



A Research on Biological Activities of Turkey Tail (*Trametes versicolor*)

Krupodorova T¹, Bal C² and Sevindik M^{3*}

¹Institute of Food Biotechnology, Genomics National Academy of Sciences, Ukraine

²Department of Biology, Gaziantep University, Turkey

³Department of Biology, Osmaniye Korkut Ata University, Turkey

***Corresponding author:** Mustafa Sevindik, Department of Biology, Science and Literature Faculty, Osmaniye Korkut Ata University, Osmaniye, Turkey, Email: sevindik27@gmail.com

Review Article

Volume 7 Issue 1

Received Date: April 05, 2024

Published Date: May 08, 2024

DOI: 10.23880/oajmms-16000185

Abstract

Mushrooms are cosmopolitan living groups. They stand out with their nutritional and aromatic properties. Apart from these features, they are also medically important natural materials. In this study, the biological activities of *Trametes versicolor* reported in the literature were compiled. As a result of the research, it has been determined that the mushroom attracts attention with its antioxidant, antimicrobial and anticancer properties. In this context, it is thought to be an important natural material to be used in pharmacological designs.

Keywords: Mushrooms; Ecosystem; Extraction; Antioxidant; Species

Introduction

Mushrooms are natural creatures with different characteristics in the ecosystem [1]. They, which are distributed all over the world, have become natural products used for many purposes by humans [2]. Mushrooms, which have existed in nature for many years, contain various proteins, minerals and vitamins that are important for human health [3,4]. They, which attract attention with their nutritional properties, are at the top of many diet lists [5]. It is recommended by many physicians as a calorie restricting food due to the low fat and carbohydrate content it contains [6]. In addition to its nutritional properties, its aromatic properties are used for many purposes such as making tools and equipment or fighting diseases [7]. The worldwide trend towards rich and low-cost natural antioxidant resources is increasing day by day, and this has accelerated especially with studies on obtaining phenolic compounds accurately and effectively through extract extraction studies [8-10]. With the increase in studies on edible mushrooms, which

are natural antioxidant sources, they have become an important and remarkable issue for patients with dietary restrictions [11,12]. Studies on different mushroom species have reported that mushrooms have many biological activities such as antioxidant, anticancer, antimicrobial, anti-inflammatory, antiproliferative, antiaging, hepatoprotective, and DNA protective [13-20]. In this context, determining the biological activities of fungi is very important in terms of their potential use. In this study, the biological activities of *Trametes versicolor* reported in the literature were compiled.

Trametes versicolor is a cosmopolitan mushroom (Figure 1). It is called "Turkey tail" because its appearance resembles a turkey tail. *Trametes versicolor* grows in tiled layers in groups or rows, often on logs and deciduous tree stumps. It is sessile and rust-brown or darker brown in color [21]. The head is flat to 8 × 5 × 0.5–1 cm. The pore surface is whitish to light brown. The pores are round and become twisted and labyrinthine over time. *T. versicolor* is a white rot fungus that degrades lignin from lignocellulosic materials in woody

structures. It is considered inedible to humans. *T. versicolor* contains protein-bound PSP and polysaccharides such as β -1,3 and β -1,4 glucans [22,23]. In this context, biological

activity studies reported in the literature on *T. versicolor* have been compiled.

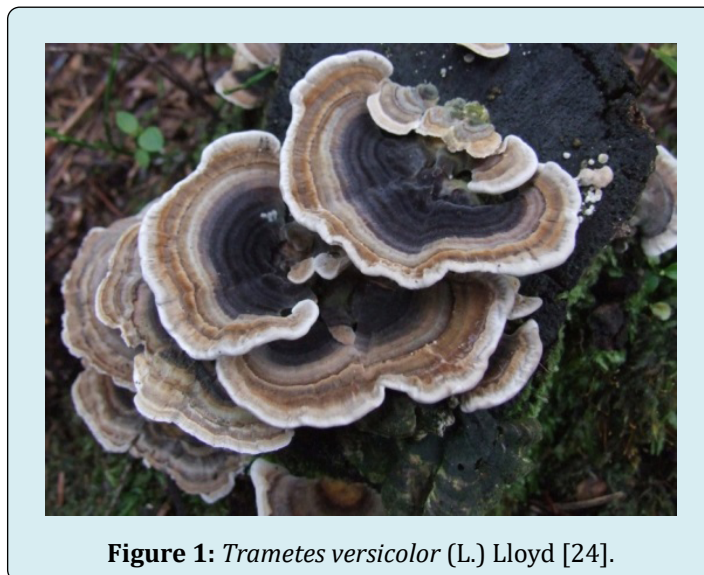


Figure 1: *Trametes versicolor* (L.) Lloyd [24].

Biological Activities

Mushrooms exhibit different biological activities thanks to the many bioactive compounds they produce. These bioactive compounds vary in different fungal species [25]. In

this context, different fungi are expected to exhibit different biological activities. In this study, the biological activities of *T. versicolor* reported in the literature were compiled. The findings obtained are shown in (Table 1).

Biological Activity	Locality	Extraction
Antioxidant, anti-inflammatory, antimicrobial, cytotoxic, antiproliferative, anticancer, DNA-protective activity	Japan, Turkey, Taiwan, Kazakhstan, Serbia, Bangladesh, India, Poland, Italy, Egypt, Slovakia, Spain	Methanol, n-hexane, chloroform, crude extract, polysaccharopeptides, ethanol, water, aqueous, ethyl acetate

Table 1: Biological Activities of *Trametes versicolor*.

Antioxidant Activity

Free radicals are oxidant compounds produced as a result of metabolic activities. High levels of these compounds cause cellular damage [26]. The antioxidant defense system plays a role in suppressing these oxidant compounds [27]. However, in some cases, the antioxidant defense system is inadequate against oxidant compounds [28]. In such cases, oxidative stress occurs. As a result of oxidative stress, serious diseases such as cancer, cardiological disorders, Alzheimer's disease and Parkinson's disease may occur in humans [29-31]. Supplementary antioxidants play an important role in reducing the effects of oxidative stress. Mushrooms are important natural antioxidant sources [32,33]. In this context, the antioxidant activities of *T. versicolor* reported in the literature were compiled. DPPH free radical scavenging activities of n-hexane, chloroform, acetone, and methanol

extracts of *T. versicolor* collected from Japan have been reported. As a result of the findings, acetone extract (50.9%) exhibited the highest activity at a concentration of 500 μ g/mL. It was later reported to exhibit methanol (33.9%), n-hexane (29.5%), and chloroform (15.2%) extracts, respectively [34]. It has been reported that the ethanol extract of *T. versicolor* collected from Turkey has DPPH activity between 5.26-26.77% at concentrations of 0.25-1 mg/mL. It was also reported that the total antioxidant status value (TAS) was 0.820 mmol/L, the total oxidant status value (TOS) was 17.760 μ mol/L and the oxidative stress index (OSI) was 2.166 [35]. It was reported that the TAS values of methanol and ethanol extracts of *T. versicolor* collected from Turkey were 0.72 and 0.88 mmol/L and TOS values were 18.39 and 16.71 μ mol/L, respectively. It has also been reported that methanol extract has DPPH activity between 10.97-62.80% and ethanol extract has 22.42-64.84% at concentrations between 125-

1000 µg/mL [36]. (İnci et al., 2022). It has been reported that *T. versicolor* collected from Poland has antioxidant potential using 2,2-diphenyl-1-picrylhydrazyl (DPPH•) and 2,2'-azino-bis(3-ethylbenzothiazoline-6-sulfonic acid (ABTS•+) radical scavenging assays [37]. It has been reported that the DPPH test result of *T. versicolor* collected from India showed an inhibition percentage varying between 32.62-72.32% and the N2O2 value varying between 34.31-62.30% [38]. In a study conducted in Bangladesh, it was reported that methanol and aqueous extracts of *T. versicolor* had high DPPH free radical scavenging activity [39]. In a study conducted in Serbia, water and ethanol extracts of *T. versicolor* were reported to have antioxidant potential using the DPPH test [40]. It has been reported that *T. versicolor* collected from Ukraine has antioxidant potential [41]. In a study conducted in Taiwan, it was reported that polysaccharides obtained from *T. versicolor* have antioxidant potential using metal chelating assay, ABTS and DPPH radical scavenging tests [42]. In a study conducted in Turkey, it was reported that *T. versicolor* has antioxidant potential [43].

Antimicrobial Activity

In recent years, there has been an increase in the number of diseases caused by microorganisms [44]. The increase in the number of resistant microorganisms due to unconscious use of antibiotics has reduced the effectiveness of the antimicrobial drugs used [45,46]. Possible side effects of synthetic drugs have now led researchers to the discovery of natural antimicrobial drugs [47]. In this context, mushrooms are natural antimicrobial sources. In our study, the antimicrobial activities of *T. versicolor* reported in the literature were compiled. In this context, it was reported that the ethanol extract of *T. versicolor* collected from Turkey had no effect against *Bacillus subtilis*, *Candida albicans*, *Enterobacter aerogenes*, *Enterococcus mavis*, *Enterococcus faecalis*, *Enterococcus faecium*, *Escherichia coli*, *Klebsiella pneumoniae*, *Listeria innocua*, *Listeria monocytogenes*, *Pseudomonas aeruginosa*, *Pseudomonas fluorescence P1*, *Salmonella enteritidis*, *Salmonella infantis*, *Salmonella kentucky*, *Salmonella typhimurium*, *Staphylococcus aureus*, *Staphylococcus epidermidis* DSMZ 20044, *Staphylococcus aureus* (MDR), *Escherichia coli* (MDR), *Klebsiella pneumoniae* (MDR), *Acinetobacter baumannii* (MDR), *Proteus vulgaris* (MDR), *Serratia odorifera* (MDR) and *Streptococcus pneumoniae* (MDR) at a concentration of 40 µL, but was effective between 80-150 µL [48]. The methanol extract of *T. versicolor* collected from Slovakia has been reported to be effective against *Escherichia coli*, *Pseudomonas aeruginosa*, *Staphylococcus epidermis*, *Enterococcus raffinosus*, *Saccharomyces cerevisiae*, *Candida albicans* [49]. The inhibition zone values of methanol and ethanol extracts of *T. versicolor* collected from Turkey against *Escherichia coli*, *Klebsiella pneumoniae*, *Pseudomonas*

aeruginosa, *Bacillus megaterium*, *Staphylococcus aureus*, *Candida albicans*, *Trichophyton* sp. were reported to be 10.23-26.76 [36]. *T. versicolor* collected from Poland has been reported to be effective against *Aeromonas veronii*, *Bacillus cereus*, *Enterococcus faecalis*, *Enterococcus faecium*, *Escherichia coli*, *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, *Salmonella Typhimurium*, *Staphylococcus aureus*, *Staphylococcus epidermidis*, *Streptococcus agalactiae*, *Streptococcus dysgalactiae*, and *Streptococcus uberis* [37]. It has been reported that chloroform, water, ethyl acetate and ethyl alcohol extracts of *T. versicolor* collected from Turkey were effective against *Bacillus subtilis*, *Staphylococcus aureus*, *Enterococcus faecalis*, *Escherichia coli*, *Pseudomonas aeruginosa*, *Candida albicans* at different concentrations [50]. The activity of *T. versicolor* collected from India was determined against *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Klebsiella pneumoniae* and *Escherichia coli*. As a result of the study, it was reported that it significantly inhibited the growth of *S. aureus* [38]. *T. versicolor* collected from Ukraine has been reported to be effective against *Bacillus subtilis*, *Bacillus mycoides*, *Bacillus licheniformis*, *Rhodococcus rhodochrous*, *Leuconostoc mesenteroides*, *Micrococcus luteus*, *Staphylococcus aureus*, *Escherichia coli*, *Comamonas terrigena*, *Pseudomonas aeruginosa*, *Aspergillus niger*, *Saccharomyces cerevisiae* and *Candida albicans* [41].

Other Activities

It has been reported that the acetone extract of *T. versicolor* collected from Japan has a dose-dependent anti-inflammatory activity of 76.4% at 500 µg/mL concentration, 55.6% at 200 µg/mL concentration and 37.0% at 100 µg/mL concentration [34]. In a study conducted in Spain, it was reported that *T. versicolor* has a reducing effect on the effects of anticancer drugs [51]. *T. versicolor* collected from India has been reported to show effective anti-inflammatory activity using membrane stabilization (33.71-73.24%) and protein denaturation (23.11-74.56) assays [38]. In a study conducted in Bangladesh, the central nervous system (CNS) depressant activity of methanol and aqueous extracts of *T. versicolor* was evaluated. Within the scope of the study, CNS activity was evaluated with open field, hole cross, forced swimming, thiopental sodium-induced sleep duration, hole board and rotarod tests in Swiss albino mice. It was reported that the result of the study was that a significant decrease in movement was observed in open field and hole-cross tests for both extracts [39]. In a study conducted in Serbia, it was reported that the genotoxicity potential of water and ethanol extracts of *T. versicolor* increased with increasing concentration [40].

Conclusion

In addition to their nutritional properties, mushrooms are also known to exhibit many biological activities. *T. versicolor*

is one of the important natural fungi with a cosmopolitan distribution. In this study, the biological activities of *T. versicolor* reported in the literature were compiled. According to the data obtained, it has been observed that *T. versicolor* has antioxidant, anti-inflammatory, antimicrobial, cytotoxic, antiproliferative, anticancer and DNA-protective activities. In this context, it has been observed that *T. versicolor* has a significant potential due to its high biological activities and in this context, it can be an important natural source in pharmacological designs.

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