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Antioxidant Potential of *Hypericum spectabile* JAUB. ET SPACH

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Abstract: Plants have been indispensable products of nature in human history. People used plants for many purposes such as building shelters, smells, flavors, medicines, warming tools, and weapons. In this study, antioxidant and oxidant potentials of *Hypericum spectabile* Jaub. & Spach were determined. Ethanol extract of the plant was extracted in soxhlet apparatus. Antioxidant and oxidant potentials were determined using Rel Assay kits. Free radical scavenging activity was measured using the DPPH method. TAS value of the plant was determined as 4.215±0.038, TOS value as 23.421±0.161 and OSI value as 0.556±0.001. DPPH free radical scavenging activity increased with increasing concentration. It showed 86.74% inhibition at 2 mg/mL extract concentration. As a result, it was determined that *H. spectabile* has high antioxidant potential.

Keywords: Antioxidant, *Hypericum spectabile*, Medicinal plants, Oxidant

1 Introduction

Humans have used plants as a source of healing in the treatment of many diseases for centuries. Especially in the backward societies that do not have the medical treatment possibilities of societies with high socioeconomic level, millions of people are still taking advantage of phytotherapy, a branch of alternative medicine (Aydın and Sevindik, 2018; Okan et al. 2018; Mohammed et al. 2020a). The genus *Hypericum* L., a member of the *Hypericaceae* family, contains about 400 species in the world, about 80 species in Turkey, all small herbaceous perennials (Robson, 1967, 1988; Dönmez 2000). *Hypericum* (*Hypericaceae*) is one of the plants used traditionally in medicine, crop protection, and flavoring, as well as fragrance in food (Isman et al. 2001; Daferera et al. 2003). Plants of the genus *Hypericum* are known for the production of naphthodianthrones such ashypericin and pseudohypericin possessing antineoplastic, antiviral and antibacterial properties, their proposed precursors emodin or emodin anthrone, as well as phloroglucinols and flavonoids (Nahrstedt and Butterweck 1997). In this study, total antioxidant status, total oxidant status and oxidative stress index of *Hypericum spectabile* Jaub. & Spach plant collected from Gaziantep (Turkey) were determined.

2 Materials and Method

Hypericum spectabile plant was collected from Gaziantep (Turkey) province. The plant was diagnosed using Flora of Turkey Volume 2 (Davis 1967). Aerial parts of the plant samples were collected. 30 g of the collected samples were weighed. It was then extracted with ethanol (EtOH) at 50 ° C in the soxhlet extractor for about 6 hours. The extracts obtained are concentrated with a rotary evaporator (Heidolph Laborota 4000 Rotary Evaporator).

2.1 Total Antioxidant and Oxidant Analyses

The antioxidant and oxidant status of the above-ground parts of the plant were determined using Rel Assay TAS and TOS kits (Erel 2004; Erel 2005). The calibrator Trolox was used in the TAS test. Calibrator hydrogen peroxide (TOS) was used in the TOS test. OSI (Arbitrary Unit = AU) value was determined according to the formula below (Erel, 2005).

$$OSI\ (AU) = \frac{TOS, \mu molH_2O_2\ ^{Equiv.}/_{L}}{TAS, mmol\ Trolox\ ^{Equiv.}/_{L} \times 10}$$

2.2 DPPH radical scavenging activity

Different stock solutions (0.25, 0.5, 1 and 2 mg/mL) were prepared using DMSO (Dimethyl sulfoxide). 50 µL of the prepared solutions were added to 160 µL of 0.039% DPPH. Then, it was incubated for 30 minutes. After the incubation process, absorbance was determined at 517 nm. These processes were repeated for all stock solutions (Shimada et al. 1992). Rosmarinic acid (RA) and ascorbic acid (AA) were used as reference antioxidants. Finally, DPPH free radical scavenging percentages; % inhibition = [(Abs control-Abs sample)\Abs control] x100.

3 Results and Discussion

Imbalance between endogenous antioxidants and oxidant compounds leads to oxidative damage of metabolic reactions (Sevindik, 2018). Antioxidants serve to suppress or eliminate the harmful effects of free radicals on living organisms. However, in cases where endogenous antioxidants are insufficient against reactive oxygen species, the use of supplementary antioxidants is very important. Many herbs used in complementary medicine have antioxidant potential (Sevindik, 2019; Mohammed et al. 2020b). In our study, TAS, TOS and OSI values of EtOH extracts of *H. spectabile* were determined. The findings obtained are shown in Table 1.

Table 1 TAS, TOS and OSI values of *Hypericum spectabile*

Sample	TAS (mmol/L)	TOS (µmol/L)	OSI
H. spectabile	4.215±0.038	23.421±0.161	0.556±0.001

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

Table 2 DPPH radical scavenging activity of *Hypericum spectabile*

Concentration (mg/mL)	Ascorbic acid (%)	Rosmarinic acid (%)	EtOH
0.25	65.47	37.32	36.01
0.5	72.77	43.51	53.09
1	89.1	68.76	73.07
2	94.88	76.32	86.74

In our study, it is seen that the EtOH extract of *H. spectabile* changes DPPH free radical activity depending on the increase in concentration. It was determined that the EtOH extract of the plant has higher activity than the standard Rosmarinic acid. It is seen that it exhibits lower activity than ascorbic acid (Table 2). It has been reported in previous studies that *H. spectabile* has an antioxidant potential using different methods (Zheleva-Dimitrova et al., 2010; Özkan et al., 2018). In this context, the DPPH potential of *H. spectabile* was similar to the literature studies in our study.

In our study, the antioxidant potential was determined for the first time using TAS kits. In studies on different plant species using TAS kits, the TAS value of *Mentha longifolia* L. Hudson ssp. *longifolia* was reported as 3.628 mmol/L, TOS value was 4.046 µmol/L and OSI value was 0.112 (Sevindik et al. 2017). The TAS value of *Rosa canina* L. was reported as 4.602 mmol/L, TOS value was 6.294 µmol/L and OSI value was 0.138 (Pehlivan et al. 2018). TAS value of *Adiantum capillus-veneris* L. was reported as 3.086 mmol/L, TOS value was 21.532 µmol/L and OSI value was 0.698 (Mohammed et al. 2019a). TAS value of *Silybum marianum* (L.) Gaertn. was reported as 5.767 mmol/L, TOS value was 12.144 µmol/L and OSI value as 0.211 (Mohammed et al. 2019b). Compared to these studies, it was determined that the TAS value of *H. spectabile* used in our study was higher than *M. longifolia* ssp. longifolia and *A. capillus-veneris*, but lower than *R. canina* and *S. marianum*. TAS value shows the whole of the antioxidant compounds produced by the plant (Mohammed et al. 2018). This difference between the TAS values of plant species is thought to be due to the plant's potential to produce compounds with antioxidant properties. The TOS value shows the oxidant compounds that the plant produces in its body with environmental effects (Mohammed et al. 2018). It is seen that the TOS value of *H. spectabile* is higher than that of *M. longifolia* ssp. *longifolia*, *A. capillus-veneris*, *R. canina* and *S. marianum*. This difference is thought to be due to the environment in which the plants grow and their potential to produce oxidant compounds. The OSI value shows how much the plant suppresses endogenous oxidant compounds with endogenous antioxidant compounds (Mohammed et al. 2018). It is seen that as the OSI value increases, the antioxidant defense system of the plant is insufficient against oxidant compounds. It was determined that the OSI value of *H. spectabile* was higher than *M. longifolia* ssp. *longifolia*, *R. canina* and *S. marianum*, but lower than *A. capillus-veneris*. As a result, it was determined in our study that the plant has antioxidant potential despite its high TOS value.

5 Conclusion

In this study, the antioxidant and oxidant potentials of *H. spectabile* were determined. As a result of the studies, it was determined that the plant has antioxidant potential. In addition, despite its high oxidant values, it is thought that it can be used as a natural antioxidant source due to its antioxidant potential.

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Conflict of interest disclosure:

No conflict of interest

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