

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

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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. Sucrose is a bulking agent in doughs and influences the pore structure, the texture, and the browning of the baked goods. This project investigated the effect of partial substitution of sucrose (10%, 20%, 30%) with bran from wheat and durum, each milled by different methods on the properties of sponge cake. Furthermore, all baked goods were evaluated by a sensory panel.

## Characterization of the brans

Durum bran and wheat bran were each finely ground using beater cross mills equipped with sieves of 800  $\mu$  and 600  $\mu$  mesh size, respectively. The particle size distributions of the ground products are shown in figure 1 and the water retention capacities in table 1.

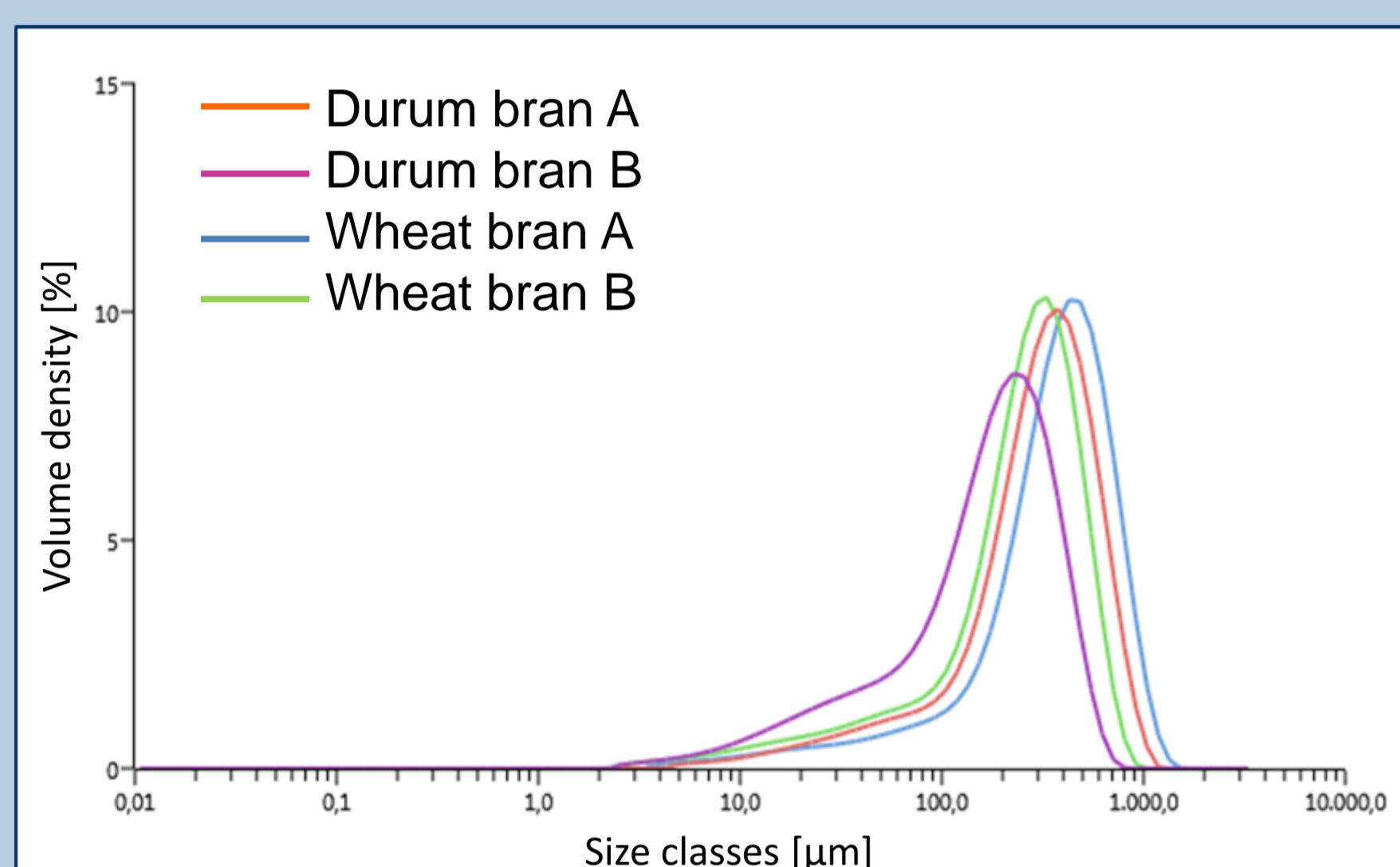


Table 1: Water retention capacities (WRC) of grounded durum bran A (800  $\mu$ m sieve), durum bran B (600  $\mu$ m sieve), wheat bran A (800  $\mu$ m sieve), and wheat bran B (600  $\mu$ m sieve).

sample	WRC [% DM]
Wheat bran A	327
Wheat bran B	294
Durum bran A	175
Durum bran B	155

Figure 1: Particel size distribution of grounded durum bran A (800  $\mu$ m sieve), durum bran B (600  $\mu$ m sieve), wheat bran A (800  $\mu$ m sieve), and wheat bran B (600  $\mu$ m sieve).

## Preparation of sponge cakes

Wheat and durum bran was used to replace 10%, 20% and 30% of sucrose, respectively.

Table 2: Sucrose percentages in the reference pastries and in pastries with 10%, 20%, and 30% sucrose reduction.

	Reference	10% subst.	20% subst	30% subst
Sucrose	24,0%	21,6%	19,2%	16,8%
Bran	-	2,4%	4,8%	7,2%

## Results of physical tests on doughs and pastries

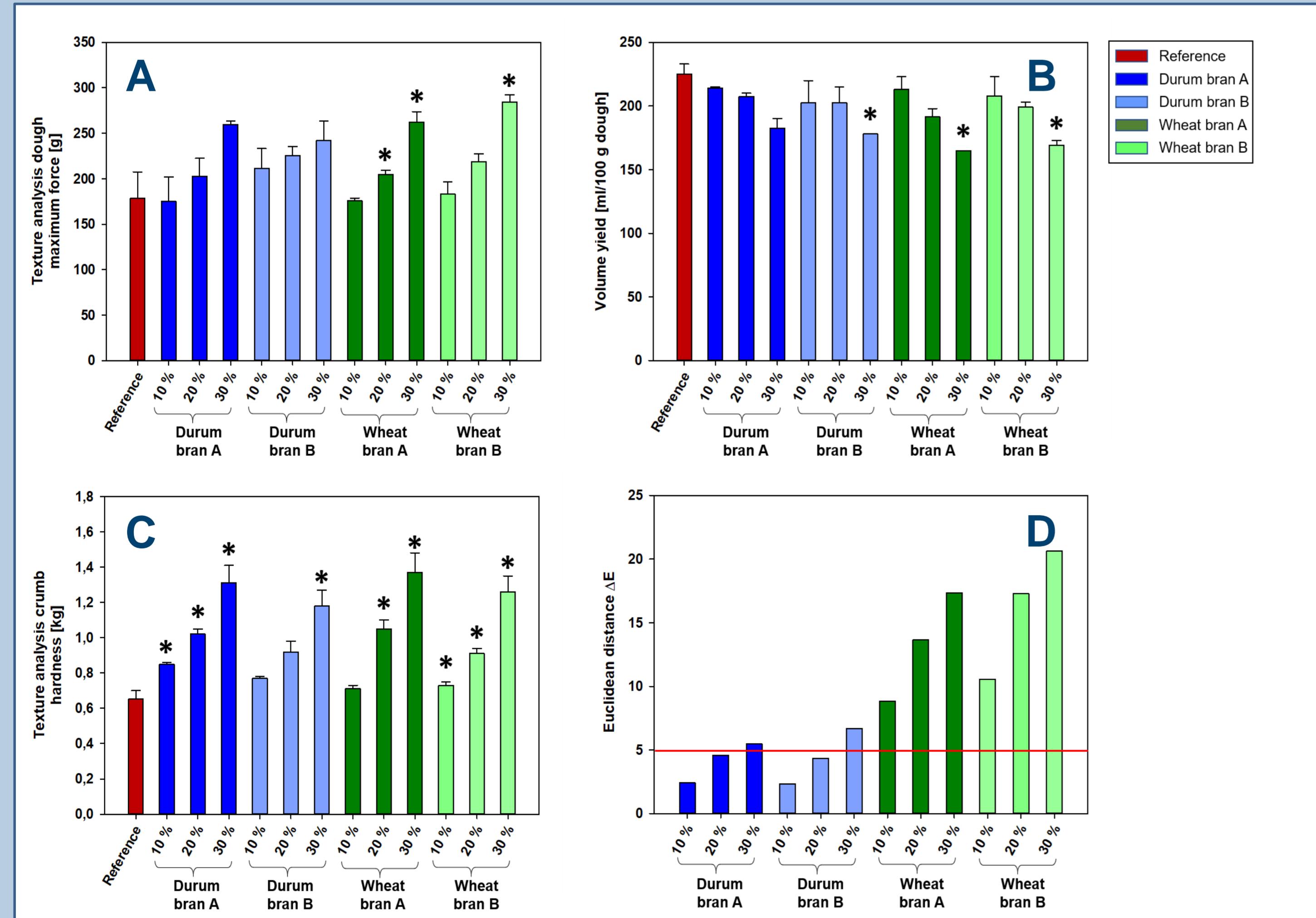


Figure 2: Results of measurements of texture analysis of the dough (A), volume yields of pastries (B), texture analyses of the crumb (C) and colour differences of the crumb, presented as euclidean distance  $\Delta E$  (D). \* significant differences to reference, — value from which another color is perceived.

## Sensory evaluations

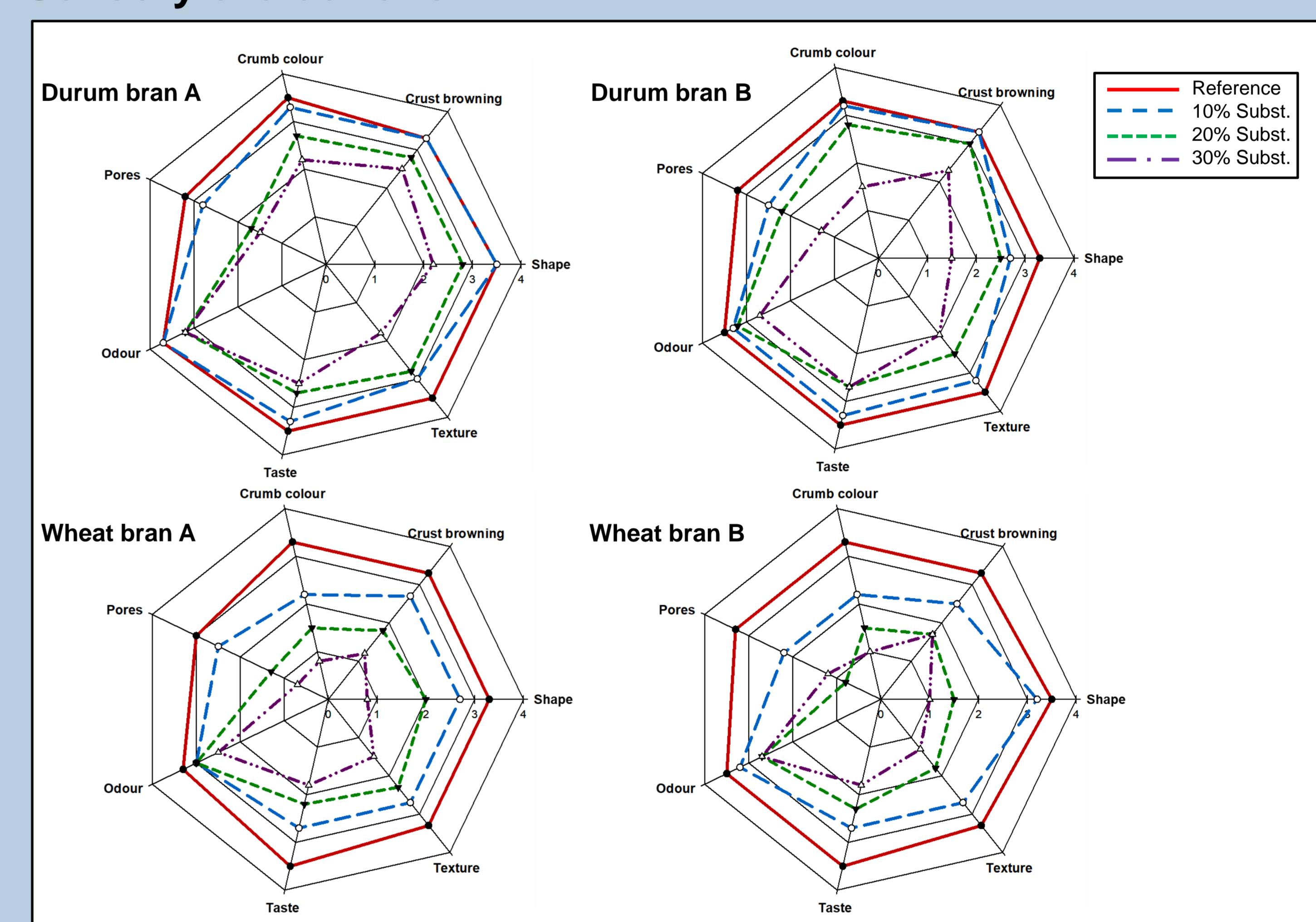


Figure 3: Results of the sensory evaluation with the features shape, crust browning, crumb colour, pores, odour, taste and texture. 4 points very good, 3 points good, 2 points fulfilling, 1 point sufficient, 0 points poor.



Figure 4: Examples of cakes, reference, 20% sucrose substitution with durum bran and wheat bran, respectively.

## Conclusion

Durum bran can be ground into finer particles than wheat bran with the same mill. Durum bran absorbs only about 50% of the water compared to wheat bran.

Substitution of 20% sucrose with durum bran B showed no significant differences compared to the reference in terms of texture of the dough, volume yield of the pastry and texture of the crumb. The color of the crumb changed noticeably less with durum bran than with wheat bran.

The sensory evaluation of the baked goods, with a 20% substitution by durum bran B, resulted in very good to satisfactory grades in all characteristics.

A 20% reduction in sugar content is possible in fine baked goods by substitution with durum bran.