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Determination of Antioxidant and Oxidant Potentials of *Thymbra spicata* Collected from Duhok-Iraq

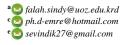
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ARTICLE INFO ABSTRACT

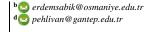
Research Article

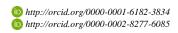
Received: 26/01/2020 Accepted: 16/03/2020 In this study, antioxidant, oxidant and oxidative stress index of *Thymbra spicata* L. collected from Duhok (Iraq) region were determined. The aerial parts of the plant were extracted with ethanol. Rel Assay Diagnostics kits were used for detect TAS, TOS and OSI values. As a result of the studies, it was determined that TAS value of plant extract was determined 8.399±0.102, TOS value was 6.530±0.115 and OSI value was 0.078±0.001. As a result, it was determined that *T. spicata* has high antioxidant potential and in this context, can be used as a natural resource.

Keywords: Antioxidant Medicinal plants Oxidative stress Thymbra spicata Iraq











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Introduction

Despite the increasing human population, complementary medicine orientation is gradually increasing due to the insufficient health services in many countries. The use of plants in complementary medicine for different purposes dates back to very old times (Kam and Liew, 2002; Ondua et al., 2019). In addition to their use as food, plants have been used for many purposes such as taste and fragrance, medicine, shelter construction, firewood and weapon making from past to present. In addition, extracts prepared from herbs called medicinal plants have been used in the treatment of many diseases (Shyur et al., 2005; Kılıç et al., 2017). After the beginning of the 19th century, drugs started to be made using the active substances found in the plants and the pharmaceutical industry was born. In addition to all these developments, especially in recent years, interest in treatment methods with herbal origin extracts has been increasing day by day. The reason for this is thought to be due to the side effects of synthetic drugs (Modak et al., 2007; Qader et al., 2011; Bozok, 2018). In this context, it is very important to determine the potential of plants as alternative drug sources.

Iraq is one of the important settlements that have hosted many civilizations. Pollen analyses conducted in neanderthal tombs discovered by Ralph Solecki and this team in Sanidar Cave, located in Northern Iraq and dated to the Middle Paleolithic Period, provided important evidence that the medicinal plants were known and used about 60 thousand years ago (Fiacconi and Hunt 2015).

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In this study, the total antioxidant status (TAS), total oxidant status (TOS) and oxidative stress index (OSI) of *Thymbra spicata* L. plant collected from Duhok (Iraq) were determined.

Materials and Methods

T. spicata was collected from Duhok (Iraq). The plant was diagnosed using Flora of Iraq (Townsend and Guest, 1966-1985). The plant samples collected during the field studies in the Mangesh region of Duhok. The samples were dried a dry and shady area. After drying, the aerial parts (leaves, flowers and partly stems) were powdered. Then, 30 g of plant samples were cartridges and extraction process was carried out with ethanol (EtOH) in the soxhlet extractor during approximately 6 hours at 50°C. The extracts obtained were concentrated with a rotary evaporator (Heidolph Laborota 4000 Rotary Evaporator).

Determination of TAS, TOS and OSI Values

TAS, TOS and OSI values of EtOH extracts of *T. spicata* were determined using Rel Assay brand kits (Erel, 2004; Erel, 2005). Trolox was used as the calibrator for TAS values. Hydrogen peroxide was used as the calibrator for TOS values. OSI (Arbitrary Unit = AU) value was determined according to the following formula (Erel, 2005).

$$OSI = \frac{TOS, \, \mu mol \; H_2O_2 \; equiv./L}{AS, \, mmol \; Trolox \; equiv./L \times 10}$$

Results and Discussion

Traditional herbal remedies have been used in developing and developed countries for thousands of years because they are natural and cause relatively few complications. The antioxidant potential of a medicinal plant depends on the condition of clearing or suppressing reactive oxygen species in the living organism. Many studies in recent years have reported that different parts of plants have antioxidant potential (Boullata and Nace, 2000; Pandey et al., 2019). In our study, EtOH extracts of *T. spicata* were used and their antioxidant and oxidant potentials were investigated. In addition, oxidative stress index was determined based on antioxidant and oxidant states. The results obtained was shown in Table 1.

Table 1. TAS, TOS and OSI values of T. spicata

Parameters	T. spicata
TAS	8.399±0.102
TOS	6.530±0.115
OSI	0.078 ± 0.001

Values are presented as mean±SD; Experiments were made in 5 parallels

In the literature, TAS, TOS and OSI values of *T. spicata* have not been reported. In studies on different plant species, TAS values of *Silybum marianum*, *Allium calocephalum*, *Rhus coriaria* var. *zebaria*, *Mentha longifolia* subsp. *longifolia*, *Rosa canina* and *Salvia multicaulis* were reported as 5.767, 5.853, 7.342, 3.628, 4.602 and 6.434 mmol/L, respectively. TOS values were reported as 12.144, 16.288, 5.170, 4.046, 6.294 and 22.441

μmol/L, respectively. OSI values were reported as 0.211, 0.278, 0.071, 0.112, 0.138 and 0.349, respectively (Sevindik et al., 2017; Pehlivan and Sevindik, 2018; Mohammed et al., 2018; Pehlivan et al., 2018; Mohammed et al., 2019a; Mohammed et al., 2019b). In addition, TAS value of *Thermopsis turcica* was determined as 2.06±0.09 μmol/g in a different study (Aksoy et al., 2013). In another study, it was reported that TAS value of Brassica rapa was 1.25 mmol/L (Gul et al., 2013). Compared to these studies, it is seen that TAS value of T. spicata was higher than S. marianum, A. calocephalum, R. coriaria var. zebaria, M. longifolia subsp. longifolia, R. canina, S. multicaulis, T. turcica and B. rapa. These different antioxidant potentials that arise among plant samples are thought to arise from the capacity of plants to produce antioxidants. In addition, it was determined by different researchers that T. spicata has antioxidant potential. In these studies, it was reported that the DPPH free radical activity of ethanol extracts of the aerial parts of *T. spicata* was high (Khalil et al., 2019). In a different study, it was reported that methanol extracts of T. spicata have antioxidant potential (Ertürk et al., 2017). In another study, it was reported that the essential oils of T. spicata have antioxidant potentials (Bayan et al., 2017). It is seen that T. spicata used in our study, which was similar to these studies, was high antioxidant potential.

When TOS values were examined, it was determined that *T. spicata* had higher values than *R. coriaria* var. *zebaria*, *M. longifolia* ssp. *longifolia* ve *R. canina* and lower values than *S. marianum*, *A. calocephalum*, *S. multicaulis*. TOS values show all of the oxidant compounds produced by the plant as a result of metabolic activities. TOS values may vary depending on environmental factors (Selamoglu et al., 2016). This difference occurring between the TOS values of plants is thought to vary depending on the oxidant compound to be produced, the habitat of the plant and the differences of the species. In this context, it was observed that the TOS value of *T. spicata* was not high.

OSI values show how much the endogenous oxidant compounds produced by the plant are suppressed with endogenous antioxidant compounds (Dogan et al., 2014). In this context, it was determined that OSI value of T. spicata was higher than *R. coriaria var. zebaria* and lower than *S. marianum*, *A. calocephalum*, *M. longifolia* ssp. *longifolia*, *R. canina* and *S. multicaulis*.

Conclusion

In this study, antioxidant and oxidant potentials of *T. spicata* collected from Duhok (Iraq) region were determined. As a result of the studies, it was determined that the ethanol extracts of the plant have high antioxidant potential. In addition, plant extracts were found to have low levels of oxidant. In this context, it was determined that *T. spicata* could be a natural antioxidant agent.

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