

A Researching on Antioxidant and Oxidant Status of *Teucrium polium* L

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Abstract

Plants are important natural materials used in complementary medicine. Many researches in recent years have revealed that plants have significant antioxidant potentials. In this study, the total antioxidant status (TAS), total oxidant status (TOS) and oxidative stress index (OSI) of *Teucrium polium* L. collected from Duhok (Iraq) region were determined. The ethanol extracts of the plant were extracted in the soxhlet device. TAS, TOS and OSI values were determined using Rel Assay kits. As a result of the studies, it was determined that TAS value of plant extracts was 3.715 ± 0.100 , TOS value was 10.496 ± 0.106 and OSI value was 0.283 ± 0.005 . In this context, it was determined that *T. polium* has antioxidant potential and can be used as a natural antioxidant source.

Keywords: Antioxidant; Medicinal Plants; Oxidant; *Teucrium polium*

Introduction

Millions of people have consumed and continue to use plant-based drugs in the treatment of diseases in many regions of the world from the past to the present [1,2]. Complementary medicine is used more in developing societies, especially in rural and socio-economically low areas. Plants have been used by people for many different purposes [3,4]. Due to the active metabolites they contain, members of the *Teucrium* genus have been used for medical purposes by the public for more than 2000 years [5]. *T. polium* is known to be effective against diabetes, rheumatological disorders, anti-inflammatory, gastrointestinal regulator and antioxidant effects [5,6]. It was collected from *T. polium* Duhok (Iraq) used in our study. Iraq is one of the important settlements that have hosted many civilizations. Pollen analysis in neanderthal tombs unearthed by Ralph Solecki and his team in Sanidar Cave, located in Northern Iraq and dated to the Middle Paleolithic Period, provided important evidence that medicinal plants were known and used about 60 millennia ago [7]. In this study, the total antioxidant status, total oxidant status and oxidative stress index of *Teucrium polium* L. plant collected from Duhok (Iraq) were determined.

Materials and Methods

It was collected from *T. polium* Duhok (Iraq). The plant was identification using Flora of Iraq [8]. The plant samples collected during the field works of Duhok in Gara Mountain were dried under suitable conditions. After the drying process, aerial parts are powdered. Then,

30 g of plant samples were cartridges and extraction process were carried out at 50 °C with ethanol (EtOH) in the soxhlet extractor for approximately 6 hours. The extracts obtained were concentrated with a rotary evaporator (Heidolph Laborota 4000 Rotary Evaporator).

Determination of antioxidant and oxidant values

The antioxidant and oxidant potentials of plant samples were determined using Rel Assay TAS and TOS kits [9,10]. Trolox (TAS) and hydrogen peroxide (TOS) were used as calibrators. OSI (Arbitrary Unit = AU) value was determined according to the following formula [10]:

$$\text{OSI (AU)} = \frac{\text{TOS, } \mu\text{mol H}_2\text{O}_2 \text{ equiv./L}}{\text{TAS, mmol Trolox equiv./L} \times 10}$$

Results and Discussion

Imbalance between endogenous antioxidants and endogenous oxidant compounds leads to oxidative damage of metabolic reactions. Antioxidants protect the harmful effects of free radicals in living organisms [11,12]. However, in cases where endogenous antioxidants are insufficient against reactive oxygen species, the use of supplementary antioxidants is very important [13]. Many herbs used in complementary medicine have antioxidant potential. In our study, TAS, TOS and OSI values of EtOH extracts of *T. polium* were determined. The findings obtained are shown in table 1.

	TAS (mmol/L)	TOS ($\mu\text{mol/L}$)	OSI
<i>T. polium</i>	3.715 \pm 0.100	10.496 \pm 0.106	0.283 \pm 0.005

Table 1: TAS, TOS and OSI values of *T. polium*
Values are presented as mean \pm SD; Experiments were made in 5 parallels

In the literature, there is no study to determine TAS, TOS and OSI values of *T. polium*. In previous studies conducted with different antioxidant activity determination methods, water extracts of *T. polium* were reported to have high antioxidant activity with DPPH, CUPRAC and β -carotene linoleic acid assays methods [14]. In a different study, it was reported that *T. polium* has significant antioxidant potential by using petroleum ether, chloroform, methanol and water extracts using DPPH radical-scavenging, beta-carotene/linoleic acid and ammonium thiocyanate methods [15]. In another study, methanol extracts of *T. polium* were reported to have high antioxidant activity using DPPH radical-scavenging capability, reducing power, xanthine oxidase inhibitory effect and inhibition of linoleic acid peroxidation methods [16]. In our study, the antioxidant potential of *T. polium* was determined for the first time by using Rel Assay kits. As a result of the study, it was determined that the plant has antioxidant potential.

In addition, in TAS, TOS and OSI studies on different plant species, TAS value of *Mentha longifolia* ssp. *longifolia* was reported as 3.628 mmol/L, TOS value was 4.046 $\mu\text{mol/L}$ and OSI value was 0.112 [17]. TAS value of *Rhus coriaria* var. *zebaria* was reported as 7.342 mmol/L, TOS value was 5.170 $\mu\text{mol/L}$ and OSI value was 0.071 [18]. The TAS value of *Allium calocephalum* was reported as 5.853 mmol/L, TOS value was 16.288 $\mu\text{mol/L}$ and OSI value was 0.278 [19]. Compared to these studies, it was determined that TAS value of *T. polium* was higher than *M. longifolia* ssp. *longifolia* and lower than *R. coriaria* var. *zebaria* and *A. calocephalum*. It is thought that this difference between the antioxidant potential of plants is due to the difference of plant species and their capacity to produce compounds with antioxidant structure. When TOS values were examined, it was determined that *T. polium* had higher values than *M. longifolia* ssp. *longifolia* and *Rhus coriaria* var. *zebaria* and lower than *A. calocephalum*. TOS values show all of the oxidant compounds produced by plants [20]. The differences in TOS values of plants are thought to vary depending on environmental factors and their potential to produce oxidant compounds.

When OSI values were examined, it was seen that *T. polium* was higher than *M. longifolia* ssp. *longifolia*, *Rhus coriaria* var. *zebaria* and *A. calocephalum*. It was seen that *T. polium* suppresses oxidant compounds with endogenous antioxidants compared to these plants. As a result, it was determined that the plant has antioxidant potential despite its high TOS value.

Conclusion

In our study, it was determined that *T. polium* collected from Duhok (Iraq) has antioxidant potential. Despite the high TOS values, the plant was show to have significant antioxidant potential.

Conflict of Interest

The authors declare no conflict of interest.

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