

Bakery products with higher rutin content

I. Paulíčková, A. Landfeld, V. Fiedlerová, S. Vavreinová
Food Research Institute Prague, Radiová 7, 102 31 Prague 10, Czech Republic

INTRODUCTION

Cardiovascular diseases represent the major cause of health problems and death in the Czech Republic and in all the industrially developed countries. In this country some 60 000 people die of these diseases every year.

Nutrition and a healthy lifestyle play an important role in the development of human society and in the maintenance of its health.

Rutin (quercetin-3beta-D-rutinoside) is an important therapeutic substance that favourably influences the increase of blood vessel elasticity and the treatment of circulatory disorders and atherosclerosis, reduces blood pressure and stimulates vitamin C utilization.

Buckwheat is recognized as a rich source of rutin. Buckwheat tops contain about 100 times more of rutin than seeds.

The development and consumption of functional food with an increased content of rutin may be a way how to reduce the risk of cardiovascular diseases in population. Bakery products were chosen for experiments with increased rutin content.

The addition of dried buckwheat tops as a source of rutin to bakery products appears to be technologically and economically feasible.

MATERIAL AND METHODS

Material

Common buckwheat (*Fagopyrum esculentum* Moench) -variety JANA (tops)

The plants were mowed, immediately afterwards dried in a hot air drier at 105°C and ground (mesh 0,5 mm)

Rye and wheat flour (flours with increased gluten content)

Methods

Extraction of rutin by methanol

Extraction of ground dried buckwheat tops in 50% methanol by reflux boiling for 2 hours at 90°C

Determination of rutin content by the HPLC method

HPLC system Summit DIONEX (USA)

Column Lichrospher 100 RP – 18; 5 µm, 250x4 mm (Merck)
guard column 4x4mm (Merck)

Mobile phase 0.28% acetic acid:methanol:ACN (35:5:10) V/V/V

Detection spectrophotometric, λ = 350 nm

Flow rate 1.5 ml/min

Injection 20 µl

Determination of vitamin C content (as ascorbic acid)

Determined according to ČSN ISO, procedure No. 6557/2, method A – titration method with 2,6 – dichlorphenolindophenol with the potentiometric indication of the end point

Laboratory baking

Bread Machine BÉDA Isolit Bravo (ensuring standard conditions)

Breads were prepared in the bread machine (program “Normal“ for 4 hours)

(dough mixing and kneading at 25 – 40°C for 3 hours, baking at 146°C for 1 hour)

Determination of texture by instrument analysis

Texture of breads (hardness, springiness, cohesiveness, chewiness, gumminess) was determined by Texture Profiles Analysis on the Texture analyser TAXT2i Stable Microsystems (GB)

Sensory methods

Sensory evaluation was conducted at a specialized laboratory of the Food Research Institute Prague, equipped in compliance with the international standard ISO 8589. Sensory analysis was accomplished under the conditions specified by ISO 6658.

The panel of assessors comprised of 10 to 12 tasters trained as required by ISO 8586. The samples were evaluated by a graphic scale method.

Specific volume

Determination of value using white mustard seeds

Antimicrobial activity

Cultivation test of the inhibitory effects of dried buckwheat tops

RESULTS AND DISCUSSION

Dried buckwheat tops exhibit favourable antimicrobial properties that can be used in the production of bakery goods.

Antimicrobial properties of dried buckwheat tops

Material/Dilution	Material content (g/100g)	Bacillus cereus CFU/ml		Aspergillus niger CFU/ml		Saccharomyces carlsbergensis CFU/ml	
		10 ⁻¹	10 ⁻³	10 ⁻¹	10 ⁻³	10 ⁻¹	10 ⁻³
Control	0	+	1 x 10 ⁷	+	1 x 10 ⁵	+	9.9 x 10 ⁷
Dried buckw. tops	0.5	-	-	-	-	+	8.6 x 10 ⁷
Dried buckw. tops	1.5	-	-	-	-	+	2.5 x 10 ⁶

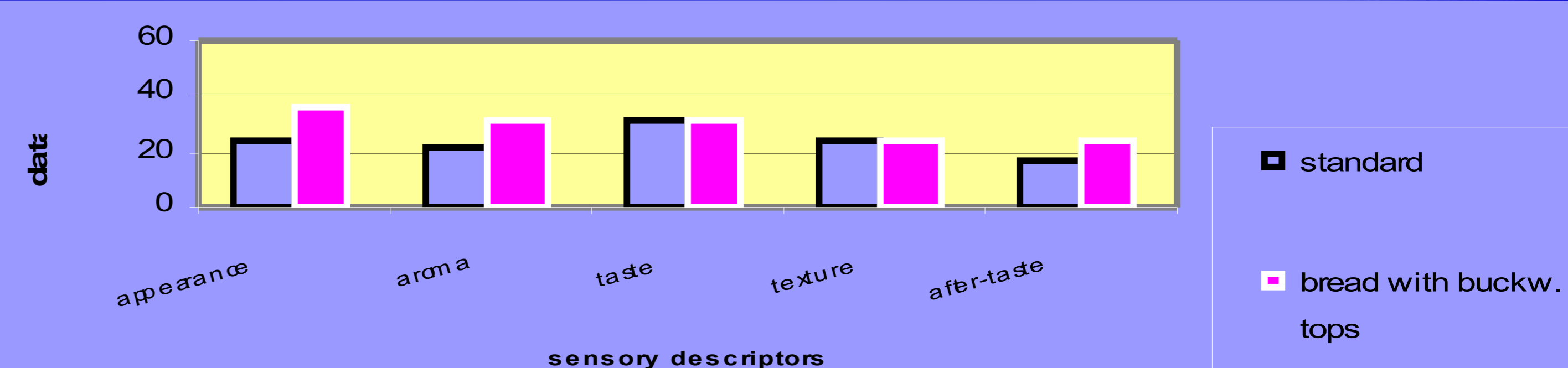
Minimum costs needed for the adaptation of technology, favourable antimicrobial activity of buckwheat tops, health effect, as well as the bakery goods themselves (enormous volume of their consumption with substantial periodicity within the year, marked variation in their local availability) may support the decision to release products containing buckwheat tops.

Sensory evaluation of bread samples made it possible to choose the optimum amount of dried buckwheat tops to be added to bakery products.

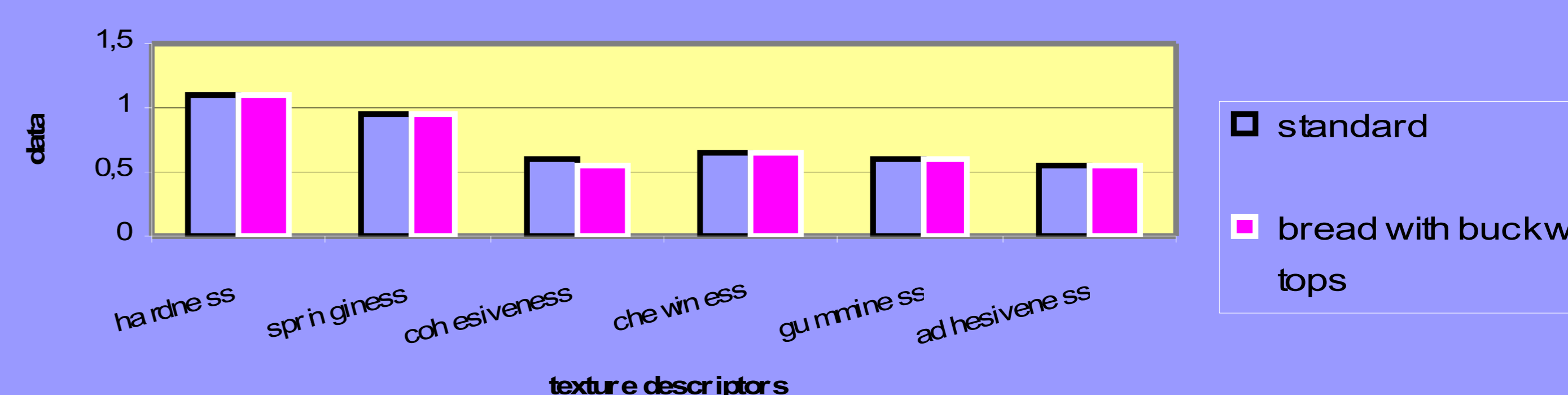
It reveals that the limiting factor for the addition of dried buckwheat tops would be their bitter taste. On the other hand, buckwheat tops, being a good water binder, kept the bakery products soft.

Altogether 25 formulas for the rye-wheat breads, 2 formulas for pastry and 2 formulas for ready made mixes for bakery production were tested in this project. The formula with the best sensory rating was then chosen for final analyses.

Sensory rating of the overall acceptability of bread with dried buckwheat tops added (appearance, aroma, taste, texture: 0-pleasant...100 – unpleasant; after-taste: 0-none...100-very strong)



Texture of bakery products by the TPA method



The properties of dough were also assessed for the content of rutin and ascorbic acid and for the specific volume of the product.

Bread	Weight (g) Mean ±SD	Specific volume (cm ³) Mean±SD	Rutin content (mg/100g sample) Mean±SD	Rutin content (mg/100g DW)	Ascorbic acid content (mg/100g sample) Mean±SD
Standard	499.91 ± 19.99	238.10 ± 14.29	0.43 ± 0.04	0.74	0.00
Bread with buckwheat tops	508.99 ± 15.27	256.30 ± 17.94	6.98 ± 0.42	11.7	21.70 ± 1.52

CONCLUSION

Dried buckwheat tops exhibit favourable antimicrobial properties utilizable in bakery industry and simultaneously do not inhibit yeast growth and reproduction.

Their addition to bakery products yielded functional foods of outstanding organoleptic properties with the increased content of rutin and ascorbic acid. Eating four slices of bread containing buckwheat tops would supply approximately 20 mg of rutin and 60 mg of vitamin C.

The recommended daily intake of rutin has not been set, but it should not exceed 50 mg. Any higher intake poses certain health risks (e.g. concrements in renal tubules).

In the course of preparation and baking of the products 60% of rutin were lost.

Dried buckwheat tops bind water very well, keeping bread crumb soft.

The results of measuring bread texture by the TPA method correlated with the data on sensory analysis.

Bread with the addition of dried buckwheat tops corresponded well to the control bread in texture parameters.

During its storage (0-72 hrs) neither any changes in organoleptic properties nor any significant drop of rutin content occurred.

Supported by grant MZE 0002702201