Mycopath (2018) 16(2): 47-49 **Research Article**

Antioxidant activity of ethanol extract of *Daedaleopsis nitida* medicinal mushroom from Turkey

*Mustafa Sevindik

Department of Biology, Faculty of Science, Akdeniz University, Antalya, Turkey
**Corresponding author's email: sevindik27@gmail.com*

Abstract

In this study, antioxidant potantial, oxidant potantial, oxidative stress index and heavy metal contents of *Daedaleopsis nitida* (Durieu & Mont.) Zmitr. & Malysheva mushroom were determined. Total antioxidant status (TAS), total oxidant status (TOS) and oxidative stress index (OSI) were determined using Rel Assay Diagnostics kits. Cr, Cu, Mn, Fe, Ni, Cd, Pb and Zn contents of fruiting bodies of mushroom were determined by atomic absorption spectrophotometer. As a result of the study, TAS value of mushroom extract was determined as 6.072 ± 0.067, TOS value was 7.165 ± 0.074 and OSI value was 0.118 ± 0.002. Cr, Cu, Mn, Fe, Ni, Cd, Pb and Zn contents of the fruiting bodies of mushroom were determined 16.87 ± 0.73, 109.95 ± 2.17, 8.14 ± 0.81, 239.54 ± 14.30, 1.91 ± 0.64, 7.05 ± 0.83, 0.68 ± 0.31 and 55.96 ± 1.07, respectively.

Keywords: Antioxidant, *Daedaleopsis nitida*, Heavy metals, Oxidant.

Introduction

Mushrooms are cosmopolitan living groups. Mushrooms, which are used extensively by humans, have been important natural sources both in food and medical fields. In addition to nutritional properties, mushrooms are natural resources with medical potential. Previous studies on different types of mushrooms; mushrooms have been reported to have many features such as antioxidant, antimicrobial, DNA protective effect, hypoglycemic, anticancer, antiallergic, anti-mutagenic, analgesic, anti-inflammatory and immune system regulator (Grüter *et al.*, 1990; Alves *et al.*, 2012; Smiderle *et al.*, 2014; Boonsong *et al*., 2016; Bal *et al.*, 2017; Blagodatski *et al.*, 2018). In this context, it is very important to evaluate the natural reserves of mushrooms in order to identify new natural resources from a medical point of view.

Saprobes or pathogens genus *Daedaleopsis* first named in 1888. *Daedaleopsis* sp. J. Schröt. is widely found in the trees and stumps of *Alnus* sp. L., *Betula* sp. L., *Salix* sp. L., *Corylus* sp. L., *Fagus* sp. L., *Quercus* sp. L. and *Prunus* sp. L. in European, North American and Asian forests. In addition, members of the genus *Daedaleopsis* have been used for medicinal properties since Neolithic times and in an archaeological site near Rome (Ćilerdžić *et al.*, 2017). In this context, antioxidant, oxidant, oxidative stress index and heavy metal contents of *D. nitida* mushroom were determined in this study.

Material and Method

D. nitida samples were collected from Balıkesir, Turkey. Mushroom samples were extracted with ethanol (EtOH) for about 6 hours at 50 °C using a soxhlet apparatus (Gerhardt EV 14). The extracts were concentrated by rotary evaporator (Heidolph Laborota 4000 Rotary Evaporator).

Antioxidant, oxidant and oxidative stress tests

Rel Assay brand kits were used to determine total antioxidant status (TAS), total oxidant status (TOS) and oxidative stress index (OSI) values of *D. nitida* samples. Trolox was used for TAS tests and hydrogen peroxide was used as calibrator for TOS tests (Erel, 2004, 2005). The following formula was applied to determine OSI (Erel, 2005). Arbitrary Unit = AU

$$OSI\ (AU) = \frac{\text{TOS, } \mu\text{moL } H_2O_2 \text{equiv. } L^{-1}}{\text{TAS, mmoL Trolox equiv. } L^{-1} \text{ X } 10}$$

Heavy metal analyses

The samples were dried at 80 ºC in order to determine the heavy metal contents (Cr, Cu, Mn, Fe, Ni, Cd, Pb and Zn) of *D. nitida* samples. An amount of 0.5 g of these samples was taken and mineralized in a mixture of 9 mL HNO_3 + 1 mL H_2O_2 in a microwave solubilizer (Milestone Ethos Easy). The heavy metal contents of the mushroom were determined using the atomic absorption spectrophotometer (Agilent 240FS AA) (Akgül *et al.*, 2016a).

Results and Discussion

Antioxidant activity

Reactive oxygen species (ROS) are produced in living organisms as a result of environmental and metabolic activities. While ROS benefit at low levels, high levels cause serious damage to organisms. By increasing the level of ROS, endogenous antioxidants in the organism are

activated and compensate for the negative effects. In addition, in cases where endogenous antioxidants are insufficient, supplementary antioxidants play an important role in maintaining this balance (Finkel and Holbrook, 2000; Mittler, 2002; Sies *et al*., 2017). Therefore, it is very important to determine the dietary supplement antioxidants. Therefore, the antioxidant and oxidant potential of *D. nitida* mushroom was determined in our study. In addition, oxidative stress index was determined depending on oxidant and antioxidant values.

As a result of the study, TAS value of EtOH extracts of *D. nitida* was determined as 6.072 ± 0.067, TOS value was 7.165 ± 0.074 and OSI value was 0.118 ± 0.002. The findings are shown in Table 1.

Table 1: TAS, TOS and OSI values of *D. nitida*

	TAS (mmol L^{-1})	TOS (μmol L^{-1})	OSI
D. nitida	6.072 ± 0.067	7.165 ± 0.074	0.118 ± 0.002

Values are presented as mean ± SD; number of mushroom samples n = 6, experiments were made in 5 parallels

Previously, TAS, TOS and OSI values of *D. nitida* have not been determined. In literature, TAS values of *Helvella leucomelaena* and *Sarcosphaera coronaria* were reported as 2.367 and 1.066, TOS values were 55.346 and 41.672, OSI values were 2.338 and 3.909, respectively (Sevindik *et al*., 2018a). TAS value of *Laetiporus sulphureus* was reported 2.195, TOS value was 1.303 and OSI value was 0.059 (Sevindik *et al*., 2018b). TAS value of *Macrolepiota procera* was reported 2.805, TOS value was 6.596 and OSI value was 0.235 (Akgul *et al.*, 2016b). The TAS value of *D. nitida* used in our study was higher than *H. leucomelaena*, *S. coronaria*, *M. procera* and *L. sulphureus*. According to our results, *D. nitida* has a higher antioxidant potential. TOS value of *D. nitida* was lower than *H. leucomelaena* and *S. coronaria* and higher than *M. procera* and *L. sulphureus*. TOS results differ according to differences in mushroom species, habitats and capacity to produce reactive oxygen species. TOS values indicate the status of reactive oxygen species produced by the living organism. TAS values indicate endogenous antioxidant status in living organisms. On the other hand, the value of OSI shows how much oxidant compounds are suppressed by the antioxidant compounds (Erel 2004, 2005). The higher OSI shows that antioxidant compounds inhibit less oxidant compounds. In this study, it is seen that OSI value of *D. nitida* was higher than *L. sulphureus*. In addition, OSI value of *D. nitida* was found to be lower than those of *H. leucomelaena*, *S. coronaria* and *M. procera*. In conclusion, it was determined that *D. nitida* has high antioxidant potential.

Heavy metal contents

One of the important tasks of fungi in nature is to break down organic matter. In this context, depending on the substrate content they use, they accumulate different levels of elements (Sarikurkcu *et al.*, 2011; Sevindik *et al.*, 2018b). In our study, Cr, Cu, Mn, Fe, Ni, Cd, Pb and Zn contents of *D. nitida* were determined. The findings are shown in Table 2.

Table 2: Heavy metal contents of fruiting bodies of *D. nitida*

Elements	Contents (mg kg^{-1})
Cr	16.87±0.73
Cu	109.95±2.17
Mn	8.14±0.81
Fe	239.54±14.30
Ni	1.91±0.64
Cd	7.05±0.83
Pb	0.68±0.31
Zn	55.96±1.07

Values are presented as mean ± SD; n = 3

The lowest and highest element levels in elemental analysis studies on wild mushrooms; it was reported that 9.63–42.7 for Cr, 60.33–95 for Cu, 18.1–103 for Mn, 14.6–835 for Fe, 0.67–5.14 for Ni, 2.71–7.5 for Cd, 2.86–16.54 for Pb and 29.8–158 for Zn mg kg^{-1} (Kalač and Svoboda, 2000; Svoboda and Chrastny, 2008; Zhu *et al.*, 2010; Gebrelibanos *et al.*, 2016; Sevindik *et al.*, 2018b). Compared to these values, the contents of Cr, Fe, Ni, Cd and Zn of *D. nitida* were found to be within the ranges indicated in the literature. Cu content of *D. nitida* was higher than the literature. In addition, Pb and Mn contents of *D. nitida* were lower than the literature ranges. In this context, it is thought that *D. nitida* may be an indicator for Cu element.

Conclusion

In this study, antioxidant and oxidant potential of *D. nitida* mushroom belonging to genus Daedaleopsis, which has been accepted as medical fungi for centuries, was determined. Studies have shown that *D. nitida* has a high antioxidant potential. In this context, it is thought that the compounds causing the antioxidant effect of *D. nitida* can be identified and used as an antioxidant source. In addition, it is thought that it can be an indicator in terms of Cu element due to the accumulation of Cu at high levels in the mushroom.

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