

DEVELOPMENT AND QUALITY EVALUATION OF PRETZEL SUPPLEMENTED WITH CARROT FLOUR AND BEETROOT FLOUR

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Introduction

- Nowadays, health problems like diabetes, obesity, cardiovascular disease are in a real growth, and the main cause is the deficiency of some nutrients.
- Worldwide, the trend is to obtain innovative products without added sugar and other additives, with high nutritional value due to the use of bioactive potential (fiber, minerals, and antioxidants) of plant products.
- Carrot (*Daucus carota* L.) is an important root vegetable rich in carotenoids and dietary fibers, and other bioactive compounds having significant health promoting properties.
- Beetroot (*Beta vulgaris* L.) is another important root vegetable, which has important amounts of bioactive compounds (antioxidants, phenolics, etc.) that are related to improvements in cardiovascular function.

Aims and Objectives

The aims of this paper is to obtain nutritionally enhanced pretzels by adding carrot flour and red beetroot flour. Also, this addition could improve the sensorial properties of the products (colour, taste, appearance) without any additives.

Objectives:

- Obtaining root flour (carrot, beetroot);
- Optimization of the manufacturing recipe for pretzels;
- Optimizing the manufacturing process for pretzels;
- Study of quality parameters and choosing the optimal variant

Materials and methods

- Carrot flour (CF) was incorporated in a mix of wheat flour and rye flour (1:1) at 10, 15 and 20% level. The same experimental variants have been made with beetroot flour (BF). Pretzels without the addition of CF and BF were considered the control sample.
- The pretzel samples were analyzed from physico-chemical (moisture, ash, fiber, protein, fat, antioxidant activity and total carbohydrates), microbiological and sensory properties.
- Sensory analyses included evaluation of overall appearance, colour, taste, aroma, consistence (9 point hedonic scale).



Results and discussion

Chemical composition (%) of raw materials:

Parameter	CF	BF	WF:RF(1:1)
Moisture,%	8.74	7.8	11.22
Ash,%	6.05	8.58	0.79
Protein,%	6.21	13.23	9.37
Fat,%	0.23	0.27	0.62
Fiber,%	27.75	38.5	4.7

Chemical characteristics of pretzels supplemented with CF and BF:

Parameter	Control pretzels WF:RF(1:1)	CF10%	CF15%	CF20%	BF10%	BF15%	BF20%
Moisture,%	5.91	5.09	5.15	5.32	5.1	5.22	5.25
Protein,%	9.75	9.07	8.43	7.78	10.45	10.84	11.2
Fiber,%	1.47	4.12	4.65	5.75	3.14	3.78	4.88
Ash,%	2.35	2.57	2.75	3.36	2.92	3.79	4.09
Fat,%	14.89	14.9	14.98	15.08	14.93	14.99	15.05
Total carbohydrate,%	65.63	64.25	64.04	62.71	63.46	61.38	59.53
Antioxidant activity,%	51.38	54.73	56.25	57.79	65.75	67.73	70.37

Sensory analyses (9 point hedonic scale):

Parameter	Control pretzels	CF10%	CF15%	CF20%	BF10%	BF15%	BF20%
Colour	6.67	7.5	7.67	7.25	7.62	7.37	6.25
Taste	7.25	6.58	5.67	5.17	7.12	7.5	6.25
Aroma	7.17	6.58	5.75	5.58	7	7.25	6
Consistence	6.83	7.25	7.42	7.17	7.62	7.65	6.62
Overall appearance	7.17	7.39	6.83	6	7.62	7.5	6.25

Microbiological properties of pretzels supplemented with CF and B

Microbiological parameters	Microbial load of samples (cfu/g)						
	Control pretzels	CF10%	CF15%	CF20%	BF10%	BF15%	BF20%
Microbial counts							
Yeast and mold count	< 10	ND	ND	ND	ND	ND	ND
Enterobacteriaceae	ND	ND	ND	ND	ND	ND	ND



Conclusions

✓ Carrot and beetroot flours revealed high content of fibers, minerals and antioxidant compounds, whereas the protein content was negligible. Consequently, the substitution of wheat flour with CP and BF improved the **fiber content of the pretzels, which is a desired nutritional effect.**

✓ Increasing the level of CF and BF resulted in a significant increase of antioxidant activity, 54.73–57.79 %, in the pretzels with carrot flour and 65.75 - 70.37% for beetroot flour. This could be due to enhanced release of phenolic compounds, associated to the dietary fibers upon baking, which results in higher antioxidant activity of pretzels. In the case of fat, ash, and total carbohydrates contents, only slight variations were recorded.

✓ The microbiological parameters of pretzel were in line with the requirements, indicating that the use of carrot and beetroot flour is suitable for the pretzel production.

✓The present study indicated that a 10% addition of carrot flour and beetroot flour were accepted by consumers and have shown the potential of developing fibre-rich pretzels in order to increase the dietary fibre intake and with better antioxidants and sensory characteristics.

References

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