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Growing Knowledge®

Corn ALERT

27 OCTOBER 2009

Drying and Storage of Low Test Weight Corn

The 2009 growing season has resulted in the potential for significant amounts of low test weight corn. A cooler than normal growing season often results in higher grain moistures and lower test weights. A low test weight is the result of more starch and less protein on a relative basis. This condition also slows the rate of dry down in the field and increases drying costs.

Test weight is expressed as pounds per bushel. Common test weights for corn range from 45 to over 60 pounds per bushel. The market standard is 54 pounds per bushel. Higher test weights mean better filled kernels with a higher percentage of hard endosperm. Lower test weights may imply that the crop did not mature entirely or that it was subjected to stress.

Lack of Energy to the Kernels

Environmental conditions from R2 through the black layer (R6) greatly affect test weight. Once corn is past R2, the number of kernels is fairly set and kernel abortion rarely occurs. If yield potential is greater than what the environment or plant can support from R2 through R6, something has to give. The corn plant simply cannot supply the kernels with enough carbohydrates due to lack of energy, damage to the plumbing, or premature death. After black layer, the movement of moisture, nutrients, and energy between kernels and the plant is minimal.

Not Enough Energy. Plants produce energy through photosynthesis (Ps). Drought, leaf diseases, cloudy or rainy weather can reduce Ps, and thereby reduce energy production. Drought stress limits water uptake as well the ability to photosynthesize efficiently.

Leaf diseases destroy leaf tissue needed for Ps. Cloudy or rainy weather limits sunshine, necessary for Ps.

Damage to Plumbing. The term "plumbing" refers to the xylem and phloem. The plumbing is needed to move moisture, nutrients, and energy to sustain the plant and develop grain. If the plumbing is damaged due to insect injury, stalk rots, stalk or root lodging, it can hinder the ability of the plant to produce and send energy to the developing kernels.

Premature Plant Death. Frost or severe stalk rot infection are common causes of premature plant death (prior to black layer). Often premature death results in the corn cob being mushy and bending easily with your hands. Premature death causes slow drydown. Even when grain from plants that have died prematurely is dried, the water can be removed, but the starch within each kernel does not shrink as it normally would. That results in larger, softer, less dense kernels, and low test weight.

What Happened in 2009?

High moistures ranging from 26% up to 35% are being registered for the early corn harvest. The majority of low test weight corn in 2009 is likely due to corn being harvested at greater than ideal moisture contents, and cloudy and cool conditions during the majority of the growing season. Cloudy and cool weather hindered energy production in the plant.

Management

It is important to pay careful attention to drying and storing wet corn with low test weight (less than 54 pounds per bushel at 15.5%) as it is more susceptible to storage moulds and damage from drying.

Drying. Test weight increases by 1 pound per bushel for every 4 points of moisture drydown. For example, corn harvested at 23.5% moisture with 54 pound test weight is likely to have 56 pound test weight when dried to 15.5%. To help reduce the risk of storage moulds and adjust for potential moisture variations in the bin due to kernel damage and

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broken cobs, harvested grain should be dried to 1 to 2% lower than the normal 13 to 14% for long term storage.

High temperature drying may be the most effective way to dry corn wetter than 26%, but it may cause immature kernels to discolour. It can also reduce test weight and dry matter which may be of concern if test weight dockage is common. If the initial cause of low test weight is a lack of energy to fill the kernels, test weight may not change as the corn is dried.

Minimize Storage Moulds. Grain stored in bins from 12.5% to greater than 20% moisture can develop mould damage. The most significant damage occurs at 18-20% moisture. Storage moulds produce heat and more moisture, which further accelerates spoilage, insect reproduction, and insect feeding. Signs of storage moulds include crusting, embryo discolouration, grain hot spots, and moisture condensation on the top of the bin. Grain containing some storage moulds may be harmful when fed to livestock.

Cool grain to prevent storage problems. Storing wet grain without aeration for 1 to 2 days before drying can decrease storage life by 2 to 3 months. Cooling grain causes insects to go dormant or die, and prolongs the storability of the grain.

Bins should be assigned based on expected storage time and grain quality at harvest. They should also be cleaned and checked for leaks and insects before filling. Moisture content should be 12-13% to help reduce the risk of storage moulds.

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Use aeration and sterators to move grain and small amounts of air through the grain to help maintain uniform temperature and prevent the development of wet spots. Grain that is more susceptible to storage problems should be stored with good aeration of 2 cubic feet per minute (cfm) per bushel or more.

Take multiple grain samples when filling the bin and during storage to help account for variable moistures. Use the highest value to make management decisions. An average value may not adequately address pockets of grain with higher moisture contents.

Bins should be sampled frequently to find potential hot spots. When hot spots or crusts are found, rotten corn should be removed, the moisture content of remaining grain should be rechecked, and the remaining grain should be turned and mixed to redistribute moisture and allow heat to escape.

Management in the Future. To help manage test weight in future years, select a package of corn products with different relative maturities and flowering times. Please contact your local DEKALB® brand agronomist for more information on low test weight corn.

Sources : 1. Stewart, G., Corn Specialist, OMAFRA. 2000. Dealing with Low Test Weight Corn; 2. Hicks, D.R. 2004. Corn Test Weight Changes During Drying. Univ. of Minnesota; 3. Hurburgh, C. Corn Quality Issues in 2008 - Moisture and Test Weight. Iowa State Univ.; 4. Storage Rots of Corn. 1992. Univ. of Illinois. RPD 206; 5. Storage and Handling Recommendations for Flood Damaged Grain. 2007. Iowa Ag Connection; and *6. Beuerlein, J. "Bushels, test weights, and calculations" The Ohio State University Extension. Fact Sheet # AGF 503-00.*

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