FUNCTIONAL FOODS BASED ON COMMON AND TARTARY BUCKWHEAT

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ABSTRACT

Buckwheat grain and other parts of buckwheat plant are rich in nutritionally important substances, like as trace elements, soluble and insoluble fiber, proteins and antioxidants. It is a possibility to develop many novel products based on common and tartary buckwheat grain, plants and sprouts. Further development of novel buckwheat food products with high nutritional value should be promoted

Keywords: buckwheat, quality, rutin, fagopyrin, selenium

INTRODUCTION

In European countries, and in many other countries around the world, common and tartary buckwheat has been grown for centuries. Buckwheat is suitable for ecological growing without the use of chemicals, following sustainable agricultural practice by developing and extending environmentally conscious technologies. All around the world flour dishes, made from buckwheat are eaten, mostly pasta (different types of noodles) and pancakes (for example in France, China, Korea). In Slovenia it is some tradition on making buckwheat bread (from mixture of wheat and buckwheat flour), but there was not yet used tartary buckwheat for bread products. In Slovenia, Croatia, Poland and in Eastern Europe it is a tradition of consuming buckwheat groats, obtained by dehusking precooked buckwheat grain. In Central or Eastern Europe it is no tradition eating buckwheat sprouts. But, as buckwheat sprouts seem to have interesting nutritional and biological value **(Kim et al., 2008; Lin et al., 2008)** it is as well in Europe a growing interest for domestic growing, or factory growing, and the consumption of buckwheat sprouts. Around the world it is interest on buckwheat sprouts as a part of general interest for sprouts as a healthy food, from different plants.

Nutritionally important elements

Buckwheat is generally a good source of nutritionally important elements **(Bonafaccia et al., 2003ab)**. Tartary buckwheat sprouts and plants are able to assimilate Zn in a moderate amount and considerably assimilate selenium **(Cuderman et al., 2010)**. In buckwheat and other plants elements like Zn, Cu, Fe etc. are normally concentrated in the aleurone and in other parts of grain, which may be during sieving allocated to bran (Bonafaccia et al., 2003ab). Buckwheat could be an interesting source of dietary selenium (Se), especially in the countries with low dietary intake of Se **(Smrkolj et al., 2006; Cuderman et al., 2010)**. As there are limited possibilities to assimilate trace and other nutritional important elements by sprouts, it is a suggestion to grow buckwheat sprouts from the seeds, grown in conditions of high availability of trace elements. Sprouts show only a modest ability to concentrate Zn under given environmental conditions. In any way, considerable amount of Zn is already contained in buckwheat seeds **(Ikeda et al., 2006)** and after the germination it may appear even in sprouts.

Rutin and other phenolic substances

Flavonoids are important constituents of buckwheat **(Fabjan et al., 2003)**. In buckwheat flour products considering amount of rutin could be altered to quercetin, however this process is only slightly affecting overall antioxidant activity of the products like tartary buckwheat bread **(Vogrinčič et al., 2010)**.

Buckwheat sprout products, including the Korean powder from tartary buckwheat sprouts, have interesting concentrations of flavonoids (mainly rutin), which are under the preparation of product not altered into quercetin, to the difference from other buckwheat products. The concentration of UV-B and UV-A absorbing compounds (these are including as well rutin) is the highest in UV-B treated plants. Increased amount of these substances in sprouts exposed to solar UV-B radiation may be a possible way to enhance the concentration of rutin in buckwheat sprouts.

Novel buckwheat product

Tartary buckwheat bread. Excellent novel product, developed in Ljubljana, is bread made of the mixture of wheat flour and tartary buckwheat flour, or solely of tartary buckwheat flour **(Vogrinčič et al., 2010)**.

It is a possibility to produce a plethora of buckwheat sprout products:

Sprouts as a vegetable. Buckwheat sprouts are very tasty refreshing vegetable. They could be cultivated in dark, under light, in glasshouse (limited amount of UV radiation, or enhanced radiation), under soaking seeds with Zn, and/or Se, and/or Fe solution, or simply with trace elements containing water **(Liu et al., 2007)**. Growing sprouts could be watered with such water. Sprouts could be grown from seeds, where parental plants were foliarly fertilized with some solution (for example Zn, Fe, Se, or other, or a combination). The quality of sprouts may depend as well on variety and species of buckwheat. There is a great number of various possible sprouts growing technologies, respective to the taste of consumer, and demands for the concentration of different substances in sprouts.

Dried sprouts. It is a dried vegetable, which could be used as an addition to different food items.

Sprout powder. Dried sprouts could be milled to obtain a green powder as a nutritionally rich supplement to diverse drinks or food items. It can give special natural green colour to some foods, for example bread, cakes or ice-cream.

Buckwheat sprouts may contain some fagopyrin, like some other green parts of buckwheat plant **(Ožbolt et al., 2008)**. Fagopyrin is a substance similar to hypericin (from Hypericum spp.) and may cause certain photosensitive reaction, especially in people (or animals) with light skin, when exposed to direct sunlight. Further investigations are

needed on this matter, and on the concentration of fagopyrin in different types of buckwheat sprouts, of different age, exposed to different light conditions, and of different genetic origin (variety, species).

CONCLUSION

Bread made of the mixture of wheat flour and tartary buckwheat flour, or solely of tartary buckwheat is an excellent novel product, with high antioxidant capacity.

We suggest addition of Se by seed treatment, prior to sowing, for obtaining Se enriched buckwheat sprouts or plants. Buckwheat sprout products have interesting amounts of flavonoids (mainly rutin). However, in buckwheat sprouts precaution should be taken in regard to possible content of fagopyrin. There are not yet final results about the possible content of fagopyrin in buckwheat sprouts, or in young buckwheat plants or about the impact of the low concentration of fagopyrin on human health.

Further development of novel buckwheat food products with high nutritional value should be promoted.

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