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FACT SHEET

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OAT DISEASES

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Oat production in Texas has steadily increased from 193,000 acres in 1876 to 1.5 million acres today. Oat production in Texas is valued at 29.2 million dollars annually, and among the cereal crops ranks second to wheat in economic importance.

Oats are subject to a number of diseases, several of which can cause severe damage. Disease losses are seen as a lowering of grain yield and quality.

The Rusts

Rusts develop only on living cells of their host plants, and do not survive on decaying crop residue. Rust fungi have a high degree of specialization in their choices of host plants.

The life cycles of oat rusts may involve as many as five different types of spores, each with a different function. All five types may be borne on a single oat plant or they may infect two entirely different hosts such as oats and buckthorn.

There may be many different races in a single species or variety of rust, and no two races of a given rust attack the same oat varieties. This complicates efforts to breed rust-resistant oat varieties.

Crown Rust (*Puccinia coronata*) — Crown rust of oats corresponds to leaf rust of wheat, barley and rye, and is sometimes called leaf rust on oats. Numerous wild grasses closely related to oats are attacked by this fungus, but no cereal crop other than oats is affected. Crown rust is a two-host rust, with buckthorn (*Rhamnus* spp.) being the alternate host. Most of the native buckthorn (*R. coroliniania*) in Texas is not a host.

Crown rust is present every year in Texas, although the severity of the disease varies from year to year. In years when crown rust is severe, loss of as much as 30 percent of the potential crop is possible.

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Some years the first infection of crown rust may occur as early as late October on fall sown oats in South Texas. The crop is infected by wind blown spores from Mexico or from wild grasses. The first symptom is oval, elevated, orange-yellow blisters scattered on the leaves. When these blisters break open, they appear as pustules surrounded by the leaf epidermis. Most of the pustules are found on the leaf blades, but some appear on the sheaths, stem and culms. They contain spores which spread the disease during the growing season. As oats mature, a black spore stage of rust is formed.

The principal control measures for crown rust are early planting and the use of resistant varieties. Early planting aids in the development of a good root system, which makes plants more tolerant to crown rust attack. Early maturing varieties generally suffer less from rust than later maturing varieties. The different races of crown rust are distinguishable only by their ability or inability to infect certain varieties of oats. Since the early 1930's, a concentrated effort by plant breeders and plant pathologists has led to the development of oat varieties resistant to certain races.

Stem Rust (*Puccinia graminis avenae*) — Stem rust is another two-host rust and occurs on most oat varieties throughout Texas. Like crown rust, it is more serious in humid areas and can cause severe damage when conditions are favorable. Stem rust causes reduced yields, lower bushel weight and lodging.

The life cycle and spore stages of the stem rust fungus are very similar to those of crown rust, except that the common barberry (*Berberis*) is the alternate host for stem rust. The stem rust fungus can overwinter in the deep South on winter grown oats or wild grasses.

The stem rust fungus is composed of several races, but not as many as the crown rust fungus.

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Control measures for stem rust are similar to those for crown rust. Early planting results in less damage from stem rust, and contributes to the general health of the crop.

Leaf Rust

The Blights

Septoria Blight (*Septoria* sp.) — Any aerial part of the oat plant may be infected with the *Septoria* fungus. On the leaves, lesions are circular to elongate, light yellow to dirty white in the center surrounded by a dull brown, which is in turn surrounded by yellowish tissue blending into green. The center of the lesion may be dotted with small, dark, spore-producing bodies. Infection of the stems sometimes causes severe lodging.

The fungus overwinters on stubble and oat straw left in the field. In the spring, spores are produced on this material and blown by the wind to the green grain. Initial infections are mainly on the leaves.

Crop rotation should help prevent the disease from building up to serious proportions. Seed treatment has little effect on this disease, as it is not generally seed-borne. Foliar fungicides will control the disease, but the cost is usually prohibitive.

Victoria Blight — This disease first appeared in 1945 on varieties of oats that possessed the Victoria type of crown rust resistance. It soon proved to be one of the most destructive oat diseases ever known, reducing yields of susceptible varieties by as much as 50 percent.

Infected plants show longitudinal bronze or lead-colored striping of the leaf blades and sheaths, a basal stem and root rot and an abundant black sporulation of the fungus on the nodes of mature plants. Infected stems often break over near the ground line. The disease fungus produces a toxin (poison) which spreads throughout the plant. The fungus is seed-borne and persists in crop residue. Once established, the disease appears each season on susceptible varieties. Seed treatment and crop rotation control the disease on susceptible varieties, except where extensive acreages of susceptible varieties are grown in the area.

Bacterial Stripe (*Pseudomonas striafaciens*) — The stripe blight occurs on oats in various sections of the State. The lesions first appear as very small, sunken, water-soaked spots that coalesce to form long, water-soaked stripes. Bacterial exudate is apparent on the surface of the lesion. Severely infected leaves later turn brown and die back from the tip. Where highly susceptible varieties are involved, the die-back may include several inches of the leaf not occupied by lesions, indicating considerable additional indirect damage.

The bacteria overwinter on seed and plant residue in the field, and plant residue is the most important source of infection in the spring. The disease is favored by cool, wet weather and is checked by warm, dry weather. Control measures are not ordinarily needed.

Culm and Root Rots

Culm Rot (*Helminthosporium* spp.) — Plants infected with culm (stem) rot may be killed or may produce low yields of poor quality. The grain is shriveled, light in weight and often cannot be separated completely from sound grain. The disease may infect single plants, small circular to irregular patches of plants, or large areas within the field.

Root Rot (Several fungi) — Several fungi attack the roots of oats as well as other parts of the plant. Two or more fungi often are found on a single plant. Damage by root and crown rotting fungi often is increased by nematodes, drought or winter injury. Similar effects may be caused by rust and other foliage diseases, yellow dwarf or soil-borne mosaic virus. Root and crown rotting fungi generally overwinter in infected seed, crop residues and soil. Infections come from sowing infected seed, bits of straw and leaves carried with the seed, cereal or grass residue on or near the soil surface and wind blown fungal spores. From the seedling stage to heading or even

later, plants are stunted, lack vigor and are pale green, purplish, yellow or bleached. Affected plants are easily pulled up because the root system is generally rotted. The roots are often brown or black with water-soaked areas. Later the roots die and sluff off. Infected crown tissue is bleached, brown or black and decayed. Under stress of wind and rain, lodging is common and may be severe. Heads are often blasted or poorly filled with a few shriveled seed. Infected plants often suffer heavily from winter killing and drought.

No one practice will control root and crown rots, but the following measures will help keep losses to a minimum: 1) Sow clean, certified, disease-free seed of varieties recommended for your area; 2) Plant in a fertile, well prepared, well drained seed bed at the recommended planting time in your area; 3) Maintain balanced soil fertility; 4) Rotate small grains with non-grass crops; 5) Do not spread manure containing infested straw and corn stalks on fields to be planted to oats within the next year.

The Smuts

Covered Smut (*Ustilago kolleri*) — The smut mass, which replaces the kernel, is covered by a thin grayish membrane that usually does not rupture until harvest or thrashing time, depending on the oat variety. At harvest and thrashing time, the spores are spread over the grain and some lodge beneath the glumes where they germinate and spread a mass of fungal threads over the seed coat. Other spores remain on the outer surface of the glumes. When the seed is sown in moist soil at the right temperature, these spores germinate with the seed and infect the young seedling, keeping pace with the growing point of the plant. When the head forms, a mass of spores replaces the kernels within the glumes. Seed treatment with a protectant fungicide will help reduce losses caused by covered smut.

Loose Smut (*Ustilago avenau*) — The individual flowers of the oat panicle are replaced by the spore mass. Loose smut is more conspicuous in the field than covered smut when it first emerges from the boot, because the smut is not hidden by the blooms or chaff. The smut mass of each spikelet may be surrounded by a delicate white membrane; but unlike the covered smut membrane, this soon breaks and the black spores are carried by the wind to the flowers of healthy heads, where they lodge beneath the glumes. Here they germinate and spread a mat of fungal threads over the seed coat under the hull. After the seed is sown, the fungus invades the young seedlings before emergence and grows inside the plant until it finally invades the developing head and forms smut masses in place of the kernels.

Loose smut of oats is not "embryo-infecting" like loose smut of wheat. Therefore, it can be controlled by chemical seed treatments.

Oat Smut

Powdery Mildew

Powdery mildew can be a serious disease on oats in various parts of the state, reducing forage yields of susceptible varieties. The fungus is an external parasite appearing first as patches of white fluffy growth on the lower leaves and leaf sheaths. As the disease progresses, the patches become powdery, turn gray or brown and may eventually cover large areas of the leaf and sheath. If control measures become necessary, resistant varieties probably will be developed.

The Viruses

Several viral diseases of oats are known. At least two, soil-borne oat mosaic and barley yellow dwarf, have been known to cause serious losses of oats in Texas and should be ranked as major oat diseases.

Soil-Borne Oat Mosaic — This mosaic disease is caused by a virus comprised of at least two distinct strains. In years favoring the disease, the virus can reduce yields as much as 50 percent in susceptible varieties. In its most destructive form, this disease causes infected plants to be stunted and to grow in a rosetted condition. Less severe symptoms sometimes include yellow streaks paralleling the axis of the leaf

and a necrotic mottling. The virus is soil-borne and over-seasons in the soil. Symptoms are most noticeable in cold temperatures. Many resistant varieties are known, and the use of these varieties will effectively control the disease. The use of rotation is another means of controlling this disease.

Barley Yellow Dwarf — This disease first appears as yellow-green blotches on older leaves, principally near the tips. These areas may then take on a reddish cast, which on different varieties and under different conditions may range from yellow to brilliant scarlet. Infected plants are dwarfed, mature early, produce seed low in bushel weight and have more blast.

Barley yellow dwarf is transmitted by a number of species of aphids. Several strains of the virus exist, and certain species of aphids transmit given strains of the virus more readily than others. The complete life cycle of barley yellow dwarf virus is not known; but it is known that wild grasses susceptible to the virus may play a part in its overwintering cycle.

Barley Yellow Dwarf

Seed-Borne Diseases and Seed Treatment

Several diseases of oats can be seed-born, namely the root and crown rots, covered and loose smut and to some extent *Septoria* blight. The organisms causing these diseases usually adhere to the seed coat, and when the seed is planted they germinate, grow and infect the young seedlings. Because these organisms are exo-embryo-borne, the conventional seed protectant fungicides will help prevent them. Seed protectant fungicides may be applied in home treaters, on-farm treaters, drill box treatment and by commercial seed treatment plants. Since lightweight seed often contain disease organisms and yield less, only clean seed should be planted.

Non-Parasitic Diseases

Blast — Blast is a type of sterility which appears at the time of heading in the form of white, empty hulls, usually near the base of the panicle. Blast appears to be associated with the extremes of temperature, moisture, light and nutrition that occur at certain critical periods in the development of the plant. The amount of blast usually is greater in late-seeded material than in early-seeded. In general, the better adapted varieties tend to be more resistant. Good cultural practices can help, but will not give complete control of blast.

Gray Speck — Gray Speck is caused by a manganese deficiency in the soil. It is sometimes a problem in alkaline-organic and other low manganese soils. The symptoms of gray speck first appear as light green to gray-brown spots and streaks mainly on the leaves. Plants may be stunted and yields reduced. The entire plant may turn yellow if the disease is severe. Gray Speck can be controlled by the application of manganese salts to the soil, or by spraying the plants with a 1 percent manganese sulfate.

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