

## **SUMMARY**

### **SHORT-DOUGH BISCUIT REFORMULATION: CHANGES IN RHEOLOGY, TEXTURE AND SENSORY PROPERTIES**

This thesis work has focused on the evaluation of physical and sensory properties of biscuits after reformulation with new ingredients to create healthier products using rheological, textural and sensory techniques.

The biscuit formulation consists of three basic ingredients: flour, fat and sugar. Currently, consumers demand healthy food. For that, fat and sugar replacement and the inclusion of fiber in the biscuits is of great interest. However, this reformulation significantly affects the properties of the biscuits. The functionality of the common and new ingredients was studied by physical and sensory techniques. After that, the optimal ingredient was selected for obtaining healthier biscuits.

The linear viscoelastic properties of the dough could predict quality aspects after baking as the dimensions and texture. The ingredients used as source of fiber were: resistant starch, apple fiber and wheat fiber. Resistant starch conferred to the dough hardness while the biscuits were softer, wheat fiber increased resistance to deformation in the dough and in the biscuit, while the apple fiber incorporation not significantly change the properties of dough or biscuit. The descriptive sensory analysis concluded that fiber least affecting the physical properties of the biscuit was apple fiber, although the color and flavor in the case of the use of resistant starch and wheat fiber were more similar to the control biscuit.

The study of oral path of biscuits was performed using a specialized sensory technique called "Temporal dominance of sensations". Biscuits were studied with high and low fat content and with and without addition of wheat fiber. Key attributes were obtained in oral processing. It was concluded that the degree of

dominance of some of the attributes obtained may adversely affect the acceptability by consumers as in the case of the sensation of dry mouth and hardness.

The reformulation of the biscuit influenced the textural properties and the sound emitted during fracture. The sound emitted by breaking biscuits and force-displacement curves related to the attributes and score obtained by qualitative and quantitative sensory testing. It was observed that the use of inulin as a replacement for sucrose gave better results than erythritol. The use of inulin as fat replacer also provided texture characteristics similar to the biscuit sound control, however, the use of hydroxypropylmethylcellulose as fat replacer provided biscuits and sound harder than the control biscuit.

A deeper study of the sugar biscuit functionality allowed elucidate that maltitol is an excellent replacement for sucrose in biscuits. The interactions of different components with different sugars biscuits (sucrose, erythritol and maltitol) in a model system, and the biscuit dough were studied. Using techniques of differential calorimetry was concluded that the polyols (erythritol and maltitol) act plasticizing gluten thus modifying its glass transition temperature. The properties of the biscuits with erythritol were more similar to those without any kind of sugar, however, maltitol biscuits showed similar rheological and texture similar to sucrose.