

Soft Wheat Quality is Ruined by Pre-harvest Sprouting

In the picture below cakes are made with different flour with increasing levels of pre-harvest sprouting. Flour from un-sprouted grain is in the upper left and the most sprouted sample in the lower right.

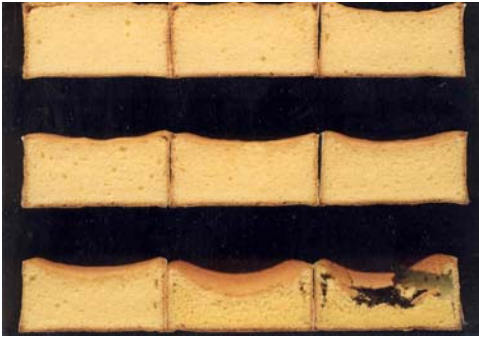


Image from USDA-ARS Pullman Western Wheat Quality Laboratory

How are Falling Numbers Measured?

Tubes with the suspended water and ground grain are heated in the falling number tester until the starch in the sample gelatinizes and thickens.

Plungers on the tester are released and fall through the thickened slurry. Sprouted samples have degraded starch and very thin gravy mixtures. The plunger falls quickly in sprouted samples. The time to reach the bottom of the tube is measured in seconds and determines the amount of sprouting.

Test accuracy requires uniform sample grinding, uniform shaking, and clean equipment.

What is the Grain Good For?

As falling number test values decrease below 350 seconds, the amount of starch damaging enzyme, alpha amylase increases. The fewer the uses for the grain, the lesser its value and the lower its price.

Depending on formulation and equipment food manufactures can use different levels of partially sprouted grain. Below is a general guide to the uses of partially sprouted grain.

General Requirements for a Few of the Many Uses of Soft Wheat

The values given below are generalizations and do not necessarily represent the requirements of all manufacturers

350 seconds Falling Number or greater
Cakes, Batters, and Breeding

290 seconds or greater
Crackers, pretzels, and most ready-to-eat cereals

270 seconds or greater
Cookies and other high sugar products

240 seconds or greater
Some ready-to-eat cereals

200 seconds or less
No major human foods use this wheat and some animal feeds may not be able to use if the grain has microbe damage

Other facts about sprouting

► Harvesting early at high moisture (~20%) then drying the grain can reduce your exposure to pre-harvest sprouting. Some cultivars are more resistant to pre-harvest sprouting than others.

► Sampling of trucks or grain lots must be uniform and systematic for measurements of sprouting to be accurate.

► Large grain samples (~ 1 lb) should be ground for the test to be accurately measure pre-harvest sprouting in a large grain lot.

► Visual sprouting symptoms are generally correlated to falling number but are not the same.

► Significant loss of quality can occur before visual sprouting occurs – This is the reason that most mills and flour purchasers require direct measures of starch quality such as falling number.

► Sprouting is not like low test weight. Blend grain lots is difficult or impossible without ruining the quality of the whole final blend.

More Sprouting Facts

- ▶ The longer sprouting continues the more damage occurs to the starch and the less usable the grain is for human consumption.
- ▶ The last stage of sprouting is the visual emergence of a shoot breaking the seed coat.
- ▶ Much of the damage to grain quality has already occurred prior to visual sprouting.

Ways of Measuring Pre-harvest sprouting

▶ FGIS Grading of Sprouting

- Visual scoring in official grade
- Falling number test is routine a supplemental grade
- Both visual and falling number tests can be reviewed and appealed in an official grade

▶ Cereal Chemistry Measurements

- Falling number
- Stirring number in a Rapid Visco-Analyzer
- Alpha-amylase assays
- Baking tests: Cookies and bread have characteristic loss of crumb-grain and texture when sprouting is present.

Pre-harvest Sprouting of Wheat, Alpha-Amylase Enzyme, and Falling Number



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Heads with differing levels of pre-harvest sprouting



<http://www.ars.usda.gov/pandp/people/people.htm?personid=2095&pf=1>

Introduction:

- ▶ Pre-harvest sprouting occurs when the wheat crop is exposed to extended periods of rain or heavy dews.
- ▶ The first stage of sprouting: alpha-amylase enzyme is synthesized and starch in the seed is broken down to make sugar for the new seedling to grow.
- ▶ When the starch is degraded by the alpha-amylase enzyme, flour milled from the grain no bakes 'normally' and produces deformed cookies, cakes, and crackers.