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Molds of Stored Grain

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Control PLANT DISEASES

on the farm

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Molds of Stored Grain

(Prepared by John Truite)

Some of the molds that we knowingly or unknowingly encounter in our foods, in our clothes, the soil, and in air are important in the deterioration of stored grains. These fungi are often called storage molds as they grow in and on a variety of materials when they are stored at relative humidities of 70% and above. Most fungi cannot grow at low relative humidities, rust fungi for example, and almost all of the fungi that cause plant diseases have high moisture requirements. Because of this, most fungi are ordinarily not important in storage. People who study plant diseases (Plant Pathologists) usually consider the storage molds as harmless, as these molds are content in most cases, to live on dead material. However, when living but dormant seed are stored they are unable to resist attack by storage molds. Thus, the temperature the grain is stored at and its moisture content determine whether storage molds will grow and do damage, more than the resistance of the seed. There are other important factors such as insect activity and amount of foreign material in the grain which influences mold development.

The importance of molds on stored grain has not been fully recognized largely because molds can grow inside stored grain without any outward sign. Laboratory seed tests are often the only way to detect seed invasion by molds. (Fig. 1) Sometimes these "hidden molds" do push their little blue, green, black, tan or yellow fruiting heads through to the outside of the seed (Fig. 2). These are frequently brushed off in the normal process of handling the grain and pass unnoticed. When storage molds are very active on stored grain, then large masses of spores are produced and the problem becomes noticeable and a subject for concern. However, when they do become obvious it is often too late as the damage has already been done.

One might ask what is the effect of all this mold growth and is it necessary to worry about it, particularly, if there is no visible evidence of mold growth or visible damage to the seed. The answer to this question depends on the amount of mold growth and what the crop is to be used for.

If the grain is stored for seed purposes there needs to be concern, as these molds invade the germ and will kill the seed even before other adverse changes occur. This preference is apparently due to the germ being so rich in nutrients.

If the grain is stored for milling and baking uses there needs to be concern about mold growth. There is a very real relationship between mold growth and loss in quality. For example sick wheat, caused primarily by storage molds, is a condition where the germs are not sick but dead and are shrunken and discolored. Stored samples containing "sick wheat kernels" infested with molds make flour of poor baking qualities and bring reduced prices in the grain trade. There are many other examples of the relationship of mold growth to loss in quality.

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Department of Botany and Plant Pathology, Life Science Building

If the grain is stored with the purpose of subsequent sale to the storage trade there needs to be concern. Excessive mold growth may result in visual damage such as bin damage (caused mainly by heat generated by molds), off odors, and obviously moldy kernels, all of which reduce the grade and price of grain.

If the grain is to be fed to livestock on the farm the importance of mold growth is uncertain. There has been cases of toxic effects to animals attributed to storage molds, but the evidence of how much growth and what kinds of molds are involved is not clear. There is enough evidence to indicate that feeding moldy corn to livestock is a very questionable practice.

What can be done about storage molds? This is not easily answered as there are economic and practical aspects which complicates the simple recommendation - to store the grain at a moisture content or at temperatures that molds cannot grow. Here at Purdue the Department of Agricultural Engineering has done and is doing a considerable amount of work to supply the answer which is based on control of mold activities. The particular details and recommendations may be obtained from Agr. Engr. Publications; but the basic methods are aeration, artificial drying and sealed storage. Aeration of the grain with a low volume of air is used to maintain an even moisture content and temperature through the bulk and to cool the grain (drying is slight). Sealed storage is being explored for use on the farm where high moisture corn is to be fed. The Dept. of Botany and Plant Pathology is cooperating in these studies and is presently interested in determining the lowest moisture content and temperature at which storage molds can grow, the use of biological tests in determining the condition of grain and prediction of the storability of grain, and if some varieties of grain have some resistance to mold attack. The effect of molds on the feeding values of grain is to be explored.

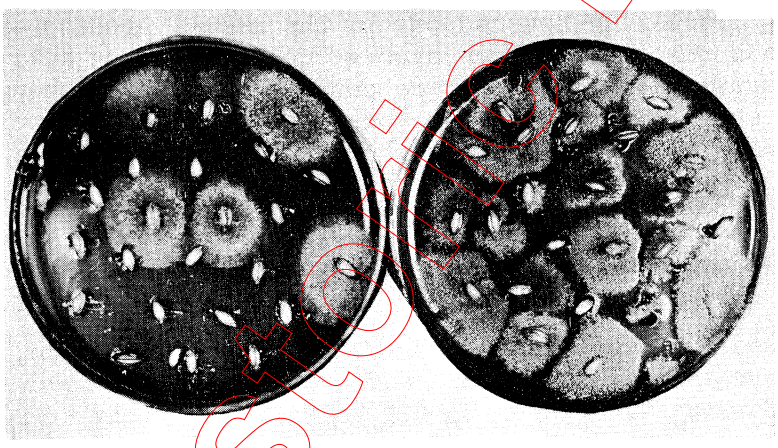

Figure 1. Molds growing from stored grain in laboratory seed test

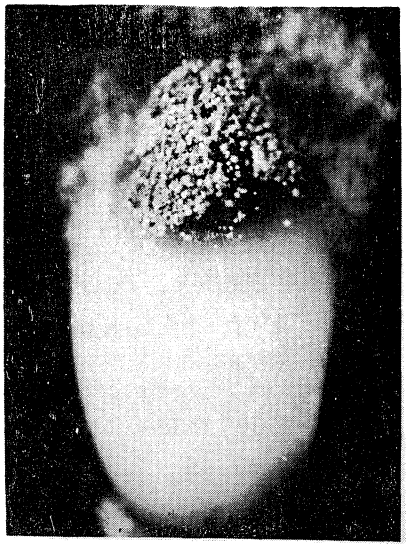

Figure.2 Masses of spores produced on mold-infested wheat

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