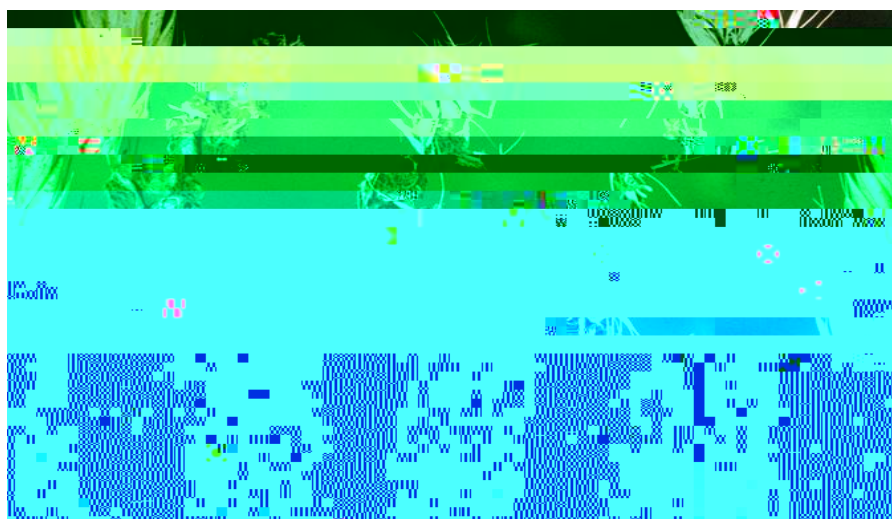




Seed Disease and Organic Management

For Cereals Grown in the Northeast



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There are many challenges to growing cereal crops in the Northeast, not the least of which is the management of seed-borne pathogens. These pathogens can decrease yield, lower quality and can have devastating effects on grain crops. Some, like *Fusarium* head blight (FHB) and ergot, can be toxic to humans or livestock if consumed even in low doses. Others, such as loose smut, can spread rapidly and render an entire crop useless.

This pamphlet serves to assist farmers and service providers identify and understand common diseases which can be present externally or internally in small grain seed or crop residue. The first step in solving disease problems in your fields begins with proper disease identification.

Though fungicides exist that are generally effective for conventional

Fusarium Head Blight aka Scab

Fusarium graminearum

FHB is currently one of the most problematic diseases facing grain growers in the Northeast. FHB results in yield loss and quality reductions due to shriveled grain with low test weight. Under certain conditions, the *Fusarium* pathogen can produce a mycotoxin called deoxynivalenol (DON). Eating grain contaminated at levels greater than 1 ppm poses a risk to human health and is restricted from use in food products. Higher rates cause adverse effects for livestock including vomiting and feed refusal.

Time and Source of Infection:

Fusarium spores persist on plant refuse, soil and seed surfaces and can be carried on air currents from a significant distance or by splashing rain. Rainy weather, high humidity and warm temperatures during flowering can result high rates of *Fusarium* infection. Wheat is particularly susceptible to infection at flowering, while barley is most susceptible at heading. Spores enter the flower and infect the kernel. Seedlings grown from infected kernels can be stunted or may die completely, decreasing yields.

Symptoms:

Spikes of infected plants are bleached while the rest of the plant remains green. Infected seeds appear shriveled and tinted gray or pink. Because DON levels are tested for in parts per million, it does not take many infected seeds to exceed the threshold. With careful sorting, infected seeds can sometimes be cleaned out of the harvested grain and DON levels reduced.

Management:

A mix of practices are needed to reduce infection potential. Plant resistant varieties, rotate crops, and **d R Q · W S O D Q W** following a host crop (corn and small grains). Tilling and burying residues can reduce spore populations, and chopping crop residues can allow infections to decompose more quickly. Staggering planting dates and crop varieties can minimize risk of widespread infection.

Bleached grain heads infected with Fusarium
Image source: UVM Extension

Loose Smut

Ustilago tritici (wheat); *Ustilago nuda* (barley); *Ustilago avenae* (oats)

Loose smut is a highly destructive fungal disease and can devastate crop yields if widespread. The Northeast is highly susceptible to this disease. Smut is easy to identify. It turns grain heads into large masses of black spores which rupture and disperse easily.

Time and Source of Infection:

Smut persists inside of the seed and infects the plant primarily at flowering (oats are infected at seedling stage). During spike or head emergence, diseased heads emerge slightly earlier than healthy ones and appear as a mass of dark brown spores covered with a paper-like membrane. This membrane tears easily as healthy plants begin to flower. Windblown spores infect the embryos of developing seeds in neighboring plants. After the fungus invades the grain embryo, it remains dormant until the seed is planted and germinates the following year. Upon germination, mycelium (threads of the fungus) grow upwards in the plant at the meristem and infect the grain head, repeating the cycle. Infection typically occurs when temperatures are cool and damp.

Symptoms:

Spore masses replace the grain head,

Ergot

Claviceps purpurea

Rye is the principal small grain host for ergot, though ergot can occur in other cereals. Ergot is easily identifiable by small amber masses that develop into large black masses, called sclerotia, protruding from the grain head. Ergot can be toxic to humans and livestock, causing vomiting, hallucinations, gangrene, muscle spasms, restricted blood

Common Bunt aka Stinking Smut aka Covered Smut

Stagonospora Leaf/Glume Blotch

Parastagonospora nodorum

The Stagonospora leaf/glume blotch pathogen

Common Root Rot, Spot Blotch,

Tan Spot

Pyrenophora tritici-repentis

Tan Spot is a disease that affects leaf surfaces of most grain crops and has the potential to significantly reduce yield. The fungus can remain active on host crop residues in the field and infection from windblown spores can be high during rainy or misty weather and cool temperatures.

Time and Source of Infection:

Infection can occur from tillering through dough stage, but is more frequent during the spring prior to jointing. Spores on crop residues are activated by spring rain events and carried onto neighboring leaf

Organic Management Practices

Since most diseases cannot be eliminated with a single practice, the goal is to minimize the disease through the use of several IPM strategies.

Identification

Proper identification is the first and most important step to manage disease outbreaks in crops. Utilizing the Plant Diagnostic Clinic, disease guides or research materials, or contacting Extension to properly identify the disease will then allow for the development of a management strategy. In most cases, preventative measures will help reduce the initial introduction or severity of disease in a field, such as using clean seed and equipment, resistant varieties and crop rotation.

Clean Seed

Use high-quality, certified seed wherever possible. Certified seed has been inspected for disease contamination and is guaranteed free of disease and weed-seed. If saving seed or purchasing non-certified seed, inspect samples to ensure grains appear healthy. They should not appear shriveled or shrunken, should have a high test weight, and should not show signs of discoloration such as pink, gray or black.

Resistant Varieties

Some grain varieties are resistant to certain diseases. Contact Extension for information on current research results and recommendations for particular diseases. A resistant variety is less likely to become infected or severity of infection is likely to be low if a disease is present. Resistance does not mean the crop is immune from infection, or that it will not become infected if a disease is present. Research is ongoing to identify varieties that show signs of resistance to diseases in the Northeast.

Clean Equipment

When harvesting a diseased crop, it is important to thoroughly clean all equipment that the pathogen comes in contact with to minimize the risk of contaminating other fields, crops or seed stocks. Pay attention to fields during harvest. If particular sections of a field have higher severity rates, consider harvesting those areas separately and

cleaning machinery after handling. Keep diseased grain separate from clean grain and seed stocks.

Crop Rotation

Rotating crops each year can be an effective means of decreasing disease presence in each field. Fungal spores or mycelium can survive on crop residues or the soil surface through the winter and attack the specific host crop but some can infect more than one, making correct identification of the pathogen and disease very important for choosing the right crop for suitable n cropfo

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Loose Smut

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