

ORIGINAL PAPER

Effects of enzymes and hydrocolloids on physical, sensory, and shelf-life properties of wheat bread[‡]^aLubomír Mikuš*, ^aMária Kováčová, ^aLadislav Dodok, ^aAlžbeta Medvedová,
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This study compares two types of enzymes: maltogenic amylase (Novamyl 10000 BG) and lipase (Lipopan F BG, Lipopan Xtra BG), both separately and in combination, and seven hydrocolloids (guar gum, xanthan gum, carrageenan, β -glucan, carob gum, and carboxymethyl cellulose (CMC)) on the physical and sensory properties of a bakery product (white wheat bread). Their effect was observed on the baking characteristics of volume, specific volume, shape, mass, shelf-life (penetration and water activity test), and overall taste. The best results in shelf-life extension from the hydrocolloids were shown by β -glucan, a combination of xanthan gum + carrageenan and guar gum. From the enzymes, the best results were achieved with Lipopan Xtra BG and Novamyl 10000 BG + Lipopan F BG combination. The sensory properties (e.g. taste, colour, shape, aroma, elasticity, hardness) were evaluated by ten trained panellists, holding certification in sensory analysis. β -Glucan and Novamyl 10000 BG + Lipopan F BG combination increased the bread volume significantly and also were deemed to afford the most favourable taste.

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Introduction

Bread is one of the world's oldest and most consumed foods. The baking industry has undergone many changes in its productive process (Mondal & Datta, 2008). The demand for fresh, soft, and durable bread was higher than ever before, so bakers started using chemical additives to improve flour properties and baking conditions. Nowadays, they seek alternatives for these chemical compounds in the form of enzymes and hydrocolloids.

Enzymes decelerate the staling process by improving moisture retention in baked products. The addition of dough-strengthening enzymes such as

α -amylase will create an optimally developed and functional protein structure. This results in improved texture, appearance, enhanced nutritional value, flavour and aroma, and in considerably increased shelf-life for the final bakery product (Frost & Sullivan, 2004; Sanz Penella et al., 2008). Novamyl 10000 BG is a maltogenic amylase obtained from *Bacillus subtilis* which hydrolyses starch molecules and prolongs the shelf-life of a bakery product (Purhagen et al., 2011). Lipopan F BG and Lipopan Xtra BG are purified lipolytic enzymes (second and third lipase generation) obtained from *Fusarium oxysporum* which improve the manufacturing characteristics of dough and its stability, as well as the quality of bakery prod-

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