



RESEARCH ARTICLE

NUTRITIONAL ANALYSIS OF VALUE ADDED GLUTEN FREE BISCUITS BY USING SOYBEAN, RICE AND CORN FLOUR

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ABSTRACT

Lifelong gluten-free diet is essential for patients having celiac disease. Since wheat flour contains gluten, it is necessary to replace wheat flour with other types of gluten-free flours. The purpose of the study was to formulate biscuits by using different combination of gluten free biscuits and evaluated for nutritional analysis. Three gluten free biscuits were prepared from blends of soybean, corn and rice flour at different ratio, sample T₁ -RF: SF: CF (15:40, 45), and T₂ - RF: SF: CF (20:45:35), T₃- RF: SF:CF(25:50:25) respectively. The study has been carried out in research laboratory of Food Science and Technology, School for Home Sciences, Babasaheb Bhimrao Ambedkar University, Lucknow. The result of the nutritional analysis indicated that that the protein, carbohydrate content of sample T₃ was significantly higher than other two samples. The dietary fiber content of sample T₁ was significantly higher. The Iron and calcium of sample T₂ was significantly higher. Calcium content was also higher in sample T₃.

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INTRODUCTION

Celiac disease is autoimmune disease in which the mucous membrane of the small intestine of gluten intolerant people is damaged by gluten, resulting in poor absorption of nutrient and consequently, weight loss, diarrhea, anemia, fatigue, deficiency of folate and osteopenia. It is recognized as long life disease. The affected people should eliminate completely and during the entire life all kinds of food that contain gluten derived components originated from cereals, wheat, rye, barely which in time results in clinical and mucosal recovery. (Simona Man *et al.*, 2014). Wheat is the main ingredient in many foods such as breads, breakfast cereals, breaded foods, crackers, pretzels, pastas and cookies (Hussain *et al.*, 2006). Avoiding wheat is probably the biggest challenge for people with CD. Biscuits are one of the oldest bakery snack consumed by all age group regularly due to its acceptability in all age group, longer shelf life, better taste (Ahmed *et al.*, 2012). Rice (*Oryza sativa*) flour is popular non-allergic gluten free source. Rice has low protein level, low sodium high starch level, and no gluten-forming proteins. Rice is a nutritional staple food which provides instant energy as its most important component is carbohydrate (starch). Rice (*Oryza sativa*) is a cereal

foodstuff which forms an indispensable part of diet, due to significant biological value and digestibility (Gujral and Rosell, 2004). Rice flour is a particularly good substitute for wheat flour, which causes irritation in the digestive systems of those who are gluten-intolerant. Rice flour has been used to prepare gluten-free bakery products, such as breads and cakes, which are traditionally made with wheat flour (Cato *et al.*, 2004). Soybeans (*Glycine max*) contain 40% high protein. The soy protein is highly digestible (92–100%) and contains all the essential amino acids except methionine which is relatively low but good source of lysine. Dry soybean contain 36% protein, 19% oil, 35% carbohydrate (17% of which dietary fiber), 5% minerals and several other components including vitamin (Ajay K. Dixit *et al.*, 2011). Soya is also known to be a good source of the trace elements copper, zinc and manganese and can be said to contain all the nutrients needed in food (Rita 2010). Corn (*Zea mays*) is richest source of carbohydrate and also contain protein, fat, some important minerals and vitamins. Corn contain vitamin B-complex such as B1 (thiamine), B2 (niacin), B3 (riboflavin), B5 (pantothenic acid) and B6 that makes it commendable for hair, skin, digestion, heart and brain. It contains vitamin C, A and K together with large amount of beta-carotene and fair amount of selenium that helps to improve thyroid gland and play important role in proper functioning of immune system. It is a potent antioxidant that guards body from harming by free radicals responsible for cellular damage and/or cancer. It is believed to improve

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symptoms of rheumatism as B-complex is able to improve joint motility (Owoyele *et al.*, 2010). The main structural component of the endosperm is starch, a complex carbohydrate that constitutes on an average 71% of the grain and is a source of concentrated energy. Mature endosperm contains large amount of protein (Prasanna *et al.*, 2001). Dates (*Phoenix dactylifera*) are highly rich in nutrients. It provides fiber, carbohydrates, minerals and vitamins. It is also having a certain medicinal properties. Because of its high nutritional value and its long life the date palm has been known as the 'tree of life' (Sultana Parvin *et al.*, 2015). Anemia is a disease which is also frequently associated with celiac disease, due to poor iron absorption, or a reduction in the consumption of products which are fortified with iron. The almond (*Prunus amygdalus*) is an effective health building food, both for the body and the mind; it is also a valuable food remedy for several common ailments. The nuts of *Prunus amygdalus* are found to possess various therapeutic properties, such as anti-stress, anti-oxidant, immunostimulant, lipid lowering, and laxative. The almond is highly beneficial in preserving the vitality of the brain, strengthening the muscles and prolonging life. Almonds are a useful food remedy for anaemia, as they contain copper, iron and vitamins (Hari Jagannadha rao *et al.*, 2012).

Walnut (*Juglans regia*) is richest source of mono unsaturated fatty acids. Walnut is a good source of Omega 3 (which is essential fatty acid) and arachidonic acid. Daily intake of Walnut protects the body against heart diseases, some certain cancer types, diabetes type 2, and other health problems. Walnut also reduces the risk of heart-attack, as it helps blood run more easily in the vein (Seyit Mehmet 2011). The aim of the present work is to replace wheat flour in biscuit by soybean, corn and rice flour and is enriched with dates, walnuts and almonds in order to increase the minerals (Iron, Calcium), Protein, Carbohydrates and other nutrients to develop gluten-free biscuit targeting a good nutritional value.

METHODOLOGY

Materials

The experiment has been carried out in research laboratory of Food Science and Technology, School for Home Sciences, Babasaheb Bhimrao Ambedkar University, Lucknow. Raw samples raw rice, dried corn, soybean, almonds, dates, walnuts, baking powder, sugar, unsalted butter and salt were purchased from local market of Lucknow area. Raw sample of the rice, soybeans, corn cleaned to remove the sand, dirt and unwanted particles. The flour was obtained by grinding them in flour mill.

Preparation of gluten free biscuits

The basic ingredients used were gluten –free flours (500 g), sugar (166 g), shortening (333g), baking powder (5.0 g), salt (2 g), and water as required. Sugar and shortening were mixed thoroughly in a bowl for 2 min at speed three using a mixer. The dry ingredients were weighed and mixed with sugar and shortening for 3 min at speed 3 to get cookie dough. The dough was rolled thinly on a sheeting board to a uniform thickness (6.0 mm) and cut out using steel biscuit cutters. The cut-out biscuit dough pieces were baked on greased pans at preheated 180 °C for 12-15 min in a baking oven and then were allowed to cool at room temperature (25±2°C) for 8-10 min. All biscuits were stored in air-tight containers until evaluation.

Nutritional analysis

The tests were determined at the RFRAC (Regional Food Research Analysis Centre) Lucknow. The protein and dietary fiber content was determined by AOAC method. The carbohydrate content was determined by SP: 18 method The calcium content was determined by IS: 5838:1970.

Table 1. Design of dough preparation for the three gluten free biscuit samples (T₁-T₃)

INGREDIENTS	SAMPLE T ₁	SAMPLE T ₂	SAMPLE T ₃
Rice flour (RF)	75g (15%)	100g (20%)	125g (25%)
Soybean flour (SF)	200g (40%)	225g (45%)	250g (50%)
Corn flour (CF)	225g (45%)	175g (35%)	125g (25%)
Almond	20gm	-	-
Walnuts	-	-	20g
Dates	-	20g	-
Sugar	166 g	166 g	166 g
Unsalted butter	333 g	333 g	333 g
Baking powder	5g	5g	5g
Salt	1 g	1g	1g

Table 2. Nutrient contents in three prepared gluten free biscuits using different blends (RF: SF: CF)

Samples	Protein (%)	Carbohydrate (%)	Dietary fiber (%)
Sample T ₁	3.45	66.70	2.95
Sample T ₂	7.58	61.17	1.99
Sample T ₃	19.15	70.24	2.53

Table 3. Nutrient contents in three prepared gluten free biscuits using different blends (RF: SF: CF)

Samples	Iron (mg/100g)	Calcium(mg/100g)
Sample T ₁	25.85	55.94
Sample T ₂	34.23	55.94
Sample T ₃	25.85	47.97

RESULTS AND DISCUSSION

The protein content of the gluten free biscuits increased with the increase in supplementation of the soy flour. The protein content ranged from 3.45% to 19.15%. The carbohydrate content of gluten free biscuits increased with the increase supplementation of rice flour from T₁-T₂. Rice flour is the richest source of carbohydrate (Gujral and Rosell, 2004). Sample T₃ (RF: SF: CF: 20:50:20) had highest carbohydrate (70.24%) content. Dietary fiber ranged from 2.95- 1.99%.

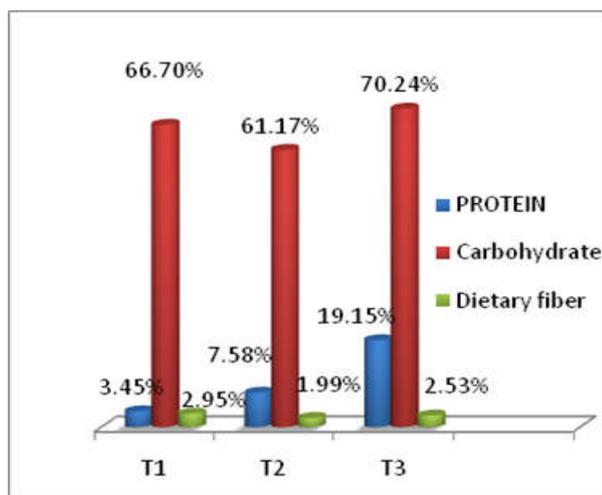


Fig. 1. Carbohydrate, Protein and Dietary fiber contents in gluten free biscuits using different blends (RF: SF: CF)

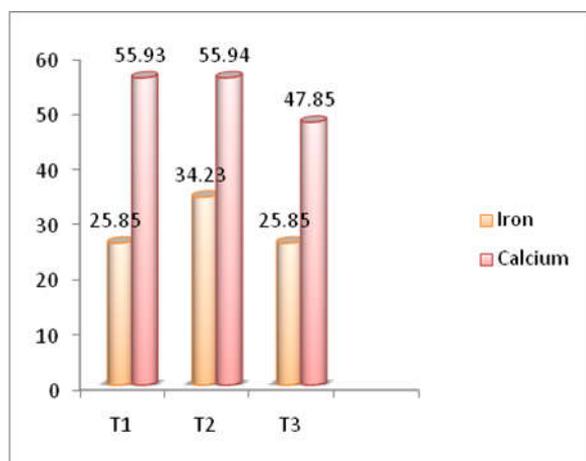


Fig. 2. Iron and calcium contents in gluten free biscuits using different blends (RF: SF: CF)

Minerals

The Calcium, Iron percentage of gluten free biscuit T₂ (55.94 mg/100g, 34.25 mg/100g) was comparatively higher than the other gluten free biscuits (51.98, 29.68) respectively.

Conclusion

Gluten free flour blends could be used to produce the gluten free biscuits with good. Therefore, this product could not only

be used by celiac patients but also by patients with diabetes, cardiovascular disease and hypertension. This product could help reduce cholesterol and constipation as it is rich in fiber.

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