CHEMICAL COMPOSITION OF DRIED FRUITS AS A VALUE ADDED INGREDIENT IN BAKERY PRODUCT

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FINS UDC 664.64.016.7 : 664.854

Abstract: Expanding the range of bakery products in terms of producing supplemented or dietetic products has been an increasingly important trend in contemporary baking. Bakery products as basic and popular food, could be used in the prevention of nutritive deficiencies of many important nutrients, by supplementing the products with biologically valuable ingredients. Such ingredients are dried fruits in the form of powder or cut in peaces.
Addition of dried fruits contributes to higher content of vitamins, potassium, calcium, iron and dietary fibers in the finished product. In bread supplemented with 10% powdered fruit or 30% of dried fruits in pieces, potassium and calcium content in bread increases 4-25 times. Iron content in the supplemented bread increases from 28% (cranberry) to 240% (apple). Dried apple and rose hip increaseds dietary fiber content in the supplemented bread for about 100%.

Key words: *Dried fruits, chemical composition, bread, nutrition*

INTRODUCTION

Epidemiological studies suggest that regular or increased consumption of fruits and vegetables may reduce the risk of chronic diseases and these health benefits are thought to be mainly attributable to their natural antioxidant and dietary fibers content. The positive roles of fiber in health and disease particularly in digestive tract health, energy balance, cancer, heart and diabetes justify the demand of increasing dietary fiber content in the daily diet. Dietary fiber is a collective term for a group of substances with varied chemical composition, structure, physical properties and physiological effects.(D. Sun-Waterhouse, 2009). Dietary fiber can be classified as either watersoluble or water-insoluble. The structural or nonviscous fibers (lignins, cellulose, and some hemicelluloses) are water-insoluble. Vegetables and cereal grains are especially rich in water insoluble fiber, with the highest amounts in wheat and corn. The natural gel-forming or viscous fibers (pectins, gums, mucilages, algal polysaccharides, some storage polysaccharides, and some hemicelluloses) are water-soluble. Foods rich in water-soluble fiber are dried beans, oats, barley, and some fruits and vegetables (Elke Theuwissen et al., 2008).

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Some authors have been studying the effects of dehydrated fruit powders as colorants and antioxidants in extruded white cornmeal breakfast cereals (M.E. Camire et al., 2007), and dietary fiber influence on bread nutritional value and alteration of the dough's rheological properties (Gomez et al., 2003). Fruits in fresh or dried form contain appropriate nutrients and like their natural source they are significant raw material in many foods, so as in bakery products (Filipčev et al, 2006).

Bread is one of the principal sources of energy, carbohydrate dietary fiber and a good source of protein for a large part of human population.

Bread provides high quantities of starch and dietary fibers, and little fat. It is a source of vitamins from the B group and minerals, mostly calcium, magnesium and iron. But many of these constituents are lost in industrial refining of cereal grains, so baking goods made from the white flour are in fact not very nutritious (Škrbić, Filipčev, 2007). There have been many attempts to increase the nutritive value of bakery products by addition of fruits and vegetables (H.P. Vasantha Rupasinghe et al., 2008) (M.E. Camire et al., 2007), (M.A. Larrea et al., 2005). In the baking industry there is requirement for high quality fruits and vegetable compounds with longer sustainability, which is achieved by using dried fruits and vegetables (Filipović N. et al, 2007). Dried fruit is a fruit that has been dried to remove some of the fruit's moisture either naturally or through the use of a machine. Drying preserves fruit, even in the absence of refrigeration and significantly lengthens its shelf life. When fresh fruit is unavailable, impractical or out of season, dried fruit can provide an alternative. It is often added to baking mixes and breakfast cereals. For example it has been reported use of apple pomace in cake making, in order to avoid the addition of other flavouring ingredients as the cakes prepared with apple pomace had pleasant fruity flavour. Dried apple pomace, a fruit industry by-product, is considered as a potential food ingredient having dietary fiber content of about 36.8% and has been used in apple pie filling and in oatmeal cookies (M.L. Sudha et al., 2007). Pectin substances constitute a major fraction of dietary soluble fiber. Pectins contained in dried apple and rose hip, an important class of plant polysaccharides are used in the food industry as a gelling agent in the production of jams, jellies and dairy products (Rahul Seshadri et al., 2003).

Therapeutic benefits attributed to pectic substances are (a) a significant reduction in plasma cholesterol levels, especially cholesterol associated with LDL and VLDL lipoproteins, and (b) an increase in fecal excretion of bile salts (Isabel Meseguer et al., 1998).

The objective of the present study was to characterize the dried fruits regarding their chemical composition, and to investigate what would be the effects of their addition to bread regarding its nutritive value.

MATERIALS AND METHODS

In the experiment four samples of dried fruit (cranberries, wild apple, rose hips, apricot) were analyzed. Their chemical content was determined. Measured parameters were: dry matter, total acids, total sugars, reducing sugars, total ash, dietary fibers, pectin, tannins, calcium, potassium, iron.

Dried fruits were purchased from a local market. Dietary fiber content was determined by an enzymatic-gravimetric method according to the AOAC (1997), Method 985.29. About 1 gram of the samples (dried and fat-free) were gelatinized with heat stable α-amylase and then enzymatically digested with protease and amyloglucosidase to remove the protein and starch present in the sample. Total sugars ash and total acids were determined according to Pravilnik o metodama uzimanja uzoraka i metodama vršenja hemijskih i fizičkih analiza radi kontrole kvaliteta proizvoda od voća i povrća (1983), pectin and tannins were determined gravimetrically by method of Vračar Lj. 2001. Calcium, potassium, and iron were determined by ashing at 450 ^{o}C by atomic absorption spectrophotometry on a Varian Specktra AA 10 (Varian Techtran, Australia, FAO 1980) spectrophotometer.

Each value was measured in duplicate and averaged with standard deviation.

RESULTS AND DISCUSION

Chemical composition of four kinds of dried fruits were analyzed, statistically evaluated and shown in Table 1.

Table 1.
Proximate compositions of dried fruit

Parameters	Dried cranberry	Dried wild apple	Dried rose hip	Dried apricot
Dry matter (%)	86.46± 0.33	90.95±0.2	92.325±0.32	76.845±0.23
Total ash (%)	0.19 ±0.014	1.295±0.02	3.71±0.13	4.43±0.17
Total acids (%)	1.305±0.007	1.345±0.01	1.905±0.01	0.8±0.01
Total sugars (%)	72.47±0.948	26.46±0.35	12±0.07	30.45±0.33
Reducing sugars (%)	61.21±0.049	16.50±0.42	9.72±0.06	23.23±0.26
Total fiber (%)	4.565±0.0106	52.18±0.91	57.85±1.77	9.975±0.06
Proteins in fibers (g)	0.00845±0.008	0.03365±0.001	0.03515±0.001	0.008±0.003
Ash in fibers (g)	0.0022±0.001	0.0195±0.002	0.11155±0.13	0.0048±0.002
Calcium(mg/kg)	14.33±0.75	509.39±1.67	3795±80.61	35.105±1.75
Potassium (mg/kg)	187.5±3.818	5848.5±109.6	11891±170.41	14155±205.06
Iron (mg/kg)	2.45±0.085	22.3±1.7	13.16±0.25	6.955±0.13
Total pectin (%)	-	6.515±0.06	7.625±0.36	0.475±0.04
Tannins (%)	-	1.52±0.1	3±0.14	-

The dietary fiber content of about 50% for dried apple is in accordance with data of Sudha M. L. et al., (2007). Dietary fiber content for dried rose hip is considerably higher than reported by Demir F et al., (2001). Also the contents of potassium and calcium were clearly higher then the results of Demir F et al., (2001), whereas the iron and ash contents of dried rose hip were considerably lower than those of the same authors. These differences could be the results of growth conditions and environmental factors. Results for dietary fiber, potassium, calcium content of dried apricot are notably lower than the findings of Haydar et al., (2007).

Possible effect of bread fortification with the dried fruits regarding its nutritional value was calculated mathematically (Filipčev, 2009).

In this assessment, the following assumptions were taken: mineral content of tap water acquired from the local municipal drinking water supplier (Ca 84 mg/l, Fe 0.05 mg/l), average mineral and total dietary fiber content of white wheat flour were acquired from the Nutritional Tables (Kaić-Rak et al, 1990), water absorption of 55% was assumed based on data related to breads made with osmotically dehydrated fruits as reported by Filipčev, (2009), assumed baking loss was 11%. Contribution of yeast to total mineral content was ignored. It was adopted that powdered dried fruits (rose hip, apple) could be added at 10% level (flour basis), whereas pieces of dried fruit (cranberry and apricot) could be added at 30% (flour basis), based on the findings of Filipčev (2009) who reported that breads of acceptable sensory properties can be made by the addition of 10% osmotically dehydrated powdered fruits or 30% fresh diced osmotically dehydrated fruits, flour basis.

Taking into account the estimated content of flour, water and fruit preparations in the bread as well as the above mentioned assumptions, data were derived by calculation.

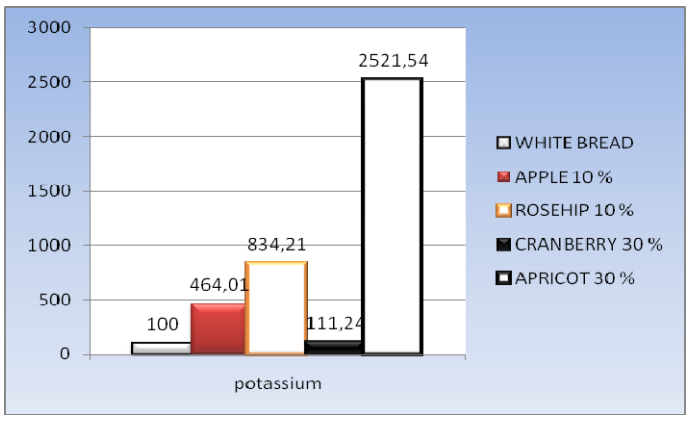

Figure 1. Estimated increase of potassium content (mg/kg) in bread by adding dried fruit

For white bread data were acquired from Nutritional Tables, Kaić-Rak et al. (1990).

The highest increase of potassium content in bread would be achieved by adding 30% of dried apricot pieces. 100 g of enriched bread would contribute to 50% of the Recommended Daily Allowance (RDA) for adults for potassium.

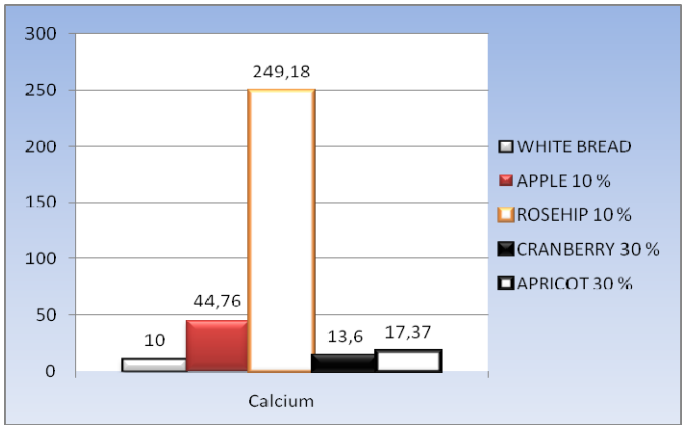

Figure 2. Estimated increase of calcium content (mg/kg) in bread by adding dried fruit

Calcium is essential to maintaining total body health. It is a necessary to our body on daily basis to keep bones and teeth strong over a lifetime, and to ensure proper functioning of muscles and nerves. It also helps blood clotting. 100 g of bread enriched with 10% rosehip powder would provide 25% of RDA for adults.

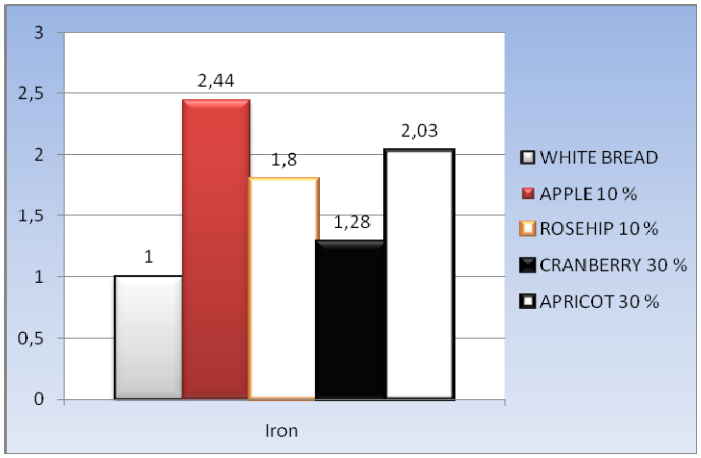

Figure 3. Estimated increase in iron content (mg/kg) in bread by adding dried fruit

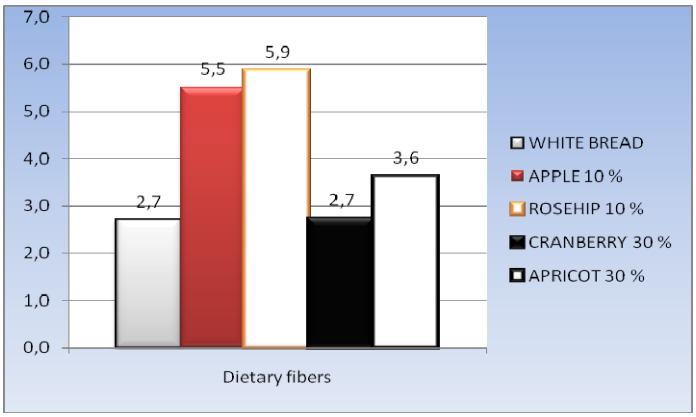

Figure 4. Estimated increase of dietary fibers content (g/kg) in bread by adding dried fruit

Iron is an essential component of hemoglobin, which transports oxygen in the blood to all parts of the body. It also plays a vital role in many metabolic reactions. Iron deficiency can cause anemia resulting from low levels of hemoglobin in the blood.

By consumption of 100 g of 10% apple powder enriched bread iron intake would be 2.44 mg of iron, whereas RDA for iron is 10-15 mg for adults.

The World Health Organization (WHO) recommends consumption (RDA) of 20-40 g of dietary fiber daily. The highest increase in the dietary fiber content of bread would be achieved by adding dried apple (5.5 g) and rosehips (5.9 g) respectively.

CONCLUSION

Today, there is a health-conscious demand for convenient, health-promoting foods. Dried fruits in the form of cut pieces or powders provide means for producers to improve the health benefits of cereal products. Dried fruits can be used in bakery products for acquiring nutritionally valuable bread which can be consumed by wide group of consumers with almost every meal. Pieces of dried apricot are the richest source of potassium and, dried rosehips could enrich bread with calcium. Dried apple and apricot are good source of iron for bread enrichment. Dietary fibers present in dried apple and rose hips are good bread enrichment factors to increase dietary fibers content. Natural colorants, vitamins, fibers, minerals and health claims are only a few of the benefits food processors can offer consumers in their finished products enriched with dried fruits.

ACKNOWLEDGEMENTS

The authors gratefully acknowledge the financial support from the Ministry of Science and Environmental Protection of the Republic of Serbia (Project TP-20068).

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