

231 MN 2000 EF 231

PAUL CAMPUS
MAR 22 1965
LIBRARY
UNIVERSITY OF MINNESOTA

IMPORTANCE OF KERNEL DAMAGE

The milling and baking qualities of spring bread wheat and durum grown in the Upper Midwest attract both domestic and foreign buyers. But wheat containing damaged kernels makes inferior flour and semolina, and therefore commands a lower price per bushel than sound grain. Keeping kernel damage to a minimum will help maintain market preference for these wheats now and in the future, and may mean increased income for those who produce, store, or market bread and durum wheats.

SPRING WHEAT GRADE FACTORS

MAR 22 1965
LIBRARY
UNIVERSITY OF MINNESOTA

FEBRUARY 1965
EXTENSION FOLDER 231

TYPES OF KERNEL DAMAGE AND OTHER GRAIN-GRADING FACTORS*

Major types of kernel damage that lower grain grades are described and illustrated in this folder. They include:

- Those that occur before or during harvest such as (a) black point, blight, ergot, immature or green kernels; and (b) frosted and sprout-damaged kernels and severe weathering.
- Those that occur after harvest, such as (a) germ damage, heat damage, weevil or insect damage; and (b) contamination by seed treatment chemicals, rodents, birds, or other undesirable substances.

Other factors in grading grain are:

- Foreign material, referred to as matter other than wheat, that is not separated from the wheat in the proper determination of dockage. Examples are: rye, barley, oats, buckwheat, mustard seed, grain sorghum, etc., in wheat.
- Shrunken and broken kernels, primarily kernels and pieces of kernels of wheat, that will pass readily through an 0.064 x 3/8-inch oblong hole sieve. This is determined after the removal of dockage.
- Contrasting classes are (a) durum, red durum, and white wheat when they are mixed with hard red spring or hard red winter wheat; and (b) all other classes of wheat when they are mixed in durum wheat.
- Wheat that has been scoured, limed, washed, sulfured, or treated in such a manner that the true quality of the lot may not be reflected by the grade is given the special grade "treated." *Note:* Treatment of grain with an insecticide that evaporates quickly and does not adversely affect the quality of the wheat is not considered in the grade determination.

*Refer to official Grain Standards of the United States, Grain Division, Agricultural Marketing Service, U. S. Department of Agriculture, for detailed information on all grain grades.



FACTORS THAT LOWER GRADE AND REDUCE GRAIN VALUE

SOUND HARD RED SPRING AND DURUM WHEAT KERNELS COMPARED WITH VARYING DEGREES OF DAMAGED OR DISEASED KERNELS

HARD RED SPRING



HEAT DAMAGE*

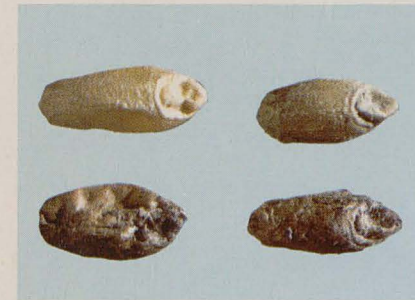
Kernels or pieces of kernels of wheat or other grains that are materially discolored black or dark brown throughout are considered heat damaged.

DURUM



WEEVIL OR INSECT DAMAGE*

Kernels that have been bored by insects are damaged kernels for grading purposes; others only slightly eaten by insects or from which the germ is removed by insects are considered as sound.



WEATHER DAMAGE*

Kernels severely darkened as a result of excessive moisture during harvest or in storage and suspected of being infected with fungi are considered weather damaged. Loss of grain color and bleaching occur in the early stages when kernels are exposed to adverse weather conditions.

HARD RED SPRING



BLACK POINT FUNGUS*

The germ of the kernels with black point fungus is black with the discoloration extending into the crease in some instances.

DURUM



HARD RED SPRING



SICK OR GERM DAMAGE*

Kernels that are damaged by heat and mold growth are known as sick or germ damaged. Germs on such kernels appear dark brown or black when the pericarp (germ covering) is scraped away. Musty and sour odors are frequently associated with such grain.

DURUM



PINK WHEAT*

The second kernel from the left has been treated with a poisonous chemical and is colored to indicate its presence. This makes the grain grade "distinctly low quality." The pinkish third and fourth kernels from the left are infected by fungi; note the unnatural appearance of the cutaway portion.



ERGOTY WHEAT (Special Grade)*

Wheat classed as ergoty contains more than 0.3 percent ergot. This fungus disease produces black bodies in place of normal kernels.

HARD RED SPRING



BLIGHT, SCAB, OR "TOMBSTONE"*

Kernels affected by blight and scab often are pink due to mold growth; have a dull, lifeless, and chalky appearance (so-called "tombstone") as a result of decay; have a moldy appearance of the germ; have mold in the crease of the kernel; or have the bran coat broken open.

DURUM



HARD RED SPRING



SPROUTED KERNEL*

The germ end of sprouted kernels is broken open as a result of germination. The sprouts are often broken off in handling grain, but such kernels are still classed as sprouted. Sprouted wheat results in unsatisfactory bread-baking or macaroni-making properties.

DURUM



RODENT CONTAMINATED WHEAT

The presence of rodent excreta in wheat makes it "distinctly low quality" grain and lowers the grade to "sample grade." Shown left to right are: sound kernel, rodent excreta (pellet), ergot, and insect excreta.



GREEN (Immature Kernels)*

Premature harvesting or the presence of late-maturing heads results in kernels with a distinctly green color. These have little value and are removed in processing.

HARD RED SPRING



FROSTED KERNELS*

Frosted kernels are green, black, or brown; or have frost blisters extending around the back of the kernels and into the crease; or the bran coat is partially flaked off; or the kernels have a distinctly waxlike or candied appearance.

DURUM



*First kernel in each illustration is sound.



REDUCE STORED GRAIN LOSSES

MAJOR CAUSES OF KERNEL DAMAGE DURING STORAGE

STORAGE FUNGI

High moisture content is the chief factor that results in germ, heat, and mold damage by fungi in stored grain. Usually such damage occurs when the average moisture content of the grain is above 13.0 percent. The chief reasons for this are:

- The moisture meter may have been inaccurate. Accuracy cannot be assumed; submit check samples to a state or federal inspection office.

- The average moisture content of a given lot does not indicate the range in moisture content of the entire lot. A truckload of wheat that averages 14.0 percent moisture content is likely to include some grain with 15.0 percent moisture. For safe storage it is essential to know the highest moisture content of any portion of the lot.

- Moisture content may shift with time in a bin of stored grain, sometimes rapidly. When lots of high and low moisture content are mixed to achieve an average presumed to be safe for storage, the moisture content may never equalize. Many such mixtures have a high storage risk; avoid them when possible.

- Activities of grain-infesting insects may increase the moisture content of the grain by as much as 1 percent per week.

INSECTS AND MITES

The best insurance against damaging attack by grain-infesting insects and mites is to store grain free of dirt,

debris, chaff, and broken kernels at a moisture content below 13 percent and a temperature below 50° F. If insecticidal sprays, dusts, or fumigants are used, consult current state or federal recommendations and follow directions carefully to avoid harmful or illegal pesticide residues.

MEASURES TO PREVENT DAMAGE BY STORAGE FUNGI

After grain has been binned, and periodically during its storage life, take samples from different portions, determine the moisture content of each sample, and examine each sample for damage by insects and storage fungi. No germ damage or heat damage will develop in grain with moisture content below 13.0 percent.

Measure and keep a record of temperatures in different parts of the grain. Even a slight rise in temperature means that damage is occurring, because only vigorously feeding insects or rapidly growing storage fungi cause heating of stored grain. If a rise in temperature is detected, remove samples and examine them, so that the size and location of the hotspot and the condition of the grain in and near it are known. In wheat with a moisture content of 13.5 to 14.5 percent, slow invasion by storage fungi can cause germ damage and heat damage without any rise in temperature. In the absence of insects, heating in stored wheat means that the moisture content of the grain is above 15.0 percent.

If facilities are available, aerate the high-moisture grain as soon as possible to provide a temperature of 40° to 50° F. throughout the bulk.

Authors of this publication are: C. M. Christensen, professor, Department of Plant Pathology and Physiology; Harold C. Pederson, professor and extension economist, marketing; and John A. Lofgren, professor and extension entomologist, all University of Minnesota; and H. W. Herbison, professor and extension agricultural economist, marketing, North Dakota State University.

The authors gratefully acknowledge assistance of the Grain Division, AMS, USDA, Minneapolis; the Crop Quality Council, Minneapolis; and the Minneapolis Grain Exchange.

Issued in furtherance of cooperative extension work in agriculture and home economics, acts of May 8 and June 30, 1914, in cooperation with the U. S. Department of Agriculture. Luther J. Pickrel, Director of Agricultural Extension Service, University of Minnesota, St. Paul, Minnesota 55101.

25M-12(6)64



UNIVERSITY OF MINNESOTA
AGRICULTURAL EXTENSION SERVICE