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INVESTIGATING THE ANTIMICROBIAL POTENTIAL OF SELECTED MEDICINAL PLANTS IN AROUND VEPPANTHATTAI TALUK PERAMBALUR DISTRICT TAMILNADU

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ABSTRACT: The significance of medicinal plants in human healthcare cannot be overstated, with many village communities relying on folk medicine for their wellness needs. In recent years, there has been a shift towards analyzing the active compounds in these plants and conserving them for future generations. In this study, we selected three medicinally important plants - *Coleus amboinicus, Phyla nodiflora,* and *Vitex negundo* - for antimicrobial analysis. We collected leaves from these plants and conducted experiments to investigate their antimicrobial properties. Our results are discussed in the context of existing literature, highlighting the potential of these plants in combating microbial infections.

KEY WORDS: Antibacterial activity, Antifungal activity, Antiviral activity, *Escherichia coli*, *Staphylococcus aureus*, *Candida albicans* etc.

1. INTRODUCTION

India is renowned for its vast array of medicinal plants, which have significantly contributed to the development of ancient Indian systems of medicine, as well as local remedies among tribal communities. Our country is a treasure trove of genetic diversity in medicinal plants (Williams, 1996). In recent years, these plants have garnered intense attention for conservation and validation of their traditional uses through pharmacological studies (Locher *et al.*, 1995; Jaiger *et al.*, 1996). With the growing acceptance of traditional medicine as a complementary healthcare option, screening medicinal plants for active compounds has become crucial. Plant-based traditional medicine has played a vital role in the healthcare systems of many countries, including India and China (Sudhersan, 1998). Notably, herbal medicine remains the primary healthcare choice for approximately 75-80% of the global population.

Medicinal plants are a treasure trove of alkaloids and phytochemicals, which have been effectively utilized to treat a wide range of ailments. These bioactive compounds are present in various plant organs, including roots, stems, buds, leaves, flowers, and fruits, and play a crucial role in the plant's physiological activities. The phytochemicals synthesized by these plants have been harnessed in herbal and homeopathic medicines to cure diseases. In recent years, there has been a resurgence of interest in traditional methods of healthcare, with many people opting for natural remedies to treat common ailments (Mahajan *et al.*, 1996). This global trend reflects a growing recognition of the validity of traditional claims regarding the efficacy of natural products in healthcare. Furthermore, the increasing resistance of microorganisms to conventional antibiotics has prompted researchers to explore the antimicrobial properties of medicinal plants, leading to the investigation of their potential as alternative therapeutic agents.

Coleus has been reported to exhibit hypoglycemic properties, which may necessitate caution in individuals receiving pharmacological treatment for diabetes. Patients taking oral hypoglycemic agents or insulin therapy should be subject to close monitoring by their healthcare provider when using coleus, as additive hypoglycemic effects may occur. Appropriate dosing adjustments may be required to mitigate the risk of hypoglycemia and ensure optimal glycemic control.

Medicinal plants, also called medicinal herbs, have been discovered and used in traditional medicine practices since prehistoric times. Plants synthesize hundreds of chemical compounds for various functions, including defense and protection against insects, fungi, diseases, and herbivorous mammals (Gershenzon, 2022). Medicinal plants are used with the intention of maintaining health, to be administered for a specific condition, or both, whether in modern medicine or in traditional medicine. The Food and Agriculture Organization estimated in 2002 that over 50,000 medicinal plants are used across the world.

Medicinal plants are considered a repository of numerous types of bioactive compounds possessing varied therapeutic properties. The vast array of therapeutic effects associated with medicinal plants includes anti-inflammatory, antiviral, antitumor, antimalarial, and analgesic properties.

2. MATERIALS AND METHODS

2.1.Plant Collection and Preparation: Fresh plant samples were collected from the surroundings of Veppanthattai Taluk in Perambalur District. The plants were shade-dried to preserve their natural properties. The species used in this study were authenticated and identified as *Coleus amboinicus, Phyla nodiflora,* and *Vitex negundo*. For further investigation, fresh leaves and roots of these plants were collected, shade-dried at room temperature, and powdered.

2.2.Extraction and Antibacterial Assay: A Soxhlet apparatus was used to extract antimicrobial compounds from the leaves of *Coleus amboinicus, Phyla nodiflora,* and *Vitex negundo*. The dried and powdered plant leaves (20g) were extracted separately with hexane, chloroform, and alcohol. The resulting extracts were concentrated by evaporation at room temperature and used for antibacterial activity assessment.

2.3.Bacterial Cultures and Inoculum Preparation: Bacterial cultures *(B. cereus, B. subtilis, S. aureus, Shigella flexneri,* and *Salmonella Paratyphi A)* were obtained from MTCC, Chandigarh, and grown in Muller-Hinton broth medium. The inoculum was prepared by adjusting the bacterial cultures to a concentration of 10^{-8} cells/ml.

2.4.Antibacterial Assay: The antibacterial activity of the plant extracts was evaluated using the agar well diffusion method. Muller-Hinton agar medium was poured into petri dishes, and the test bacterial cultures were inoculated into the medium at a temperature of 40-42°C. The plant extracts (100 µl) were added to wells punctured in the culture medium, and the plates were incubated at 37°C for 24 hours. Antibacterial activity was assessed by measuring the inhibition zone diameters.

3. RESULT

In this study, three medicinally important plant species - *Coleus amboinicus, Phyla nodiflora,* and *Vitex negundo* were selected to investigate the antibacterial potential of their secondary metabolites. The leaf extracts of these plants, obtained using hexane, chloroform, and alcohol, were evaluated for their antibacterial activity against a panel of bacteria, including *Bacillus cereus, Bacillus subtilis, Staphylococcus aureus, Shigella flexneri,* and *Salmonella Paratyphi A*. The results showed that the extracts exhibited significant antibacterial activity, highlighting the potential of these plant species as a source of natural antimicrobial agents

3.1.Antibacterial Activity: The antibacterial effects of various extracts from the three test plants on pathogens are presented in Tables 1, 2, and 3. The results demonstrate that the plant extracts exhibited selective inhibition of bacterial growth. Notably, the leaf extracts of *Coleus amboinicus* and *Vitex negundo* showed relatively higher zones of inhibition, followed by *Phyla nodiflora*. This suggests that the extracts of *Coleus amboinicus* and *Vitex negundo* possess more potent antibacterial properties compared to *Phyla nodiflora.*

Table 1: Effect of hexane, chloroform and alcohol extract leaf samples of *Coleus amboinicus* on pathogens

Name of the pathogens	Control	Hexane	Chloroform	Alcohol
Bacillus cereus	--	--	--	8
B. subtilis	--	12	--	9

S.aureus	--	10	11	--
Shigella flexneri	--	--	7	8
Salmonella P.typhi A	--	12	10	--

Tetracycline used as Standard (30 µg/disc)
Zones Measure in Millimeter (mm)

Table 2: Effect of hexane, chloroform and alcohol extract leaf samples of *Phyla nodiflora* on pathogens

Name of the pathogens	Control	Hexane	Chloroform	Alcohol
Bacillus cereus	--	10	10	13
B. subtilis	--	9	13	10
S.aureus	--	6	10	9
Shigella flexneri	--	10	14	10
Salmonella P.typhi A	--	9	15	8

Tetracycline used as Standard (30 µg/disc)
Zones Measure in Millimeter (mm)

Table 3: Effect of hexane, chloroform and alcohol extract leaf samples of *Vitex negundo* on pathogens

Name of the pathogens	Control	Hexane	Chloroform	Alcohol
Bacillus cereus	--	7	5	7
B. subtilis	--	8	7	9
S.aureus	--	12	9	7
Shigella flexneri	--	9	-	9
Salmonella P.typhi A	--	7	8	11

Tetracycline used as Standard (30 µg/disc)
Zones Measure in Millimeter (mm)

4. DISCUSSION

In this study, we screened three medicinal plant species - *Coleus amboinicus, Phyla nodiflora,* and *Vitex negundo* for the presence of bioactive compounds with potential therapeutic properties. Our results showed that the choice of extraction solvent and method significantly impacted the antimicrobial activity of these compounds. Additionally, environmental and climatic factors also influenced the degree of antimicrobial activity. Medicinal plants are rich in alkaloids and phytochemicals, which are effective in treating various ailments. These bioactive compounds are present in all plant organs, including roots, stems, buds, leaves, flowers, and fruits, and play a crucial role in the plant's physiological activities. Phytochemicals are used in herbal and homeopathic medicines to cure diseases. With the growing popularity of traditional medicine, many people now prefer to use natural remedies to treat common ailments

While many substances exhibit antimicrobial properties, only a select few have potential as therapeutic agents due to the sensitivity of mammalian cells to chemical inhibition (Sivakumar and Alagesaboopathi, 2006). Furthermore, drugs derived from medicinal plants require rigorous toxicity testing, as crude products often contain compounds with adverse effects (Ramdass et al., 2006). Therefore, herbal drugs must undergo extensive pharmacological, toxicological, and clinical testing to ensure safety and efficacy. The ethnobotanical approach involves searching for molecular diversity by testing a wide range of plant-derived molecules using various assays, as emphasized by Muhammad and Muhammad (2005).

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