



Effect of hydrothermaled bran on physicochemical, rheological and microstructural characteristics of Sangak bread

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ABSTRACT

Increased consumption of whole grain products has been associated with decreased risk of health problems such as cardiovascular disease, diabetes and obesity. Phytate however, has always been a matter of concern, since it chelates minerals such as iron. Sangak is very popular Iranian flat bread invented five hundred years ago, made from 95% extraction flour. The bread is fermented but usually fermentation is not able to remove all phytate from the dough. In this study flours were first debranned; resulting bran was subjected to a hydrothermal process. The hydrothermaled (HT) brans were then incorporated in the Sangak flour. In the next step, physicochemical, rheological and microstructural characteristics of Sangak flour and dough prepared from two Iranian wheat varieties, Tajan and Back Cross of Roshan were investigated. Results indicated a reduction in phytate up to 55% in the samples. The resulting dough containing HT bran showed a higher development time and valorimetric value and was more stable than doughs made with normal bran. Dough made with HT bran showed a kind of protein matrix in which proteins and starch granules are oriented in a more non-ordered structure.

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1. Introduction

Flat breads are staple food in Iran, provide most of the calories and protein in Iranian diet and have a special importance in this part of the world. Most flat breads are made from high extraction or near whole wheat flours, bearing incomplete fermentation. This produces breads with high fiber and phytate content which may complex with bivalent metals such as iron, zinc, calcium, and manganese (Davidsson et al., 1995; Lioger et al., 2007; Palacios et al., 2008; Sandberg et al., 1999). Phytic acid or myo-inositol hexakisphosphate is widely distributed in nature as it is the major storage form of phosphorus in cereals, legumes, and oil seeds. It is typically found in the outer (aleurone) layers of cereal grains. Therefore, products such as whole-meal breads are rich in phytic acid (Harland and Oberleas, 1991; Reddy et al., 1989).

The nutritional benefits of fiber to diets have been also investigated in many studies. Consumption of foods rich in whole grains and cereal fiber has been shown in epidemiological studies to reduce the risk of chronic diseases such as diabetes, cardiovascular disease and certain cancers (Jacobs and Gallaheer, 2004; Larsson et al., 2005; Murtaugh et al., 2003). To improve mineral

bioavailability, phytic acid levels may be decreased by phytase. Fungal phytase can improve nutritional and breadmaking performance of whole wheat bread. However, not all the phytates are hydrolysed (Haros et al., 2001). That could be due to the limited accessibility of the exogenous enzyme to phytates in the presence of unbroken aleurone large particles in bran-enriched wheat flour. The enzyme substrate contact may thus be hampered by physical factors (Sanz Penella et al., 2008)

In fact, the phytic acid breakdown in the stomach and small intestine of humans is influenced mainly by dietary phytase, whereas intestinal phytase activity is very low (Eklund-Jonsson et al., 2006; Iqbal et al., 1994). Washing the bran to remove harmful components, grinding the bran to obtain a smaller particle size, pearling of wheat grains or using various heat treatments to inactivate enzymes (Liu et al., 2007) have been successfully used to improve the quality of bread supplemented with bran (de Kock et al., 1999; Lai et al., 1989a,b; Nelles et al., 1998).

Sourdough microflora generally contains a complex mixture of yeasts (mainly *Saccharomyces cerevisiae*) and hetero and homo-fermentative lactic acid bacteria (LAB). The latter plays a key role during fermentation. LAB causes rapid acidification of the raw material through the production of organic acids, mainly lactic acid. Also, their production of acetic acid, ethanol, aroma compounds, bacteriocins, exopolysaccharides, and several enzymes is of importance. In this way, they enhance shelf life and microbial safety, improve texture and contribute to the pleasant sensory

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