Genoprotective effect of *Scutellaria altissima* L. extracts against H_2O_2- induced oxidative damage

Tamara Anđić, Biljana Nikolić, Ksenija Mileski, Ana Džamić, Stefana Vuletić, Tea Ganić, Dragana Mitić-Ćulafić, Stefana Cvetković

University of Belgrade – Faculty of Biology, Studentski trg 16, Belgrade, Serbia
Email: b3008_2023@stud.bio.bg.ac.rs

Republic of Serbia
MINISTRY OF SCIENCE, TECHNOLOGICAL DEVELOPMENT AND INNOVATION

eemgs EUROPEAN ENVIRONMENTAL MUTAGENESIS & GENOMICS SOCIETY

Introduction

Oxidative damage caused by reactive oxygen species is a key factor in the development of various human diseases. One approach to safeguard human health involves using natural compounds with antioxidant properties, which can be incorporated into the diet. As a result, there has been growing interest in plant-derived compounds for their potential health benefits.

Scutellaria altissima, known as skullcap, is a perennial herbaceus plant which belongs to Lamiaceae family. Plants from genus Scutellaria are used in traditional medicine and their active principals are featured with several pharmacological effects. The effects of *S. altissima* extracts reported so far include antioxidative, antimicrobial, antitumor and neuroprotective effect.

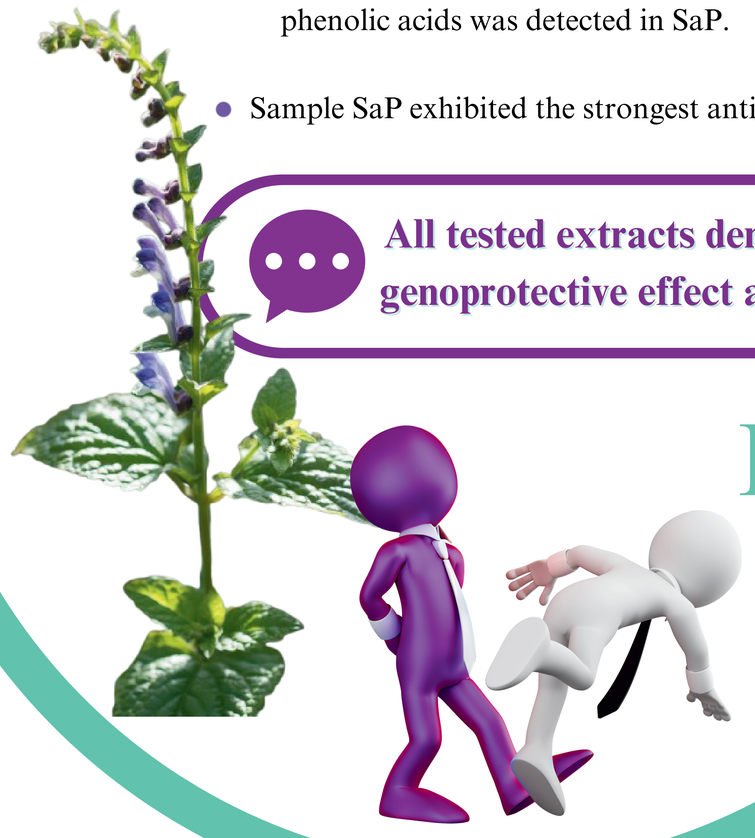
Aim of the study

The aim of this study was to evaluate the total phenolic content (TPC), total flavonoid content (TFC), and phenolic acids in 70 % aqueous-ethanolic plant extracts sourced from three distinct locations. Cytotoxicity and genotoxicity of the extracts were assessed to identify non-cytotoxic and non-genotoxic concentrations. The genoprotective potential of the extracts was evaluated by assessing their ability to counteract hydrogen peroxide-induced genotoxicity.

Conclusion

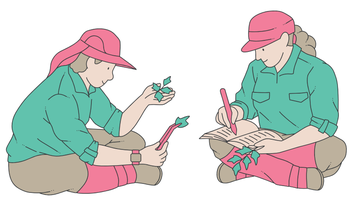
- Sample SaS was the most abundant in phenols and flavonoids, whereas the highest concentration of phenolic acids was detected in SaP.
- Sample SaP exhibited the strongest antioxidant activity.

All tested extracts demonstrated a genoprotective effect against H_2O_2



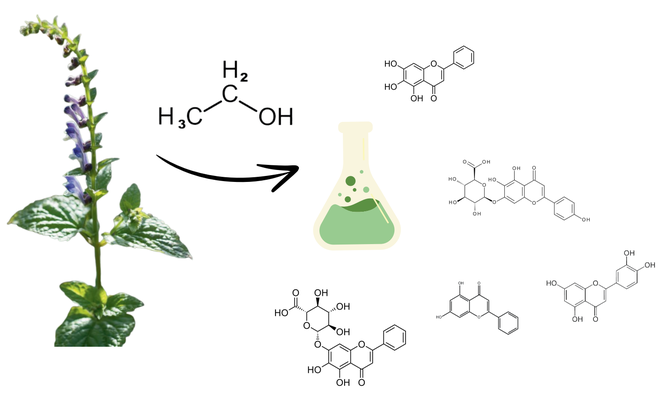
- **Total phenolics content**
- **Antioxidant activity**
- **Cytotoxicity and genotoxicity**
- **Genoprotective effect**

Material and methods

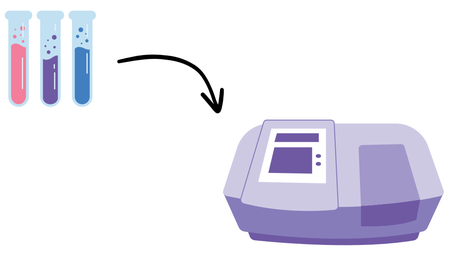


Plant material was collected at three different locations in Serbia.

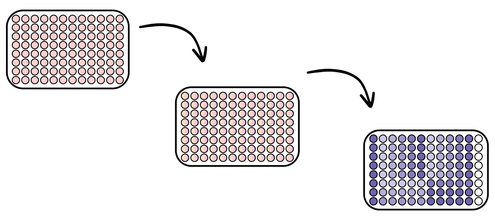
SaB SaP SaS



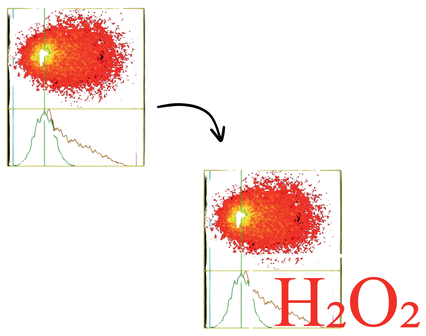
Air-dried and shredded aerial parts of *S. altissima* were used for the preparation of extracts, with 70% ethanol as the solvent.



Spectrophotometric methods were used in colorimetric assays to determine the content of polyphenols and antioxidant activity.



Cytotoxicity was assessed on normal human fetal fibroblasts (MRC-5) using the MTT assay to determine non-cytotoxic concentrations.



The alkaline comet assay on MRC-5 was initially used to identify non-genotoxic concentrations and subsequently to assess the genoprotective effects of *S. altissima* extracts.

Results

The highest total phenolic content and total flavonoid content were recorded for SaS, while SaP was the most abundant in phenolic acids (Table 1).

Table 1. Content of phenolic compounds

Sample/Test	Total phenols (mg GAE/ g DE)	Total flavonoids (mg QH/ g DE)	Total phenolic acids (mg CAE/ g DE)
SaB	53.42±1.45^{c}	19.49±2.72^{c}	23.58 ± 5.19^{b}
SaP	74.61±0.49^{b}	32.36±0.69^{b}	57.84 ± 0.58^{a}
SaS	79.71±3.11^{a}	39.74±2.60^{a}	32.14± 4.62^{b}

Table 2. Antioxidant potential of *S. altissima* extracts

Sample/Test	DPPH (IC50, mg/mL)	ABTS (IC50, mg/mL)	FRAP (µmol Fe2+/g DE)
SaB	1.53±0.04^{b}	1.62±0.02^{b}	65.15±1.42^{c}
SaP	**0.89±0.01**^{a}	**1.14±0.00**^{a}	**124.38±2.43**^{a}
Sas	0.93±0.02^{a}	1.16±0.01^{a}	117.07±0.20^{b}

Antioxidant assays revealed the highest activity for SaP (Table 2).

Non-cytotoxic and non-genotoxic concentrations were determined (Fig. 1, Fig. 2). In the alkaline comet assay, a dose-dependent genoprotective effect was observed for SaB and SaP, while a hormesis effect was noted for SaS (Fig. 3).
The highest inhibition of H_2O_2-induced genotoxicity was observed for SaB (Table 3).

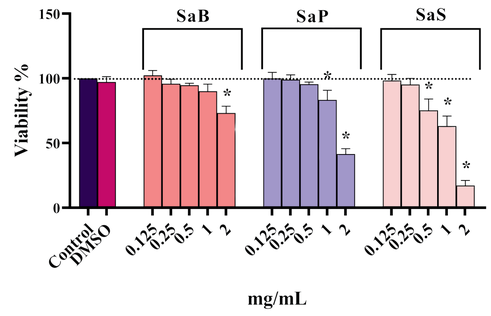


Figure 1. Cytotoxicity of *S. altissima* extracts evaluated on normal fetal fibroblasts

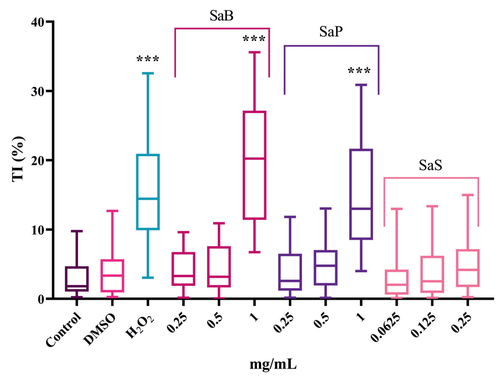


Figure 2. Genotoxicity of *S. altissima* extracts

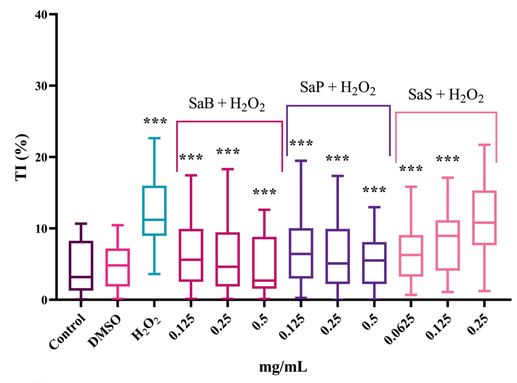


Figure 3. Genoprotective effect of *S. altissima* extracts

Table 3. Inhibition (%) of H_2O_2-induced genotoxicity

	H_2O_2		
mg/mL	0.125	0.25	0.5
SaB	49 %	50.9%	**62.7%**
mg/mL	0.125	0.25	0.5
SaP	41.5%	50.3%	**55.9%**
mg/mL	0.0625	0.125	0.25
SaS	**46.8%**	33.6%	7.8%

ACKNOWLEDGEMENT: This work is supported by the Ministry of Science, Technological Development and Innovation of the Republic of Serbia (Contract No. 451-03-66/2024-03/ 200178 and No.451-03-65/2024-03/ 200178).