



SORGHUM CHECKOFF

information

Facts about Test Weight

According to Dr. Jim Buerlin, Ohio State University, Bushel is a volume measurement for grain created many years ago by Celtic peoples (Scotland, Wales, Brittany, Ireland) to facilitate fair grain trade. Although grain is referred to in terms of bushels in the United States, it is referenced and traded on the basis of weight (tons or metric tons) throughout the rest of the world.

The Test weight concept was developed many years ago by the grain trade as a means of accounting for the varying densities of grain caused by weather, hybrid or variety and/or production practices. When grain density is lower than the accepted standard (low test weight), more volume is needed to store and transport a given weight of grain, thus increasing storage and transport costs. Different grades of each grain have different standard test weights. No. 2 Sorghum has a standard of 55 pounds per bushel while No. 3 has a lower weight (53 pounds per bushel).

Test weight is determined on each load of grain and sold by weighing a known volume of the grain. If the weight is

lower than the acceptable range, the sale is "docked" on a percentage basis. The seller of grain with test

weight greater than the acceptable range is usually not rewarded for a superior product. Hybrid varieties of sorghum often vary in their inherent test weight. Two common causes of low test weights for a given hybrid are:



1. Grain is prevented from filling completely and/or maturing and drying naturally in the field due to a killing frost, hail, heat, or insect damage. When this happens the starch molecules inside the grain are prevented from the natural process of shedding absorbed water molecules that allows the grain to shrink to a normal size. Artificial drying with heat removes this excess water but the starch molecules do not shrink and grain size doesn't change appreciably, so test weight (density) remains low.

2. Grain matures and dries naturally in the field but is sometimes rewetted by rainfall, dew, or fog causing the grain to germinate before harvesting. During germination, oil, starch, and protein are digested to provide energy and molecules to produce a new seedling. This process leaves small voids inside the grain, although the seed size does not change, the result is a decreased test weight. Maximum test weight is achieved when grain is harvested on the first dry-down.

Due to its lower bulk density, lower test weights can have a direct result on transportation and storage space costs per ton and can take longer to process in a flaker, grinder or mill than normal grain. Low test weight sorghum can also be more difficult to process

because of greater variation in seed size, smaller berries, and foreign material.

End-Use Quality of Reduced Test Weight Grain

The inherent quality of grain as a feed for ethanol or for food may or may not change with reductions in test weight. The effect on functionality will depend on what is causing the reduced test weight (shrunken kernels, weather damage, sprouting, etc...) For example:

Feed

- Research conducted by Albin and White (1975), at Texas Tech University, showed no difference in 40 lb vs. 56 lb test weight sorghum in digestibility studies using invitro tests. However, due to kernel size differences the same lower test weight sorghum had higher crude protein lowering its energy value.
- According to Richard C. Snell, Barton County Extension Agent, Barton County, KS (2008) "The feed value of clean milo weighing 35 to 40 pounds or more per bushel is virtually equal to standard test weight milo on a pound for pound basis. Nutritionally, light weight milo is higher in crude protein, fiber, and minerals, but somewhat lower in starch than normal grain. However, their digestible energy values are similar when properly processed"
- Research at Texas Tech University on swine showed no effect on swine feeding values down to 46 pounds per bushel test weight (Boren, 1987)
- Several other studies have shown a direct linear reduction in rate of gain efficiency in broiler chicks as test weight decreased (Joe Hancock, KSU).

Ethanol

- Work done by Dr. Donghai Wang, Kansas State University, has shown that test weight had little effect on ethanol yield in fermentation tests down to a test weight of about 50 pounds per bushel.

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- The effect of test weight on end-use functionality depends on the reason for the low test weight and on processing (flaking, milling, etc...). Processing that renders the grain to a flour or meal can minimize the effect of test weight on end-use performance.

Citations:

Bruce Boren, Feeding Value of Low Test Weight Sorghum for Growing-Finishing Swine. Feed Facts, National Grain Producers Association.

Robert Albin and Deborah Heitz, 1975, Nutritional Characteristics of Sorghum Differing in Bushel and Seed Size.

Texas Tech University study done for Texas Cattle Feeders Association, Amarillo, TX

Ohio State University, FactSheet, Department of Horticulture and Crop Science, 2021 Coffey Road, Columbus, Ohio 43210-1044 Bushels, Test Weights and Calculations, AGF-503-00

Richard Snell, Low Test Weight Sorghum, High Plains Journal, 11/20/08.

