ADVANCED TECHNOLOGY OF OAT BRAN BIOTRANSFORMATION INTO FUNCTIONAL INGREDIENTS

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Abstract

Novel biotechnological approaches are suggested for the processing of by-products into functional food concentrates: carbohydrate-protein, dietary fiber, polyphenols and xylooligosaccharides (XOS). The study shows a complex biotechnology of oat bran biotransformation into functional ingredients with antioxidant and prebiotic properties utilizing: ultrasound processing, enzymatic hydrolysis in comparison with chemical extraction.

The processed material was oat bran. The technology of its biotransformation was based on the chemical extraction, ultrasound processing and enzymatic hydrolysis. The amount of protein was determined using the Kjeldahl method, carbohydrates and ash were determined according to the standard methods, XOS - -using the thin layer chromatography. Extracts were examined for their scavenging effect on the diphenyl-2-picrylhydrazyl (DPPH) free-radical activity. The study of prebiotic activity was performed by cultivating cultures of microorganisms *Lactobacillus acidophilus* and *Bifidobacterium bifidum* on standard nutrient media with the addition of the test substances of the following composition: skim milk with XOS and skim milk with a mixture of biologically active substances (XOS and polyphenols). The control sample was a nutrient medium with the addition of lactulose and skim milk. Cultivation was carried out at a temperature of (37 ± 1) ^{0}C for 72 hours.

The carbohydrate - protein concentrate contain a significant amount of protein, the products of hydrolysis of polysaccharides (glucose, maltodextrins) and free polyphenols. The resulting concentrates, in addition to polyphenols, whose content reached 67% of the total amount in oat bran, also include: protein up to 6.9%, carbohydrates up to 80.7% including XOS - from 35.3% to 71.5% and ash 11.3%. Obtained data indicating a high antioxidant activity of extracts of polyphenols. Differences in antioxidant activity between different methods of extraction are associated primarily with the completeness of extraction and the stability of the extracted phenolic compounds. It is established that ultrasonic treatment improves the kinetics of extraction and yield of polyphenols at the initial stage with an increase in antioxidant activity. The results of the study on the change in the antioxidant activity of polyphenol concentrate during storage did not reveal changes within 8 months at a temperature of 20 ± 1 ^{0}C and a relative humidity of 70 ± 5%. The study of the growth dynamics of *Lactobacillus acidophilus* and *Bifidobacterium bifidum* on a media containing xylooligosaccharides concentrate confirm the presence of prebiotic properties and their selectivity.

It is noted that the accumulation of biomass of prebiotic cultures occurs faster with the use of nutrient media with the use of xylooligosaccharides concentrate and lactulose, as compared with milk. Thus, the feasibility of biotechnology for transforming oat bran into functional ingredients has been confirmed, which will further allow them to be used in new technological solutions with bifidogenic properties.

***Key words**: Polyphenols, Prebiotics, Xylooligosaccharides, Secondary products of grain processing.*