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

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**A R T I C L E  I N F O**

| Research Article | 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. |

| Keywords: | Antioxidant  
| Asteraceae  
| *Centaurea rigida*  
| Medicinal Plants  
| Oxidant |

**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; Sardogan 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, anti-inflammatory, anti-allergic, anti-inflammatory (Chandra, 2013; Sofowora et al., 2013; Gupta et al., 2016; Eamberdiev 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 cartridge and extracted with 200 mL of ethanol at 50 OC 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 (Akgül 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

|                | Centaurea rigida |
|----------------|------------------|
| 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 Gundelilla tournefortii have been reported (Sarac et al., 2019). TAS (6.758 mmol/L), TOS (5.802 μmol/L) and OSI (0.086) values of Rumex crispus have been reported (Dastan 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 TAS 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, oxidant 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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