

NUTRITIONAL AND TECHNOLOGICAL PROPERTIES OF COOKIES PREPARED FROM MINOR CEREALS AND FRUIT AND VEGETABLE BY-PRODUCTS

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BACKGROUND AND OBJECTIVES

- Cookies are one of the cereal products typical for the area of Vojvodina, where they are usually consumed with coffee or tea. However, they are usually produced from wheat flour, leaving the nutritional potential of minor cereals growing in the area of Vojvodina unused. On the other hand, fruit and vegetable processing industry in Vojvodina generate large amounts of by-products that could be used as natural flavorings and colorings. The combination of these raw materials could be used to produce cookies with improved nutritional properties and interesting sensory properties, which would be appealing to consumers, especially those concerned with the consumption of natural ingredients.
- The objective of this research was to develop optimal formulations of cookies prepared from triticale, rye, spelt and barley flour with the addition of apple pomace, beetroot pomace, pumpkin pulp and pumpkin oilseed cake. Then, technological and nutritional properties of these cookies were assessed.

METHODOLOGY AND EXPERIMENTAL DESIGN

- Wholegrain rye, spelt and barley flours bought in the market, and refined triticale flour obtained by milling grains were used as the basic ingredients for the manufacturing of cookies. Apple, beetroot and pumpkin pomace were dried and powdered, while powdered pumpkin oilseed cake was obtained from the producer of pumpkin seed oil. The following combinations of basic ingredients were used: triticale flour substituted with 10% of apple pomace (TA); spelt flour substituted with 5% of beetroot pomace (BP); rye flour substituted with 10% of pumpkin pomace (RP); and barley flour substituted with 10% of pumpkin oilseed cake (BPC).
- Moisture, ash, protein, total carbohydrates, sugar, fatty acids composition, soluble and insoluble dietary fiber and energy value were determined and calculated using standard methods. Spread ratio was calculated from dimensions; color of upper and lower surface of cookies was measured using a Chroma meter CR-400 (Konica Minolta, Japan), and hardness and fracturability of cookies were determined by using a TA.XT plus Texture Analyser (Stable Micro Systems, UK).

RESULTS

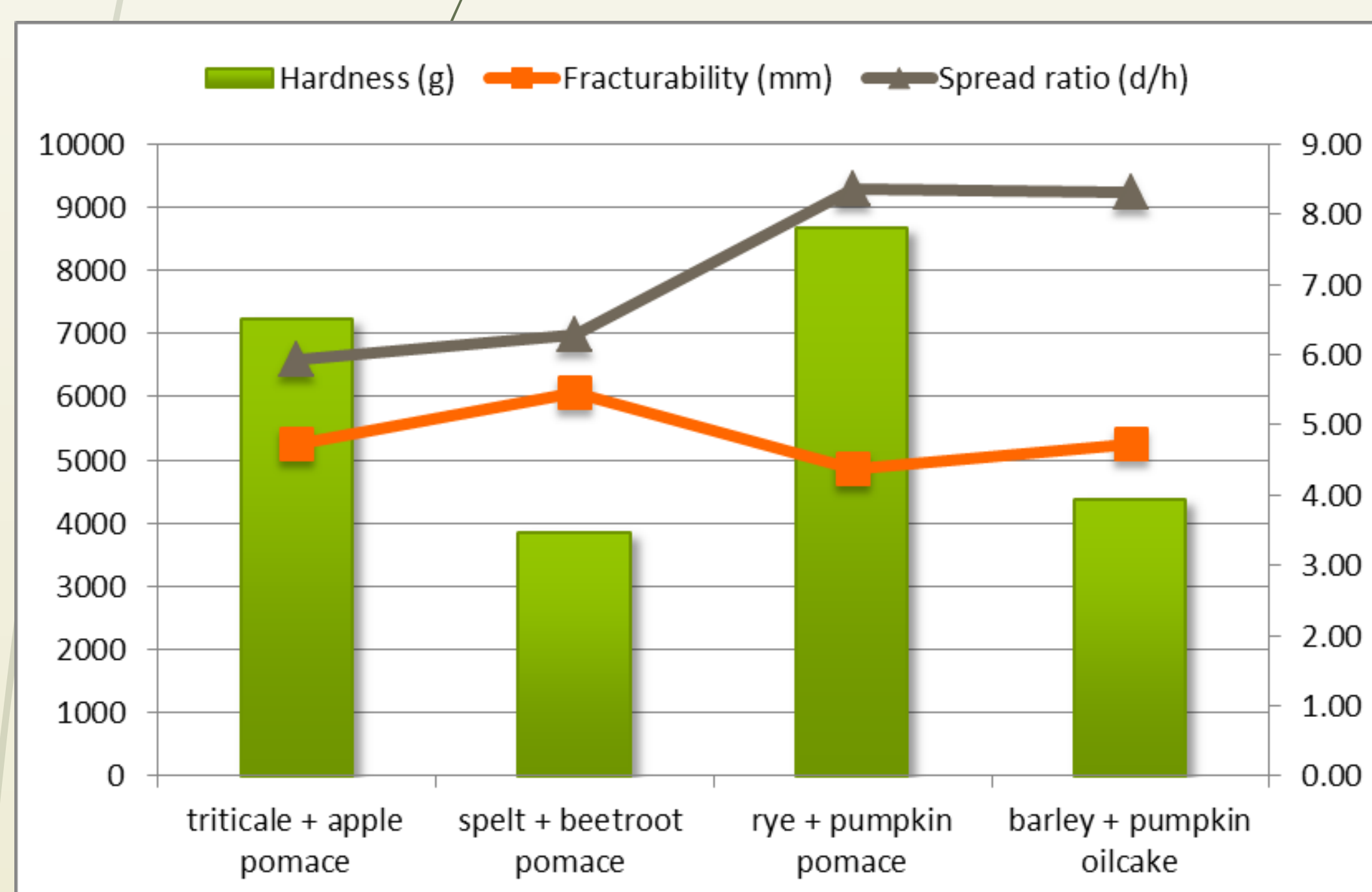


Figure 1. Spread ratio, hardness and fracturability of cookies

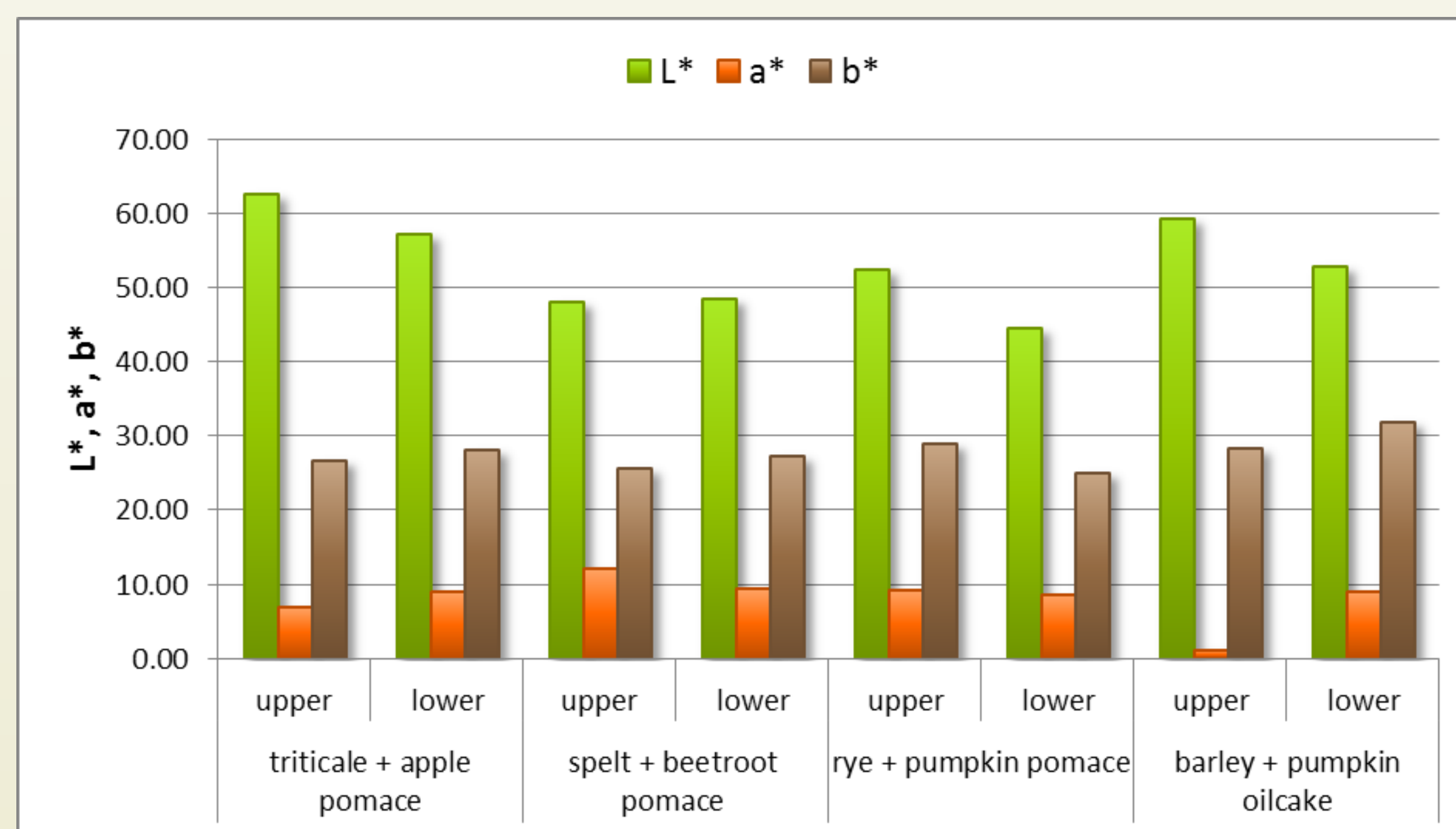


Figure 2. Color parameters of cookies

Table 1. Basic nutritional composition of cookies

Parameter (g/100 g)	Triticale + apple pomace	Spelt + beetroot pomace	Rye + pumpkin pomace	Barley + pumpkin oilcake
Moisture	4.75	2.50	5.97	2.89
Ash	0.82	1.20	1.45	1.35
Protein	7.61	8.87	7.22	9.82
Carbohydrates	68.62	69.33	67.04	67.15
Sugar	17.63	17.12	18.12	14.42
Fat	18.20	18.10	18.32	18.79
SFA	8.58	8.32	8.67	8.67
MUFA	7.33	7.15	7.43	7.45
PUFA	2.29	2.62	2.22	2.67
TDF	8.90	7.09	4.50	6.69
IDF	7.22	5.61	3.51	4.05
SDF	1.68	1.48	0.99	2.64
Energy value (kJ/kcal)	1889.3/450.9	1935.1/461.5	1899.7/452.9	1943.5/463.6

Abbreviations: SFA – saturated fatty acids, MUFA – monounsaturated fatty acids, PUFA – polyunsaturated fatty acids, TDF – total dietary fiber, IDF – insoluble dietary fiber, SDF – soluble dietary fiber.



Figure 3. Photograph of cookies (from left to right: triticale + apple; barley + pumpkin oilcake; spelt + beetroot; rye + pumpkin)

>6% HIGH FIBER
>3% SOURCE OF FIBER
Regulation EC No. 1924 (2006)

CONCLUSIONS

- All doughs were easy to manipulate and developed cookies had acceptable technological properties, indicating that they can be easily manufactured in coffee shops and restaurants. The results of nutritional composition indicate that cookies can contribute to the increase of daily intake of dietary fiber. Utilization of fruit and vegetable by-products as natural colorings can support the sustainability of food industry. Nutritional properties and attractive appearance of cookies can make them recognizable products from Vojvodina, improving the gastro-tourist offer of this region.