

## ISPITIVANJE *IN VITRO* ANTIOKSIDATIVNE I ANTIHIPERGLIKEMIJSKE AKTIVNOSTI VODENO-ETANOLNIH EKSTRAKATA VRSTE *HYPERICUM OLYMPICUM* L., HYPERICACEAE

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*Hypericum olympicum* L. (Hypericaceae) je višegodišnja vrsta koja se tradicionalno koristi u lečenju gastrointestinalnih tegoba, rana i inflamatornih stanja. S obzirom na porast interesovanja za prirodne proizvode sa antioksidativnim i antihiperглиkemijskim svojstvima, cilj ovog istraživanja bio je hemijska karakterizacija vodenno-etanolnih ekstrakata *H. olympicum* i procena njihovog biološkog potencijala primenom različitih *in vitro* metoda. Tri uzorka nadzemnih delova biljke *Hypericum olympicum*, sakupljena na području Severne Makedonije, ekstrahovana su 70% etanolom i analizirana u pogledu sadržaja ukupnih fenola i flavonoida, antioksidativne aktivnosti i sposobnosti inhibicije enzima uključenih u metabolizam ugljenih hidrata [1, 2].

Dobijeni ekstrakti sadržali su značajne količine ukupnih fenola (113–136mg EGK/g s.e.) i ukupnih flavonoida (29–36mg EK/g s.e.). Antioksidativni potencijal ispitan je pomoću više testova, uključujući neutralizaciju DPPH, OH i NO radikala, inhibiciju lipidne peroksidacije i FRAP-test. Svi uzorci pokazali su snažnu neutralizaciju DPPH radikala ( $RSC_{50}=3,12-3,43\mu\text{g/mL}$ ), umerenu neutralizaciju OH i NO radikala i dobru redukcionu moć u FRAP testu (178–201mg ekvivalenata askorbinske kiseline/g s.e), dok inhibicija lipidne peroksidacije nije bila značajna. U pogledu antihiperглиkemijskog potencijala, ekstrakti su pokazali slabu inhibiciju  $\alpha$ -amilaze ( $IC_{50}=2892-5109\mu\text{g/mL}$ ), dok su u slučaju  $\alpha$ -glukozidaze ispoljili snažan inhibitorni efekat ( $IC_{50}=27-42\mu\text{g/mL}$ ), izraženiji čak i od standardnog inhibitora akarboze ( $IC_{50}=42,87\mu\text{g/mL}$ ).

Dobijeni rezultati ukazuju da vodenno-etanolni ekstrakti *H. olympicum* poseduju značajnu sposobnost neutralizacije slobodnih radikala i izraženu inhibiciju  $\alpha$ -glukozidaze, što sugerise njihovu potencijalnu primenu u prevenciji poremećaja povezanih sa oksidativnim stresom i postprandijalnom hiperглиkemijom. Dalja istraživanja su neophodna radi izolacije i identifikacije aktivnih jedinjenja odgovornih za ove efekte.

### Literatura

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2. Saddiqe Z, Naeem I, Abbas G, Shahzad M. Aerial parts of *Hypericum olympicum* possess antioxidant, anti-lipid peroxidation and antiglycation activity. International Journal of Phytomedicine 2014, 6(2):248-55.

## **IN VITRO EVALUATION OF THE ANTIOXIDANT AND ANTIHYPERGLYCEMIC ACTIVITIES OF HYDRO-ETHANOLIC EXTRACTS OF *HYPERICUM OLYMPICUM* L., HYPERICACEAE**

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*Hypericum olympicum* L. (Hypericaceae) is a species traditionally used in the treatment of gastrointestinal disorders, wounds, and inflammatory conditions. Considering the increasing interest in natural products with antioxidant and antihyperglycemic properties, the aim of this study was the chemical characterization of hydroethanolic extracts of *H. olympicum* and the evaluation of their biological potential using different *in vitro* methods. Three samples of aerial parts of *H. olympicum*, collected in North Macedonia, were extracted with 70% ethanol and analyzed for total phenolic and flavonoid content, antioxidant activity, and the ability to inhibit carbohydrate-metabolizing enzymes.

The obtained extracts contained significant amounts of total phenolics (113–136mg GAE/g dry extract) and total flavonoids (29–36mg QE/g d.e.). Antioxidant potential was assessed by several assays, including DPPH, OH and NO radical scavenging, lipid peroxidation inhibition, and FRAP-test. All extracts demonstrated strong DPPH radical scavenging activity ( $RSC_{50}=3.12\text{--}3.43\mu\text{g/mL}$ ), moderate neutralization of OH and NO radicals, and significant reducing power in the FRAP-assay (178–201mg AAE/g d.e.), while lipid peroxidation inhibition was not significant. Regarding antihyperglycemic potential, the extracts exhibited weak  $\alpha$ -amylase inhibition ( $IC_{50}=2892\text{--}5109\mu\text{g/mL}$ ), whereas in the case of  $\alpha$ -glucosidase they exerted a strong inhibitory effect ( $IC_{50}=27\text{--}42\mu\text{g/mL}$ ), even more pronounced than the standard inhibitor-acarbose ( $IC_{50}=42.87\mu\text{g/mL}$ ).

The results indicate that hydroethanolic extracts of *H. olympicum* possess significant radical scavenging capacity and pronounced  $\alpha$ -glucosidase inhibition, suggesting their potential application in the prevention of disorders related to oxidative stress and postprandial hyperglycemia. Further investigations are necessary to isolate and identify the active compounds responsible for these effects.

### **References**

1. Balıkcı N, Sarımahmut M, Arı F, Aztopal N, Özel MZ, Ulukaya E, Celikler S. Toxicity assessment of *Hypericum olympicum* subsp. *olympicum* L. on human lymphocytes and breast cancer cell lines. *J Appl Biomed*. 2020;18(1):18-25.
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