



## Enhancing Freshness of Crème Muffin with Nouravant® Maple Fiber

Muffins are often purchased at moment of consumption or within a few hours of the eating occasion. So, freshness is critical.

Nouravant® maple fiber is a unique hydrogel that can help manage moisture in bakery applications. In addition to helping maintain softness and consumer appeal, Nouravant is a clean ingredient for labeling that supplements a formulation with fiber.

Nouravant was tested in a crème muffin formulation to evaluate its impact on crumbliness over two days as indicator of freshness. In this basic formulation experiment, the control muffin without Nouravant had a 24 hour shelf life, while the addition of Nouravant maple fiber extended the freshness of muffins by at least 6 hours (25% longer,) and it contributes about 0.9g fiber per serving (110g RACC).

### Test methods

#### *Producing muffins*

Muffins were made using a simple recipe (see Table 1) with and without Nouravant. Since Nouravant is a hydrogel, there is moisture coming from the ingredient. On a total weight percentage-basis, the control formula adds 18.8% water and the formula using Nouravant adds 18.5% water. All other ingredients contributing moisture were kept the same.

**Table 1: Muffin Formulation**

Ingredient	Control	Maple Fiber
	%	(Test) %
All-purpose flour	34.8	34.8
Granulated sugar	18.9	18.9
Baking powder	2.0	2.0
Whole dry milk	2.7	2.7
Salt	0.5	0.5
Water	18.8	17.1
Nouravant® maple fiber	0.0	1.7
Canola Oil	13.0	13.0
Liquid whole eggs	9.0	9.0
Vanilla extract	0.3	0.3
TOTAL	100.0	100.0

Inclusions can be added on top of formula at 15-40%.

Procedure:

1. Combine dry ingredients.
2. Combine liquid ingredients and add to dries.
3. Mix until just combined, about 2 minutes.
4. Bake 325°F 40 min (500g loaf) or 22 minutes (75g muffin).
5. Cool completely and store in plastic clamshell container.

*Texture analysis*

The AIB shelf-life of muffins project based on the AACC (74-09) method from Stable Microsystems Exponent Connect software was used to evaluate the texture of muffins. Sample preparation was done according to the project description. This includes using a 2.5"x4"x1" box to cut muffins into 1" cubes of the center crumb. The one-inch acrylic cylindrical probe was used to compress muffins 7.0mm and hold for 30 seconds. Forces were measured at three points: 6.25mm, 7.0mm and 7.0mm after 30 second hold. The ratio between the initial 7mm force and the final 7mm force is calculated by the software. Muffins were measured at 2 hours, 8 hours, 24 hours, 27 hours, 30 hours, and 48 hours post-bake. Six samples were measured at each time point. Outliers to the data were common due to the precision needed to cut the fragile muffins. A minimum of four data points were used for statistics. The ratio is reported as "cohesiveness" as it quantifies the extent that the sample breaks down (lower cohesiveness) or stays intact (higher cohesiveness).

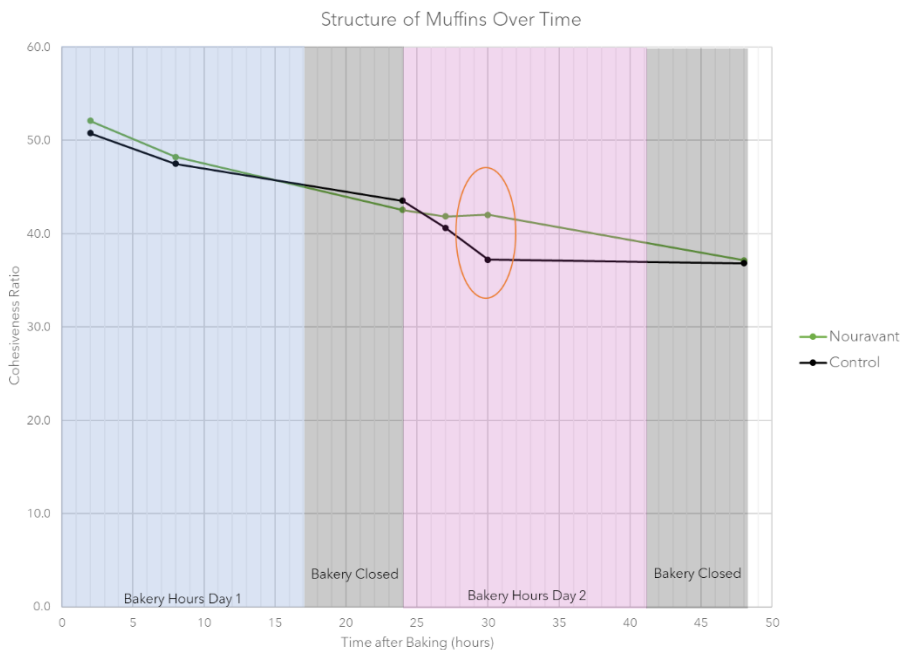
**Table 2:** TA Settings

Test mode	Force in compression, hold until time
Pre-test speed	2.0mm/second
Test speed	1.0mm/second
Distance	7.0mm
Time	32 second
Trigger	Auto 0.5g

## Results

The difference between Nouravant and control muffin is the most apparent at hour 30 after baking. Graph 1 is overlaid with bakery shop hours. The times assume a 5:00am opening and 10:00pm closing time. So, at 11:00am on day two, the control muffins crumbled significantly more under the texture analyzer probe than the muffins made with Nouravant ( $p < 0.01$ ).

**Graph 1:** Bakery hours are overlaid on the graph of the structure data.

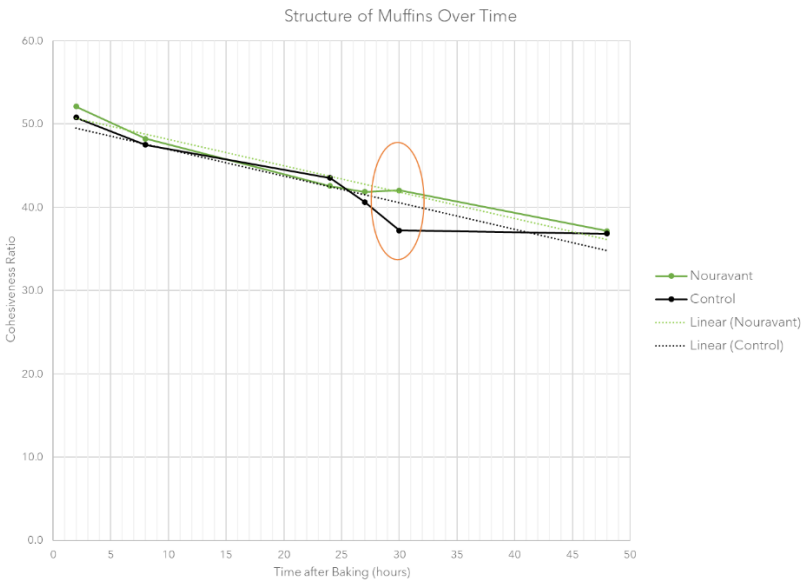


**Table 3:** The mean ratio of force at 7.0mm, 0 seconds to 30 seconds, was significantly different between the two groups at 30 hours post-bake calculated by t-test.

	Control	Nouravant
2 hours	50.80	52.09
8 hours	47.06	48.22
24 hours	44.69	42.57
27 hours	40.66	41.87
<b>30 hours</b>	<b>37.24</b>	<b>42.03</b>
48 hours	37.15	36.83

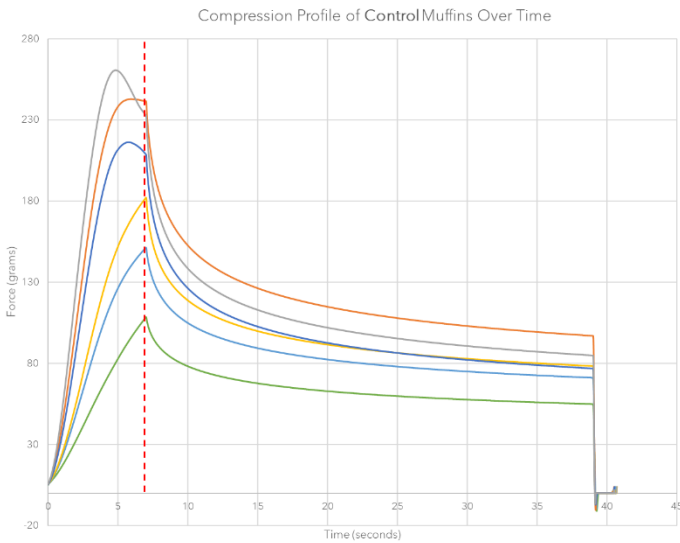
The trendlines for each muffin set might not be accurate to predict forward. However, they may be used to interpret what is happening with the data points captured. These points fit the trendline until 24 hours. After 24 hours, the control muffins begin to diverge from its line. This can be interpreted as the end of freshness. If so, the Nouravant muffins showed at least 6 more hours of freshness by holding its structure until 30 hours, an increase of 25%.

**Graph 2:** A linear trendline was applied to the graph of structure data.

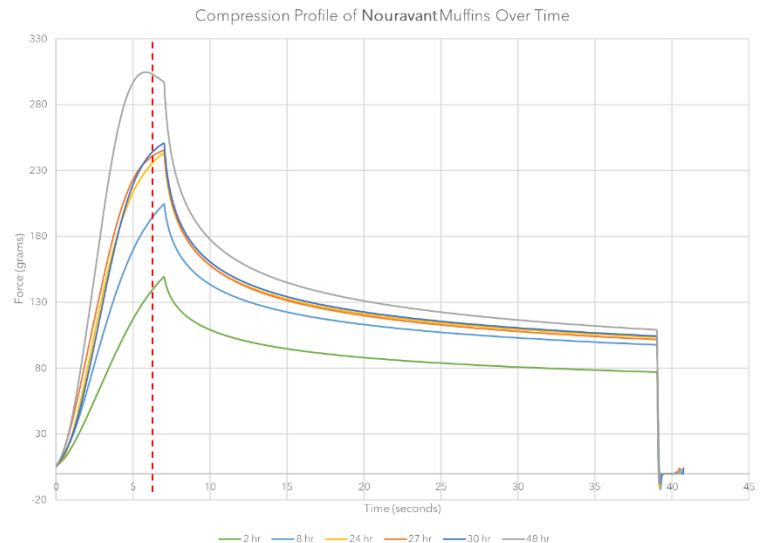


The breakdown of the muffins from each recipe can be seen in their compression profiles. The red line in each graph (3 & 4) represents 7.0 seconds, or 7.0mm of compression since the test speed is 1.0mm/second. Therefore, the graph to the left of the line is active compression; the graph to the right of the line is the probe holding in place.

**Graph 3**



**Graph 4**



— 2 hr — 8 hr — 24 hr — 27 hr — 30 hr — 48 hr

The control muffins show they resisted compression up to 24 hours. The curves for the control muffins show they stopped resisting, indicating crumbling, before the end of the downward compression at the 27hr, 30hr, and 48hr points. The muffins made with Nouravant eventually broke down under compression but didn't exhibit his behavior until the 48 hour test.