quality, black point on seeds can affect next year's crop by harboring fungi in the genus *Alternaria*, *Cladosporium*, *Rhizopus* (type of bread mold), and *Fusarium*. Some, such as *Fusarium* sp., can cause root and crown rots or decrease germination if the embryos are infected.

For example, wheat samples normally received at the Texas Plant Diagnostic Clinic in Amarillo in early October had black point. Three fungi were identified from the infected seed: *Bipolaris sp*., *Nigrospora* sp., and *Alternaria* sp. Samples also processed in early October were found to have seedling blights and three fungi were recovered: *Bipolaris* sp., *Fusarium* sp., and *Rhizoctonia* sp. Samples can come from throughout the state.

**Figure 3.** Black point of wheat from samples obtained from the Central Texas Blacklands in 2007.

Other wheat issues in the head can be more pronounced. Glumes can be discolored, some rotting can be observed observed and seeds can be infected. Glumes can often be infected with fungi in the genera *Bipolaris*, *Drechslera*, and *Alternaria*. Any seeds that were infected and rotting were found to be infected commonly by fungi such as *Drechslera* sp. (Figure 4)


**Figure 4.** Symptoms and signs observed from the glume of wheat **A.** Glume discoloration, soft tissue rot, sooty mold. **B.** Mycelia (fungal growth) of *Drechslera* sp. growing on seeds. **C.** Conidia (asexual spore) of *Drechslera* sp. observed from seeds. **D.** Conidia of *Bipolaris* sp. observed from the glume. **E.** Conidium of *Drechslera* sp. observed from glume tissue **F.** Conidium of *Alternaria* sp. observed from glume tissue.

The issue with *Drechslera* sp. is that the species *Drechslera tritici-repentis* (more correctly known as *Pyrenophora tritici-repentis*) is the causal agent of tan spot of wheat. One sample had leaves with symptoms of leaf spot or blotch and two fungi were recovered: *Drechslera* and *Alternaria* (Figure 5). The head was also infected with both of these fungi.

All fungi mentioned can survive in crop debris, in seed (infecting seed or attached as spores on the seed coat), and in soil. Some fungi or water-molds can survive for several years due to the production of survival structures such as chlamydospores, oospores, or sclerotia.

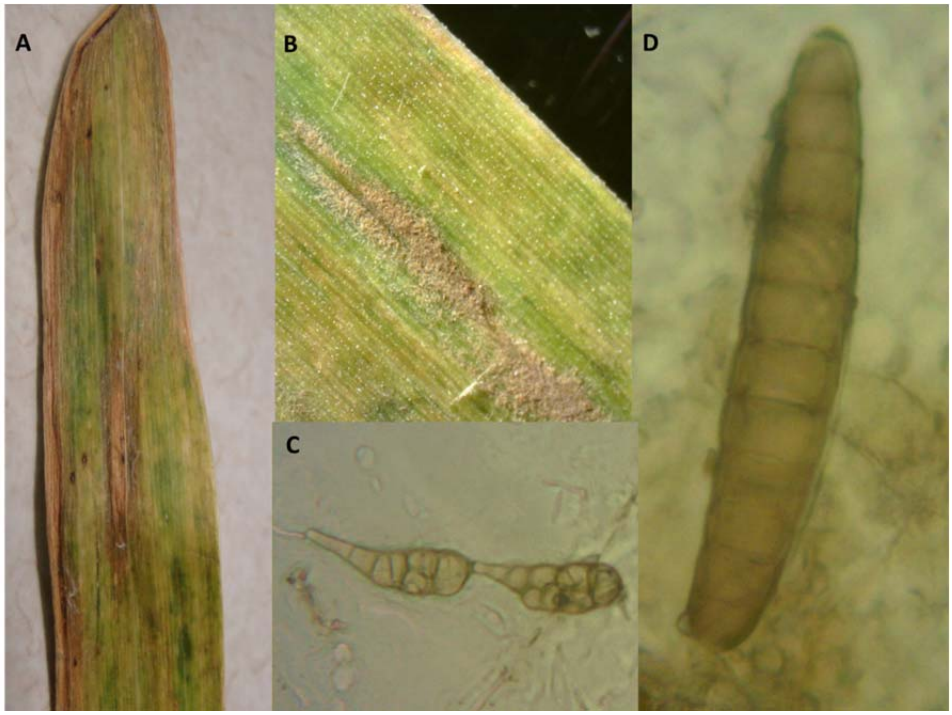


**Figure 5.** Symptoms and signs observed from wheat **A.** Leaf spot/blotch. **B.** Mycelia (fungal growth) of *Drechslera* sp. growing on plant tissue **C.** Conidia (asexual spores) of *Alternaria* sp. observed from leaf tissue. **D.** Conidium of *Drechslera* sp. observed from leaf tissue.

### Fusarium head blight (head scab) and seed scab

Fusarium head blight (FHB) is usually caused by the fungus *Gibberella zeae* (also referred to by its asexual phase, *Fusarium graminearum*). This fungus has the potential to produce mycotoxins, and in wheat, deoxynivalenol (DON) or vomitoxin could be a major issue under the right conditions such as flowering time, spore availability, high humidity, splashing rain, wind, and resistance levels by the wheat variety. Several other species of Fusarium may also cause FHB but may not produce a mycotoxin. Having FHB does not mean that DON will be produced by the fungus.

*Fusarium* spp. can overwinter in crop residue or stubble, of wheat, barley, corn, and as soilborne inoculum. *Fusarium* spp. can be responsible for head molds in sorghum and sorghum may be another source of inoculum if wheat is planted thereafter. Although at lower levels, *Fusarium* spp. can survive for several years as soilborne inoculum or in debris.

Although most infections may occur during anthesis (when female flower is open), spores of Fusarium can also infect during kernel development.

**Figure 6.** Large tan or brown colored lesions shown affecting a large section of the wheat head. In many cases, the whole wheat head may be affected.

**Figure 7.** Grain can exhibit kernels that may have a pink to red discoloration and are shriveled.

**Management of Seedborne or Soilborne Pathogens and Their Diseases.**

Since many of these fungi can survive from one season to another in soil or in seed, the potential exists for disease issues to re-occur and to a greater extent due to increased fungal populations in the soil and in harvested seed. Moisture is critical for fungal spore germination and growth and such moisture can occur in both soil (root and crown issues) and leaf tissue (leaf and head diseases). A wet year may accentuate the problem. Because different fungi require different temperatures for their optimum growth, some fungal issues may be more prevalent during early season rather than late season. Some may be suppressed by either low (*Bipolaris* sp., *Fusarium* sp.) or high temperatures (*Rhizoctonia solani*).

**If seed quality was compromised due to head (glume) and seed issues, there are several potential management approaches that can be done together or separately.** Crop rotation is a key factor in

plant disease management as this allows for fungal populations in soil to decrease and reach levels below those required for a major disease issue to occur. If crop rotation is to be effective, rotating with a non-grass would be best as other grasses may allow for fungal populations to persist in a similar or related crop (ie. barley, triticale, corn, sorghum).

If switching to a resistant variety is not an option (ie. keeping same variety and reusing seed), cleaning seed can reduce the amount of infected seed that will be planted. Cleaning seed will not affect any healthy seed that may have fungal spores attached to the seed coat (and spread from infected seed during storage) or seeds that may have low levels of disease such as blackpoint. Therefore, a more effective approach may be that of fungicide seed treatments.

**Fungicide seed treatments have proven effective as most seedborne diseases are fungal.** Not only can they target fungi that cause damping off, blackpoint, and early root rot and crown rot, but can also target fungi that may cause head diseases such as common (stinking) smut and loose smut. There are several commercial fungicides available for seed treatments. Many of those fungicides contain triazoles (ie. propiconazole, triticonazole, tebuconazole). Triazoles inhibit sterol biosynthesis which are components of fungal cells and therefore affect fungal growth. Triazoles are also used against foliar fungal disease once they are present as they affect fungal growth and post-infection activity. These fungicides tend to target smuts, bunts, root rots, and seedling rots.

Other fungicide seed treatments can include strobilurins such as pyraclostrobin which can also target most smuts and root rots. A strobilurin disrupts energy production by the fungus and can be useful for pre-infection (when spores become active) or when spores are being produced. Other fungicide seed treatments contain fludioxonil and can target seedling roots, and root rots (i.e. *Rhizoctonia*). For *Pythium* spp which are known to cause seedling blight and root and crown rots, both triazoles and strobilurins may be effective but products containing metalaxyl may prove more efficient against this “water mold”.

**For a list of fungicide seed treatments, go to:** http://sickwheat.tamu.edu/. You will find products from several companies listed with their active ingredients and some fungi or diseases that can be managed with them. Depending on what is needed, some products have a higher or lower dose of a certain fungicide, depending on whether a higher or lower dose is warranted. Some fungicides listed may not be needed if you do not have a history of a certain disease or fungal organism that is being target by that chemistry

For more information and advice, consult your local Texas A&M AgriLife County Extension Agent. For more information on wheat or other crop diseases go to: http://sickcrops.tamu.edu

If your wheat issue has disease issues, contact your local Texas A&M AgriLife County Extension Agent. If you need to submit a plant disease sample to the Texas Plant Diagnostic Clinic, you can download a submission form at: http://plantdiagnostics.tamu.edu/