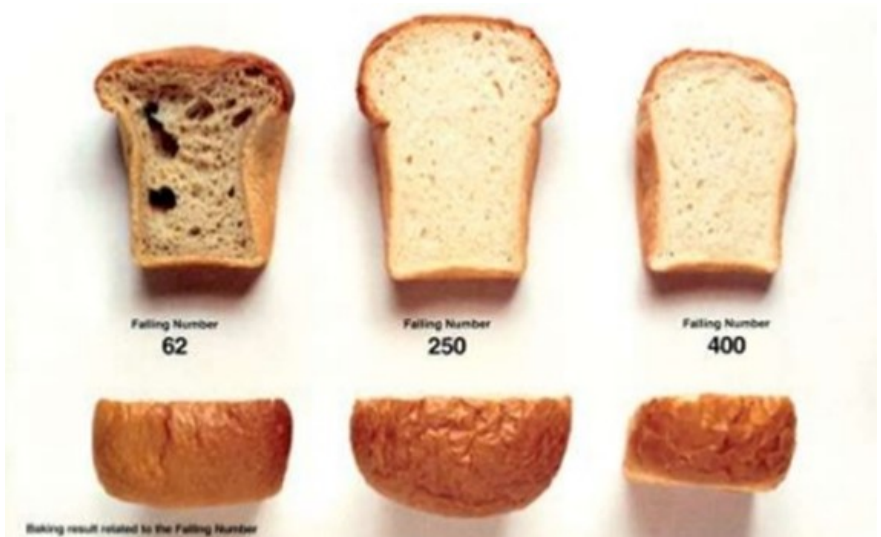


Understanding Falling Number In Cereal Crops

As interest in grain crops for food and beverage markets continues to grow in Vermont, many farmers and processors have questions about a key quality parameter - falling number. This factsheet provides some background on what falling number is, how it corresponds to grain quality, requirements for specific markets and crops, and testing information. More information is available by contacting the UVM Extension Northwest Crops & Soils Program.

What is Falling Number?

Falling Number measures the amount of pre-harvest sprouting that occurs in the grain while on the stalk in the field. It is a lab test in which a slurry is made of flour and water, placed in a test tube, and measures how many seconds it takes for a plunger to fall through the slurry to the bottom of the test tube. This is a method of testing enzymatic activity in the grain. A higher falling number means it takes longer for the plunger to fall through the slurry; this means there is low enzymatic activity in the grain and it has not begun to germinate. If a falling number is low it means the grain has begun to germinate, enzymatic activity is high, and the plunger falls through the slurry quickly.



What Causes High or Low Falling Number?

If a grain crop is left in the field too late after maturity (particularly during rainy or especially humid conditions), the kernels can begin germinating. Though it is invisible to the eye, enzymes in the kernel begin to break down carbohydrates into simpler sugars to feed the growing seed. This affects baking quality in a number of ways, including fermentation, a caramelized crust and bread structure. Low falling numbers are rejected by malt houses because to malt a grain it has to be sprouted in a controlled environment. If the grain already began sprouting in the field, it leads to low quality malt. There are some control measures to minimize sprouting damage in a given year.

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How do I Achieve a High Falling Number?

There are several factors that impact falling number such as variety, weather, harvest date, and storage moisture. Some varieties of grain are resistant to pre-harvest sprouting. They can tolerate more humid or rainy conditions before beginning to germinate in the field prior to harvest. Some varieties are more susceptible and must be harvested on time. Harvest date can affect falling number; the longer the crop is left in the field the more likely it is that grain kernels will begin to sprout on the grain head, especially if it is humid or rainy. It is important to dry down grain quickly to below 13% moisture. It is oftentimes difficult to harvest grain at that low moisture in the Northeast, if harvested at 15-18% or higher it is important to dry it quickly to avoid sprouting. Finally, weather affects falling number. Heavy rainfall events at harvest time can lead to sprouting in the field and reduce grain quality. Select sprout-resistant varieties, stagger planting dates, plant multiple varieties with different maturity dates, and grow different types of crops in a year to minimize risk of total loss if weather at harvest time is not ideal.

Falling Number Considerations for Specific Grains:

Wheat

Primary use: flour for baking

A higher falling number is necessary for baking. Low falling numbers disrupt the fermentation process in the bread dough, and lead to poor crumb structure and low bread volume, reducing the overall bread quality. Falling numbers may be too high, depending on the product being baked. This can slow fermentation; however, adjustments can be made at the bakery to correct for high falling numbers.

| | | |
|--------|---------|--|
| Wheat | 200-400 | Low falling numbers lead to poor fermentation and dough quality. Lower than 250 may be rejected by the mill or bakery. |
| Barley | >300 | Barley being sent to malt houses must have a very high falling number so it will sprout properly during malting. |
| Rye | 100–250 | These numbers are based on current findings and may be updated as research progresses. |

Barley

Primary use: malt for brewing

Malt houses have high requirements for falling number. Malting is a modified germination process in a controlled environment. If the falling number is too low - meaning the grain has begun to sprout on its own – then the maltster will be unable to germinate the grain uniformly, which decreases the overall quality of the malt. Brewers need consistent, uniform malt for their beer formulas and will oftentimes reject poor quality malts.

Rye

Primary use: flour for baking or grain for distilling

Research is being conducted to better understand ideal falling number ranges for baking with rye. Typically, bakers prefer rye with *lower* falling numbers (100–250), in contrast to wheat and barley. Rye breads ferment for a much shorter period of time. If the dough is fermented for too long it becomes overly dense and gummy. The availability of sugars in the low falling number rye aides in rapid fermentation and high quality bread.

Where Can I Find Testing Services?

The UVM Cereal Quality Testing Lab conducts Falling Number tests year round. For more information visit www.uvm.edu/extension/nwcrops/cereal-grain-testing-lab, email uvmgrain@uvm.edu or call 802-656-5392.