Turkish Journal of Agriculture - Food Science and Technology, 8(9): 2008-2010, 2020
DOI: https://doi.org/10.24925/turjaf.v8i9.2008-2010.3705

Turkish Journal of Agriculture - Food Science and Technology

Available online, ISSN: 2148-127X | www.agrifoodscience.com | Turkish Science and Technology Publishing (TURSTEP)

Antioxidant and Oxidant Status of Endemic *Helleborus vesicarius*

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ARTICLE INFO

Research Article

Received : 24/06/2020
Accepted : 27/07/2020

Keywords:
Antioxidant
Endemic
Helleborus vesicarius
Medicinal plants
Oxidant

ABSTRACT

Plants are important antioxidant sources. In our study, total antioxidant status (TAS), total oxidant status (TOS) and oxidative stress index (OSI) of endemic *Helleborus vesicarius* Aucher ex Boiss. were determined. The aerial parts of the plant samples were dried and extracted with ethanol (EtOH). TAS and TOS values of plant extract were determined using Rel Assay Diagnostics kits. As a result of the studies, the TAS value of *H. vesicarius* was determined 5.548±0.23, the TOS value was 13.778±0.119 and the OSI value was 0.249±0.009. In this context, the plant has been shown to have significant antioxidant potential.

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Introduction

Many natural products such as plants, animals and fungi form the basis for the treatment of human diseases (Zlatković et al., 2014). The earliest evidence for the use and preparation of herbal remedies was found on a Sumerian clay plate, about 5000 years ago from Nagpur. According to some inscriptions, Egyptians and Chinese who have been using plants as medicines since the 27th century BC are assumed to be among the first humans. Medicinal plants synthesize many different bioactive compounds called secondary metabolites (Li et al., 2017; Mohammed et al., 2018). Studies have reported that plants have different activities such as antioxidant, antimicrobial, anti-proliferative, DNA protective, anti-inflammatory, anti-diabetic and anti-aging due to the bioactive compounds within the plants (Ginovyan et al., 2017; Yasin et al., 2017; Buyel, 2018; Naveen and Baskaran, 2018; Laxa et al., 2019; Lin et al., 2019; Mohammed et al., 2019a; Nandhini et al., 2019). In this context, determining the medicinal potential of plants is very important.

In this study, it was aimed to determine the antioxidant and oxidant potential of endemic *Helleborus vesicarius*. Helleborus genus is a genus that belongs to the Ranunculaceae family, usually spreading under forests and forest openings. *H. vesicarius* is an endemic species spread in Hatay, Gaziantep, Adıyaman and Kahramanmaraş and its close environs (Davis, 1965).

Materials and Methods

H. vesicarius samples was collected from Sof Mountain (Gaziantep/Turkey). The plant was diagnosed using Flora of Turkey, volume 1. Aerial parts were used for extraction of the plant. Samples were dried under suitable conditions. 30 grams of dry samples were weighed and extracted with EtOH at 50 ^{0}C for approximately 6 hours (Gerhardt EV 14). The extracts obtained are concentrated with a rotary evaporator (Heidolph Laborota 4000 Rotary Evaporator).

Antioxidant, Oxidant Tests

The antioxidant and oxidant status of EtOH extracts of *H. vesicarius* were determined using Rel Assay TAS and TOS kits. TAS kits were calibrated with Trolox. TOS tests were calibrated with hydrogen peroxide (Erel, 2004; Erel, 2005). OSI (Arbitrary Unit = AU) value was determined according to the following formula (Erel, 2005).

$$\text{OSI (AU)} = \frac{\text{TOS, } \mu\text{mol } H_2O_2 \text{ equiv./L}}{\text{TAS, mmol Trolox equiv./L} \times 10}$$

Results and Discussion

Living organisms produce oxidant compounds as a result of environmental factors and metabolic activities (Sevindik, 2018; Yang et al., 2019). High levels of these oxidant compounds pose a danger to living things. The antioxidant defence system plays a role in the suppression of oxidant compounds (Waszczak et al., 2018; Sevindik, 2019). In cases where the antioxidant defence system is insufficient, oxidative stress occurs. Reinforcement antioxidant is required to eliminate or suppress the harmful effects of oxidative stress (Sevindik, 2020). Many of the chemical compounds considered as natural compounds are of natural origin. The vast majority of these sources have been reported to have bioactivities such as antioxidants (Yumrutas et al., 2012; Bal et al., 2017), anticancer (Ege et al., 2020) hepatoprotective (Yalcin et al., 2017), antimutagenic (Pehlivan et al., 2020), antimicrobials (Sevindik et al., 2018; Güzel et al., 2019), wound healing (Ozay et al., 2019). In our study, TAS, TOS and OSI values of EtOH extracts of *H. vesicarius* were determined. The values obtained are shown in table 1.

Table 1. TAS, TOS and OSI values of *H. vesicarius*

	TAS	TOS	OSI
H. vesicarius	5.548±0.237	13.778±0.119	0.249±0.009

Values are presented as mean±SD

There is no study to determine the antioxidant activity of *H. vesicarius* in the literature. The antioxidant and oxidant potential of *H. vesicarius* was determined in our study. In previous studies on different plant species, TAS values of *Mentha longifolia* subsp. *longifolia*, *Salvia multicaulis*, *Scorzonera papposa*, *Thymbra spicata*, *Adiantum capillus-veneris*, *Silybum marianum* and *Satureja hortensis* were reported 3.628, 6.434, 4.504, 8.399, 3.086, 5.767 and 5.403, respectively. TOS values were reported as 4.046, 22.441, 21.317, 6.530, 21.532, 12.144 and 3.537, and OSI values were reported as 0.112, 0.349, 0.473, 0.078, 0.698, 0.211 and 0.065 (Sevindik et al., 2017; Pehlivan and Sevindik, 2018; Mohammed et al., 2019b; Mohammed et al., 2019c; Mohammed et al., 2019d; Mohammed et al., 2020a; Mohammed et al., 2020b). In addition, the TAS value of *Calendula officinalis* has been reported as 5.55 (Verma et al., 2016). Compared to these studies, TAS value of *H. vesicarius* has a higher than *M. longifolia* subsp. *longifolia*, *S. papposa*, *A. capillus-veneris* and *S. hortensis*, and lower than *C. officinalis*, *S. multicaulis*, *T. spicata* and *S. marianum*. TAS values show all of the antioxidant compounds produced in plants (Mohammed et al., 2018). In our study, it is seen that *H. vesicarius* has a high TAS value. In this context, the plant is thought to be a natural antioxidant source. In addition, it is thought that the compounds responsible for antioxidant activity within the plant can be identified and used as a pharmacological agent.

The TOS value shows all of the oxidant compounds produced by environmental factors in plants. OSI value shows how much the oxidant compounds are suppressed by the antioxidant defense system (Mohammed et al., 2018). In our study, TOS and OSI values of *H. vesicarius* were higher than *M. longifolia* subsp. *longifolia*, *T. spicata*, *S. marianum* and *S. hortensis*, and lower than *S. multicaulis*, *S. papposa* and *A. capillus-veneris*. In this context, antioxidant defense system of the plant appears to be significantly active. As a result, it is seen that the plant is at suitable levels in terms of oxidative stress.

Conclusion

In this study, total antioxidant and total oxidant status of *H. vesicarius* were determined. Also, oxidative stress index was calculated based on these values. As a result of the findings, it has been determined that the plant has high antioxidant potential. It is suggested that compounds with antioxidant effects are determined in the plant and used in pharmacological designs.

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