



# FALLING NUMBER

## WHAT IS FALLING NUMBER (FN)?

- Falling number (FN) is the result of the Hagberg test, which indirectly measures alpha-amylase activity.
  - Alpha-amylase breaks down long starch chains into simple sugars.
  - More alpha amylase = more starch breakdown = lower FN.
- FN is primarily influenced by environmental factors during harvest, such as excessive moisture resulting from rain or heavy dew.
- The Hagberg test is an internationally standardized measurement, but it is not part of the Canadian Grain Commission (CGC) grading standards.
- A minimum FN requirement is increasingly becoming a part of grain contracts.

## WHY IS THE FN OF A WHEAT SAMPLE IMPORTANT?

- FN affects end use quality:
  - Common/Milling wheat (CWRS, CPSR, CWRW, CNHR):
    - ▶ Bread can have reduced loaf volume (smaller in size), poor crumb structure (internal appearance of the slice of bread) and overall poor colour.
    - ▶ Milled flour can have poor water holding capacity resulting in dough handling and processability challenges (stickiness).
    - ▶ Asian noodles can have higher cooking loss, poor texture and colour, which are all quality defects.

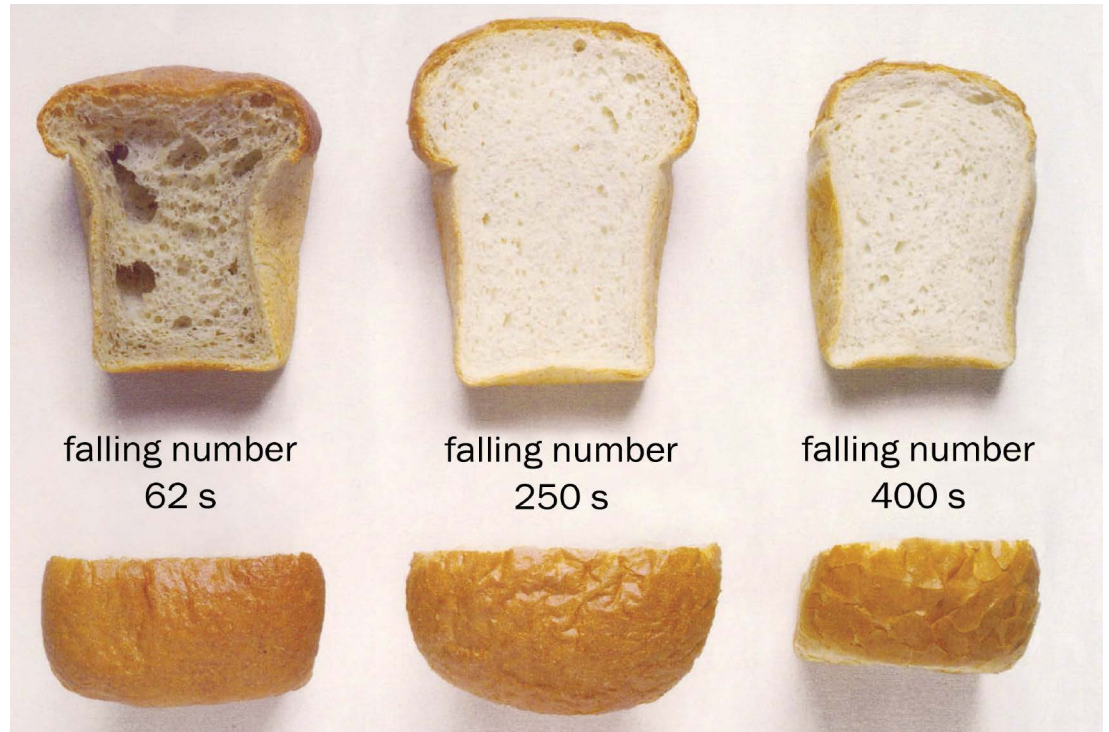


IMAGE COURTESY OF PERKIN-ELMER.

**Figure 1.** Low FN impacts quality of end-products, as demonstrated in the pan-breads pictured. Markets around the world have different standards and are often blending high-quality Canadian wheat with lower-quality wheat from other sources. While a high-quality loaf can be made with 250 s wheat, higher FN (over 300 s) values give the end user desired control over unique baking processes.

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### THE HAGBERG FN TEST

- A sample of ground wheat is added to water and mixed vigorously, creating a slurry.
- A stirrer is inserted and allowed to fall through the slurry under its own weight.
- The total time in seconds it takes for the stirrer to fall through the slurry is the FN value.
- A low FN value indicates high alpha-amylase activity (more sprout damage) and vice versa.
- In general, FN values below 300 seconds indicate poor quality for milling and baking purposes.

### FACTORS THAT INFLUENCE THE FN TEST

- **Altitude:** mathematical correction<sup>1</sup> should be performed if testing location is higher than 610 m<sup>2</sup>.
- **Water:** should be distilled and at room temperature (22 ± 2°C).
- **Variability:** FN tests on the same sample can vary by ≤3.44% in the same lab, and ≤5.05% in different labs<sup>3</sup>.
- **Sampling:** ensure your sample is representative of your crop/bin. Research has shown that one highly sprouted kernel in 2500 sound kernels can decrease FN by 100 seconds<sup>4</sup>.

### HOW CAN WHEAT WITH LOW FN VALUES BE MANAGED?

- Segregate impacted grain.
- Get your grain tested (elevators, independent labs, CGC Harvest Sample Program).
- Use caution if blending as the relationship between FN and alpha-amylase activity is not linear (proportional blending will not work).
- Ensure your grain is properly stored. Research has shown that FN values may increase over time in storage, unless the grain has a FN value lower than 150 s<sup>4</sup>.



### MITIGATING RISK OF LOW FN IN THE FUTURE

- Prevent lodging by selecting a wheat variety with good lodging resistance and/or consider a plant growth regulator (PGR) application.
- To mitigate the risk of a late harvest when poor weather conditions are more likely, consider planting an early maturing variety, and/or seeding your crop earlier.
- Select a variety with good sprouting resistance.
- Seed at a higher rate to target quick plant establishment.
- Know if a minimum FN is in your contract and determine in advance how a dispute on FN with your grain buyer will be handed.

### LEARN MORE

- ▶ Seed Manitoba <https://www.seedmb.ca/digital-edition/>
- ▶ CGC Harvest Sample Program: <https://grainscanada.gc.ca/application/HSS/SignUp-en>
- ▶ CGC Taking a Representative Sample: <https://grainscanada.gc.ca/en/grain-quality/sampling-grain/guide-taking-representative-sample/05-reducing-composite-sample.html>
- ▶ CGC Grain Storage: <https://www.grainscanada.gc.ca/en/grain-quality/manage/manage-storage-prevent-infestations/prevent-spoilage.html>

#### References

1. Delwiche, S. (2019). A New Correction Function for Falling Number at Non-Sea Level Conditions. *Cereal Foods World*, 64(2).
2. AACC Approved Methods of Analysis, 11th Ed. Method 56-81.04. Determination of Falling Number. Approved Nov 2, 1972. Cereals & Grains Association, St. Paul, MN, U.S.A. <http://dx.doi.org/10.1094/AACCIntMethod-56-81.04>
3. ICC Standard No. 107/1. (1995). Determination of the "Falling Number" According to Hagberg-As as a Measure of the Degree of Alpha Amylase Activity in Grain and Flour Alpha-Amylase Activity (Falling Number).
4. Lukow, O. M., White, N. D. G., & Sinha, R. N. (1995). Influence of ambient storage conditions on the breadmaking quality of two hard red spring wheats. *Journal of Stored Products Research*, 31(4), 279-289



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