



Phytochemical compounds of horseradish with potential application in biotechnology

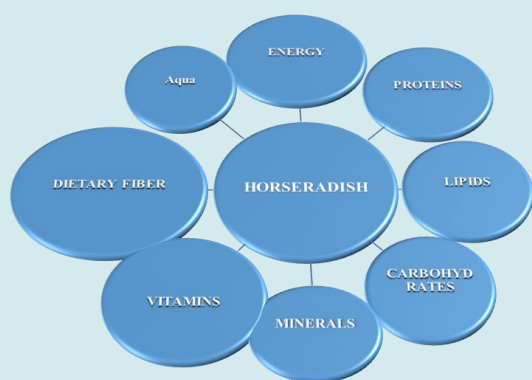
Magdalena Rosu, Monica Dragomirescu

University of Life Sciences „King Mihai I” from Timisoara, Calea Aradului, 119, 300645, Timisoara, Romania
magdalenaarosu@gmail.com

INTRODUCTION

Horseradish (*Armoracia rusticana*), is an edible plant from the *Brassicaceae* family. Horseradish is a very rich source of vitamins and minerals (vitamin C, vitamin B6, calcium, iron, magnesium, potassium), enzymes, isothiocyanates, glycosylates, flavonoids, pigments, oils, etc. Horseradish through its bioactive compounds provides antibacterial, anti-inflammatory and anti-carcinogenic properties. The biologically active compounds extracted from roots and leaves of horseradish can find applications in the food, pharmaceutical, chemical and agrochemical industries. Extraction from plant sources is a complex field involving various techniques to successfully obtain essential compounds and substances from live or dried plants. For the extraction of biologically active compounds, aqueous buffer systems are used (in a neutral, weakly basic environment - monosodium phosphate-disodium phosphate buffer solution, in an acidic environment citric acid-disodium phosphate buffer solution), organic solvents (tetrahydrofuran, benzene, methyl alcohol, etc.), eutectic solvents (ChCl: urea, ChCl: acetamide, ChCl: ethylene glycol, etc.), supercritical solvents (CO₂). Regardless of the solvent used, it must be nontoxic, biocompatible, biodegradable, and sustainable. The obtained extract must be analyzed for biologically active compounds using specific instrumental analysis methods (chromatographic analyses, spectrophotometric analyses, electrophoretic, etc.).

Bioactive compounds



EXTRACTION OF BIOLOGICALLY ACTIVE COMPOUNDS FROM HORSERADISH

Conventional methods - disadvantages:

- complexity and high time consumption
- large quantity and high toxicity of the conventional organic solvents
- degradation of target biomolecules and loss of the enzyme's activity
- high energy consumption
- low extraction yield

Green chemistry technology:

- use non-hazardous solvents for health and the environment
- economically efficient
- applicable in biotechnologies

The green solvents:

- water, aqueous ionic solutions, agro-solvents (alcohols - bioethanol, glycerol, esters of vegetable fatty acids, etc.), ionic liquids, deep eutectic solvents, supercritical fluids
- have good chemical and physical stability and low volatility
- are easy to use, and sometimes to reuse in optimized processes

Medical applications

- external friction for back pain
- improvement of digestion
- treatment for liver, lung, heart, kidney disease
- treatment for influenza, sinus dysfunction, headaches
- removal of worms in children
- remedy for scurvy
- decreased risk for cancer
- aphrodisiac
- antibacterial and insecticidal activity

Food applications

- seasoning for meat, fish, vegetables
- side dishes
- flavouring of ground beets and mustard
- flavouring of pickles
- preservation of preserved vegetables for the winter
- flavouring the bread during baking

REFERENCES

- Silvana Petrović, Milica Drobac, Ljuboš Ušjak, Vladimir Filipović, Marina Milenković, Marjan Niketić, Volatiles of roots of wild-growing and cultivated *Armoracia macrocarpa* and their antimicrobial activity, in comparison to horseradish, *A. rusticana*, *Industrial Crops and Products*, 109, 2017, 398-403, ISSN 0926-6690, <https://doi.org/10.1016/j.indcrop.2017.08.056>.
- Rosa Agneta, Christian Mo'lers, Anna Rita Rivelli, Horseradish (*Armoracia rusticana*), a neglected medical and condiment species with a relevant glucosinolate profile: a review *Genetic Resources Crop Evolution* 60, 2013, 1923–1943, <https://doi.org/10.1007/s10722-013-0010-4>
- Elena Jimenez Negro, Jandirk Sendker, Timo Stark, Bartosz Lipowicz, Andreas Hensel, Phytochemical and functional analysis of horseradish (*Armoracia rusticana*) fermented and non-fermented root extracts, *Fitoterapia*, Volume 162, 2022, 105282,ISSN 0367-326X, <https://doi.org/10.1016/j.fitote.2022.105282>.

CONCLUSIONS

The horseradish:

- reservoir of bioactive compounds
- the degradation products of the glucosinolates have shown biological activities
- changes the conventional food and transform it in biofunctional food with high nutritional value
- having food preservation activities
- HRP is a very efficient biocatalysts used more and more in green technologies based on its high activity, selectivity and specificity