

Pesticide Certification Information

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DISEASES
OF
WHEAT

WEST VIRGINIA UNIVERSITY
EXTENSION SERVICE
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DISEASES OF WHEAT

FUNGUS DISEASES

PYTHIUM ROOT ROT

The Pythium root rots are distributed throughout the world on wheat, other cereals and grasses, and especially on fine prairie and loess soils. Under moist soil conditions and continuous cereal and grass culture, these browning root rots cause considerable damage.

Symptoms: Characteristic symptoms of the disease are the light-brown soft rot of rootlets and roots, and the pale-green stunted growth of tillers. A severe development of the disease causes browning of the leaves and a soft rot of the leaf sheaths and cortical tissues of the crown below the soil surface.

Optimal Environmental Conditions: The development of root rot is increased by several environmental factors such as tightly compacted fine soils, high nitrogen in relation to phosphate, continuous cropping of cereals or wheat, and summer fallow.

Control: Wheat varieties show differences in reaction to the disease. Legumes in the crop rotation system help reduce the damage. Balanced soil fertility is important in the control of the disease. Seed treatment is somewhat beneficial.

POWDERY MILDEW

Symptoms: The mildew is first evident as white fluffy patches on the lower parts of the plant. As the disease progresses, the patches become powdery, turn gray or brown, and may eventually cover extended areas of the plant.

Optimal Environmental Conditions: The disease is prevalent on winter and spring wheats during periods of cool, cloudy weather. Heavy mildew infection, especially during the period of tillering and stem growth, reduces the size of kernels and yield of grain.

ERGOT

Refer to the discussion of ergot on barley for information about this disease.

GIBBERELLA AND FUSARIUM BLIGHT OR SCAB

Stand, yield, and quality are affected by the disease.

Symptoms: The disease occurs as a seedling blight, foot rot, and head blight. The blighted seedlings are characterized by a light-brown to reddish-brown water-soaked stem rot and blight before or after emergence. The crown and culm-rot phase of the disease occurs as the plants approach maturity. The head blight is conspicuous before the spikes mature. The infected spikelets have a pink or salmon-pink cast, especially at the base and in the crease of the kernel. The infection frequently spreads to adjacent spikelets or through the entire spike. The infected kernels are shriveled, have a scabby appearance from fungal outgrowths, and range in color from white or pink to light brown, depending on the time of infection and on environmental conditions during disease development.

Optimal Environmental Conditions: Fusarium head blight causes severe damage to wheat, especially where temperature, rainfall, and relative humidity are high during the heading and blossoming periods.

Control: Crop rotation, sanitation, soil preparation, and seed treatment are important control measures. Covering the crop residue completely when plowing helps control head blight, and treating the seed with the fungicide compounds aids in the control of seedling blight. Wheat varieties vary greatly in susceptibility; no highly resistant wheats are known.

SNOW MOLD, FOOT ROT, AND HEAD BLIGHT

Symptoms: The fungus is conspicuous on leaf and crown tissues of winter cereals and grasses as snow melts in the spring. The white superficial growth is abundant under moist conditions. The leaf and bud tissues are penetrated and killed; they become bleached and dried. Local areas or spots frequently display dead plants with healthy plants adjoining.

The crown-rot stage of the disease is inconspicuous and frequently associated with other diseases. The head blight is also less noticeable, because individual kernels are infected without extensive blighting of the floral bracts. The kernels are shriveled and light brown.

Optimal Environmental Conditions: Winter wheat and rye and the grasses are damaged in areas where snow covering is heavy and soil temperatures are mild.

Control: Control measures are similar to other Fusarium diseases. Soil drainage is especially important.

TAKE-ALL

This is one of a complex of diseases attacking the roots, crown, and basal culm of cereals and grasses. The plant parts invaded, geographical distribution, environmental conditions under which the diseases develop, and fungi concerned are slightly different for each disease.

Symptoms: The symptoms vary greatly under different environmental conditions. Under relatively moist conditions, the conspicuous symptoms of take-all appear at about the time wheat is heading. Localized areas occur in which growth is checked, the green color fades, and the leaves, culms, and heads bleach. This sequence of symptoms is characteristic for the disease under favorable conditions, although not entirely specific for take-all. The main roots, crown, and basal culm tissues show a dry rot accompanied by a dark brown to black surface mat of thick-walled, coarse fungus growth. This fungal mat is conspicuous, especially on the culm base under the leaf sheaths.

Under drier conditions, the symptoms are less conspicuous. The plant tillering is reduced, plants are short, few plants show the dead bleached condition, and the fungus growth is less pronounced.

Optimal Environmental Conditions: The greatest losses from the disease occur in porous alkaline soils where winter wheat culture is continuous or associated with the culture of grasses and with the breaking of the native grass sod.

The damage is dependent largely on the presence or absence of soil microorganisms that suppress the activity of the fungus. Those organisms will probably not be abundant in alkaline sandy soils, soils with low phosphate and low potash levels, and soils without residues of crops other than wheat.

Control: Crop rotations involving legumes, other decotyledonous crops, oats, or corn are important in reducing damage. A balanced fertility with a good supply of available phosphate and potash reduces losses.

Wheat varieties show only small differences in susceptibility; adaptability of the varieties rather than resistances to the disease is apparently associated with susceptibility.

CROWN ROT AND ROOT ROT

The disease complex caused by the Helminthosporium group of fungi is distributed widely on wheat. Frequently, the Helminthosporium fungi are associated with species of Fusarium, which

further complicates the relationship of this group of fungi to root rot and foot rot of wheat. Crown and root rot, under favorable conditions, causes severe damage to wheat, barley, and grasses, especially as the plants approach maturity. Wheat recovers from the disease when growing conditions are unfavorable for the continued development of the fungus.

Kernel infection is severe on barley and durum wheats, and some of the stem-rust resistant wheats are relatively susceptible.

Control: Seed treatment is believed to be of some benefit.

SEPTORIA LEAF BLOTCH AND GLUME BLOTCH

Two septoria blotches occur on wheat. The leaf blotch is generally the more important disease, and occurs more consistently than glume blotch. Epidemics of the glume blotch, however, occasionally cause severe shriveling of kernels in the soft-red winter wheat fields.

Symptoms: The leaf blotch appears first as light-green to yellow spots between the veins of the leaves. The lesions spread rapidly to form light brown, irregular blotches. Lesions on the culms, floral bracts, and pericarps of the kernels are less conspicuous and much smaller, with sparse speckling.

The glume blotch generally occurs on the floral bracts and nodal tissues of the culm. The lesions are small, linear to oblong, light brown to dark brown, and the speckles are less conspicuous than the spots of leaf blotch.

Optimal Environmental Conditions: Under favorable conditions, especially in the late autumn and early spring, defoliation and invasion of the crown tissues occur, resulting in weakened or dead plants.

In the autumn, the leaves of winter wheat become infected, and the fungus remains active even at temperatures near freezing. Early-spring spread of the disease is rather general. Infection in spring wheat occurs from spores formed the previous season, from spores produced on wheat refuse during the spring, and from infected seedlings. The glume blotch fungus develops in a similar manner, but is less resistant to severe winter conditions and develops at higher temperatures than the leaf blotch fungus.

Control: Crop rotation, sanitation, and plowing under volunteer wheat plants in the fall are important control measures.

RHIZOCTONIA

Symptoms: The disease appears in patches in which the plants are stunted. The leaves in many varieties show a purple cast. Plants are weakened and sometimes killed; more generally they recover, in which case maturity is delayed and yield is low. Tan-colored rot of the root system and tan lesions on the basal leaf sheaths are the conspicuous symptoms. The characteristic fungus growth is present in rotted tissues and root stubs near the crown.

Optimal Environmental Conditions: The disease develops best at low temperatures.

Control: Crop rotation and balanced soil fertility are important control measures.

SMUTS

LOOSE SMUT

The loose smut of wheat is distributed generally in humid and semi-humid wheat-producing areas. The disease is most severe in the hard- and soft-red winter wheat areas.

Symptoms: For a description of this disease, refer to the section about nuda loose smut on barley.

Control: Loose smut can be reasonably controlled by using treated seed.

BUNT OR STINKING SMUT

The disease causes losses in yield, produces difficulties in threshing, and lowers quality.

Symptoms: The symptoms of bunt usually are apparent until the wheat heads; however, some varieties of wheat infected with certain races of the disease show dwarfing of the plants, small light-colored spots on the leaves, and a grayish cast on the foliage and culms during the period of tillering and stem elongation. Root development in smutted plants is reduced from the time shortly after heading until maturity.

The smutted plants of many varieties appear bluish-green to grayish-green, and the heads frequently show characteristics unlike healthy spikes of the variety. A fishy odor is present from the period of spore formation to maturity, even in the threshed grain.

The smut balls that replace the kernels frequently are conspicuous in the smutted spike. The smut balls, somewhat the shape of the wheat kernels, are grayish-green and change to brown as the grain ripens. The presence of the smut balls and the dark spores adhering to the kernels are evident by the reduced stem growth of the infected plants; the spore balls are nearly round instead of the shape of the kernels.

Control: Seed treatment is the recommended method of control to prevent the occurrence and spread of specialized races of the fungus to which even resistant varieties are susceptible. Dwarf bunt is not readily controlled by seed treatments.

Many wheat varieties are resistant to certain groups of the causal fungus.

RUSTS

STEM RUST

This disease has probably caused greater and more spectacular damage than any other disease of wheat. Yield is reduced, and composition is modified, varying considerably with the stage of plant growth when the rust develops.

Symptoms: Two stages of the rust occur on wheats.

The red rust is evident on the leaves and culms at any stage of plant growth. Reddish-brown oblong spots appear, and the surface of the leaves and culms is ruptured and pushed back around the blister-like spots. Stem rust is distinguished readily from leaf rust, except perhaps in very early spring or late autumn when the two rusts appear similar.

Black rust develops more abundantly on the leaf sheaths and culms of the rusted plants, especially during and just prior to maturation of the wheat tissue. The flecks are oblong to linear, dark brown to black, and the spores inside the spots are exposed. Severe stem-rust development results in many dark spots on the leaves, culms and spikes, and in the drying out and early maturity of the wheat plant.

The alternate-host stage of this rust-causing fungus first appears in the spring. The orange-yellow lesions are common on leaves, petioles, and blossoms of the barberry. The first noticeable lesions are lightly elevated, orange-yellow, and produce a substance that attracts insects; they are the carriers of the fungus to the wheat plants.

Optimal Environmental Conditions: In the drier areas, the disease develops in epidemic form only in moist seasons. Losses are usually higher in the spring wheat sections than in either the soft or hard winter wheat areas. This is due apparently to (1) relatively high summer precipitation in the spring wheat areas, and (2) plant growth occurring over a longer period of favorable summer conditions.

Control: The control of stem rust can be achieved by barberry eradication and by use of resistant varieties.

LEAF RUST

The leaf rust of wheat is distributed through the humid and semi-humid wheat-producing areas, and is distributed more uniformly and occurs more regularly than either of the other rusts of wheat. Damage is severe, especially when the rust infection occurs early and continues during the growing season. Total yield of grain is reduced appreciably. Kernel volume is lowered without appreciable shriveling of the grain, and nitrogen content of the grain is decreased.

Symptoms: The rust is evident on the leaves from seedling stage to maturity. In early spring, orange-yellow growths of fungus frequently form a circle around the growths of the previous autumn.

Optimal Environmental Conditions: In areas of moderate to plentiful moisture, the fungus on the mature crop reinfects volunteer wheat seedlings and fall-sown wheat.

Control: Leaf rust-resistant varieties offer the chief means of control of this disease. Resistant wheats are essential to economical wheat production, especially in the humid regions where winter and spring varieties overlap.

VIRUS DISEASES

SOILBORNE MOSAIC

Symptoms: Infected leaves become mottled with light green streaks which tend to follow the direction of the long axis of the leaf. Mottling can also be found on the leaf sheaths and glumes. In addition to the mosaic mottling, the virus disease causes stunting or dwarfing and excessive proliferation in some wheat varieties. This condition—rosette—gives a field a spotted or patchy appearance. The leaves of rosetted plants eventually become dark green and mask the mosaic mottling.

STREAK MOSAIC

Symptoms: The first symptoms on both winter and spring wheat are faint chlorotic streaks which run parallel to the leaf veins. The streak-type symptom is frequently followed by a general mottling and eventually a complete necrosis. Diseased plants are usually stunted, and tillers on the same plant may vary considerably in height. It is not uncommon to find sterile-headed stunted plants just the height of, or shorter than, the stubble. Complete or partial sterility of the heads and poor filling of the kernels reduce the yield and grade of the grain.

Mites are carriers of this virus disease.

SPINDLE-STREAK MOSAIC

The virus that causes this disease builds up in the soil from year to year. Where wheat is grown continuously in the same field, yields become so poor that production is usually discontinued.

Symptoms: The spindle-streak mosaic is characterized by light-green to yellow, spindle-shaped dashes and short streaks on the younger leaves, and by mosaic patterns and necrosis on the older leaves of winter wheat in May and June.

Optimal Environmental Conditions: The disease causes losses every year, and in those years when the spring temperature remains near 50°F, spindle-streak mosaic becomes severe and causes yield losses of 25 percent or more.