WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 8.453
Volume 13, Issue 22, 08-13. Research Article ISSN 2277–7105

ANTIMICROBIAL ACTIVITY OF CINNAMOMUM CAMPHORA LEAVES EXTRACT AGAINST HUMAN PATHOGENIC BACTERIA

Md. Mahamudul Hasan Bhuiyan[1], Kamrun Nahar Paulin[2], Md. Awlad Hossain Babu[3], Ayrin Akther Mili[4], Md. Wasif Iqbal[5] and Md. Abdul Mannan[6]*

[1]Lecturer, Rawshan Jahan Eastern Medical College & Hospital (Unani), Lakshmipur, Chittagong, Bangladesh.
[2]Professor, Rawshan Jahan Eastern Medical College & Hospital (Unani), Lakshmipur, Chittagong, Bangladesh.
[3]Department of Unani Medicine, Hamdard University Bangladesh, Hamdard City of Science, Education & Culture, Gazaria, Munshiganj, Dhaka, Bangladesh.
[4]Lecturer, Hakim Said Eastern Medical College & Hospital, Dhaka, Bangladesh.
[5]Executive Production, Srijan Unani Laboratory, Dhaka, Bangladesh.
[6]Assistant Professor, Department of Unani Medicine, Hamdard University Bangladesh, Hamdard City of Science, Education & Culture, Gazaria, Munshiganj, Dhaka, Bangladesh.

Article Received on
02 September 2024,
Revised on 22 October 2024,
Accepted on 12 Nov. 2024
DOI: 10.20959/wjpr202422-34604

***Corresponding Author**
Dr. Md. Abdul Mannan
Assistant Professor, Department of Unani Medicine, Hamdard University Bangladesh, Hamdard City of Science, Education & Culture, Gazaria, Munshiganj, Dhaka, Bangladesh.

ABSTRACT

A medicinal plant is a plant that has therapeutic properties and is used for the prevention, treatment, or alleviation of diseases or health conditions. These plants contain bioactive compounds that can provide health benefits, whether consumed, applied topically, or used in traditional remedies. Medicinal plants have been integral to various traditional healing systems and are increasingly studied for their potential in modern medicine. Microbial diseases occur when harmful organisms such as bacteria, viruses, fungi or parasites enter and multiply in the body. These diseases can affect many parts of the body and cause a variety of symptoms depending on the type of disease and the location of the disease. Most people in developing countries get their basic health care from plants or organic preparations. Many plants have been found to have antibacterial properties. *Cinnamomum camphora*, commonly known as the camphor tree, is known for its antibacterial properties, primarily due to the presence of camphor and other active ingredients in its volatile oil. *Cinnamomum camphora* leaf extract has antibacterial properties. Methanolic extracts of *Cinnamomum camphora* leaves suppressed the growth of harmful

microorganisms i.e., *Escherichia coli*, *Staphylococcus aureus*, and *Streptococcus pyogenes*. The result of this study revealed that the test disk containing 250µg, 500µg and 1000µg *Cinnamomum camphora* leaf extract showed 10 mm, 13 mm and 15 mm zones of inhibition against *Escherichia coli*; 8 mm, 11 mm and 13 mm zones of inhibition against *Staphylococcus aureus*; and 6 mm, 8 mm and 10 mm zones of inhibition against *Streptococcus pyogenes.* On the other hand, positive control 30 µg Amikacin containing standard antibiotic disk showed 14 mm, 12 mm and 10 mm zone of inhibition against *Escherichia coli*, *Staphylococcus aureus*, and *Streptococcus pyogenes.* This research concluded that *Cinnamomum camphora* leaf extract contains antimicrobial properties. The composition of *Cinnamomum camphora* leaves extract as a natural source for antibacterial medication development might be clarified by a thorough and comprehensive investigation.

KEYWORDS: Antimicrobial activity, Zone of inhibition, *Cinnamomum camphora.*

1. INTRODUCTION

Microscopic organisms that exist as single cells, multicellular animals, or clusters of cells are known as microorganisms or microbes. In spite of the fact that most microorganisms within the world are accommodating to life, a few can be exceptionally destructive.[1] Normal flora are helpful to the human body; these microorganisms colonize several sites on and in the human body, where they adapt to specific features of each appropriate place.[2] Microbial diseases are illnesses caused by pathogenic microorganisms, which include bacteria, viruses, fungi, and parasites. These diseases can affect various parts of the body and vary widely in severity and symptoms. Among the microbial diseases infectious diseases can transfer infected person to healthy person so that the severity is worse than other ailments.[3] Medicinal plant origin products have been used to treat a extend of human diseases since ancient times, and because of their distinctive and enormous chemical diversity, they have risen as a potential source of new therapeutic agents.[4] Several medicinal plants are recognized for their antimicrobial properties and have been used traditionally and in modern. Finding new treatment options is necessary because of the global rise in multidrug resistance in bacterial infections that are linked to both community and healthcare associated settings.[5] A member of the Lauraceae family, the camphor tree (*Cinnamomum camphora*) is native to South Korea, China, and India. It is now cultivated in many other places, including Australia and the Himalayas.[6] The camphor tree is large in size with light brown bark, dark green to yellowish foliage, and tiny white blossoms that are followed by tiny purple berries and grow

in tropical rain forests at various altitudes. The camphor tree has a particularly alluring camphoraceous odor.[7] The camphor has several chemical varieties, each with different essential oil compositions, and the leaf of *Cinnamomum camphora* contains camphor, as the main component along with cineol, linalool, eugenol, limonene, safrole, pcymene, nerolidol, borneol, camphene and some other components.[8] Topical home remedies containing camphor are used to treat a variety of symptoms. *Cinnamomum camphora* has a long history of use as an antibacterial, antipruritic, rubefacient, abortifacient, aphrodisiac, contraceptive, and lactation suppressant. The main ingredient in balms for the mitigation of fibrosis, neuralgia, and related disorders is camphor, which possesses anti-irritant, rubefacient, and mild analgesic properties.[9] In our study, the methanolic extract of *Cinnamomum camphora* leaf was used to observe the zone of inhibition against *Escherichia coli. Staphylococcus aureus* and *Streptococcus pyogenes* in Mueller-Hinton agar media.

2. MATERIALS AND METHODS

2.1. Plants extraction

The extraction was carried out as per procedure described by Marjhan and Mannan, 2024. The leaves of *Cinnamomum camphora* were taken from the medicinal plant garden of Hamdard University Bangladesh. After thoroughly cleaning with running tap water, the leaves were rinsed with distilled water and allowed to dry in the shade. To pass through a 100 mm sieve, dried leaves of *Cinnamomum camphora* were ground into a fine powder. To get a clear filtration, 100 g of the fine powder was soaked in 400 ml of methanol for 72 hours while being stirred. Then the mixture was filtered through two layers of muslin, centrifuged for 10 minutes at 9000 rpm, and then filtered once more through Whatman filter paper No. (1). Using water bath, the filtrate was evaporated and dried at the temperature of 45^{o}C. The yield of the extract was measured and subsequently stored in a small bottle in the refrigerator at 5°C.[10] The calculation of the percentage yield was performed using the formula: Extract yield % = R/S × 100, in which R signifies the weight of the extracted plant residues and S indicates the weight of the raw plant sample.[10]

2.2. Assessment of antibacterial activity

Pathogenic microorganisms, specifically *Escherichia coli, Staphylococcus aureus, and Streptococcus pyogenes*, were obtained from the diagnostic facilities of Hamdard General Hospital located in Gazaria, Munshigonj. Mueller-Hinton agar media and blank disk were

purchased from Tradesworth Limited & Technoworth Associates Limited, Dhaka, Bangladesh.

Initially, inoculum for each bacterial strain was generated through subculturing, utilizing an incubation temperature of 35°C for a duration of 24 hours, with Mueller-Hinton agar serving as the growth medium. Subsequently, bacterial growth was collected using 5 ml of sterile saline solution; the absorbance was calibrated to 580 nm using a spectrophotometer, and further diluted to achieve a viable cell concentration of 10^7 CFU/ml. To evaluate the antibacterial properties of the leaf extract from *Cinnamomum camphora*, the disc diffusion method was employed in this study. A final concentration of 10 mg per disc was achieved by re-dissolving 50 mg of the plant extract residues in 2.5 ml of methanol, which was then sterilized using a Millipore filter (0.22 mm) and applied to sterile blank discs. To prepare a medium with a concentration of 10^5 CFU/ml, 10 ml of Mueller-Hinton agar was combined with 15 ml of a previously inoculated medium containing a bacterial suspension (100 ml of medium/1 ml of 10^7 CFU) and placed in sterile petri dishes. The sterile blank discs, infused with the plant extract at a concentration of 10 mg/ml, were positioned on top of the Mueller-Hinton agar plates. A blank disc containing 30 µg of Amikacin served as a positive control. The plates were stored at 5°C for 2 hours to allow for the diffusion of the plant extract, followed by incubation at 35°C for 24 hours. The presence of a zone of inhibition was measured using a Vernier caliper, documented, and interpreted as an indication of antibacterial activity.[10]

3. RESULT

Table 3.1: Results of the zone of inhibition produced by the methanolic extract of *Cinnamomum camphora* leaf extracts at concentrations of 250 µg, 500 µg, and 1000 µg on paper discs, along with a 30 µg Amikacin antibiotic disc, against Escherichia coli, Staphylococcus Aureus and Streptococcus pyogenes.

Sample with Concentration	Zone of inhibition *(mm)*		
	E. coli	***Staphylococcus aureus***	***Streptococcus pyogenes***
MECC 250µg	10 mm	8 mm	6 mm
MECC 500µg	13 mm	11 mm	8 mm
MECC 1000µg	15 mm	13 mm	10 mm
Amikacin 30µg	14 mm	12 mm	10 mm
Note: MECC – Methanolic Extract of *Cinnamomum camphora*			

4. DISCUSSION

Antibacterial activity of *Cinnamomum camphora* against food related bacteria was reported by Zhou et al., 2017. *Cinnamomum camphora* has antibacterial activities against five food-related bacteria (*Escherichia coli, Pseudomonas aeruginosa, Staphylococcus aureus, Bacillus subtilis, Salmonella enterica*), which were detected using both broth dilution method and disk diffusion method.[11] The results of this research, as shown in Table 3.1, revealed that a disk containing 250µg of methanolic extract from *Cinnamomum camphora* leaves produced 10 mm zone of inhibition against Escherichia coli, 8 mm zone of inhibition against Staphylococcus aureus, and 6 mm zone of inhibition against Streptococcus pyogenes. A disk infused with 500µg of methanolic extract derived from the leaves of *Cinnamomum camphora* exhibited 13 mm zone of inhibition against *Escherichia coli*, 11 mm zone of inhibition against Staphylococcus aureus, and 8 mm zone of inhibition against Streptococcus pyogenes. A disk containing 1000µg of methanolic extract obtained from the leaves of *Cinnamomum camphora* demonstrated 15 mm zone of inhibition against *Escherichia coli,* 13 mm zone of inhibition against Staphylococcus aureus, and 10 mm zone of inhibition against *Streptococcus pyogenes*. A standard disk containing 30µg of amikacin resulted in 14 mm zone of inhibition against *Escherichia coli*, 12 mm zone of inhibition against *Staphylococcus aureus*, and 10 mm zone of inhibition against *Streptococcus pyogenes*. Methanolic extracts of *Cinnamomum camphora* leaves were used for the antimicrobial activities assessed by disk diffusion method, showing good zones of inhibition against *Escherichia coli, Staphylococcus aureus, and Streptococcus pyogenes.*

5. CONCLUSION

The experiment's findings indicate that methanolic extract of *Cinnamomum camphora* leaf has antibacterial properties against harmful bacteria. Furthermore, *Cinnamomum camphora* is a useful source of natural antibacterial material.

6. Conflicts of interests

The authors do not disclose any conflicting interests.

7. ACKNOWLEDGMENT

The authors acknowledge Muhammad Yeasin Arafat's assistance with the experiments.

8. REFERENCES

1. Maraz KM, Khan RA. An overview on impact and application of microorganisms on human health, medicine and environment. GSC Biological and Pharmaceutical Sciences, 2021; 16(1): 089-104.
2. Ogunrinola GA, Oyewale JO, Oshamika OO, Olasehinde GI. The human microbiome and its impacts on health. International journal of microbiology, 2020; 12: 2020.
3. Australian Institute of Health and Welfare, 2022. Infectious and communicable diseases. Retrieved from https://www.aihw.gov.au/reports/australias-health/infectious-and-communicable-diseases.
4. Amedei, Amedeo, Niccolai E. "Plant and Marine Sources: Biological Activity of Natural Products and Therapeutic Use." Natural products analysis: instrumentation, methods, and applications, 2014; 43-113.
5. Marasini, Bishnu P., et al. "Evaluation of antibacterial activity of some traditionally used medicinal plants against human pathogenic bacteria." BioMed research international, 2015; (2015).
6. Lee S-H, Kim D-S, Park S-H, Park H. Phytochemistry and Applications of *Cinnamomum camphora* Essential Oils. Molecules, 2022; 27(9): 2695.
7. Malabadi, Ravindra B., et al. "Camphor tree, *Cinnamomum camphora* (L.); Ethnobotany and pharmacological updates." Biomedicine, 2021; 41, 2: 181-184.
8. Hamidpour, Rafie, et al. "Camphor (*Cinnamomum camphora*), a traditional remedy with the history of treating several diseases." Int. J. Case Rep. Images, 2013; 4, 2: 86-89.
9. Malabadi, Ravindra B., et al. "An age-old botanical weapon for herbal therapy: Camphor tree, *Cinnamomum camphora*." Int. J. Innov. Sci. Res, 2021; 3: 1518-1523.
10. Marjhan N and Mannan MA. Antibacterial activity of Echinacea pallida against some human pathogenic bacteria. International Journal of Unani and Integrative Medicine, 2024; 8(1): 100-102.
11. Zhou H, Ren J, Li Z. Antibacterial activity and mechanism of pinoresinol from *Cinnamomum Camphora* leaves against food-related bacteria. Food Control, 2017; 1, 79: 192-9.