

# EFFECT OF SUBSTITUTION OF WHEAT FLOUR BY SOURDOUGH AND WHEY PROTEINS ON THE PROPERTIES OF SPONGE CAKE

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## INTRODUCTION

As a result of consumer preferences, including the demand for healthier and high protein and high dietary fibre plant-based food, there is a trend towards fortifying or completely replacing refined wheat flour with whole grains or alternative ingredients. Incorporation of proteins and/or fibres from different sources in food formulations present one of the most used approaches. Recently, the application of sourdough technology has gained research interest due to its complexity as well as its ability to promote beneficial modifications on sensory, technological and nutritional properties of bakery products. The technological application of sourdough can offer several advantages such as improving texture and palatability of cereal based products, stabilizing or increasing levels of various bioactive compounds, retarding starch bioavailability and improving mineral bioavailability.

This study aims to investigate the effects of substitution of wheat flour by sourdough from whole wheat flour (at levels 20% and 30%) and whey protein concentrate (at level 20%) on the quality of sponge cakes.

## RESULTS

Table 1. Proximate composition of sponge cake samples

Parameter	Control	P+SD20	P+SD30	P+SD20-1H	P+SD30-1H
Moisture (%)	23.37±0.1 <sup>c</sup>	19.38±0.01 <sup>d</sup>	24.72±0.02 <sup>a</sup>	18.84±0.1 <sup>e</sup>	24.26±0.04 <sup>b</sup>
Protein (%)	9.14±0.1 <sup>d</sup>	14.07±0.1 <sup>b</sup>	14.16±0.1 <sup>bc</sup>	14.56±0.00 <sup>a</sup>	14.41±0.04 <sup>ab</sup>
Crude fat (%)	3.86±0.1 <sup>ab</sup>	3.49±0.1 <sup>bc</sup>	3.93±0.02 <sup>a</sup>	3.82±0.1 <sup>bc</sup>	3.39±0.2 <sup>c</sup>
Carbohydrates (%)	62.35±0.1 <sup>a</sup>	61.88±0.2 <sup>b</sup>	55.74±0.1 <sup>e</sup>	61.32±0.01 <sup>c</sup>	56.61±0.1 <sup>d</sup>
Ash (%)	1.29±0.00 <sup>d</sup>	1.18±0.01 <sup>e</sup>	1.44±0.02 <sup>b</sup>	1.46±0.01 <sup>a</sup>	1.34±0.00 <sup>c</sup>
Energy (kcal)	321	335	315	338	315

Table 2. Colour properties and specific volume of sponge cake samples

Parameters	Control	P+SD20	P+SD30	P+SD20-1H	P+SD30-1H	
Colour properties						
L*	Crust	77.11±1.28 <sup>a</sup>	63.29±5.71 <sup>b</sup>	56.72±3.04 <sup>c</sup>	64.07±5.78 <sup>b</sup>	57.59±3.22 <sup>c</sup>
	Cross section	77.29±1.34 <sup>d</sup>	83.36±0.97 <sup>a</sup>	81.15±0.80 <sup>b</sup>	81.01±1.26 <sup>b</sup>	79.33±0.99 <sup>c</sup>
a*	Crust	4.03±1.05 <sup>c</sup>	13.46±1.79 <sup>b</sup>	15.31±0.90 <sup>a</sup>	13.26±2.22 <sup>b</sup>	14.76±0.93 <sup>ab</sup>
	Cross section	-1.84±0.18 <sup>d</sup>	-0.62±0.13 <sup>c</sup>	-0.14±0.20 <sup>a</sup>	-0.41±0.14 <sup>b</sup>	-0.12±0.25 <sup>ab</sup>
b*	Crust	36.44±0.82 <sup>a</sup>	34.80±2.21 <sup>b</sup>	34.08±1.05 <sup>b</sup>	36.79±1.88 <sup>a</sup>	35.59±1.44 <sup>ab</sup>
	Cross section	25.23±1.13 <sup>a</sup>	23.56±0.80 <sup>b</sup>	24.92±0.77 <sup>a</sup>	24.79±0.59 <sup>a</sup>	25.51±0.78 <sup>a</sup>
Specific volume (ml/g)						
		3.04±0.09 <sup>a</sup>	2.72±0.06 <sup>b</sup>	2.72±0.03 <sup>b</sup>	2.78±0.03 <sup>b</sup>	2.78±0.08 <sup>b</sup>

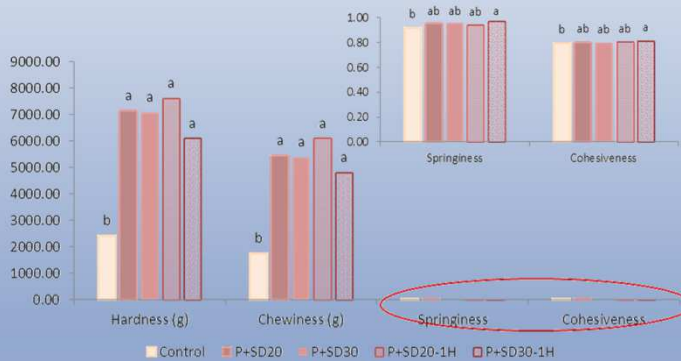


Fig 1. Textural properties of sponge cake samples

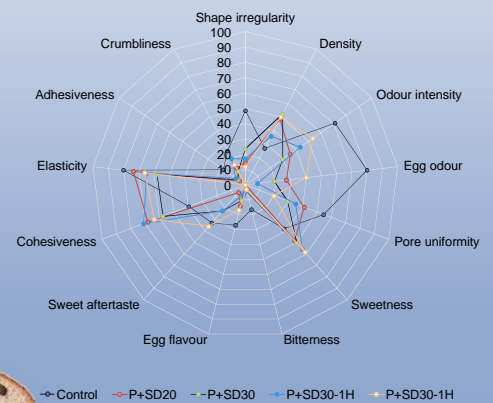
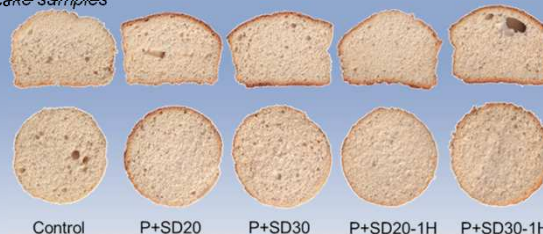


Fig. 2. Sensory analysis of sponge cake samples

## CONCLUSIONS

The incorporation of proteins resulted in creation of product which can be labelled as protein source since more than 12% of their energy value is provided by protein. Compared to the control sample, reduction of wheat flour by sourdough and whey proteins caused a significant decrease in specific volume while values of hardness of tested samples were significantly higher. Regarding the sensory analysis, samples with sourdough and proteins exhibited much denser structure with a noticeable number of non-uniform large pores. Reduction of wheat flour by sourdough and whey proteins caused the loss of bitter taste, flavour and odour on eggs while the sweetness for these samples was significantly pronounced. The results indicate that this combination of used ingredients have a potential to be considered as an alternative value-added food ingredients for bakery products but further research should be conducted in this area.

