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Stinging Nettle: How Fermentation Unlocks the Hidden Potential of *Urtica dioica*

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Abstract

Urtica dioica (stinging nettle) is a nutrient-rich plant with long-standing culinary and medicinal uses. Fermentation, particularly lactic acid fermentation, enhances the nutritional value and bioavailability of plant compounds by stimulating beneficial microorganisms (*Lactobacillus spp.*) and stabilizing bioactive fractions. The plant material, collected from wild populations in Timiș County (Romania), was prepared and fermented to assess changes in bioactive compounds and microbiological activity. The aim of the study is to evaluate the bioactive compounds and microbiological activity during fermentation of *Urtica dioica* leaves and stems, as well as the health-promoting potential of the resulting products.

Keywords: bioactive compounds, antioxidant capacity, microbiological activity, functional foods.

• Introduction

Urtica dioica is a perennial herb known for its rich nutritional profile and health-promoting properties. Its leaves and stems contain vitamins A, C, and K, essential minerals such as iron, calcium, and magnesium, and numerous bioactive compounds (flavonoids, polyphenols, and amino acids) which contribute to its antioxidant, anti-inflammatory, and immune-supporting effects.

Fermentation, particularly lactic acid fermentation, is an eco-friendly biotechnological process that enhances the nutritional value and bioavailability of plant compounds. It promotes the growth of beneficial microorganisms (*Lactobacillus spp.*), leading to organic acid production that lowers pH, prevents spoilage, and stabilizes bioactive fractions.



Figure 1. Stinging nettle

• Material and method

Plant material (leaves and stems of *Urtica dioica*) was collected from wild populations in the Bazoș area, Timiș County, Romania.

After harvesting, the samples were separated, cleaned of impurities, and homogenized prior to the fermentation process.

Lactic acid fermentation was carried out under controlled conditions. During fermentation, both bioactive compounds and microbiological activity were evaluated to assess the transformation and enhancement of nutritional and functional properties.

• Results and discussions

Lactic fermentation significantly improved the phytochemical profile of stinging nettle by:

Increasing antioxidant potential and bioavailability of bioactive compounds;

Reducing anti-nutritional factors such as oxalates and nitrates;

Possibly generating new bioactive metabolites with functional health benefits.

The process thus contributes to the development of functional fermented nettle-based products, suitable for nutraceutical and functional food applications.

• Conclusions

Lactic acid fermentation is a sustainable and efficient method to enhance the nutritional and functional potential of *Urtica dioica*. The resulting fermented nettle products hold promise as natural sources of bioactive compounds, promoting sustainable use of wild edible plants and supporting the production of functional foods. Moreover, the fermentation process contributes to the reduction of anti-nutritional factors, improving both safety and digestibility. These findings encourage further research on the optimization of fermentation parameters and the development of innovative nettle-based nutraceutical formulations.

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