Sprouted and Moldy WHEAT

A Report on Chemical Composition and Mold Organism Analysis

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Editor's Note: This report on the chemical composition and mold organisms associated with sprouted and molded wheat is based on information gathered from Gaines wheat samples sent to University of Idaho for analysis. In addition to these tests, feeding trials with beef are underway at the Caldwell branch experiment station and with swine and poultry at Moscow to determine feed values of sprouted wheat. Results from these trials will be reported in 1969.

Many growers in Idaho periodically are confronted with the problem of harvesting and selling sprouted or moldy wheat as a result of wet weather prior to and during harvest. Such was the case in Idaho following the 1968 wheat harvest when unusual rainy weather occurred throughout much of Idaho and the intermountain region.

Current U.S. grade standards discount wheat in a lot showing more than two percent sprouting. The grade is lowered with increased sprouting until, at 15 percent, the grain is classified *sample* grade.

This year *sample* grade wheat showing 15 to 20 percent sprouting was discounted 14 cents per bushel. Wheat having over 50 percent sprouting could receive a maximum discount of 45 cents a bushel.

Recent data compiled from sprouted and moldy grain samples submitted from southern Idaho (Magic Valley, Twin Falls, Burley, American Falls areas), indicate that the feed value and chemical composition of such grains may not be different from normal grains. Limited research literature concerned with value of damaged grains also bears this out. Furthermore, in tests conducted at the University of Idaho, *no* harmful mold organisms were isolated from the wheat samples.

The following chemical analysis and mold organism information was obtained from samples immediately after harvest and not after a prolonged storage period. However, correspondence with elevator people has revealed no serious problems associated with storing sprouted grain. Furthermore, chemical deterioration and mold growth should not be a problem if grain is stored at proper moisture levels. This is because germination and mold organism growth require moisture levels considerably higher than the 8 to 12 percent moisture levels of properly stored grain. Subsequent seed germination of sprouted kernels is a different matter and will not be discussed here. Work is now underway to determine the germination percentages of sprouted grain and this information will be published at a later time.

Chemical Composition of Sprouted Wheat

In the University chemical composition tests, protein, ash, fat, and crude fiber showed a slight percent increase as the percent of sprouting increased (Table 1). Protein, ash, and fat are not lost during early stages of germination. However, dry weight decreases as a result of respiratory losses (i.e. carbon dioxide and heat) in conversion of starch to sugar. Thus on a percentage

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Table 1. Chemical Composition of Gaines Soft White Winter Wheat at 0, 25, 50, and 75 Percent Sprouting—1968 Harvest

Lot no.[1]	% sprouting	test weight	% protein	% ash	% fat	% crude fiber	%NFE[2]
1	0	59.3	10.48	1.33	1.32	2.57	74.75
2	25	56.2	10.64	1.53	1.40	2.65	74.39
3	50	55.8	10.91	1.54	1.37	2.74	73.74
4	75	54.2	10.94	1.60	1.42	2.73	73.81

[1] Each level of sprouting represents a composite of approximately five separate grain samples received from Ogden.

[2] NFE=Nitrogen free extract

basis, protein, ash, and fat increase. Also, increased enzymatic activity and synthesis during early stages of germination could account for some of the increase in protein content.

Test weight and the amount of nitrogen free extract decreased as the percent of sprouting increased. Reductions in test weight likely were caused by dry weight loss, plus an incomplete shrinking of the wheat kernel as it lost absorbed moisture. Wheat kernels swell when they absorb moisture but may not shrink to their original volume when this moisture is lost. The kernel remains somewhat swollen but has less weight. Consequently, test weight is down.

Based on test weight and percent of sprouting, lot numbers two, three and four would be discounted at least 18, 30, and 45 cents per bushel, respectively (Table 1). Chemically these samples were nearly identical with grain showing no sprouting. These data point out the need for revised grain standards for evaluating wheat used as feed for animals.

Mold Organisms

Only common air-born fungi were detected on the moldy wheat samples taken from the fields in various wheat growing areas of Idaho. These were primarily *Alternaria, Stemphyllium,* and *Fusarium.* About the same amounts of these organisms were isolated from grain harvested before the rains as after. Spores of these fungi are common, superficial contaminants of cereal grains and are a part of the natural flora of the kernel.

The prolonged rainy period prior to the 1968 harvest provided ideal conditions for these organisms. They grew profusely and their presence became quite obvious. Examination of moldy grain inside and out revealed that most of the fungal growth was superficial.

Public concern with the mycotoxin (mold toxin) problem that began in 1960 came with the identification of "Aflatoxin." This toxic material is produced by a storage mold* in stored grains of 16 percent moisture content or above. Typically it is never found on grain in the field. This mold was not isolated from any of the wheat samples tested regardless of location.

High levels of air-borne fungal spores may be irritating. Fortunately, these high preharvest spore levels are generally greatly reduced during havesting and cleaning operations. Irritating spore concentrations are typically found only after storage of high moisture grain.

Recommended moisture content for harvested grain is below the level needed for growth or sporulation of mold organisms. Consequently, harmful effects should not result from feeding grain similar to the grain analyzed in these tests.

**Aspergillus flavus* Link ex Fries.

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