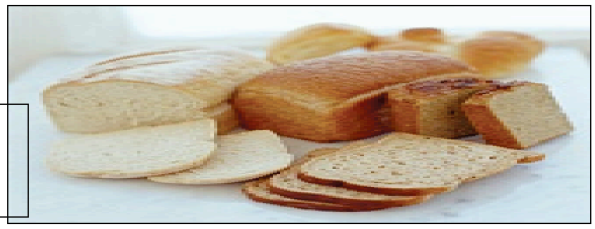
It's All About Bread . . .



2009 has certainly been a year of unexpected changes in many areas. Despite a few major potholes in the economy there continued to be many innovations in food ingredients and many new products introduced to take advantage of them. Many of them, from high melt-point "crunchy" chocolate to gluten replacements for baked goods to healthier thickening modifiers, all have one common theme in mind: mouth-feel is critical to consumer acceptance.

Among the exciting new developments mentioned at IFT this year were gluten replacements for bread and other baked products. In the work presented below we'll take a quick look at a gluten free product and compare its properties to three other styles of bread.

Mouth-feel is a complex concept implying a mixture of many physical properties. To properly analyze the complexity of mouth-feel a rigorous science is required. Sensory science has been developed to fulfill this need and is necessary for adequately describing mouth-feel. Sensory science employs trained, human panelists under very controlled conditions to focus on specific sensory attributes of the product in question.

Once these sensory attributes are identified and measured however, they can be related to the product's mechanical properties through Texture Analysis.

Mechanical properties can be easily measured using compression and tensile machines. It is the manipulation of the raw instrument data by software that enables a compression-tensile machine to become a texture analyzer. Let's look at just four sensory properties and their comparative texture definitions, and then we'll see how the different types of bread measured up using the two cycle instrumental method of Texture Profile Analysis.

Hardness

Sensory meaning – the maximum force required to compress a food between the teeth.
Texture meaning – peak force of the first compression cycle

Cohesiveness

Sensory meaning – The strength of the internal bonds comprising the body of the product
Texture meaning – the ratio of the work of compression for the second cycle divided by that of the first cycle

Springiness

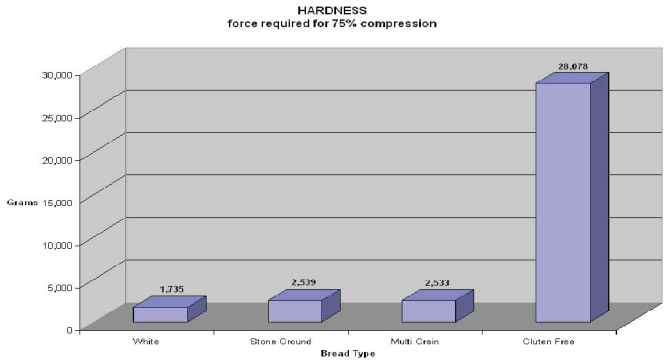
Sensory meaning – the rate at which the product returns to its uncompressed state after the deforming force is removed
Texture meaning – the height that the sample recovers between the end of the first compression cycle and the beginning of the second cycle

Chewiness

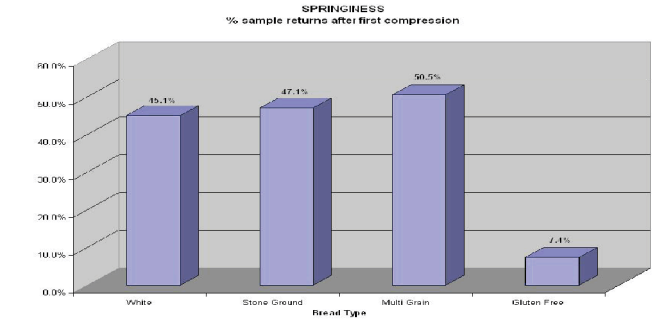
Sensory meaning – the energy required to chew a solid food to the point required to swallow it
Texture meaning – the product of hardness *cohesiveness* springiness

These four textural properties are examined for four types baked bread purchased in a local grocery store. The bread types are white, stone-ground, multi-grain and one gluten free product. Two slices were used for each test. Because the thickness of the slices varied between the types of bread a percent deformation test was used. For each test the samples were compressed 75% of their two-slice thickness.

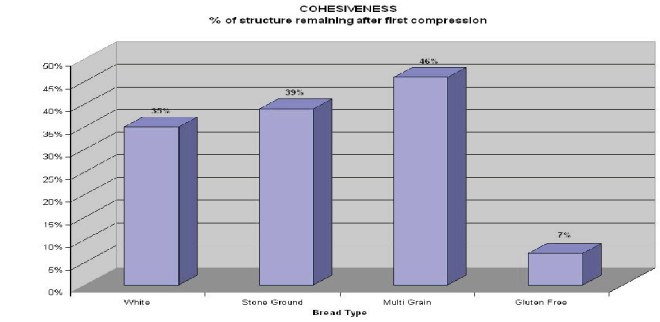
In the hardness graph (**see figure 1**) we see the stone ground and multi-grain were firmer that was the white bread. Most of us would agree this seems typical. The gluten free product is ten times firmer. What affect does this property imply to springiness, cohesiveness and chewiness?



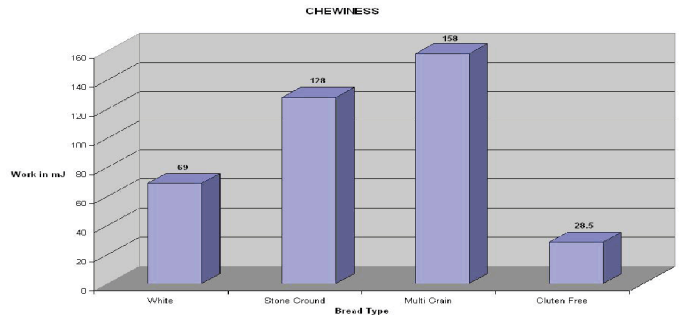
The springiness graph (**see figure 2**) shows that the gluten free product isn't nearly as resilient. Although it is firmer, a single compression significantly destroys its structure preventing any spring-back.



Remember that cohesiveness (**see figure 3**) is the ratio of the work for the second compression divided by the first? As you might then expect, the Gluten free product has almost no cohesion for the same reason it has no springiness. The structure is severely compromised by the first compression.



Chewiness (**see figure 4**) is higher than one might expect given that the product is destroyed by one compression. This is because the gluten free product is so hard initially. Recall the instrumental definition of chewiness above.



As newly developed ingredients for producing gluten free baked goods begin appearing on store shelves we hope to see the gap narrow between the textures of wheat bread and gluten free bread. This will be welcome news to those consumers who cannot tolerate wheat or gluten products.

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