



## Substitution of wheat flour with whole-grain spelt flour in cakes and its influence on consumer acceptance

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In typical bakery products, wheat flour is the principal ingredient<sup>(1)</sup>, and wheat gluten has been associated with negative health consequences in individuals with gluten-related disorders<sup>(2)</sup>. Wholegrain spelt flour (WSF) appears to offer a suitable alternative to wheat for some gluten-sensitive individuals. In order to be accepted by consumers, any 'healthy alternative' version of a food product must be of comparable sensory quality to the standard product<sup>(3)</sup>. To date, new product-development (NPD) efforts involving WSF have mainly been focused on breads, with little NPD work in the area of other baked goods such as cakes<sup>(1)</sup>. The aim of this study was to develop WSF versions of sponge cake and butter cake – both popular in Singapore -, with similar baking quality and product acceptability to those of the standard wheat-based versions. In a series of controlled bakery trials, baking performance (specific volume: cm<sup>3</sup>/g) of WSF- and standard wheat-based versions was compared (seed-displacement method). During a five-day post-baking period, crumb firmness (g) and springiness (%) were compared (TX – XT Plusä Texture Analyzer). All assays were performed in triplicate. Analysis of the resulting data indicated an absence of significant difference ( $p > 0.05$ ) between WGS- and standard wheat-based sponge cakes and butter cakes, in terms of specific volume, firmness and springiness (Mann-Whitney/Kruskal-Wallis tests used).

In consumer testing, the perceptions of 50 mainly Singaporean consumers (aged 19–37 years) regarding the wheat- and WGS-based sponge cake and butter cake products were assessed using a 9-point hedonic scale<sup>(4)</sup>. At the 5% significance level, the wheat-based butter cake scored significantly better than the WGS-based butter cake in terms of overall appearance, overall aroma and texture-softness, while the wheat-based sponge cake outscored the WGS version in terms of overall appearance and overall aroma. With the remaining attributes ('flavour' and 'overall acceptance', and additionally 'texture-softness' in the case of the sponge cake), no significant differences ( $p > 0.05$ ) were noted between the wheat-based and WGS-based cakes (Mann-Whitney U test used).

The results of the study demonstrate the potential of WGS as a potential substitute for wheat flour in some cake-type products. Although no significant differences were found in terms of specific volume, firmness and springiness between the WGS- and the standard wheat-based cakes, nonetheless the consumer-derived data indicate something of a "preference gap" in favour of the standard wheat-based products. If WGS-based cake products are to be fully successful, it appears that NPD efforts will be required to focus on improving sensory quality.

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