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QUALITY PARAMETERS OF WHOLEGRAIN DURUM WHEAT BREAD ENRICHED WITH CITRUS FIBRE

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ABSTRACT

This paper reports the results of the quality parameters and the sensory evaluation determined on a durum wheat wholegrain breads enriched with citrus fibre. Wholegrain breads enriched with 2.0% of citrus fibre were produced in an industrial bakery, packaged under MAP conditions and stored at 25°C for as long as 90 days. Morphometric (volume, height, weight, porosity, crust and crumb color) and chemical parameters (pH, acidity, HMF, moisture) were determined to study the effect of the addition of citrus fibre in wholegrain bread. Results showed that the addition of 2.0% citrus fiber does not imply any deterioration in the appearance of bread, nor a reduction in the quality parameters. A trained panel of 12 judges determined the sensory profiles of bread samples. The results of the sensory data highlighted that the samples differed in citrus flavour but the overall evaluation were similar. The addition of citrus fibre to durum wheat flour could be considered a promising and innovative way to obtain functional bread rich in fibre.

Keywords: *Triticum turgidum* L. ssp. *turgidum* convar. *durum*, wholegrain bread, physical properties, shelf-life, sensory evaluation

1. INTRODUCTION

The high nutritional value of dietary fibre is well documented and is widely accepted its role in the prevention of certain diseases and benefits to human health (RODRIGUEZ *et al.*, 2006). Health benefits associated with dietary fibre include: blood glucose and cholesterol attenuation, protection against cardiovascular diseases, regulation of intestinal functions and promotion of gut health, protection against colon cancer (KING, 2005). WHO recommends on average a portion of 30 g of dietary fibre to be daily consumed. However, according to the European nutrition and health report, in most of European countries the dietary fibre intake is lower than the recommended level.

In southern Italy, and particularly in Sicily, the citriculture produces about 600.000 t/year of 'pastazzo', by-products derived from the citrus industry. It is possible to obtain citrus fibre from citrus residues, after numerous washing and purification steps, which can be added into food products. The addition of fibre to baked products lead to a reduction of loaf volume, hard crumb, a bitter flavor and a dark bread color (KTENIOUDAKI and GALLAGHER, 2012).

The present work shows the results of a study aimed at the production of bread enriched with citrus fibre in order to obtain a product with functional properties. The quality parameters of durum wholemeal wheat bread were evaluated. Loaf height and weight, porosity, moisture content and sensory changes were determined during shelf life.

2. MATERIALS AND METHODS

2.1. Bread making process

Breads were produced in an industrial company (Valle del Dittaino Società Cooperativa Agricola, Assoro, Enna, Italy), according to a consolidated industrial process and packaged under MAP conditions and stored at 25 °C up to 4 months. For each dough, 50 kg of durum wheat wholegrain flour was mixed with water, compressed yeast, salt and 2.0% of citrus fibre.

2.2. Bread quality parameters

The volume was determined according to the rapeseed displacement in a loaf volume meter; the loaf height was measured with a digital caliper (Digi-Max™, Scienceware®, NJ, U.S.A.). The CIE L*a*b* colour parameters were measured, using a Minolta spectrophotometer CR-300 (Minolta, Japan), for the crumb, in the transversely cut bread and on the crust surface, averaging 10 distinct points in each case.

Moisture content was determined on grounded samples by gravimetric method.

2.3. Sensory evaluation

The sensory profile was determined by applying the methods UNI 10957 2003 and UNI EN ISO 8586 2008 according to LANZA *et al.* (2011). The judges, using a scale between 1 (absence of the sensation) and 9 (extremely intense), have evaluated the intensity of the selected sensory attributes.

3. RESULTS AND CONCLUSIONS

With regard to the loaf volume, no significant differences were recorded among the bread samples and during the storage time (Fig. 1a). Bread with 2.0% of citrus fibre had a lowest loaf height (Fig. 1b). The addition of small quantities of citrus fibre on durum wheat whole flour has not increased the bread yield. Bread containing 2.0% of citrus fibre had the lowest lightness (L^*) values of the crumb.

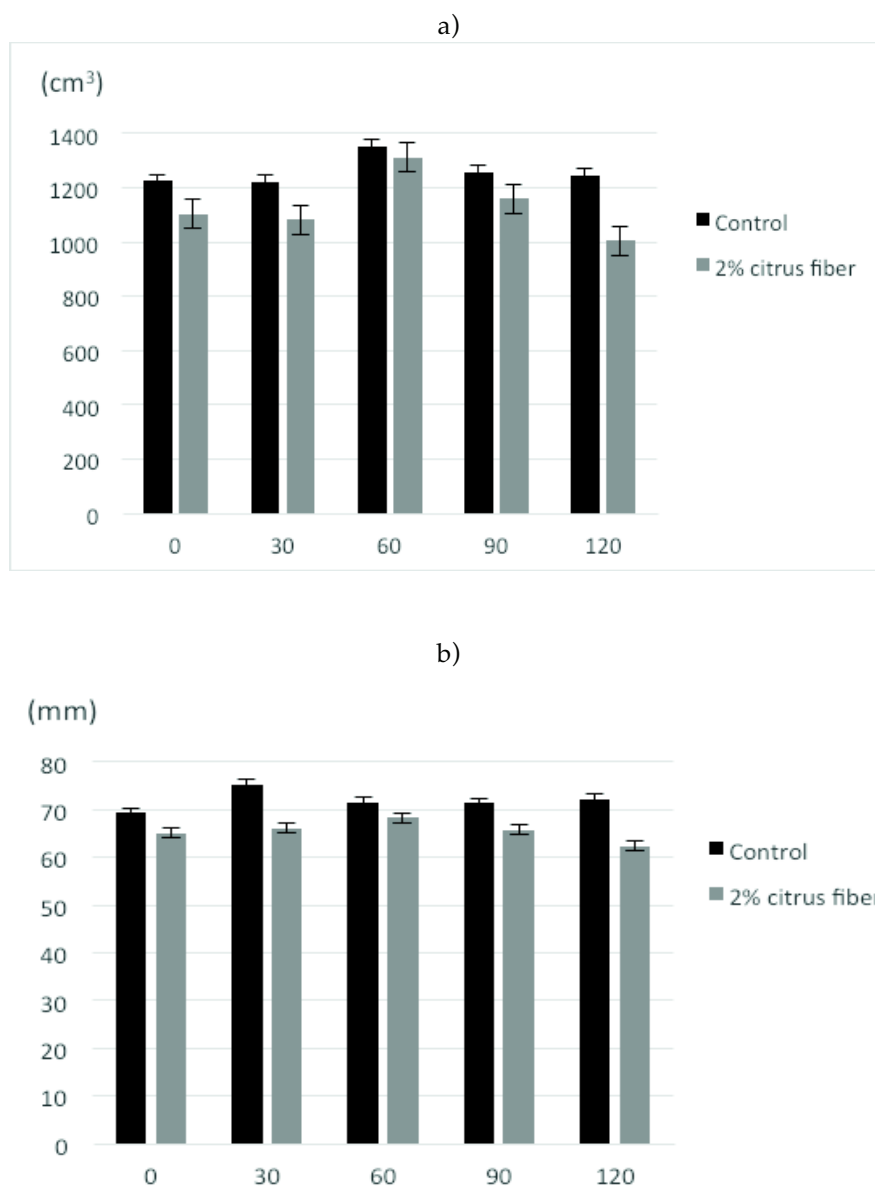


Figure 1: Effect of citrus fibre addition on physical properties of bread during storage.
a) Loaf volume; b) loaf height.

Moisture content in control bread ranged from about 38% in the freshly baked to 23% after 120 days of storage. Bread added with 2.0% of citrus fibre had the highest moisture level ranging from 42% in the freshly baked to 33% at the end of storage period. In both bread

samples at 60 days of storage, moisture content decreases quickly. At 90 and 120 days of storage, no remarkable differences were evidenced among bread samples. SPINA *et al.*, (2015) reports a similar trend of moisture content in durum wheat bread during storage. Sensory evaluation performed on the freshly baked bread samples highlights that control bread had the highest intensity of bread flavor, softness, moisture and overall judgment, while bread added with 2.0% of citrus fibre had the highest intensity of yeast odor, salty, off flavor and crumb color (Fig. 2). During storage, samples were statistically different for the citrus odor and flavor attributes (Fig. 2). The results of this study demonstrated that the addition of citrus fibre to durum wheat flour could be considered a promising and innovative way to obtain functional bread rich in fibre.

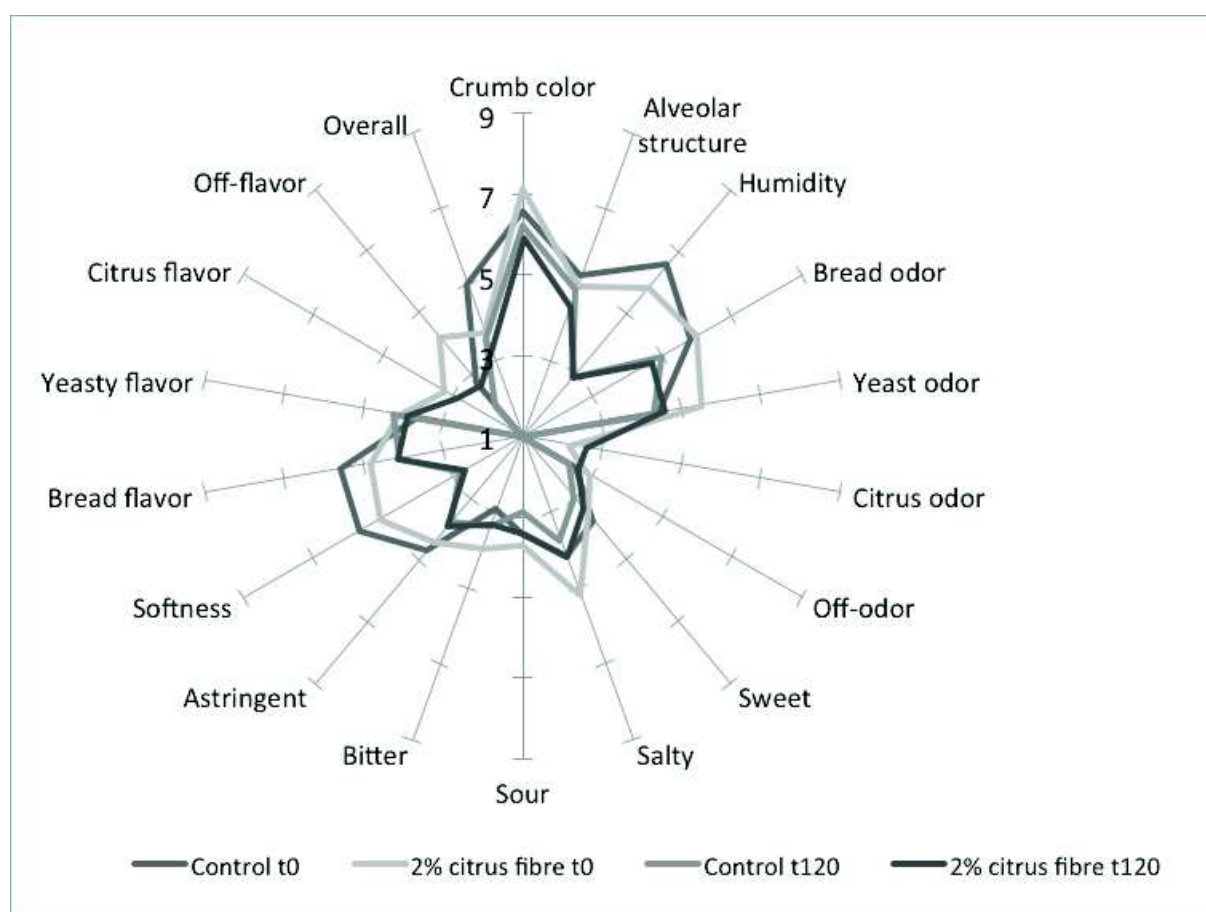


Figure 2: Evaluation of the sensory attributes in freshly baked bread samples and at 120 days of storage.

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