

Testing Rye Bread Quality With Various Falling Numbers

In February 2020, the University of Vermont Northwest Crops and Soils (NWCS) team joined forces with Northern Grain Growers Association (NGGA) board members Randy George and Jeffrey Hamelman to test bake 100% rye loaves with various falling numbers. The rye came from a harvest date trial at Borderview Research Farm as part of a larger Northeast SARE funded project investigating the agronomics and quality parameters of cereal rye.

The objective of the harvest date trial was to better understand the effect harvest timing has on grain quality, specifically falling number. The trial report can be found on the NWCS Research web page (<https://www.uvm.edu/extension/nwcrops/research>). Falling number is a value that describes the degree of pre-harvest sprouting in a particular grain. Falling numbers are well-understood in wheat and barley, though less so in rye. More about falling number can be found on the Falling Number Factsheet on the UVM NWCS website (https://www.uvm.edu/sites/default/files/Northwest-Crops-and-Soils-Program/Articles_and_Factsheets/Falling_Number_Factsheet_Apr2020.pdf).



*Rye variety trial at
Borderview Research Farm*

Jeffrey received the Hazlet samples and Randy received Danko. Both bakers had the samples milled at their respective bakeries, randomized and coded so that they did not know which sample was from which harvest date. They also did not know the falling numbers. They baked 100% rye loaves from the same recipe and scored the samples using a 200-point quality analysis system they developed.



Preparing rye loaves

The hypothesis going into the bake was that the rye samples with the lower falling numbers would turn out better than the higher falling numbers. This is based on the unique characteristics of rye. Though rye does have gluten, it is in low amounts and does not develop well in the dough. Rye is high in pentosan starches which bind to water and inhibit the development of gluten. Rye bread relies on these and other starches for its structure, rather than gluten. If it is fermented for too long, the starches degrade, the loaf winds up with poor volume and a gummy texture.

Low falling number may be preferable in rye because the goal in baking with rye is a rapid fermentation. If the carbohydrates in the kernel are already being broken down, there are more simple sugars available for yeasts and the dough ferments quickly. This means the starches do not degrade in the dough and the bread has a high volume and dry, crumbly texture; ideal for 100% rye breads.



Scoring loaves for baking

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Variety	Harvest Date	Falling Number	Loaf Code
Danko	1	250	C
Danko	2	294	D
Danko	3	236	B
Danko	4	214	A
Hazlet	1	250	
Hazlet	2	270	
Hazlet	3	153	
Hazlet	4	112	

We reached a consensus that B was the best quality bread from this test even though A and D seemed to be better quality doughs. Loaf B had nice crust development; it was well-caramelized and chewy. The crumb had a nice network of air pockets, good flavor, and was crumbly, moist and chewy. The overall flavor was complex and well-balanced. This hit all the marks of high quality rye bread.

The results were somewhat unanticipated because loaves A and D, though actually being the lowest and highest falling numbers, respectively, had the most consistent and regular fermentation times and dough-feel. Loaves B and C were thought to have the lower and higher falling numbers, respectively, but the actual values turned out to be in the mid-range.

It is important to note that these results are only from a single test and the findings do not represent concrete recommendations. It would seem as though bakers can be flexible when baking with rye with various falling numbers. There are a range of values that can produce good quality rye breads and amendments can be made to increase fermentation speed at the bakery if the falling number is high, such as adding diastatic malt powder or adjusting time and temperature controls. This may also suggest that if the rye is going to be used for baking rather than distilling, it may be possible to harvest at later dates without sacrificing quality.



Crumb comparison

More research, including additional bake tests (!), is needed to more fully understand the effects of harvest date on falling number in rye and the significance of falling number on baking with rye. This was an exciting and interesting glimpse into the unique characteristics of cereal rye and we're looking forward to continuing our research on this crop as interest and demand continues to grow in the Northeast.



Bread evaluations



Full bake test line-up

