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Important Diseases of Corn in Nebraska

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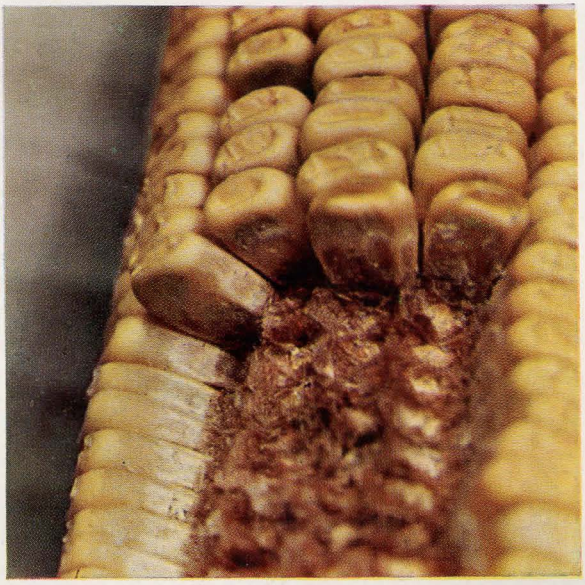
Fig. 1: Diplodia dry rot. The mold begins at either the tip or the butt of the ear and may cover the entire ear. The picture on the right shows the mold on the germ end of the kernels.



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Important Diseases of Corn in Nebraska

J. E. Livingston*

Corn is the most important feed crop in Nebraska. Production was officially estimated at 329,855,000 bushels in 1944, and would have been even greater except for the presence of several corn diseases, as shown in Table 1. Serious losses were caused by both ear rots and stalk rots. The loss figures on ear rots is the total estimated yield loss based on an estimate of the per cent of damage on each ear observed. The loss in yield caused by stalk rots was calculated by cutting approximately 100 stalks in two replications of each hybrid in the outstate testing fields of the College of Agriculture in Pawnee, Nemaha, Washington, and York Counties. An average of 42 per cent of the stalks were diseased and the average weight of an ear from a rotted stalk was found, in these tests, to be 13 per cent less than the average weight of an ear from a healthy stalk. The total loss from all corn diseases in 1944, as shown in Table 1, was approximately 15 per cent. Fortunately, the loss from disease is not as great in most years as it was in 1944.

Table 1

Estimated Percentage of the 1944 Nebraska Corn Crop Lost From Diseases.[1]

Disease	Eastern Nebraska Estimated crop loss Per Cent	Western Nebraska Estimated crop loss Per Cent
Diplodia dry rot	4	trace
Fusarium pink rot	1.5	4
Gibberella red rot	1	trace
Nigrospora cob rot	1	trace
Smut	2.5	9
Stalk rots	5	1

[1]Ear rot losses are based on a survey of 87 fields in 26 eastern Nebraska counties and 14 fields in 7 western Nebraska counties. Ears on approximately 200 stalks observed in each field. Stalk rot losses are based on the loss in weight of ears from rotted stalks compared to healthy stalks.

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The Nature and Cause of Plant Diseases

The most important corn diseases in Nebraska, and the ones discussed in this circular, are all caused by fungous organisms. These organisms may be considered as tiny, parasitic plants with parts that are equivalent to the roots, stems, and seeds of higher plants. They do not, however, have green leaves and stems and, since these are the food-manufacturing organs of plants, the fungi are not able to make their own food and must live parasitically on other plants. These parasitic plants are influenced by environmental conditions the same as are the common higher plants. They live from one year to the next either on old infected plant parts or as dormant fungous material in the soil. In the spring, the seed-like spores of the fungi are produced on stalks and ears lying on the surface of the ground and are blown by the wind to the growing plants where the spores germinate, in the presence of moisture, and cause infection. In addition to this source of infection, dormant material of the disease-producing organisms may live in the soil and attack the plants growing in that soil. The organisms attacking corn commonly affect the plant by robbing it of food materials, and by rotting and destroying the plant tissues. This weakens the plant, resulting in reduced yields through small and rotted ears and stalk breaking.

EAR ROTS

Diplodia Dry Rot[1]

Of the four important ear rots occuring in Nebraska, Diplodia dry rot causes the most damage. The organism causing this disease also causes a stalk rot that will be discussed later. The development of dry rot is favored by ample moisture during the time of ripening and, in wet seasons, ears that are entirely molded, dry, and light in weight may be found early in September. Because of this moisture relationship, dry rot is most prevalent in eastern Nebraska and decreases westward to a minor disease in the Panhandle.

Symptoms: Ears affected early in the season, about the soft-dough stage, may be completely rotted. The husks become bleached and dry and are frequently "cemented" to the ear. Tiny, black fruiting bodies in which the spores of the causal organism are produced may be found inbedded in the moldy husks and kernels. Ears affected later in the season may show rot varying from a few moldy kernels to a completely rotted ear (cover page). Infection most frequently takes place in the shank and progresses upward into the ear; however, rotting may also begin at the tip of the ear.

Control: There are marked differences in the susceptibility of different inbred lines to this disease. Limited information indicates that it should be possible to produce hybrids with considerable resistance. This is the most practical means of controlling Diplodia dry rot, as well as most other corn diseases. Damage from dry rot may be reduced by avoiding the growing of corn after corn, and by clean plowing to bury diseased stalks which otherwise serve as a source of infection. Seed treatment has no effect on the development of the ear rot.

[1]Caused by **Diplodia zeae.**

Fusarium Pink Rot[1]

Fusarium pink rot is the most widely distributed ear rot in Nebraska and is the most important in the western part of the state.

Symptoms: A pinkish mold may be found in spots scattered over the ear (Fig. 2). This mold seldom involves the entire ear in contrast to Diplodia dry rot. Pink rot frequently follows injuries such as hail and ear-worm damage. The kernels of certain hybrids and varieties have a tendency to "pop" or crack and pink rot often develops on these kernels.

Control: Avoid using hybrids and varieties showing tendencies toward cracked kernels and ears poorly covered by husks.

Fig. 2: Fusarium pink mold is found in spots scattered over the ear.

Gibberella Ear Rot[2]

Gibberella ear rot, sometimes called "red ear rot", is serious in northeastern Nebraska in wet seasons. The organism causing this disease also attacks barley, causing barley scab.

Symptoms: The mold begins at the tip of the ear and progresses toward the base; however, it seldom rots the entire ear. The rotted portion shows a deep pink to reddish discoloration (Fig. 3). The husks are frequently moldy and "cemented" to the tip of the ear. This fungus also causes a stalk rot of minor importance and the organism lives through the winter on the infected stalks.

Control: Damage from this disease can be reduced by clean plowing to bury diseased stalks which serve to perpetuate the disease from season to season. Barley is also affected by this disease thus planting corn after barley or barley after corn tends to increase the amount of infection caused by this organism. Diseased ears should be discarded as they occasionally cause toxic effects when fed to farm animals, particularly hogs.

Fig. 3: Gibberella red rot showing the pink to brick-red mold on the tip-end of the ear. The picture on the right shows the fruiting bodies of the fungus as it overwinters on cornstalks.

[1]Caused by **Gibberella fujikuroi (Fusarium moniliforme).**

[2]Caused by **Gibberella zeae.**

Nigrospora Cob Rot [1]

Fig. 4: Nigrospora cob rot. Healthy ear on the right with the two ears showing discoloration and shredding of the cob. The picture on the right shows the tiny black fruiting bodies of the fungus on the butt of the cob.

This disease occurs in localized areas in eastern Nebraska. The loss is not great although often a high percentage of the ears are infected.

Symptoms: Infection begins at the butt of the ear causing a discoloration of the cob (Fig. 4). As the rot advances the cob becomes shredded and the ear is light in weight and easily crushed. The ear attachment is weakened and the ears frequently drop before harvest. The kernels from infected ears are usually injured and fail to germinate, even though they show no visible mold. Corn that has suddenly stopped growth through some injury or disease is most frequently attacked.

Control: Hybrids and varieties that mature early in relation to the growing season are more susceptible than those that require a full season to develop; thus planting well adapted, full season varieties and hybrids reduces the damage. Vigorously growing plants are highly resistant.

STALK ROTS

Stalk Rots

There are two important stalk rots in the state. These are responsible for much of the stalk breaking late in the season, making harvesting difficult and increasing the danger of ear rots. In addition, studies made in 1944 showed that ears on rotted stalks weighed an average of 13 per cent less than ears on healthy stalks.

Diplodia Stalk Rot[2]

The development of this stalk rot depends to a great extent on abundant rainfall during the latter part of the growing season. It is, therefore, most important in eastern Nebraska, but is also found over most of the state causing premature dying and breaking of stalks.

Symptoms: Diplodia stalk rot seldom develops before the ear reaches the dough stage. It is characterized by a brownish discoloration of the internal tissues at the base of the stalks and a softening of the lower nodes. The rotted tissues are usually quite moist. The disease can be identified by the tiny, black fruiting structures of the fungus on the outside of the stalk just below the lower nodes (Fig. 5).

[1]Caused by **Nigrospora sphaerica.**

[2]Caused by **Diplodia zeae.**

The fungus enters the stalks at one of the lower nodes and rots the interior of the stalk. The organism lives from season to season on old diseased stalks and ears.

Control: Any method of removing diseased stalks and ears, such as deep, clean plowing, is beneficial. Crop rotation helps avoid the disease-producing fungus.

There appears to be considerable variation in the susceptibility of the different hybrids, although at present there are no hybrids possessing a high degree of resistance. Those that require the full season to develop are affected less than those that mature early.

Charcoal Root and Stalk Rot[1]

This is the most recent serious corn disease to be identified in Nebraska. It is most serious in the drier areas in contrast to Diplodia, which requires abundant moisture.

Fig. 6: Interior of a cornstalk rotted by the charcoal rot fungus showing the fruiting bodies of the organism on the fibers. Healthy stalk at left.

[1]Caused by **Macrophomina phaseoli.**

Fig. 5: Fruiting bodies of the fungus *Diplodia zeae* on a rotted cornstalk.

The charcoal-rot fungus attacks a number of field crops grown in the state, such as soybeans, dry beans, sorghum, and potatoes, although corn and sorghum are the only crops seriously damaged.

Symptoms: Charcoal rot first attacks the roots, then as the plant approaches maturity it causes a rot of the lower 8 to 12 inches of the stalk. This rot is characterized by an internal shredding with the pith being destroyed and the fibrous strands left free in the stalk. The rotted tissues are typically dry in contrast to the wet rot caused by the Diplodia fungus. The fibrous strands become covered with tiny, black "charcoal-like" spots, as shown in Fig. 6, which serve to identify this disease and distinguish it from Diplodia stalk rot.

Control: Long rotations, avoiding the planting of corn after susceptible crops, are desirable. Abundant soil moisture, where irrigation is possible, during the latter part of the growing season will give practical control.

Smut[1]

Corn smut affects both the ears and stalks. It is much worse in some seasons than in others, being more serious with late planting and mechanical injuries such as hail and detasseling. It may be severe in either dry or wet seasons and it occurs throughout the state, causing considerable loss nearly every year. Infection starts each year from the black smut galls remaining in the field from the previous season.

Fig. 7: Corn smut. The black powdery smut galls may occur on any aboveground portion of the plant. (Courtesy of B. Koehler.)

Symptoms: Black, powdery smut galls, as shown in Fig. 7, may appear on any above ground portion of the plant. The galls are at first covered with a silvery white membrane and may be any size up to about 6 inches in diameter. Galls over 2 inches in diameter and located above the ear appear to cause more damage than those located below the ear. Smut often prevents ear formation, resulting in barren plants.

Control: Crop rotation and destruction of the smut galls in the field by clean plowing are beneficial.

Corn breeders are attempting to develop hybrids that are resistant to this disease. Resistant hybrids offer the only practical means of controlling smut.

Control of Corn Diseases

The control of corn diseases is dependent upon a well-rounded program involving crop rotation, field sanitation, soil management, and the use of less susceptible hybrids. The most practical cropping practice may not always be the most desirable from the standpoint of minimizing losses from disease. Continuous cropping to corn tends to increase the severity of corn diseases; however, in the major corn-producing areas of the state the most practical rotation requires the growing of corn two successive years on most farms. More than two successive crops of corn should be avoided as far as practicable, because of the increased disease hazard.

The removal of diseased stalks and ears from the ground reduces the source of infection. However, soil conservation practices favor leaving the stalks on the surface of the soil to prevent erosion and to conserve moisture. The use of stalk cutters or shredders would break the stalks into pieces sufficiently small so that many infected stalks would be worked into the top soil by the tillage machinery. These stalks would thus be removed as a source of infection.

The most practical control would be the use of disease-resistant varieties. Certain inbred lines are known to have considerable resistance to one or more diseases and these lines are being used by the corn breeders in an attempt to obtain more resistance in commercial hybrids. Until such resistant hybrids are available in Nebraska, the use of those hybrids known to be extremely susceptible to the different diseases should be avoided.

[1]Caused by **Ustilago maydis.**