

## THE ANTIOXIDANT ACTIVITY OF DIFFERENT EXTRACTS *SESELI RIGIDUM W. ET K.*

*P. Mašković<sup>1</sup>, G. Vičentijević-Marković<sup>2</sup>, V. Kurćubić<sup>1</sup>, G. Marković<sup>1</sup>,  
J. Pantović<sup>1</sup>*

**Abstract:** In this study the antioxidant activity of chloroform and petroleum extract of *Seseli rigidum*, as well as the total quantity of phenols and flavonoids. The highest content of total phenolics and flavonoids was determined in the chloroform extract. The results obtained indicate that the extract of the chloroform can be a source of natural antioxidants and can be applied in biological systems and food products.

**Key words:** *Seseli rigidum W. et K.*, antioxidant activity, phenolic compounds

### Introduction

Aromatic plants have been known about for a very long time and owing to their aromatic and antiseptic properties they are used as spices and natural food preservatives, in the perfume industry, for aromatherapy and for different medical purposes. Antioxidants are micronutrients that have gained interest in recent years due to their ability to neutralize the actions of free radicals (Cadenas and Packer, 1996). Apart from their biological properties, phenolic antioxidants are also of interest in the food, cosmetic and pharmaceutical industries, as they can be used as substitutes for synthetic antioxidants (Moure et al, 2001), since synthetic additives are more and more rejected by consumers because of their toxic properties (Schieber et al., 2001). However, synthetic antioxidants, such as butylated hydroxytoluene (BHT) and butylated hydroxyanisole (BHA), widely known for their ability to terminate the chain reaction of lipid peroxidation, have been proven to be carcinogenic and cause liver damage (Nobuyuki et al., 1985). *Seseli rigidum* belongs to the family Apiaceae.

### Materials and Methods

#### Preparation of extracts

The air-dried aerial parts of the plant (50 g) were broken into small pieces by a cylindrical crusher, and extracted with chloroform and petroleum ether extracts using a Soxhlet apparatus.

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<sup>1</sup>University in Kragujevac, Faculty of Agronomy in Čačak, Cara Dušana 34, Čačak, Serbia (corresponding author: pavlem@kg.ac.rs)

<sup>2</sup>Food and catering school in Cacak, Serbia

### **Determination of total phenolic content, flavonoid content and total antioxidant capacity**

Total phenols were estimated according to the Folin-Ciocalteu method (Singleton et al., 1999). Total phenols were determined as gallic acid equivalents (mg GA/g extract). Total flavonoids were determined according to (Brighente et al., 2007). Total flavonoids were determined as rutin equivalents (mg RU/g dry extract). The total antioxidant activity of the *S. Rigidum* extracts were evaluated by the phosphomolybdenum method (Prieto et al., 1999).

### **Determination of DPPH free radical scavenging activity**

The method used by (Takao et al., 1994), was adopted with suitable modifications from (Kumarasamy et al., 2007). The DPPH free radical scavenging activity (%) was calculated using the following equation:

$$\% \text{ inhibicije} = ((Ak - Au) / Ak) \times 100$$

The IC<sub>50</sub> value, defined as the concentration of the test material that leads to 50% reduction in the free radical concentration, was calculated as µg/ml through a sigmoidal dose-response curve.

### **Determination of inhibitory activity against lipid peroxidation**

Antioxidant activity was determined by the thiocyanate method (Hsu et al., 2008).

### **Determination of hydroxyl radical scavenging activity**

The ability of *S. rigidum* to inhibit non site-specific hydroxyl radical-mediated peroxidation were carried out according to the method described by Hinneburg et al. (2006).

### **Statistical analysis**

The results are presented as mean ± standard deviations of three determinations. IC<sub>50</sub> values were calculated by nonlinear regression analysis from the sigmoidal dose-response inhibition curve.

## **Results and discussion**

The use of herbal medicines as alternative treatments has been increasing worldwide and gaining popularity in developing countries (Rosidah et al., 2009). The results on total phenolic, flavonoids and total antioxidant capacity are given in Table 1.

Table 1. Content of Total phenolics, Flavonoids and Total antioxidant capacity  
 Tabela 1. Sadržaj ukupnih fenola, flavonoida i ukupan antioksidativni kapacitet

Type of extract Vrsta ekstrakta	Total phenolics (mg GA/g) Ukupni fenoli (mg GAE/g ekstrakta)	Flavonoids (mg RU/g) Ukupni flavonoidi (mg RU/g ekstrakta)	Total antioxidant capacity (µg AA/g) Ukupna antioksidativna aktivnost (mg AA/g ekstrakta)
Chloroform extract Hloroformski ekstrakt	105.26±0.89	42.24±0.75	118.45±0.38
Petroleum ether extract Petroletarski ekstrakt	91.34±0.56	39.89±0.28	101.75±0.95

Total phenolic, flavonoid and total antioxidant capacity contents were 105.26±0.89 mg GA/g, 42.24±0.75 mg RU/g and 118.45±0.38 µg AA/g recently for the chloroform extract. Total phenolic, flavonoid and total antioxidant capacity contents were 91.34±0.56mg GA/g, 39.89±0.28 mg RU/g and 101.75±0.95 µg AA/g, recently for the petroleum ether extract. The results on antioxidant activity were compared with control antioxidants, ascorbic acid, gallic acid, α -tocopherol and BHT.

IC<sub>50</sub> values were determined for chloroform extract for all measurements: 7.29±0.64 µg/mL for DPPH free radical scavenging activity, 22.73±1.85 µg/mL for inhibitory activity against lipid peroxidation, 58.34±0.76 µg/mL for hydroxyl radical scavenging activity. IC<sub>50</sub> values were determined for chloroform extract for all measurements: 24.89±1.15 µg/mL for DPPH free radical scavenging activity, 54.89±1.03 µg/mL for inhibitory activity against lipid peroxidation, 64.59±0.95 µg/mL for hydroxyl radical scavenging activity (Table 2).

Chloroform extract *S. rigidum* has stronger antioxidant power compared to the petroleum ether extract. Compared to standard chloroform extract has a stronger DPPH scavenging activity compared to BHT a slightly weaker compared to gallic acid and ascorbic acid. Petroleum ether extract is lower DPPH scavenging activity compared to standard. Petroleum ether extract and chloroform extract of plant species have poor *S. rigidum* inhibitory activity against lipid peroxidation as compared to BHT and α -tocopherol, while both possess the stronger activity of the extract relative to the ascorbic acid. Chloroform extract has a slightly stronger hydroxyl radical scavenging activity as compared to the petroleum ether extract, gallic acid and ascorbic acid, while having a lower activity than BHT. All *S. rigidum* extracts possess high and intermediate antioxidant activity.

Table 2. Antioxidant activity of the of *Seseli rigidum*  
Tabela 2. Antioksidativna aktivnost biljke *Seseli rigidum*

Type of extract and standard Vrsta ekstrakta i standarda	<sup>a</sup> IC <sub>50</sub> (µg/mL)		
	DPPH scavenging activity Aktivnost na DPPH <sup>·</sup> radikale	Inhibitory activity against lipid peroxidation Inhibicija lipidne peroksidacije	Hydroxyl radical scavenging activity Antioksidativna aktivnost na nivou hidroksi radikala
Chloroform extract Hloroformski ekstrakt	7.29±0.64	22.73±1.85	58.34±0.76
Petroleum ether extract Petroletarski ekstrakt	24.89±1.15	54.89±1.03	64.59±0.95
Gallic acid Galna kiselina	3.79±0.69	255.43±11.68	59.14±1.10
Ascorbic acid Askorbinska kiselina	6.05±0.34	> 1000	160.55±2.31
BHT	15.61±1.26	1.00±0.23	33.92±0.79
α-Tocopherol α- Tokoferol	-	0.48±0.05	-

### Conclusions

In this paper, the original results of antioxidant activity of extracts plant *Seseli rigidum*, for the purpose of selective analysis of antioxidant activity of extracts of different polarity. Based on the obtained results it can be concluded that the tested extracts, particularly chloroform extract, has a high degree of antioxidant activity which gives rise to further research these plants in order to determine the scope of the application as a natural antioxidant in food products.

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## ANTIOKSIDATIVNA AKTIVNOST RAZLIČITIH EKSTRAKATA BILJKE *SESELI RIGIDUM W. ET K.*

*P. Mašković<sup>1</sup>, G. Vićentijević-Marković<sup>2</sup>, V. Kurćubić<sup>1</sup>, G. Marković<sup>1</sup>,  
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### Izvod

U ovom radu ispitivana je antioksidativna aktivnost hloroformskog i petroletarskog ekstrakta biljke *Seseli rigidum*, kao i količina ukupnih fenola i flavonoida. Najveći sadržaj ukupnih fenola i flavonoida određen je u hloroformskom ekstraktu. Dobijeni rezultati ukazuju da hloroformski ekstrakt može biti potencijalan izvor prirodnih antioksidanata i može naći primenu u biološkim sistemima i prehrambenim proizvodima pa zato zahteva dalja ispitivanja.

**Ključne reči:** *Seseli rigidum W. et K.*, antioksidativna aktivnost, fenolna jedinjenja

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<sup>1</sup>Univerzitet u Kragujevcu, Agronomski fakultet u Čačku, Cara Dušana 34, Čačak, Srbija (autor za kontakte: pavlem@kg.ac.rs)

<sup>2</sup>Prehrambeno-ugostiteljska škola u Čačku, Srbija