

20/20 Tech Bulletin

What is a Fungal Screen™ for Cereals?

The Fungal Screen™ is a test that identifies potentially devastating seed-borne pathogens that may be present on cereal seed (Please note: True Loose Smut requires a separate test).

This is one of the most valuable diagnostic tools available to growers of cereal crops. It was developed by and is exclusive to 20/20 Seed Labs Inc.

Why do a Fungal Screen™?

Seed-borne pathogens can cause a host of problems with germination, vigour, and seedling health, which can impact stand establishment and, ultimately, yield potential.

Seed-borne pathogens can infect the seed surface, such as *Aspergillus spp.*, or infect the interior of the seed, such as true loose smut in barley.

Soil-borne pathogens survive in the soil and when they come in contact with the seed or seedling and the conditions are favourable, the infection process is initiated. Most seed treatments will control common seed and soil-borne diseases and smuts by protecting the seed and emerging seedlings, and provides an economical advantage when compared to untreated seed.

If these pathogens are identified prior to seeding, growers can take action to minimize the risks, either by selecting a seed treatment that controls the identified pathogens, or deciding to not use the seed lot altogether.

It is always beneficial to learn why crops may have performed poorly in the field. If a pathogen was a contributing factor, a professional diagnosis is helpful as many diseases show similar field symptoms.

Disease pathogens can be categorized into four groups:

- 1. Seed rots and seedling blights:** Fungi such as *Fusarium spp.* and *Cochliobolus sativus (Bipolaris sorokiniana)* may cause the death of seeds or of seedlings before or shortly after emergence.
- 2. Foot and root rots:** Seedlings affected with *Fusarium spp.* and *Cochliobolus sativus (Bipolaris sorokiniana)* and that survive the seedling stage might die later, or ripen prematurely, producing fewer heads, resulting in reduced seed set and/or shriveled seed.
- 3. Leaf blights:** *Septoria spp.* and *Pyrenophora spp.* can cause severe spotting on leaves and glumes, resulting in reduced seed set and shriveled seeds.
- 4. Head blights:** Three species of *Fusarium (F. avenaceum, F. culmorum and especially F. graminearum)* cause floret sterility and poor seed fill, causing significant yield loss. These species also produce mycotoxins (DON) that can be harmful to certain livestock and humans. Other species of *Fusarium* are associated with head blight, as well as foot and root rots.

How do we perform a Fungal Screen™?

200 seeds are surface sterilized, placed on a growth medium, and incubated for 7 days.

This test identifies the pathogens present and provides the percentage of infection.



Our disease diagnosticians analyze the colonies produced and identify the pathogens as follows:

- *Pathogenic Fungi* (Common Name/Symptoms): *Cochliobolus sativus* - Seedling blight, foot and root rot or spot blotch (leaf blight). Roots are severely affected and leaf lesions can occur.
- *Fusarium graminearum* - Fusarium Head Blight (FHB) leads to Fusarium Damaged Kernels. Chalky white bleached kernels; yields are reduced.
- *Fusarium spp.* - Seedling blight, root and crown rot, and head blight. Seed and seed germination are impaired; yields are reduced.
- *Pyrenophora spp.* - Leaf blight (leaf stripe, net blotch and tan spot), and seedling blight (oats). Symptoms include dark brown necrotic leaf lesions possibly becoming yellow (chlorotic). Discolouration of the seed (black point and red smudge) can develop.
- *Septoria spp.* - Leaf blotch; shriveled grain similar to FDK. Leaf lesions with dark patches.

Saprophytes or Weak Pathogens: *Alternaria spp.*, *Cladosporium spp.*, and *Epicoccum spp.* - Common saprophytes that can become more aggressive during delayed harvest and through mechanical damage. These fungi can cause seed discoloration resulting in lower seed grades. *Alternaria spp.* is very widespread and can be in the 30-60% range; *Cladosporium spp.* is usually in the 10-20% range, and *Epicoccum spp.* is usually in the 5-20% infection range.

Storage molds (Opportunistic): *Aspergillus spp.* and *Penicillium spp.* - These are found on the seed surface and can damage improperly stored seeds. Grain may become discoloured, rancid, heated, or bin-burnt, which affects germination and may produce harmful toxins. Ensure storage conditions are optimal to prevent spoilage. Moulds quickly multiply in warm humid conditions and cause degradation of the seed. *Aspergillus spp.* and *Penicillium spp.* are typically less than 2% infection.

How do I Use Fungal Screen™ Results?

Seeds that test positive for the presence pathogens are not necessarily unusable.

Fungicide seed treatments can protect seeds from both seed-borne and soil-borne pathogens; fungicide seed treatment costs can be high, therefore identifying the pathogens is the first step in making the decision to treat seed.

Cochliobolus sativus, for example, causes common root rot and can significantly reduce germination. Treating seed with a registered seed-applied fungicide to control the fungus allows the seed to germinate and reach its full potential to produce healthy plants.

Infected seed is the primary inoculum source; seed treatments control the infection thereby controlling the disease.

If the infection level of any one of the pathogenic fungi is higher than 8% infection, seed treatments may not provide the necessary control of the pathogen. When *Fusarium graminearum* is at 0.5% or higher, planting of the seed should be avoided unless the disease is already established in the area and/or the field.

If three or more of the five pathogenic fungi total more than 12%, control by seed treatments may not provide the necessary control of the pathogen.

There are no industry standards for the above mentioned pathogens other than True Loose Smut in barley (Please refer to Grade Tables II and III of the Seeds Act for the allowable limits). It is important to remember to correlate the germination results with the results of the Fungal Screen. For example, if a germination result is low due to a seed-borne infection it is possible to re-test that same seed lot in the laboratory with a seed treatment. Contact the lab and ask about seed treatment options. Controlling the pathogen with a seed treatment will often show improvements in the germination result.

Growers should always be aware of overall quality of their seed and use vigorous disease-free seed whenever possible. The Fungal Screen™ is a tool that allows growers to make more informed decisions about the seed's use.

More Information:

The Fungal Screen™ is a snapshot of one aspect of seed quality and is most useful when used in conjunction with other seed quality tests. 20/20 Seed Labs Inc. offers a number of testing packages to help you find out exactly what you need to know about your seed. For more information, see our Agronomic Test Packages.

The responsibility for seed utilization under this report with respect to any result or specification rests entirely with the client.



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