

Abstract 16th ICC Cereal and Bread Congress, online

29–31 March 2021

Substitution of sugar by bran in fine bakery products - possibilities and limits

In fine bakery products, sugar (sucrose) is not only used to create sweetness. Rather, sucrose is also an important component of recipes from a technological point of view, as this raw material influences the characteristics of the various baked goods.

Sucrose is a bulking agent in doughs and binds water due to its hygroscopicity. The result is an increased gelatinization and denaturation temperature of starch and proteins, respectively. This gives the pore structure and texture of fine bakery products their characteristic properties. Sucrose also influences the Maillard reaction taking place during the baking process and thus, the browning of the baked goods. Finally, sucrose influences the shelf life of the baked products.

However, it should not be ignored that excessive consumption of so-called free sugar is partly responsible for civilization diseases (overweight/obesity with consequences, caries). It is therefore of interest to reduce the sucrose content also in fine bakery products. Different substance classes are available for this purpose. Fructose syrup and fruit juice concentrates, such as agave syrup, are widely used. However, these have just as high a calorific value as sucrose and are suspected of promoting non-alcoholic fatty liver. Numerous studies have developed approaches using a combination of sugar substitutes (bulk sweeteners) and sweeteners instead of sucrose. The quality of these products may be compromised.

Only a few studies have dealt with the use of plant fibres or bran as a substitute for sucrose. Changes in the viscosity of the doughs, a lower pastry volume or a changed breaking strength, as well as changes in the colour of the crust and crumb have been observed.

A WHO-sponsored study concluded that even a small reduction in the intake of free sugars has positive long-term effects on the health of the population. The project presented here therefore investigated the effect of partial substitution of sucrose by various brans on the properties of dough and baked goods.

As model pastries, sponge cakes were produced according to a standardized process. The amount of sucrose was reduced by 10%, 20% and 30% and replaced by bran from wheat and durum, each ground with different mills. The brans had different particle size distributions and different water binding capacities. Since an increase in the viscosity of the masses could be expected, a second series of tests was carried out in which the amount of bulk water was individually adjusted to the respective bran used in the pastries.

The density and the consistency of the dough, the volume yield of the pastry, the texture of the crumb, and changes in the colour of the crust and the crumb by $L^*a^*b^*$ -colour value measurements were investigated. Furthermore, all baked goods were evaluated by a sensory panel for shape/appearance, browning, crumb colour, pores, odour, taste, and texture.

The following conclusions can be drawn: Durum bran frequently showed a lower influence on the respective measured variables compared to wheat bran. The differences in crumb colour were particularly noticeable. In the sensory evaluation, the baked goods with durum bran performed better than the corresponding baked goods with wheat bran. The adjustment of the bulk water to the respective recipe had no positive influence on the quality of the baked goods. Substitution of up to 20% of sucrose with durum bran is possible without noticeable quality deterioration of the final products.