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report on
PLANT
DISEASE

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STORAGE ROTS OF CORN

Storage rots or molds may develop on either shelled corn in a bin or cribbed ear corn if the moisture content of the kernels is above 12.5 to 13.5 percent at a relative humidity of 65 to 70 percent—and the air temperature is high enough to permit fungi to grow.

Storage fungi (commonly called storage molds) cause loss of germination, discoloration, caking, heating, and mustiness, resulting in heat-damaged and bin-burned corn.

Figure 1. Mold growth (Aspergillus) on shelled corn. (Dr. J. Tuite, Purdue University).

Storage rots can reduce the feeding value of grain and lower the market grade. Occasionally, certain rot-producing fungi will form toxins and hormones that seriously affect livestock. Only a few parts per billion of certain toxins can cause pathological changes to those animals which are susceptible to them. Rotted corn is worthless for seed and is high risk for use as feed.

Symptoms

The first external symptom is the development of mold on and between the kernels (Figure 1). However, damage may occur within the kernel before external growth or symptoms are visible (Figure 2). The germ or embryo is often killed and discolored (Figure 3). In the case of the common "blue-eye," the mold is blue. Other molds are bluish green, green, tan, white, black, or pinkish red in color. When storage rots develop, the kernels frequently "cake" together and form a crust, usually at the center and top of a bin. Mold growth is often extensive, and infested bins have a musty odor. Spoilage of the surface grain is often intensified by migration of moisture to the upper layers in bins which lack adequate aeration (Figure 4).

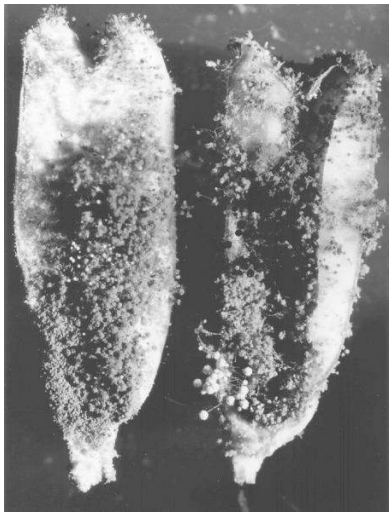

Figure 2. Aspergillus, a common storage mold, growing from the germ of two split corn kernels (Dr. C.M. Christensen, Univ. of Minnesota.).

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Cause

Over 25 different species of fungi are known to cause storage rots. The majority are species of *Aspergillus* and *Penicillium*, the most common genera causing storage rot.

Ear-rotting fungi are common and destructive in storage when moisture contents are 18 to 20 percent or more. At least one species of Aspergillus can grow slowly on and in corn with a moisture content of 12.5 percent. Other fungi are able to grow at moisture contents of 14, 16, 18, and 20 to 22 percent or higher. However, no one storage mold attacks corn over a wide range of moisture and temperatures. These fungal species work like a "bucket brigade" at a fire. Each fungus works within rather narrow limits. When these limits are reached, another fungus takes over, resulting in a succession of organisms colonizing the grain.

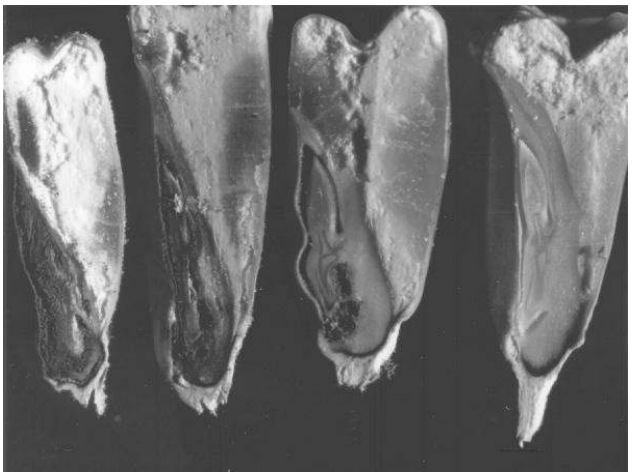

Figure 3. Corn kernels split to show the germ or embryo. Right, sound germ; left, three kernels with germ killed by mold infection (Dr. C.M. Christesen, Univ. of Minnesota).

All storage-rotting molds give off heat and moisture which, in turn, are utilized by their successors to accelerate rotting of the stored grain. The higher the temperature and moisture content, within limits, the more rapid the rotting process. Insects are often present in spoiled corn, taking advantage of and contributing to the heat and moisture given off by the molds.

Control

1. Shelled corn stored in **tight** bins should be dried to 12 or 13 percent moisture. Calibrated moisture meters, "official" ovens or distillation methods for determining moisture should be used. Avoid taking several samples from a bin and averaging them. The **highest** moisture content, rather than the "average," determines storability.

2. Bin-stored corn should be probed frequently for "hot spots," which indicate that active spoiling is taking place.

3. When "hot spots" or a crust of moldy grain is found, the following corrective measures should be taken:

    a) The rotted and moldy corn should be removed, dried, and either fed or sold. (**Moldy corn should be fed with extreme caution to all classes of livestock**. If mixed with sound corn, it can be fed with less risk to cattle and hogs being finished for market. **Moldy corn is considered unsafe for all breeding animals or lactating cows or sows, and immature animals**).

    b) The moisture content of the remaining corn should be checked; a vacuum probe for sampling any portion of grain stored in any type of bin is available from Cargill, Inc., Cargill Building, Minneapolis, Minnesota 55402. For small bins of 6000 bushels or less, hand probes can be used.

c) The remaining corn should be turned and thoroughly mixed to redistribute moisture and allow heat to escape.

4. Bins should be thoroughly cleaned and checked for leaks and insects before filling.

5. **Aeration**. Fans should be installed to move small quantities of air through the grain to maintain a uniform temperature and prevent the development of "wet" spots due to moisture migration (Figure 4).

6. Ear corn in well-ventilated covered cribs is ordinarily not damaged by storage rots if the moisture content at harvest is 23 percent or less.

7. When fall weather does not permit proper maturing and drying, mold may develop on ears in the field. When stored, such corn must be dried to 13 percent moisture to stop mold growth.

8. Passing grain through a sieve or grain cleaner will remove trash and broken kernels which can serve as an initial food source for storage molds.

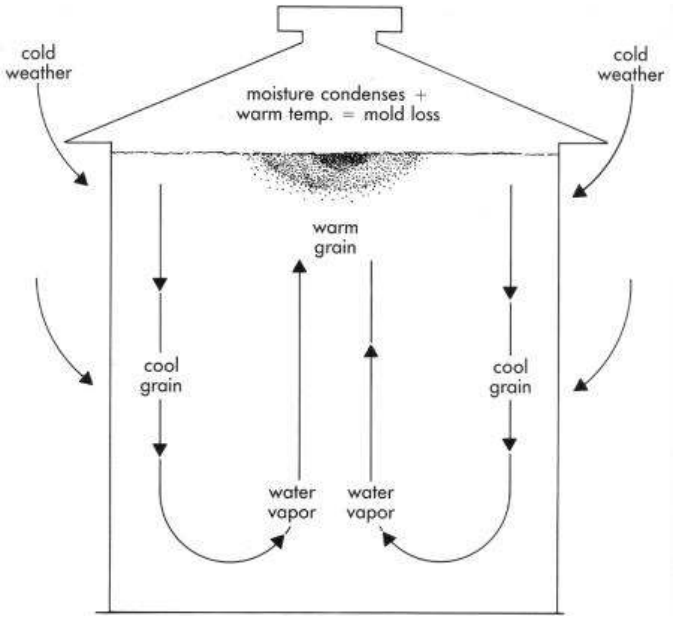

Figure 4. When warm grain is put into a bin followed by cold weather, migration of moisture takes place, resulting in grain loss from storage molds commonly in the center and upper layers (Drawing by L. Gray).

9. Airtight bins—which may include airtight silos or specially designed structures—permit farmers to safely store corn of 28 to 30 percent moisture. As the oxygen is soon used up by the respiration of the microorganisms and grain, growth of harmful molds is eliminated. The corn may contain some yeast fungi however, which in conjunction with its high moisture make the corn suitable only for feed. Research tests indicate a high feeding value for this corn but show that the **storage structures must be free of air leaks**.

References

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