



In-vitro Antioxidant and Oxidant Properties of *Centaurea rigida*

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ABSTRACT

Many different natural materials are used in complementary medicine. Among natural products, herbal materials are used quite a lot. *Centaurea rigida* Willd. was used as material in this study. The antioxidant and oxidant potential of the plant was determined. The aerial parts of the plant sample were extracted with ethanol in a Soxhlet device. Antioxidant and oxidant potentials were measured with Rel Assay kits. As a result of the studies, the total antioxidant value of the plant was determined as 3.522 ± 0.166 , the total oxidant value as 15.424 ± 0.281 and the oxidative stress index as 0.440 ± 0.020 . It was determined that the plant has antioxidant potential, but its oxidant values are high. As a result, it was determined that *C. rigida* could be used as a natural antioxidant source.

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Introduction

People face many disease factors at different stages of their lives. In this process, they benefit from complementary medicine as well as modern medicine. Many different natural materials are used in complementary medicine (Islek et al., 2021; Saridoğan et al., 2021). Plants have been used in the treatment of many diseases since ancient times. Many studies have shown that plants have many biological activities such as antioxidant, antimicrobial, anticancer, DNA protective, antiallergic, anti-inflammatory (Chandra, 2013; Sofowora et al., 2013; Gupta et al., 2016; Egamberdieva et al., 2017; Pehlivan, et al., 2018; Sevindik, 2018; Salehi et al., 2019; Li et al., 2020; Madani et al., 2021). Plants produce secondary metabolites in their bodies with environmental effects. These non-nutritive compounds are responsible for many biological activities. In particular, many plant species contain compounds with antioxidant properties (Soni et al., 2015; Jamwal et al., 2018; Cardoso et al., 2019; Salehi et al., 2020; Kaushik et al., 2021). In this context, it is very important to determine the antioxidant potential of plants. In this study, *Centaurea rigida* Willd. plant was used as

material. The genus *Centaurea* is in the Asteraceae family. The family Asteraceae is a genus of 350 to 600 species of herbaceous thistle-like flowering plants. The genus *Centaurea* is distributed in different parts of the world (Caruso et al., 2013; Ranjbar and Negaresh, 2014). *C. rigida* used in our study is widely distributed in the Southeastern Anatolia region of Turkey. In this study, it was aimed to determine the antioxidant and oxidant potentials of the plant.

Materials and Methods

C. rigida samples were collected from Gaziantep (Turkey). Plant identification was made using Flora of Turkey volume 5 (Davis, 1975; 540). Plant samples were dried in a dry, shaded and ventilated area. Then, 30 g of the plant sample was cartridged and extracted with 200 mL of ethanol at 50 °C for about 6 hours. The solvents of the extracts obtained were removed in the condenser. (Heidolph Laborota 4000 Rotary Evaporator).

Total Antioxidant and Oxidant Tests

Antioxidant (TAS) and oxidant values (TOS) of the plant sample were measured using Rel Assay kits. Calibrator trolox was used for TAS values and hydrogen peroxide was used for TOS values (Erel, 2004; Erel, 2005). The oxidative stress index was determined by the ratio of TOS values to TAS values (Sevindik, 2019).

Results and Discussion

Antioxidant and Oxidant Status

Living organisms produce reactive oxygen species under the influence of biotic and abiotic factors. As a result of the increase in the levels of these ROSs at the cellular level, oxidative stress occurs (Korkmaz et al., 2018). Antioxidant defense system functions in reducing the effect of oxidative stress. In cases where the antioxidant system is insufficient, taking products with antioxidant properties from outside reduces the effects of oxidative stress (Akgul et al., 2020). Plants are an important source of supplemental antioxidants (Bahmani et al., 2014). In this context, it is very important to investigate the antioxidant activities of plants in terms of their use. In this study, total antioxidant and total oxidant levels of *C. rigida* were determined. The obtained results are shown in Table 1.

Table 1. Antioxidant and Oxidant Status of *Centaurea rigida*

????????	<i>Centaurea rigida</i>
TAS	3.522±0.166
TOS	15.424±0.281
OSI	0.440±0.020

Values are presented as mean±SD

Plants produce many biologically active compounds. Due to the antioxidant potential of some of these compounds produced in their structure, they are used as antioxidant sources in complementary medicine (Vanisree et al., 2004; Gobbo-Neto and Lopes, 2007). In this study, the antioxidant and oxidant potentials of *C. rigida* were determined for the first time. In a previous study, DPPH activity of *C. rigida* was reported as 70.813% (Duran et al., 2015). In addition, in studies on different plant species, TAS (3.628 mmol/L), TOS (4.046 µmol/L) and OSI (0.112) values of *Mentha longifolia* subsp. *longifolia* have been reported (Sevindik et al., 2017). TAS (6.831 mmol/L), TOS (3.712 µmol/L) and OSI (0.054) values of *Gundellia tournefortii* have been reported (Saraç et al., 2019). TAS (6.758 mmol/L), TOS (5.802 µmol/L) and OSI (0.086) values of *Rumex crispus* have been reported (Daştan et al., 2019). TAS (5.314 mmol/L), TOS (24.199 µmol/L), and OSI (0.473) values of *Scorzonera papposa* have been reported (Mohammed et al., 2020a). TAS (7.677 mmol/L), TOS (12.387 µmol/L) and OSI (0.162) values of *Marrubium globosum* have been reported (Pehlivan et al., 2021). TAS (7.559 mmol/L), TOS (10.711 µmol/L) and OSI (0.142) values of *Datura stramonium* have been reported (Mohammed et al., 2021). TAS (5.688 mmol/L), TOS (15.552 µmol/L) and OSI (0.273) values of *Ferulago platycarpa* have been reported (Mohammed et al., 2020b). TAS (5.853 mmol/L), TOS (16,288 µmol/L) and OSI (0.278) of *Allium calocephalum* have been reported (Mohammed et al., 2019). TAS (7.342 mmol/L), TOS (5.170 µmol/L), and OSI (0.071) of *Rhus coriaria* var. *zebaria* has been reported (Mohammed et al.,

2018). The TAS value is an indicator of the whole of the antioxidant compounds produced within the plant. The high TAS value indicates that the plant has a high level of antioxidant compounds (Mohammed et al., 2020c). In our study, TAS value of *C. rigida* was determined to be lower than *G. tournefortii*, *R. crispus*, *S. papposa*, *M. globosum*, *D. stramonium*, *F. platycarpa*, *A. calocephalum*, *R. coriaria* var. *zebaria* and *M. longifolia* subsp. *longifolia*. In this context, it was determined that the antioxidant potential of *C. rigida* used in our study has a lower antioxidant potential compared to the plants with TAS values in the literature. TOS values show the whole of the oxidant compounds produced by environmental factors in the plant. When these oxidant compounds increase at the cellular level, they can become harmful (Mohammed et al., 2020c). In this context, the TOS value of *C. rigida* was determined to be higher than *G. tournefortii*, *R. crispus*, *M. globosum*, *D. stramonium*, *R. coriaria* var. *zebaria* and *M. longifolia* subsp. *longifolia*, and lower than *S. papposa*, *F. platycarpa* and *A. calocephalum*. In this context, in our study, it was determined that the oxidant levels of *C. rigida* were higher. OSI values show how much the oxidant compounds produced in the plant are suppressed by antioxidant compounds. As the OSI value increases, it is seen that the plant is more affected by oxidant compounds (Mohammed et al., 2020c). The OSI value of *C. rigida* was lower than *S. papposa* and higher than *G. tournefortii*, *R. crispus*, *M. globosum*, *D. stramonium*, *F. platycarpa*, *A. calocephalum*, *R. coriaria* var. *zebaria* and *M. longifolia* subsp. *longifolia*. According to these results, due to the insufficiency of antioxidant compounds produced by *C. rigida*, it was insufficient to suppress oxidant compounds. On the other hand, it is thought that the above-ground parts of *C. rigida* samples collected from regions suitable for oxidative stress may be an antioxidant source.

Conclusion

In this study, antioxidant and oxidant potentials of *C. rigida* were determined. According to the findings, it was determined that the oxidant levels of the plant were high. In addition, antioxidant levels were found to be at normal levels. In addition, it is seen that the antioxidant defense system is insufficient in suppressing oxidant compounds. As a result, it is thought that *C. rigida* has antioxidant potential and samples collected from suitable regions in terms of oxidative stress may be a natural source.

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