



Antioxidant and Oxidant Status of Medicinal Plant *Echium italicum* Collected from Different Regions

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ABSTRACT

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It is known that plants have been used by humans for a very long time in the treatment of diseases. A wide variety of plant species grown in different regions have been very successful in the treatment of many diseases. In this study, *Echium italicum* L. plant collected from different regions was used as material. The plant was extracted with ethanol in a soxhlet device. Then, antioxidant and oxidant levels of the plant extract were determined using Rel Assay kits. As a result of the analysis, the TAS values of the plant were determined 5.442±0.240 (Gaziantep), 4.896±0.081 (Hakkari) and 6.056±0.139 (Mersin), TOS values were 21.372±0.747 (Gaziantep), 12.255±0.341 (Hakkari) and 19.107±0.438 (Mersin), OSI values were 0.395±0.027 (Gaziantep), 0.250±0.005 (Hakkari), and 0.316±0.005 (Mersin). It was observed that antioxidant and oxidant values changed as the regions where the plant was collected changed. In addition, it was determined that *E. italicum* could be a natural antioxidant source.

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Introduction

Since ancient times, people have benefited from plants that they think are medicinal in the treatment of various diseases (Mohammed et al., 2020). It is known that plants that have been used in the treatment of diseases for a very long time have various biological activities (Li et al., 2020). These biological activities; such as antimicrobial, antioxidant, analgesic, antiproliferative, anticancer, antiallergic, antihypertensive (Pehlivan et al., 2018; Sevindik, 2018; Fujitaka et al., 2020; Lisa et al., 2020; Maarisit and Lawani, 2020; Ng et al., 2020; Chen et al., 2021). Today, with the use of advanced instrumental methods, it is possible to isolate the components found in plant tissues, even in traces, and to determine their biological activities by making qualitative and quantitative analyzes (Al, 2008). In this context, in this study, total

antioxidant, total oxidant and oxidative stress index of *E. italicum* (Boraginaceae) plant were determined. Boraginaceae is a family of plants containing about 100 genera and 2000 species. It is very common in tropical and temperate climates of the world (Özcan, 2008). *Echium italicum* L. spreads in many regions of Turkey such as calcareous slopes, fallow fields and steppes (Özcan, 2013).

Materials and Methods

E. italicum specimens were collected from Gaziantep, Hakkari and Mersin provinces of Turkey. Identification of the plant was made using Flora of Turkey volume 6 (Davis, 1978). The aerial parts of the plant samples were dried in a shaded and ventilated environment. The dried samples

were pulverized. Then, 30 g of the powder samples were weighed and extracted with 200 mL EtOH at 50 °C for approximately 6 hours (Gerhardt EV 14). The solvents of the obtained extracts were removed in the condenser (Heidolph Laborota 4000 Rotary Evaporator).

Total Antioxidant and Oxidant Status

Total antioxidant (TAS) and oxidant status (TOS) of plant extracts were measured using Rel Assay kits (Erel, 2004; Erel, 2005). Trolox was used as calibrator in TAS tests. Hydrogen peroxide was used as calibrator in TOS tests. OSI (Oxidative stress index) values were determined by proportioning TOS and TAS values (Sevindik, 2019).

Results and Discussion

Antioxidant and Oxidant Status

Free radicals are produced by enzymatic or non-enzymatic means in living organisms by environmental effects. The increase in the levels of free radicals causes oxidative stress (Sevindik et al., 2021). Oxidative stress is thought to be effective in the formation of many diseases such as Alzheimer's, Parkinson's, cardiological disorders and cancer in humans (Babaei et al., 2020; Eraslan et al., 2021). Antioxidant defense system functions in reducing

the effects of oxidative stress. In cases where the antioxidant defense system is insufficient, the use of supplemental antioxidants is very important (Mushtaq et al., 2020; Khazaei et al., 2021). Plants produce biologically active compounds with many medicinal properties. These plants are preferred in complementary medicine due to their antioxidant properties (Ogbe et al., 2020; Mohammed et al., 2021). In this context, the antioxidant and oxidant potential of *E. italicum* was determined in order to determine the antioxidant properties of the supplement. The results obtained are shown in Table 1.

There is no data in the literature on TAS, TOS and OSI values of *E. italicum*. In this context, it was determined for the first time in this study. It has been reported that *E. italicum* has antioxidant activities in previous studies using different methods and solvents (Eruygur et al., 2012; Bošković et al., 2017). In our study, it was determined that *E. italicum* has significant antioxidant potential. In the samples collected from different regions of the plant, the highest TAS value was measured in the samples collected from Mersin province, and the highest TOS and OSI values were measured in the samples collected from Gaziantep province. According to these results, it was seen that the growing areas of the plant changed the antioxidant and oxidant values.

Table 1. TAS TOS and OSI Values of *Echium italicum* samples

Locations	TAS	TOS	OSI
Hakkari	4.896±0.081	12.255±0.341	0.250±0.005
Gaziantep	5.442±0.240	21.372±0.747	0.395±0.027
Mersin	6.056±0.139	19.107±0.438	0.316±0.005

*Values are presented as mean ± SD.

In addition, in studies on the TAS values of different plant species, the TAS values of *Mentha longifolia* subsp. *longifolia*, *Allium calocephalum*, *Salvia absconditiflora*, *Thymbra spicata*, *Scorzonera papposa*, *Adiantum capillus-veneris* and *Marrubium globosum* were reported as 3.628, 5.853, 7.350, 8.399, 5.377, 3.086, and 3.086, respectively. TOS values were reported as 4,046, 16,288, 8,501, 6,530, 24,199, 21,532, and 12,387, respectively. OSI values were reported as 0.112, 0.278, 0.116, 0.078, 0.456, 0.698, and 0.162, respectively (Sevindik et al., 2017; Mohammed et al., 2019a; Mohammed et al., 2019b; Akgül et al., 2020; Mohammed et al. al., 2020a; Mohammed et al., 2020b; Pehlivan et al., 2021). Compared to these studies, the highest TAS value of *E. italicum* was found to be higher than *M. longifolia* subsp. *longifolia*, *A. calocephalum*, *S. papposa* and *A. capillus-veneris*, and lower than *S. absconditiflora*, *T. spicata* and *M. globosum*. The TAS value shows all of the antioxidant-effective compounds produced in the plant and functioning in the antioxidant defense system (Mohammed et al., 2018). In our study, it was determined that *E. italicum* has antioxidant potential and can be used as a natural antioxidant agent in this context. In addition, TOS values show the oxidant compounds produced as a result of environmental effects and metabolic activities within the plant. In addition, OSI values show how much oxidant compounds are suppressed with the help of antioxidant defense system. It is seen that the increase in OSI values makes the antioxidant defense system less effective (Mohammed et al., 2018). In our study, it was observed that TOS values also changed when the localities where the same plant species were collected

changed. Compared to these studies, the highest TOS and OSI values of *E. italicum* were found to be higher than *M. longifolia* subsp. *longifolia*, *A. calocephalum*, *S. absconditiflora*, *T. spicata* and *M. globosum*, and lower values compared to *S. papposa* and *A. capillus-veneris*. As a result of the studies, it was concluded that *E. italicum* can be an important natural antioxidant source.

Conclusion

In this study, antioxidant and oxidant status of *E. italicum* samples collected from different regions were determined and compared. As a result of the studies, it was observed that the antioxidant and oxidant values of *E. italicum* samples collected from Gaziantep, Hakkari and Mersin provinces changed. In addition, it was determined that *E. italicum* could be an important natural antioxidant agent.

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