

Antimicrobial Effects of Ganoderma leucidum Extract on Microorganisms Causing Gastrointestinal Infections

Narges Yadollahi Movahed¹, Mohamad Dakhili¹, Asghar Yadollahi Movahed¹, Moteza Khodaparast², Davoud Esmaeili^{3*}

¹Department of Laboratory Science, Qom Branch, Islamic Azad University, Qom, Iran

²Clinical Cardiac Electrophysiology, School of Medicine Atherosclerosis Research Center, Baghiyyatollah University of Medical Sciences, Baqiyatallah University of Medical Sciences Tehran, Iran.

³Department of Microbiology and Applied Virology Research Center, Baqiyatallah University of Medical sciences, Tehran, Iran

*Corresponding Author

Davoud Esmaeili, Clinical Cardiac Electrophysiology, School of Medicine Atherosclerosis Research Center, Baghiyyatollah University of Medical Sciences, Baqiyatallah University of Medical Sciences Tehran, Iran.

Submitted: 16 Jan 2023; Accepted: 06 Feb 2023; Published: 20 Feb 2023

Citation: Movahed, N.Y., Dakhili, M., Movahed, A.Y., Khodaparast, M., Esmaeili, D. (2023). Antimicrobial Effects of Ganoderma leucidum Extract on Microorganisms Causing Gastrointestinal Infections. *Biomed Sci Clin Res*, 2(1), 124-127.

Abstract

Introduction & Objective

Several studies have demonstrated the antibacterial effect of the medicinal fungi extract, including the Ganoderma fungi. The aim of this study is to determine the antimicrobial and antioxidant properties of Ganoderma leucidum.

Methods

The antioxidant and antimicrobial effects of essential oil and Ganoderma leucidum studied against fungi some bacteria and compared with antibiotics. Chloroform extracts, hydroalcoholic methanol, ethyl acetate, and aqueous Ganoderma fungi are prepared. The MIC, MBC and were determined.

Results & Conclusion

Results indicated that the diameter of the inhibition zone was between 7- and 28.33-mm. E. coli was the most susceptible bacterial strain and Bacillus cereus was the most resistant bacterial strain. Activity of methanolic extracts is higher than other extracts.

According to the results of this study concentrations of methanolic, hydrochloric, ethyl acetate and hydroalcoholic extracts have the highest percentage of free radical inhibition, respectively. It can be concluded that various extracts of Ganoderma leucidum have an antibacterial effect against fungal infections.

Keywords: Ganoderma lucidum, Antibacterial, Antifungal, Antioxidant, Gastrointestinal Infection, Drug Resistance

Introduction

Given the increasing tendency of humans to treat natural materials, fungi can be a good source for this need [1]. One of the fungi which have been named as the most effective medicinal fungus due to its numerous therapeutic properties is Ganoderma Leucidum [2]. This Fungus is a world-class warhead mushroom found in red, brownish, yellow and light colors. [3, 4]. It contains 400 active substances, the most important of which are triterophenhydes, polysaccharides, sterols, fatty acids, proteins, pectins, and many other rare fungi [5, 6]. One of the most valuable medicinal properties of this fungus is the treatment of hepatitis, arthritis, neuropathy, insomnia, bronchitis, asthma, high cholesterol, and especially gastric cancer [7, 8].

The digestive system is one of the most vulnerable parts of the body in relation to pathogens [9-11]. The use of antibiotics to treat and prevent this bacterium not only creates drug resistance but also interferes with normal gastrointestinal flora and predisposes the body to various intestinal diseases [12, 13].

Materials and Methods

Essential oil extraction is carried out by distillation with water vapor simultaneously with a water solvent then extracted with the Clevenger system. Essential oil is extracted [14, 15]. Extraction was prepared by a Soxhlet apparatus [16-20].

Antifungal and antimicrobial effects of the extracts were investigated in two ways Disc Diffusion and MIC [21-25]. Antioxidant Effect Assessment was done by DPPH that is simple and fast and reduces the antioxidant capacity to DPPH radicals. During the increase in various antioxidant values, the DPPH color is gone and goes yellow. [26-28].

Statistical Analysis

In this paper, Excel software was used to plot the graphs and SPSS software was used to measure the statistical data. Each test is repeated 3 times.

Results & Discussion

Bacterial Susceptibility Test by Disc Diffusion Method

The microbial susceptibility to the fungal extracts was measured (Fig. 1). According to results, the diameter of the inhibition zone of bacteria was higher in aqueous extracts than other extracts except for *Staphylococcus aureus* and was effective on all microorganisms.

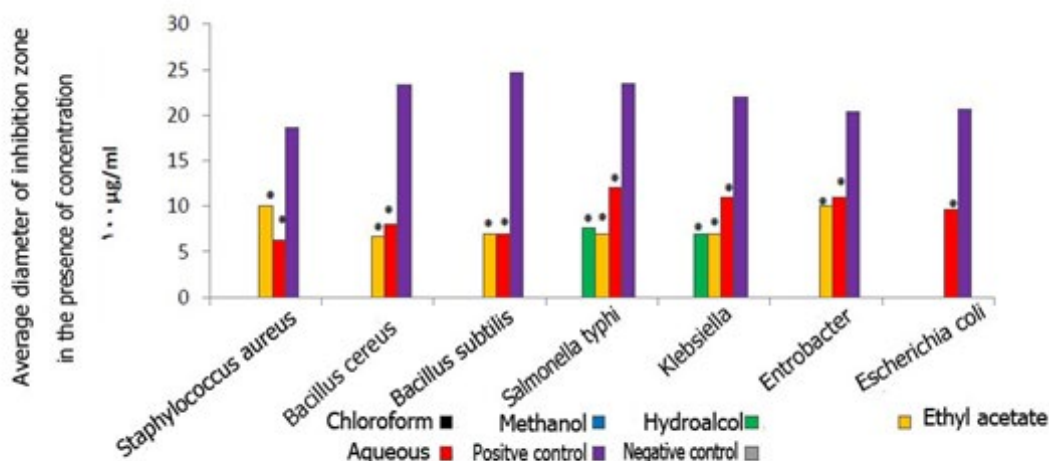


Figure 1: Average diameter of the inhibition zone of bacteria studied at a concentration of 100 mg/ml

The comparison of the solvent function for *H. pylori* comparison showed that the diameter of the bacterial growth inhibition zone only in aqueous and ethyl acetate extracts but other extracts have no antibacterial effect.

Antioxidant Activity

The absorption of different extracts of fungi and BHT was read by UV / Vis, and then the percentage of inhibition was calculated.

According to results this fungus has the highest percentage of free radical scavenging in concentrations equal to methanolic, aqueous, chloroform, ethyl acetate and hydroalcoholic extracts, respectively. Based on IC50, the antioxidant activity of the methanolic extract is higher than other extracts (Fig2).

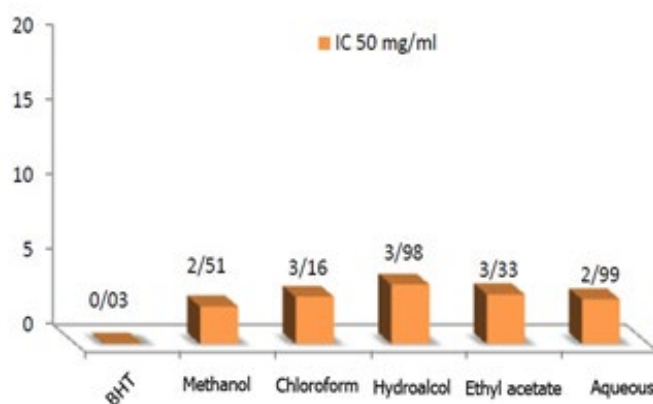


Figure 2: IC50 different extracts compared to BHT standard

The use of commercial antibiotics creates various problems, including possible poisoning e, drug retention in tissues and the emergence of antibiotic-resistant strains [29, 30]. In this study Ganoderma leucidum extract were studied on fungi and bacteria. The results showed that inhibitory effect increased in higher concentrations. The results of antibacterial activity of different extracts of Ganoderma leucidum with high concentration showed that all microorganisms were sensitive to the extracts and the diameter of the inhibition zone was between 7 and 28.33 mm. E. coli with 28.33 growth inhibition zone was the most susceptible and Bacillus cereus with the lowest diameter was the most resistant.

Phytochemical analysis of the Ganoderma leucidum and the study of the antimicrobial effects and the safety of the use of active ingredients can play a significant role in the use of this fungus in the control of gastrointestinal diseases [31-33].

Conclusion

In a general conclusion, it can be stated that various extracts of Ganoderma fungi have antibacterial and antifungal and antioxidant activity in the in vitro condition on gastrointestinal tract microbes.

Acknowledgement

The results described in this paper have been supported by the researcher and we would like to thank Baqiyatallah hospital. Ethics Committee Approval Not applicable

Conflict of Interest

None declared.

Author Contribution

D.E and N.Y.M and M.D participated in specimen collection and preservation as well as a review of the manuscript, N.Y.M, participated in data collection, specimen collection, bench work, results from analysis and drafting of the manuscript. M.D, M.D., A.Y.M and D.E designed the study, collected data, performed bench work, result from analysis, and drafted the manuscript. All authors have read and approved the manuscript.

Funding

This research was supported by researchers.

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