



Lythrum salicaria L. (Lythraceae) as a promising source of phenolic compounds in the modulation of oxidative stress: Comparison between aerial parts and root extracts

Nikola Srećković^a, Jelena S. Katanić Stanković^b, Sanja Matić^b, Nevena R. Mihailović^a, Paola Imbimbo^c, Daria Maria Monti^c, Vladimir Mihailović^{a,*}

^a University of Kragujevac, Faculty of Science, Department of Chemistry, Radoja Domanovića 12, 34000 Kragujevac, Serbia

^b University of Kragujevac, Institute for Information Technologies Kragujevac, Department of Science, Jovana Cvijića bb, 34000 Kragujevac, Serbia

^c Department of Chemical Sciences, University of Naples Federico II, Complesso Universitario Monte Sant'Angelo, via Cinthia 4, 80126, Naples, Italy

ARTICLE INFO

Keywords:

Lythrum salicaria L.
Phenolic compounds
C-glycosylflavones
Antimicrobial activity
Antioxidant activity
Cytotoxicity

ABSTRACT

Lythrum salicaria is a flowering plant traditionally used for inflammatory diseases, gastrointestinal ailments, dysentery, and as astringent for external use. The aim of this study was to determine the phenolic content, antioxidant, cytotoxic, and antimicrobial activities of *L. salicaria* aerial part and root methanol extracts, as well as the protective effects against oxidative damage on DNA and on a cell-based model. Moreover, simulated *in vitro* digestion studies were performed to estimate the stability of individual compounds present in the extracts. *L. salicaria* extracts contained a significant amount of total phenolic compounds and several phenolic compounds including C-glycoside flavones, orientin, isoorientin, and vitexin, were identified in extracts. The extracts demonstrated high antioxidant potential in different *in vitro* methods, moderate antimicrobial properties, and low cytotoxicity on studied normal and cancer cell lines. Also, the extracts showed significant DNA protection and protection of cells against arsenite-induced oxidative stress. These results suggest that, although the aerial part of *L. salicaria* is in extensive use since ancient times as a medicinal plant, its root may also possess the valuable biological properties and both could be used as functional food ingredients, considering their good antioxidant and antigenotoxic activities, and stability during *in vitro* digestion.

1. Introduction

Oxidative stress is a complex physiological process that is behind many diseases. Alzheimer's disease, Parkinsonism, cancer, hypertension, atherosclerosis, ischemic diseases, and inflammatory conditions, as well as some age-related disorders, are related to oxidative stress imbalance. Among diverse factors that have an influence on that process, external factors such as environmental exposure to toxicants, including natural toxins, air pollutants, metals, cigarette smoke, automobile exhaust fumes, radiation, pesticides, etc., have been proven to induce oxidative stress (Hodjat et al., 2015). Therefore, significant attention is being directed to the suppression of imbalance between pro-oxidant and antioxidant homeostasis as a primary cause of these diseases in the body and enrichment organism with antioxidants (Tiwari, 2001). Developing new food supplements with antioxidant properties is important for the prevention of oxidative DNA and cellular damage, as well as the aging of cells. Nowadays, synthetic pharmaceuticals have

suppressed the use of medicinal herbs, which have been popular for centuries. Indeed, many medicinal plants successfully used to treat a variety of diseases, are now forgotten. However, the numerous studies about biological activities of medicinal plants confirmed their efficacy in the treatment of different diseases, thus allowing the development of more economic, safer and greener innovative drugs based on natural compounds (Yakoub et al., 2018; Rached et al., 2018; Saravanakumar et al., 2019).

Lythrum salicaria L., known as purple loosestrife, is a perennial herbaceous plant of the genus *Lythrum* (Lythraceae), which grows in wet and flooded places, so it can often be found along the rivers, streams, and lakes. *L. salicaria* is of Eurasian origin, but in the 19th century, it was transferred to the soil of North America where it spread rapidly. Due to the high invasive ability and its ornamental and pharmacological values, biological control of purple loosestrife is one of the most widely implemented programs of weeds biocontrol in North America (Tunali et al., 2007; Piwowarski et al., 2015). Purple

* Corresponding author.

E-mail address: vladimir.mihailovic@pmf.kg.ac.rs (V. Mihailović).

<https://doi.org/10.1016/j.indcrop.2020.112781>

Received 19 March 2020; Received in revised form 8 July 2020; Accepted 10 July 2020

0926-6690/ © 2020 Elsevier B.V. All rights reserved.