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Effects of processing conditions on the FODMAP contents of common wheat and rye breads

Over the last years, there have been intense discussions about the tolerability of cereals and cereal products. A clear medical diagnosis can prove or exclude celiac disease or wheat allergy (0.5 and 0.1% of the population, respectively). In the latter case, patients suffer from the so-called irritable bowel syndrome (IBS), one of the most common functional and often chronic intestinal dysfunctions. Since the symptoms vary greatly between patients and the discussed causes of IBS are diverse, a clear diagnosis is difficult. For approximately half of the patients, a food intolerance can be identified as the most probable cause. Those affected suffer from bloating, abdominal pain, flatulence and diarrhoea, which impairs their quality of life.

Intolerable in this case, are indigestible, osmotically active carbohydrates in the food that can be fermented by intestinal bacteria, summarized under the acronym "FODMAP". These are **f**ermentable **o**ligo-, **d**i-, **m**onosaccharides **a**nd **p**olyols. These carbohydrates occur naturally in various foods, including cereals and cereal products. Since baked goods made from wheat and rye are widely consumed, it is of interest to investigate how changes in baking recipes and processes can reduce the levels of the triggering carbohydrates. From existing literature, it is known that rye contains more fructans (main component of FODMAP) than wheat, and in both cereals the fructans are enriched in the outer layers (bran) of the grain. Laboratory experiments have already shown how prolonged fermentation of bread doughs can reduce FODMAP levels.

In the present study, it was investigated to what extent different baking procedures, established in practice, influence the FODMAP content in the respective baked goods. For this purpose, baked products based on different wheat and rye flours were produced according to standard baking procedures, including the use of sourdough. Both raw materials and products were analysed chromatographically using HPAEC-PAD (high performance anion exchange chromatography with pulsed amperometric detection) for the content of relevant carbohydrates and the fructan contents were determined enzymatically according to AOAC 991.03.

For classic wheat breads, an extension of the fermentation time by 20 min resulted in a reduction of both fructans and total FODMAP content by about 50% each. The use of sourdough also reduced the fructan content, but the fermentation processes of the lactic acid bacteria led to an accumulation of polyols, mainly mannitol. Particularly in rye baked goods, the total FODMAP content was not significantly reduced. This study showed, that the use of standard baking procedures can result in the production of low-FODMAP white wheat bread but requires further optimisation to achieve similar results for wholegrain wheat and rye breads.