

Abstract

In recent years, there has been a growing interest in the use of medicinal mushrooms as natural sources of bioactive compounds in the production of functional foods. The aim of this doctoral dissertation was to evaluate the impact of partial substitution of wheat flour with powders derived from fruiting bodies of *Ganoderma lucidum* (Curtis) P. Karst. (*G. lucidum*), *Hericium erinaceus* (Bull.) Pers. (*H. erinaceus*), and *Ophiocordyceps sinensis* (Berk.) G.H. Sung, J.M. Sung, Hywel-Jones & Spatafora (*O. sinensis*) on the technological, physicochemical, functional, and sensory properties of wheat bread. The experiment was conducted in three research models, applying a four-level substitution of flour at 3%, 6%, 9%, and 12% (w/w).

The mushroom powders were characterized by higher contents of dietary fibre, protein, minerals, and fat compared with type 750 wheat flour, while simultaneously containing lower levels of digestible carbohydrates and exhibiting reduced caloric value. All three mushroom components contributed to increased water absorption (WA) and prolonged dough development time (DDT). *G. lucidum* and *H. erinaceus* had a positive effect on dough stability (ST), whereas *O. sinensis* reduced stability while simultaneously increasing the degree of softening (DS). The highest water absorption index (WAI) was recorded for bread enriched with *G. lucidum*, while the greatest water solubility index (WSI) was observed in bread supplemented with *O. sinensis*. The incorporation of mushroom powders enhanced the nutritional value of the bread, with significant increases in dietary fibre, total protein, minerals (Fe, Mg, Zn, Se, Cu, Ca), and β -glucans. In contrast, starch and protein digestibility decreased. Antioxidant activity increased in all bread variants containing mushroom powders, with the highest antioxidant potential – associated with the greatest concentration of polyphenolic compounds – recorded for samples with *O. sinensis*. Sensory analysis confirmed the acceptability of bread at all substitution levels, with the highest overall scores obtained for loaves supplemented with 6–9% *O. sinensis*. Changes in colour (darkening and a shift towards warm yellow–red hues) and texture (increased hardness and chewiness) were observed, although these did not disqualify the products.

The results confirm the potential of medicinal mushrooms as sources of bioactive compounds and demonstrate their value as functional components in the formulation of bread with enhanced nutritional value and health-promoting properties.

Keywords: medicinal mushrooms, functional bread, *Ganoderma lucidum*, *Hericium erinaceus*, *Ophiocordyceps sinensis*, β -glucans, antioxidant properties, farinograph parameters