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Phenolic Content and Antioxidant Potential of *Terfezia boudieri*

Mustafa SEVINDIK[1,*], Mustafa PEHLIVAN[2], Muhittin DOGAN[3], Zeliha SELAMOGLU[4]

[1]*Department of Biology, Faculty of Science, Akdeniz University, 07058, Antalya, Turkey*

[2] *Nurdagı Vocational School, Gaziantep University, 27310, Gaziantep, Turkey*

[3] *Department of Biology, Faculty of Science and Literature, Gaziantep University, 27310, Gaziantep, Turkey*

[4] *Department of Medical Biology, Faculty of Medicine, Nigde Omer Halisdemir University, 07058, Nigde, Turkey*

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Abstract

The present study aimed to determine the phenolic content, total antioxidant status (TAS), total oxidant status (TOS) and oxidative stress index (OSI) of *Terfezia boudieri* Chatin, known as truffle mushroom. In this context, phenolic content was determined with an HPLC device. TAS, TOS and OSI were determined with Rel Assay kits. As a result of the conducted analyses, 30.89 mg/kg gallic acid, 554.64 mg/kg syringic acid and 5.52 mg/kg 4-hydroxybenzoic acid were determined in the mushroom. It was determined that TAS value was 2.332 ± 0.034, TOS value was 26.945±0.144 and OSI value was 1.156±0.011. It was suggested to avoid excessive consumption of mushrooms collected in this region due to the high TOS value. It was also considered that samples collected in appropriate regions could be consumed as a good antioxidant source based on the determined OSI.

1. INTRODUCTION

In addition to their nutritional properties, mushrooms, which are common on Earth including several species, are also significant natural sources in medicine. Mushrooms are organisms that exhibit cosmopolitan deployment and have become a popular gastronomical item in several countries and societies [1]. Mushrooms could be designated as functional nutrients due to their health benefits, as well as their nutritional properties. In recent years, consumer interest in functional nutrients has been augmented due to the increased interest in health, nutrition and prevention of diseases [2,3]. Plants contain several phytochemicals with medicinal properties in their stems. It was determined that mushrooms, like plants, contain certain bioactive compounds and thus, exert significant biological activities [4]. Certain mushroom species harbor rich antioxidant compounds such as phenolic compounds and tocopherols [5]. In addition to the antioxidant properties of these bioactive compounds, they were shown to possess several medical antibacterial effects such as antimicrobial, antitumor, anti-inflammatory, DNA protective action and immunosuppressive agents [6-10]. Today, these bioactive compounds that were identified by molecular research are increasingly used in the production of pharmacological products [11,12]. Thus, identification of new natural resources and determination of the compounds these natural sources produce are very important for the production of pharmacological products.

The present study aimed to determine the total antioxidant status (TAS), total oxidant status (TOS) and oxidative stress index (OSI) and phenolic content of *Terfezia boudieri* Chatin mushroom.

*Corresponding author, e-mail: sevindik27@gmail.com

2. EXPERIMENTAL

Terfezia boudieri Chatin samples were collected in Şahinbey (Gaziantep/Turkey) region. The collected mushroom samples were dried at 40 °C. Then, 30 g sample was weighed and treated with ethanol in a Soxhlet apparatus. (BUCHI Extraction System Model B-811). The extracts, which were concentrated by rotary evaporator (BUCHI Rotavapor Model R-144), were stored at + 4°C until the experiment was conducted.

2.1. Determination of TAS, TOS and OSI Values

T. boudieri mushroom ethanol extract TAS, TOS and OSI values were determined with Rel Assay brand kit (Rel Assay Kit Diagnostics, Turkey). Analyses were carried out with 5 replicates. In determination of the TAS values, Trolox was used as the calibrator and hydrogen peroxide was used as the calibrator in determination of the TOS values. The results are reported as mmol Trolox equiv./L for the TAS value and μmol H_2O_2 equiv./L for the TOS value [13,14]. The following equation was used to calculate the OSI value obtained using the TAS and TOS values (1).

$$\text{OSI} = \frac{\text{TOS, } \mu\text{mol H2O2 equiv./L}}{\text{TAS, mmol Trolox equiv./L X 10}} \quad (1)$$

2.2. Determination of the Mushroom Phenolic Content

The mushroom extract phenolic content was determined by the modified Caponio et al. [15], method with SHIMADZU system HPLC device and DAD detector. Injection volume was adjusted to 20 μL. As the mobile phase A: 3% acetic acid and B: methanol were used and the flow rate was regulated to 0.8 mL per minute. Chromatographic separation was conducted with Agilent Eclipse XDB-C18 column (250x4.6 mm id 5 μm) at 30°C.

3. RESULTS AND DISCUSSION

3.1. Phenolic Content

Conducted phenolic analyzes demonstrated that three phenolic compounds were identified in *T. boudieri*, namely 30.89 mg/kg gallic acid, 554.64 mg/kg syringic acid and 5.52 mg/kg 4-hydroxybenzoic acid. Gallic acid, syringic acid and 4-hydroxybenzoic acid were reported to exhibit high antioxidant activity as well as several pharmacological effects [16-21]. Dundar et al. [22], determined the phenolic content of T. boudieri in the study they conducted and found 8.45± 1.63 mg/mL gallic acid in the mushroom. In a study conducted by Doğan and Aydın [23], 20 mg/g catechin, 15 mg/g ferulic acid, 10 mg/g p-coumaric acid and 6 mg/g cinnamic acid were identified in *T. boudieri*. In a study conducted by Kıvrak [24], gentisic acid (25.48 and 14.84 μg/kg), protocatechuic acid (21.55 and 15.54 μg/kg), and p-hydroxy benzoic acid (18.07 and 16.99 μg/kg) were determined in *Terfezia olbiensis* and *T. claveryi*. In addition to the abovementioned studies, in the present study, we also found gallic acid, syringic acid and hydroxybenzoic acid in *T. boudieri*. It was considered that this difference was due to the region where the mushrooms were collected. Furthermore, the presence of syringic acid in the mushroom indicated that this mushroom is a natural syringic acid source.

3.2. TAS, TOS and OSI Values

Study findings demonstrated that TAS value of *T. boudieri* was 2.332±0.034 mmol/L, TOS value was 26.945±0.144 μmol/L and OSI value was 1.156±0.011. In the literature, there are no studies that aimed to determine the oxidative stress status of *T. boudieri*. However, in the oxidative stress studies conducted on mushrooms, it was determined that the TAS value of *Tricholoma terreum* (Schaeff.) P. Kumm was 0.38, the TOS value was 16.76 and the OSI value was 4.41. The TAS value of *Coprinus micaceus* (Bull.) Fr was 0.46, the TOS value was 16.87 and the OSI value was 3.67. It was reported that the TAS value of *Laetiporus sulphureus* (Bull.) Murrill. was 2.195, the TOS value was 1.303 and the OSI value was 0.059.

it was determined that the TAS value of *Fomitopsis pinicola* (Sw.) P. Karst was 1.44, the TOS value was 14.21 and the OSI value was 0.99. It was reported that the TAS value of *Pleurotus eryngii* (DC.) Quél was 1.93 and the TAS value of *Auricularia polytricha* (Mont.) Sacc. was 0.93. *Omphalotus olearius* (DC.) Singer TAS value was 2.836, TOS value was 8.262 and OSI value was 0.291. *Macrolepiota procera* (Scop.) Singer TAS value was 2.823, TOS value was 10.349 and OSI value was 0.367. It was determined that *Auricularia auricula* (L.) Underw. mushroom TAS value was 1.010, the TOS value was 23.910 and the OSI value was 2.367. The TAS value of *Trametes versicolor* (L.) Lloyd mushroom was determined as 0.820, the TOS value was determined as 17.760 and the OSI value was determined as 2.166 [25-32]. When comperaed to the abovementioned studies, the TAS value determined in the present study was lower than that of the *O. olearius* and *M. procera* mushrooms, but higher than that of the other mushrooms tested. TOS value determined in the current study was higher than the values reported in the literature. The TOS value indicates the amount of oxidant compounds that the mushroom produces due to environmental and inherent factors. The fact that TOS value was higher than that of the other mushrooms indicatated that *T. boudieri* produces more oxidant compounds when compared to other mushrooms. It was considered this was due to the differences between the regions where the mushrooms were collected. It was also found that the OSI values of *T. boudieri* were lower than those of *T. terreum, C. micaceus, A. auricula* and *T. versicolor* mushrooms. This was due to the fact that *T. boudieri* produced a higher amount of antioxidants to tolerate the oxidant compounds. It was also observed that *T. boudieri* had a higher OSI value when compared to *O. olearius, F. pinicola, L. sulphureus* and *M. procera* mushrooms. This could be due to the fact that *T. boudieri* TAS values were lower and TOS values were higher.

4. CONCLUSION

In the present study, significant compounds such as gallic acid, syringic acid and 4-hydroxybenzoic acid were identified in *T. boudieri* mushroom. It could be argued that this mushroom could be a natural source of syringic acid due to the fact that syringic acid is detected at high levels in the said mushroom. It was also considered that *Terfezia boudieri* mushroom samples that were collected in proper regions with respect to oxidative stress levels could be consumed as a natural antioxidant source due to high TAS value. However, since the mushroom TOS values were high, it was suggested that the mushroom collected in this region should only be consumed in limited amounts.

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CONFLICTS OF INTEREST

No conflict of interest was declared by the authors

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