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PHYTOCHEMICAL PROFILING AND DETERMINING THE ANTI OXIDANT AND ANTI FUNGAL INSIGHTS OF *ROSMARINUS OFFICINALIS*

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ABSTRACT

Traditional medicine has long been known for the healing properties of Rosemary (*Rosmarinus officinalis*), which researchers are increasingly interested in. This review examines rosemary's medicinal profile, phytochemical composition, and pharmacological properties, with a focus on its antioxidant and antimicrobial effects. An extensive analysis is done on rosemary's bioactive compounds, such as flavonoids, phenolic acids, and essential oils, with a focus on their antibacterial, anti-inflammatory, and antioxidant properties. This article combines current research to provide a better understanding of rosemary's health benefits and its potential use in disease prevention and treatment. Further studies are necessary to establish the safety profiles and clinical efficacy of rosemary, which will enable its integration into modern medicine.

KEYWORDS: *Rosmarinus officinalis*, phytochemical composition, antioxidant activity, antimicrobial activity, bioactive compounds, pharmacological activities.

INTRODUCTION

Rosemary (Rosmarinus officinalis L.) is a prominent herb recognized for its culinary and therapeutic attributes. Originating from the Mediterranean region, this fragrant plant is abundant in bioactive constituents, such as essential oils, flavonoids, and phenolic acids, which are integral to its health-promoting effects. Importantly, rosemary demonstrates significant antioxidant and antimicrobial properties, rendering it a valuable asset for food preservation and overall wellness. As the demand for natural products continues to grow, it is crucial to comprehend the phytochemical composition and bioactivity of rosemary. This review seeks to consolidate the existing knowledge regarding the advantageous properties of rosemary, emphasizing its potential uses in both dietary and medicinal applications.

Rosmarinus officinalis

Rosemary (Rosmarinus officinalis L.), an aromatic herb indigenous to the Mediterranean region, is renowned not only for its culinary applications but also for its rich phytochemical profile and potential health advantages. This perennial shrub is abundant in essential oils, flavonoids, phenolic acids, and various bioactive substances that contribute to its antioxidant and antimicrobial effects. As interest in natural health products continues to rise, rosemary has attracted considerable attention in both traditional medicine and contemporary pharmacological studies.

The phytochemical analysis of rosemary reveals a diverse array of compounds, such as rosmarinic acid, carnosic acid, and numerous terpenes, which demonstrate significant antioxidant properties. These compounds play a crucial role in neutralizing free radicals, thus reducing oxidative stress and its related health concerns, including chronic illnesses and inflammation. Additionally, the antimicrobial properties of rosemary have been documented against various pathogens, including bacteria and fungi, indicating its potential as a natural preservative and therapeutic agent.

AIM AND OBJECTIVES

The aim of the present study is to profile the phytoconstituents, anti microbial and anti oxidant activities of *Rosmarinus officinalis.*

MATERIALS AND METHODS

Plant material

Rosemary plant leaf was collected from local markets of Kerala, shadow dried and powdered.

Preparation of ethanol extract

5g of plant powder was dissolved in 50ml of ethanol and shaken and kept in dark room for 48 hours. The extract was filtered through Whatman NO.1 filter paper and the extract was collected.

Preparation of methanol extract

5g of plant powder was dissolved in 50ml of methanol and kept for 48 hours. The extract was filtered through Whatman NO.1 filter paper and the extract was collected.

Preparation of aqueous extract

5g of plant powder was dissolved in 50ml of water and shaken and kept in dark room for 48 hours. The extract was filtered through Whatman NO.1 filter paper and the extract was collected.

Phytochemical screening

Antioxidant activity

To 0.5ml of homogenate sample was taken, 1ml of TCA.0.5ml of water was add all the test tubes and 0.1ml of supernant was taken,0.2ml of DTC reagent was added and incubated at 37°c for 3hours. Then 1.5 ml of sulphuric acid for each test tube was added, mixed well and the solutions were allowed to incubate the room temperature for 30minutes. The colour developed and measured at 520nm in a spectrometer.

Diphenyl picrylhydrazyl (DPPH) radical scavenging assay

DPPH react with antioxidants to form diphenyl-picryl hydrazine. The quantity of discoloration from purple to yellow color was measured at 518nm, which is an assess of the scavenging potential of Rosmarinus officinalis extracts. 0.4 mm of ethanol solution of DPPH was added with 20 µg of different solvent extracts of different concentrations ranging from 20µg to 100µg/ml. The mixture was shaken vigorously and allowed to stand at room temperature for 30min. Ethanol served as blank. DPPH in ethanol without the leaf extracts served as positive control. Standard used as ascorbic acid and an experiment was done in triplicate. Then, absorbance was measured at 518nm using a spectrophotometer (UV-VIS Shimadzu). The higher free radical potential indicates the lesser absorbance of the reaction mixture. The percent DPPH scavenging effect was calculated using the following equation:

DPPH scavenging effect (%) or Percent inhibition = A0-A1/A0×100.

Fourier Transform Infrared Spectroscopy (FTIR) is a widely used analytical technique for identifying chemical compounds and studying molecular structures based on how they interact with infrared (IR) light. Below is an overview of the principle, procedure, and how compounds are identified using FTIR:

Identification of compounds

The FTIR spectrum contains peaks that correspond to different vibrational modes of the bonds within a molecule. By analyzing these peaks, you can identify the functional groups and overall structure of the compound.

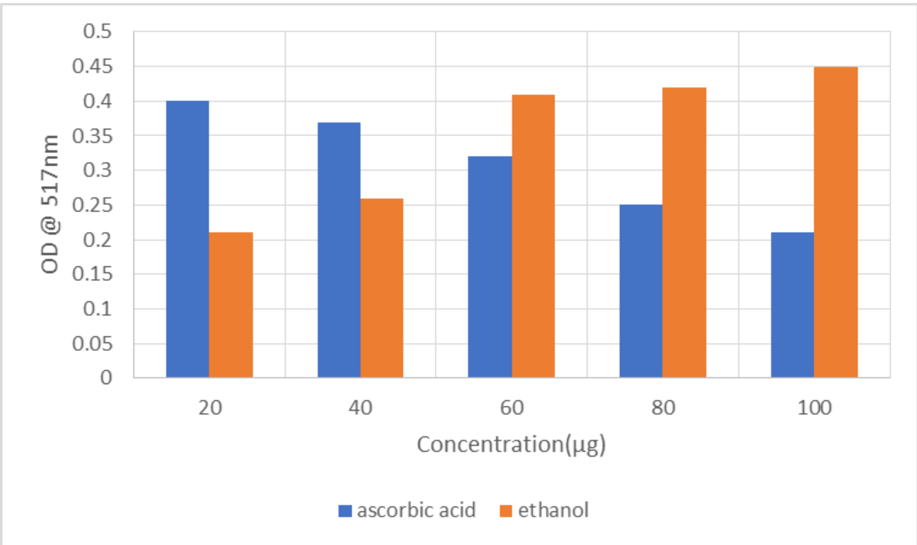
RESULT AND DISCUSSION

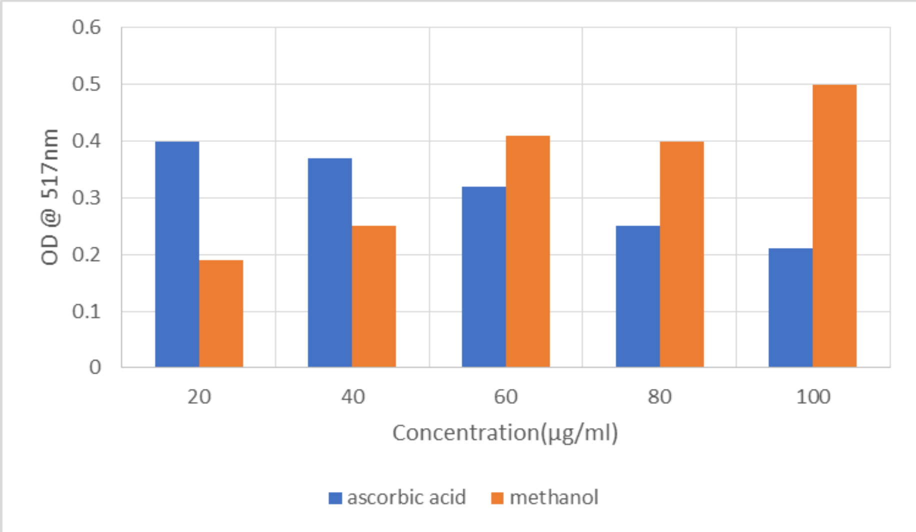
Phytochemical Screening of *Rosmarinus Officinalis*

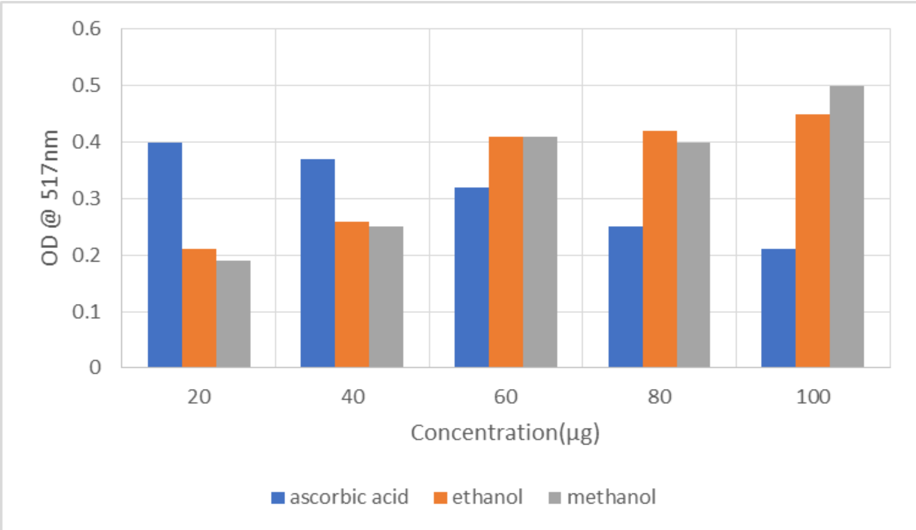
The phytochemical analysis of rosemary extracts revealed the presence of bioactive compounds, confirming its medicinal potential. Ethanolic, methanolic, and water extracts contained alkaloids, flavonoids, phenols, tannins, glycosides, and carbohydrates. Terpenoids were detected in ethanolic and water extracts.

Antioxidant Activity

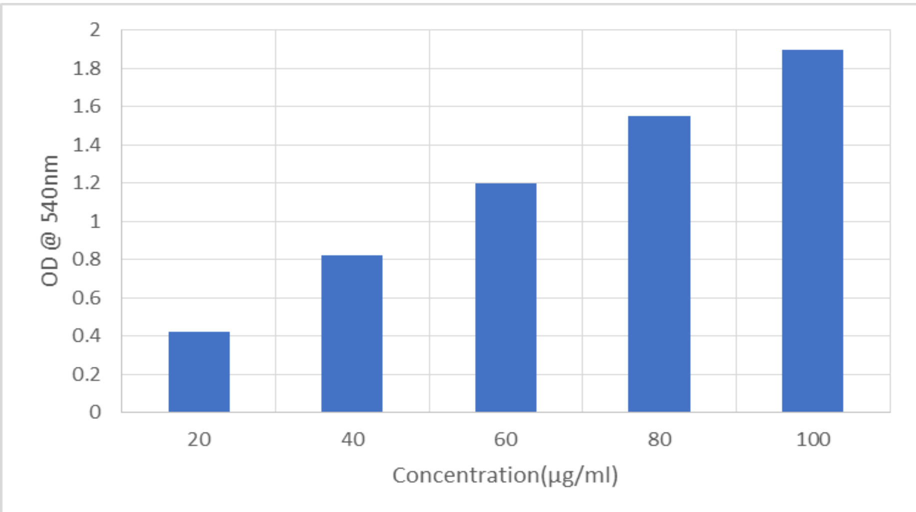
Rosemary extracts exhibited potent antioxidant activity, with methanolic extract showing slightly higher activity (OD 0.50) than ethanolic extract (OD 0.45) at 100 µg/mL. Both extracts surpassed ascorbic acid's activity at concentrations ≥60 µg/mL, indicating strong free radical scavenging potential.







Antioxidant Activity of Vitamin C



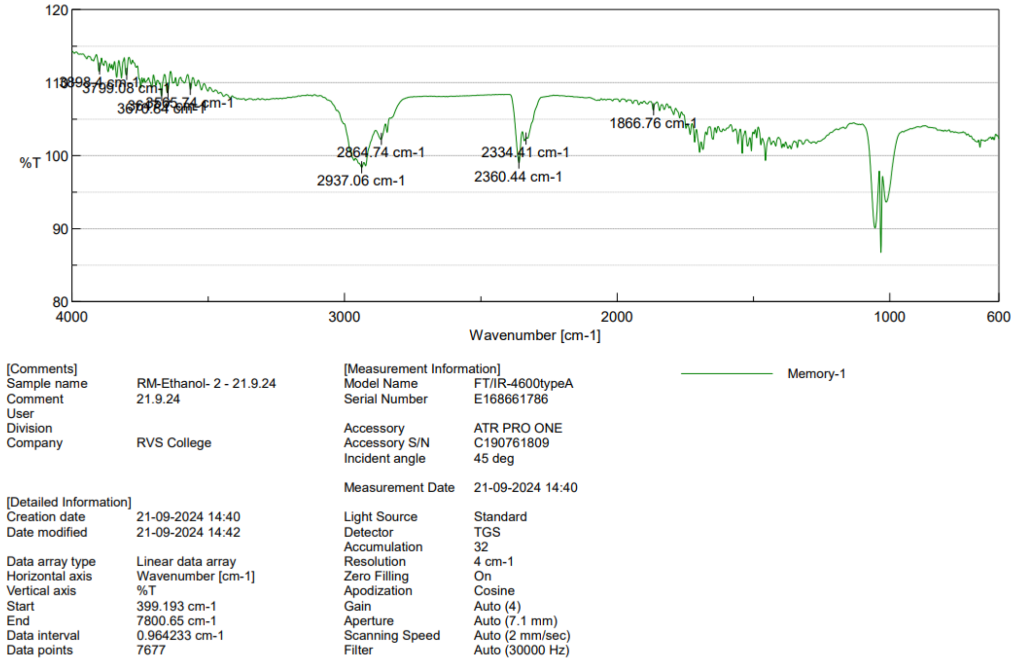
Vitamin C's antioxidant activity increased dose-dependently. Rosemary extracts demonstrated significant antioxidant activity, surpassing Vitamin C's activity at ≤ 80 µg/mL. The ethanolic extract showed slightly higher activity (OD 1.55) than the methanolic extract (OD 1.20).

16 mg of ascorbic acid had been found in ethanolic extract

12 mg of ascorbic acid had been found in methanolic extract

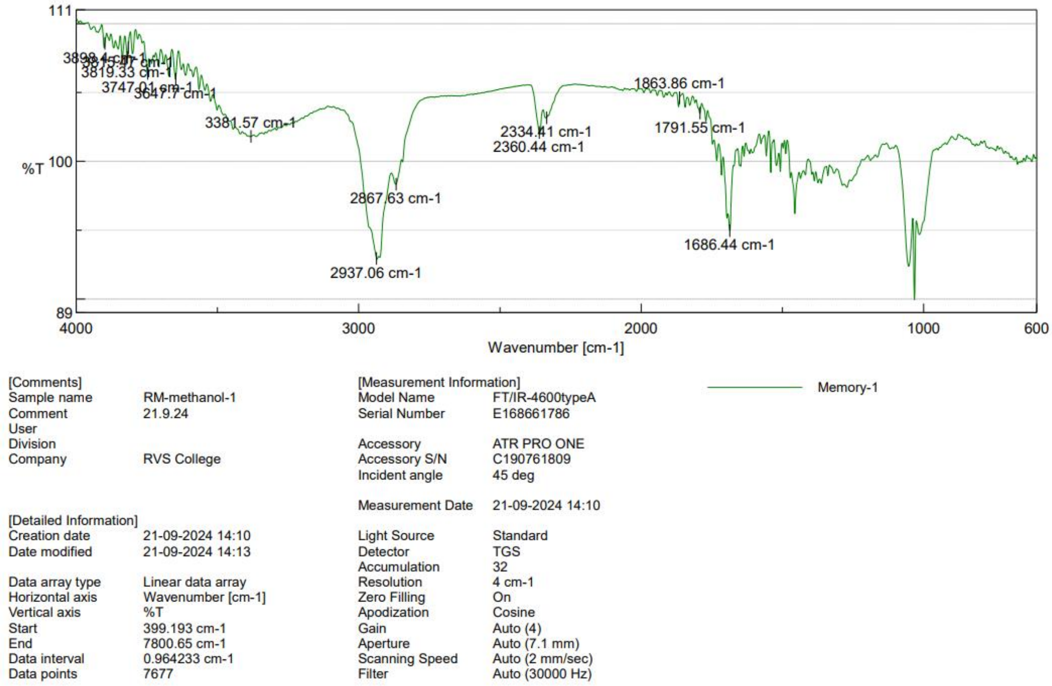
Fourier Trans Form Infrared (FTIR) spectroscopy of *rosmarinus officinalis*

Ethanolic extract

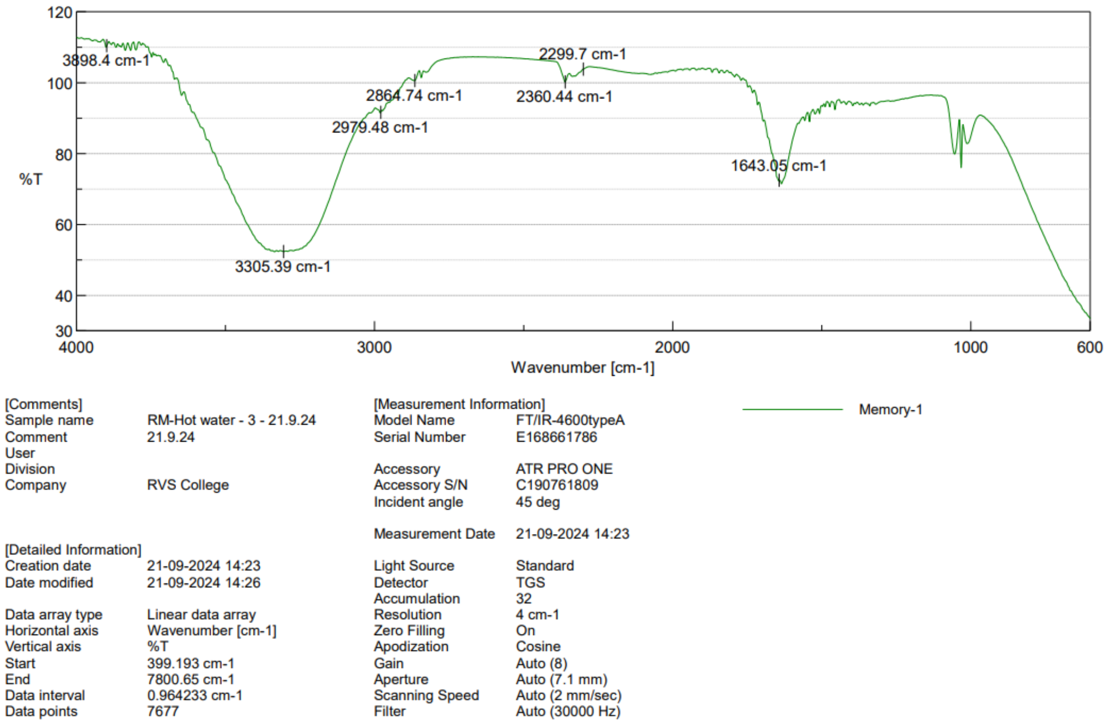


The FTIR spectrum of rosemary ethanol extract revealed characteristic absorption peaks, indicating the presence of various functional groups.

Methanolic extract

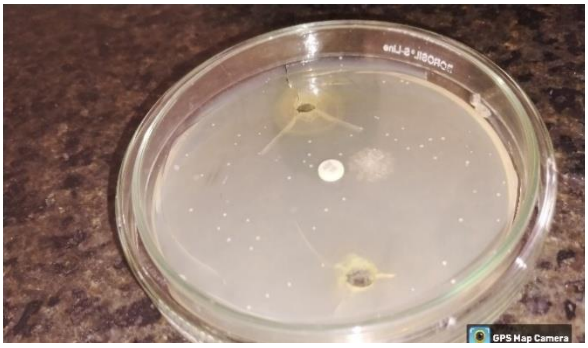


Water extract

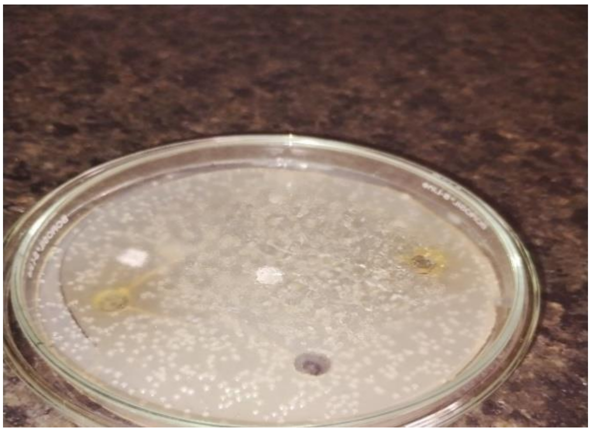


ANTIMICROBIAL ACTIVITY

Antibacterial activity of rosemary against Staphylococcus aureus



Antibacterial activity of rosemary against Escherichia coli



The antibacterial activity of Rosemary extracts was evaluated against two bacterial strains, Staphylococcus aureus and Escherichia coli, using the disk diffusion method. Amoxicillin and Ampicillin were used as standard antibiotics for comparison.

The Rosemary extracts demonstrated varying degrees of antibacterial activity against both bacterial strains. Against Staphylococcus aureus, Ethanolic and Methanolic extracts showed good antibacterial activity, while Amoxicillin and Ampicillin showed strong antibacterial activity.

Against Escherichia coli, Ethanolic and Methanolic extracts showed moderate antibacterial activity, while Amoxicillin and Ampicillin showed strong antibacterial activity.

SUMMARY AND CONCLUSION

Rosmarinus officinalis is a medicinal plant with potential therapeutic properties due to its condary metabolites, including flavonoids, alkaloids, and phenolic acids. In this study, the secondary metabolites of Rosmarinus officinalis, and the free radical scavenging activity was evaluated using the 11-diphenyl-2-picrylhydrazyl (DPPH) assay.

The FTIR spectrum indicates the presence of hydroxyl (O-H) groups, alkyl (C-H) groups, and C-O bonds, suggesting the compound is a mixture of hydroxyl, alkyl, and possibly oxygenated functional groups like ethers or esters. This composition is typical of plant extracts or organic substances containing alcohol or alkane functionalities.

The results of this study suggest that *Rosmarinus officinalis* has significant potential as a source of natural antioxidants and therapeutic agents. While the DPPH assay is an effective method for evaluating their free radical scavenging activity.

In conclusion, this study highlights the importance of analyzing the secondary metabolites and antioxidant activity of medicinal plants such as *Rosmarinus officinalis*, which can help to identify new sources of natural compounds with potential therapeutic properties. The findings of this study provide a foundation for future research on the pharmacological and medicinal properties of *Rosmarinus officinalis* and its secondary metabolites.

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