

CHAPTER 11

EVALUATION OF ANTIOXIDANT ACTIVITY OF *Ferula communis* L. AND *Malva sylvestris*

Assoc. Prof. Dr. Esra UÇAR¹
Assoc. Prof. Dr. Nuraniye ERUYGUR²
Assist. Prof. Dr. Hülya ÖZPINAR³
Assist. Prof. Dr. Gülşen GÜÇLÜ⁴
Prof. Dr. Hüseyin Aşkın AKPULAT⁵

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¹ Sivas Cumhuriyet University, Sivas Vocational School of Technical Sciences, Medicinal and Aromatic Plant Department, Sivas, Türkiye, ORCID ID: 0000-0001-6327-4779, e-mail: eucar@cumhuriyet.edu.tr,

² Selcuk University, Faculty of Pharmacy, Department of Pharmacognosy, Konya, Türkiye, ORCID ID: 0000-0002-4674-7009, e-mail: nuraniye.eruygur@selcuk.edu.tr,

³ Sivas Cumhuriyet University, Faculty of Pharmacy, Department of Basic Pharmacy Sciences, Pharmaceutical Botany, Sivas, Türkiye, ORCID ID: 0000-0001-8154-0874, e-mail: hozpinar@cumhuriyet.edu.tr,

⁴ Sivas Cumhuriyet University, Health Services Vocational School, Department of Health Programmes, Sivas, Türkiye, ORCID ID: 0000-0002-3599-213X, e-mail: gulsenguclu@cumhuriyet.edu.tr,

⁵ Sivas Cumhuriyet University, Faculty of Science, Department of Biology, Sivas, Türkiye, ORCID ID: 0000-0001-8394-2746, e-mail: aakpulat99@yahoo.com

INTRODUCTION

The genus *Ferula* are from the Umbelliferae family (Yaqoob and Nawchoo, 2016). It is known that the genus *Ferula* has been used as a medicinal plant for many years. Its pharmacological properties in humans and animals have been demonstrated in numerous studies (Rahali et al., 2018). Previous phytochemical investigations revealed that the *Ferula* genus contain active components like coumarin derivatives, sesquiterpene coumarins, aromatic lactones and phenylpropanoid compounds (Appendino et al., 1988; Miski and Jakupovic, 1990; Kojima et al., 2000; Isaka et al., 2001; Lahouel et al., 2007; Kasaian et al., 2014; Zhou et al., 2017). This genus have biological effects like antitumor, anti-inflammatory, antibacterial, antidiabetic, anticoagulant, mitochondrial dysfunction and antiviral activities (Appendino et al., 2004; Appendino et al., 2006; Monti et al., 2007; Gliszczyńska and Brodelius, 2011). Some species of the genus *Ferula* are also used in traditional medicine, but *F. communis* has been noted to be harmful to both people and animals (Marchi et al., 2003).

Malva sylvestris from the Malvaceae family is an annual herb with lobed, purple petals. This plant is also known as mallow. It can be said that this plant, which is widespread in Europe, Southwest Asia and North Africa, is found in moist environments such as salt marshes, meadows and riverbanks. The plant is very commonly used in herbal medicine. In Southwest Asia, it is also used as a vegetable. This herb is reportedly used to treat stomach problems, cystitis, bronchitis and other respiratory disorders and skin diseases (Billeter et al., 1991; Gasparetto et al., 2012). Studies have shown that plant anthocyanins cause a

decrease in plasma total triglyceride and cholesterol levels. (Liu et al., 2016). The leaves of this plant are rich in mucilages and flavonoids, terpenoids, vitamins E and C, coumarins (Billeter et al., 1991; Farina et al., 1995; Cutillo et al., 2006; Barros et al., 2010; Najafi et al., 2017).

Hydrogen peroxide, superoxide radical and hydroxyl radical are oxygen-centric free radicals. They have the ability to oxidize proteins, lipids, and DNA, which causes cell death (Ames, 1983; Özsoy et al., 2008; Bhattacharya, 2011; Sathuvan et al., 2012; Halliwell and Gutteridge, 2015; Boran and Uğur, 2017; Caro et al., 2019). Phenols, which are abundant in medicinal and aromatic plants, defend the body from the negative effects of free radicals, thanks to their antioxidant properties (Do et al., 2004). From this perspective, it is crucial to find novel plants that have antioxidant properties.

In this work, 80% ethanol extracts of *Ferula communis* L. and *Malva sylvestris* were investigated for their antioxidant activities, total phenolic concentration and flavonoid content.

1. MATERIAL AND METHODS

The aerial parts of *Malva sylvestris* were collected from the Cumhuriyet University campus, while *Ferula communis* L. was collected from the natural area in Sivas. After the fresh plants were dried and the experiments were done in triplicate by the Pharmacognosy lab of pharmacy faculty at Sivas Cumhuriyet University in Sivas in 2020.

1.1. Preparation of extracts

A blender was used to grind dried plants (Bluehouse). A 10 g sample from the ground plant was placed in 50 ml of 80% ethanol (Sigma) and shaken periodically for 48 hours. The filter paper was used to filter the mixture. The final product was concentrated in triplicate under reduced pressure on a rotary evaporator at 35°C until completely dry.

1.2. *In vitro* antioxidant activity

The DPPH radical scavenging activity (RSA) of the extracts was assessed using a slightly modified version of Blois' method from 1958, and the ABTS radical scavenging activity (RSA) was assessed using the method of Re et al. from 1999. Using the Folin-Ciocalteu spectrophotometric technique, the total phenolic substance in the extracts was calculated and stated as gallic acid equivalents (Clarke et al., 2013). The amount of total flavonoids was calculated using Molan and Mahdy's (2014) aluminum chloride colorimetric method, and the results were reported as milligrammes of catechin equivalent per gram of dry weight of the extracts.

2. DISCUSSION and CONCLUSIONS

In the present study, the antioxidant potential of %80 ethanol extracts of *Ferula communis* L. and *Malva sylvestris* were measured by two different biochemical assay on DPPH and ABTS radicals. As can be seen from Figure 1a and 1b, the DPPH and ABTS radical scavenging activity of *Ferula communis* L. and *Malva sylvestris* demonstrated concentration dependent manner in terms of RSA. However, the RSA

was lower than the reference compound gallic acid at every concentration tested.

Phenolic compounds are known as the important secondary metabolites with strong antioxidant activity. When compared to each other, the total phenolic and flavonoid content of *Ferula communis* L. extract (251.08 ± 0.5 mg GAE/g and 78.77 ± 0.05 mg QE/g, respectively) were higher than the extract of *Malva sylvestris* (140.82 ± 0.04 mg GAE/g and 49.23 ± 0.06 mg QE/g, respectively).

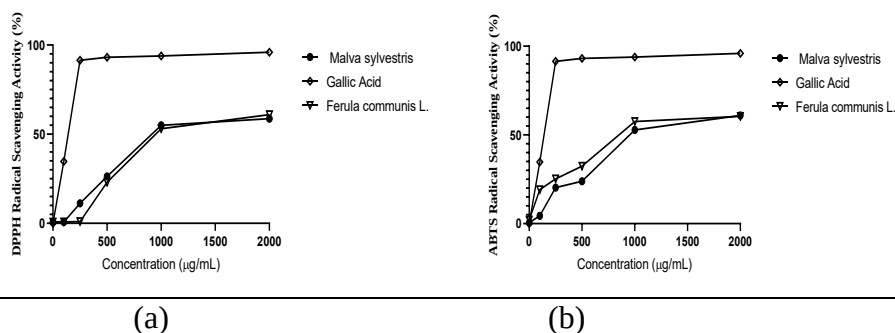


Figure 1: DPPH (a) and ABTS (b) RSA of *Malva sylvestris* and *Ferula communis* L.

In a study conducted with the methanol extract of *F.communis* in 2018, the antioxidant activities of various organs of the plant were investigated using the ORAC method. As a result, it was reported that the flower organ of the plant has higher antioxidant capacity than other organs (Rahali et al., 2019). In another study in which different extracts (hexane, chloroform, ethanol, ethanol-water (50%)) of *F. communis* were prepared, it was reported that the antioxidant activity of the plant was not stronger than that of ascorbic acid determined by default (Aydın

et al., 2021). Studies suggest that there is not yet sufficient and reliable data on the antioxidant capacity of this plant.

In the other study investigating the antioxidant activity of *Malva sylvestris* using the enzyme activities CAT, POD, A_xPOD and SOD, it was reported that the enzyme activity CAT was high. The total phenolic content was determined as 5.34 (Kordalı et al., 2021). In the same year, a more comprehensive study was carried out, four different (hexane, methanol, water and dichloromethane) extracts of *M. sylvestris* were prepared and their antioxidant activities were investigated (DPPH assay), with the highest antioxidant activity in the water extract (IC₅₀: 60.61) compared to ascorbic acid used as standard. ± 0.07) was determined. The highest phenolic and flavonoid content was determined in the dichloromethane extract (73.31 ± 0.16 and 69.22 ± 0.25 , respectively).

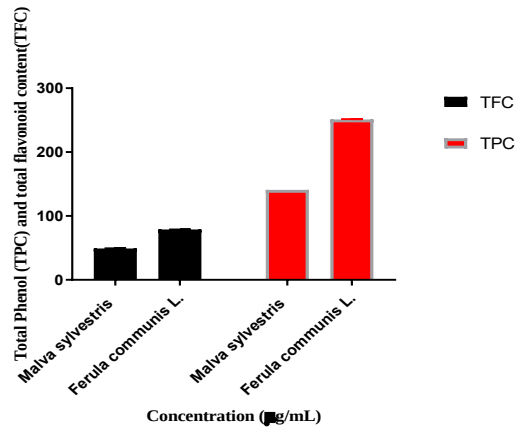


Figure 2: Total phenolic and flavonoid content of *Malva sylvestris* and *Ferula communis L.*

In conclusion, the plant *Malva sylvestris* and *Ferula communis* L. evaluated showed some level of antioxidant potential. The findings for *Ferula* here in shown indicate further phytochemical investigation need to identify the active compounds which are attributed for antioxidant. In general, it can be said that ethanol or aqueous etanol extracts containing strongly polar compounds are more effective.

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