

**ANTIOXIDANT AND ANTIMICROBIAL ACTIVITY  
OF *LYCIUM BARBARUM* L.**

mgr inż. Aleksandra Plucińska-Krawczyk

Supervisor

prof. dr hab. inż. Alina Kunicka-Styczyńska

## Abstract

Awareness of the impact of nutrition on health increases the demand for food with health-promoting properties. The link between oxidative stress and the development of civilization diseases encourages the inclusion of plant materials with potential antioxidant activity in the daily diet, including the Chinese wolfberry (*Lycium barbarum* L.), known as goji berries. The work assessed the antioxidant activity of 160 extracts from dried and freeze-dried goji berries obtained using different extraction conditions (solvent, extraction time and temperature, freeze-drying of extracts) and the antimicrobial activity of selected extracts *in vitro* and in the food matrices. It was found that the antioxidant activity of goji berry extracts depends on the process parameters, and the optimal extraction conditions are 55°C for 48 hours and the use of organic solvents (dioxane and tert-butanol). Increasing the temperature to 55°C resulted in an increase in the total polyphenol content in the extracts and the ability to scavenge free radicals, while the use of a higher temperature led to a decrease in antioxidant activity. Extracts from dried fruits were characterized by higher antioxidant activity compared to freeze-dried goji berries. Microbiological analysis showed the microbiological safety of both traditionally dried and freeze-dried berries, and no pathogenic *Bacillus cereus* bacteria were found in the tested fruit samples. *Bacillus subtilis* was identified as the main microbiological contaminant of freeze-dried goji berries. Microbiological contamination of dried berries was more diverse. In addition to *Bacillus subtilis*, the following bacteria were identified: *Pseudomonas luteola*, *Rhizobium radiobacter*, *Aneurinibacillus aneurinilyticus*, and *Brevibacillus laterosporus*.

The extracts showed varied antimicrobial activity *in vitro* against gram-negative bacteria *Escherichia coli* and *Pseudomonas aeruginosa*, with limited efficacy against molds *Aspergillus niger*, yeasts *Candida albicans* and gram-positive bacteria *Bacillus subtilis* and *Staphylococcus aureus*. The addition of dried goji berries and their aqueous extract may contribute to ensuring microbiological stabilization of soft drinks stored under temperature changes. The introduction of goji berries to a milkshake improved its microbiological stability under delayed cooling conditions, which was verified in model conditions *in situ* (milkshake with the addition of dried goji berries, aqueous extract of goji berries) using predictive microbiology tools. Studies indicate a significant potential of goji berries as a food ingredient due to the content of polyphenols, antioxidant activity and antibacterial effect. The antimicrobial activity of active substances of goji berries may support the microbiological stability of soft drinks, especially under delayed cooling.

**Keywords:** goji berries, polyphenols, antioxidant activity, food safety, prognostic microbiology