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ORIGINAL PAPER

Combination of buckwheat and almond flour as a raw material for gluten-free bakery products

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Abstract

The purpose of this study was to evaluate the effect of the incorporation of buckwheat flour and almond flour at concentration 100:0, 90:10, 80:20 and 70:30% w/v on physicochemical, functional, rheological, baking properties and antioxidant activity of developed gluten-free biscuits. Significant differences ($p \leq 0.05$) in nutritional, functional and rheological properties among flours were observed. Buckwheat almond-supplemented biscuits showed an increase in protein content (14.50–22.05%), fat content (25.90–32.10%), ash content (1.53–2.81%) and fibre content (2.45–7.97%) respectively. Among flours, buckwheat exhibited high water absorption capacity (139%), water solubility (1.50%) foam capacity (15.47%) and stability (89.21%) compared to almond flour. However, with increased flour supplementation, biscuit baking characteristics like thickness, width, spread ratio, puffiness, and volume index decreased. Buckwheat and almond flour ratio of 80:20 showed the best sensory characteristics. Results revealed that 80% buckwheat and 20% almond flour could be utilized to develop gluten-free biscuits with desirable characteristics.

Keywords Almond flour · Antioxidant activity · Buckwheat flour · Gluten free biscuits

Introduction

Wheat is the major energy provider, however, due to the presence of gluten in it, patients suffering from celiac disease are unable to consume it. In recent years, there has been a steady rise in consumer interest in gluten-free foods as a way to reduce the risk of relatively unknown disorder known as celiac gluten-sensitive enteropathy that affects the small intestine by causing villous atrophy. It is a global health issue that affects around 1% of the world's population [1]. Until date, celiac disease has only been treated with a gluten-free diet [2]. The production of reinforced biscuits or other composite flour baking goods is the latest trend in the bakery industry. Biscuits have several

appealing characteristics among ready-to-eat snacks, including a larger consumer base, more convenience, superior eating quality, and relatively extended shelf life [3]. Biscuits are appealing for fortification and other nutritional improvement because of their good eating quality.

However, making biscuits with gluten-free flour is difficult as being an essential structural protein required for developing high-quality cereal-based products. The absence of gluten results in biscuits of lesser quality, both in terms of technological and sensory aspects. Therefore, gums/hydrocolloids are the most significant ingredients in gluten-free formulations for improving product texture and appearance [4]. They have certain properties such as network and film formation, thickening and water holding capacity that are useful in producing gluten-free products.

Buckwheat (*Fagopyrum esculentum*) is a pseudocereal that could be a viable nutritional supply for the "starving world" issue [5]. It contains 55% starch, 12% protein, 4% lipids, 2% soluble carbohydrates, 7% total dietary fibre and 2% ash. But does not contain gluten, making it an ideal raw material for gluten-free products. Buckwheat has a very strong nutritional profile compared to other cereals, because of having high lysine content, vitamins notably B-group and contains several nutraceutical compounds like rutin, catechin and polyphenols [6]. Buckwheat's functional

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