Effects of Sweet Potato Puree Additive on the Spelt Wheat Bread Quality

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Introduction

Bread products and their production techniques vary greatly around the world. Cereal flour, water, yeast or another leavening agent, and salt are the basic ingredients of bread. Optional plant raw materials can be added to create breads with improved nutritional value.

The purpose of this study was to establish the effect of a sweet potato tuber puree additive on the contents of fiber, sugar, ash, some mineral elements, and antioxidant activity of spelt wheat bread.

Materials and methods

Research was conducted in 2022 at Agricultural Academy of Vytautas Magnus University. The bread was made with whole spelt wheat flour, water, salt, sugar, dry yeast, and sweet potato tuber puree. Sweet potato puree substituted a particular amount (0%, 20%, 35%, and 50%) of the spelt wheat flour in the bread.

Experiment treatments (Figure 1.):

1) Control (bread without sweet potato puree);
2) Bread with 20% sweet potato puree;
3) Bread with 35% sweet potato puree;
4) Bread with 50% sweet potato puree.

In bread, standard methods have been established: amount of fibre Henebergo – Štomano method (Methodenbuch – VDLUFA, 1983–1999); amount of sugar Luff Schoorl method; amount of ash by combustion at 550 °C. The DPPH assay was used to measure antioxidant activity, inductively coupled plasma mass spectrometry – to quantify calcium, potassium, magnesium, and phosphorus. The data were processed by the STATISTICA 10 (StatSoft, Inc., USA) The statistical significance of differences between the means was estimated by Fisher's LSD test ($p<0.05$).

Results

The results have shown, that the spelt wheat bread with 50% sweet potato puree had the highest amounts of ash (5.02%), sugar (11.4%), calcium (840 mg kg^{-1}), and potassium (8620 mg kg^{-1}), as well as the highest antioxidant activity (19.30%). Bread enriched with 35% and 50% sweet potato puree contained significantly higher amount of fiber (3.31% and 3.35%, respectively) compared to bread sample without puree.

Table 1. Effect of sweet potato puree additive on the amounts of ash, sugars, fiber, and antioxidant activity in spelt wheat bread.

Bread samples	Ash, %	Sugar, %	Fiber, %	Antioxidant activity, %
Control (bread without sweet potato puree)	3.95^{c}	3.25^{d}	2.86^{c}	8.50^{c}
Bread with 20% sweet potato puree	3.98^{c}	4.33^{c}	3.02^{bc}	16.30^{b}
Bread with 35% sweet potato puree	435^{b}	7.83^{b}	3.31^{ab}	17.60^{ab}
Bread with 50% sweet potato puree	5.02^{a}	11.4^{a}	3.35^{a}	19.30^{a}

Note*:* different letters in column show significant difference at $p\leq0.05$

Table 2. Effect of sweet potato puree additive on the amounts of calcium, potassium, magnesium, and phosphorus in spelt wheat bread.

Bread samples	Calcium	Potassium	Magnesium	Phosphorus
	mg kg^{-1}			
Control (bread without sweet potato puree)	587^{c}	5343^{d}	1759^{a}	2327^{a}
Bread with 20% sweet potato puree	626^{c}	6363^{c}	1721^{a}	2173^{b}
Bread with 35% sweet potato puree	722^{b}	7280^{b}	1670^{a}	2042^{bc}
Bread with 50% sweet potato puree	840^{a}	8620^{a}	1628^{a}	1903^{c}

Note*:* different letters in column show significant difference at $p\leq0.05$

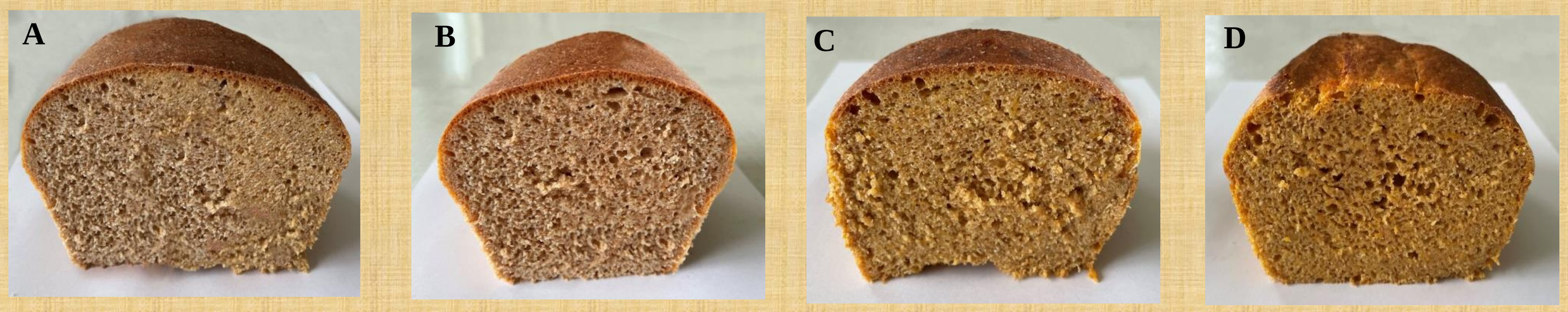

Figure 1. Spelt wheat bread with sweet potato tubers puree additive 0% (A), 20% (B), 35% (C) and 50% (D) (photo by R. Prusevičė)

Conclusion

In conclusion, the enrichment of spelt wheat bread with sweet potato tuber puree might increase its quality. The addition of 50% sweet potato tuber puree resulted in bread with a better nutritional value and higher antioxidant activity.