COMPARATIVE ANALYSIS OF ANTIBACTERIAL ACTIVITY OF *Psidium guajava* and *Murraya koenigii*

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***Abstract*: Using the agar-well diffusion method with different concentrations (50µl, 75µl, 100µl, 125µl) and minimum inhibitory concentration and minimum bactericidal concentration methods, the antibacterial activity of the acetone leaf extracts of *Psidium guajava and Murraya koenigii* against medically important pathogens such as *Escherichia coli, Staphylococcus aureus, Bacillus subtilis, Enterobacter.* The acetone leaf extract of *Psidium guajava* was found to be more effective against selected pathogens than the acetone leaf extract of *Murraya koenigii,* according to the finding. Therefore, leaf extracts from these plants can be chosen for further research to see if they have therapeutic potential.**

***Keywords*: *Psidium guajava, Murraya koenigii,* Agar-well diffusion method, Antibacterial activity.**

I. INTRODUCTION

Anti-diarrheal, hepatoprotective, hypoglycemic, lipid lowering, antibacterial, and antioxidant activities have been reported for *Psidium guajava L*. *Psidium guajava* is a tropical and subtropical food crop and medicinal plant that is widely consumed as food and used in folk medicine around the world. This aims to provide a comprehensive list of chemical constituents, as well as pharmacological and clinical applications. Various pharmacological experiments have been carried out in a variety of in vitro and in vivo models. Extracts and metabolites of this plant, particularly those from leaves and fruits possess useful pharmacological activities (Rosa Martha PérezGutiérrez *et al.,* 2008).

Murraya koenigii belongs to the Rutaceae family and is a tropical to subtropical tree native to Asia. (which includes rue, citrus, and satinwood). *M. koenigii* is also known as sweet neem, despite the fact that it belongs to a different family than neem, Azadirachta indica, which is in the Meliaceae family. Its leaves, also known as curry leaves, are used in a variety of Indian dishes. Murraya is a generic name that comes from Johann Andreas Murray (1740-1791), who studied botany under Carl Linnaeus and went on to become a professor of medicine at the University of Gottingen, Germany, with a special interest in medicinal plants. *M. koenigii* is a plant that has a number of important uses in Eastern Asian traditional medicine. *M. koenigii* is used as a stimulant, antidysentric, and for the management of diabetes mellitus, according to ethanol medicine. The plant is prized for its leaves, which are used in Indian cuisine to stimulate appetite and digestion. Tonic, stomachic, and carminative properties are found in the leaves, root, and bark.The leaves are used to prevent vomiting and treat dysentery.The leaves' steam distillate can be used as a stomachic, purgative, febrifuge, and antianemic agent. Externally, the leaves are used to treat bruises and eruptions. Piles, body heat, thirst, inflammation, and itching are all treated with the bitter, acrid, cooling, anti-helminthic, analgesic leaves and roots. It is also beneficial in the treatment of leucoderma and blood disorders. Kidney pain can be relieved by drinking the root juice. In Indo-China, fruits are also considered astringent. Externally, crushed leaves are used to treat skin eruptions and burns. Externally applied leaf pastes are used to treat poisonous animal bites. Tonic and stomachic properties are attributed to the plant. The fruits are well-known for their high nutritional value as well as their numerous medicinal properties. (Harish K Handral and colleagues, 2012)

Therefore in this work we have attempted to find the antibacterial activity of *Psidium guajava* and *Murraya koenigii* and compare them using agar well diffusion method, minimum inhibitory concentration and minimumbactericidal concentration.

II. MATERIALS AND METHODS

COLLECTION OF PLANT MATERIALS

The leaves were collected from the garden of Avanz bio training and research institute, Tambaram, Chennai, Tamil Nadu.

PROCESSING OF PLANT MATERIALS

Leaves of *Psidium guajava* and *Murraya koenigii* were plucked and collected from respective plants, washed thoroughly under distilled water. The leaves were then cut into smaller pieces to speed up the drying process. The cleaned leaves were dried in the shade for 2-3 days.The dried plant materials were crushed into fine powder with the help of mixer grinder. Finally, the fine powder was kept at room temperature in an airtight container.

PREPARATION OF ACETONE PLANT EXTRACTS

300 ml of acetone was measured and 16 gm of *Psidium guajava* plant extract was weighed separately and added in round bottom flask and thimble respectively. The Soxhlet was carried out for 3 cycles. The same procedure was carried out for *Murraya koenigii* plant extract. After running the Soxhlet apparatus to obtain both the extracts, they were subjected to Agar well diffusion method.

PROCUREMENT OF BACTERIA

Bacterial strains used for antibacterial studies were procured from Avanz bio training and research institute, Tambaram, Chennai, Tamil Nadu. Pathogens used for the study were *Escherichia coli, Bacillus subtilis, Staphylococcus aureus* and *Enterobacter soli.*

REVIVAL OF PATHOGEN

The pathogens were resurrected in nutrient broth and stored at 4°C in nutrient agar slants.

AGAR WELL DIFFUSION METHOD

The antibacterial activity of leaf extracts was determined by Agar Well Diffusion method. MHA plates were prepared by pouring 25 ml of Mueller-Hinton agar into sterile petriplates. After solidification of media, 20-25 µl suspension of bacterial inoculums was swabbed uniformly. Wells are punched using the well puncture. Then the plant extracts was poured into the wells in the concentration 50µl, 75µl, 100µl, 125µl. The plates were incubated for 24 hours at 37° C. Triplicates of the assay were run, and control plates were kept as well. The zone of inhibition was measured in millimetres from the well's edge to the zone.

MINIMUM INHIBITORY CONCENTRATION

The minimum inhibitory concentration was determined using the turbidimetric method or tube dilution method. In test tubes containing 2 ml sterile nutrient broth, the extract was serially diluted to give concentrations of 15, 7.5, 3.75, 1.875, 0.9375, and 0.4687 mg for 2ml. After that, 10 l of bacterial suspension was added to the tubes. To serve as a control, a tube containing only nutrient broth was seeded with the test organism. After that, all of the tubes were incubated for 24 hours at 37 degrees Celsius, and turbidity was measured to check for growth.

MINIMUM BACTERICIDAL CONCENTRATION

Pipetting out 1 ml bacterial culture from the mixture obtained in the determination of MIC tubes that did not show any growth and subcultured on to nutrient media and incubated at 37°C for 24 hours was used to determine the MBC of the plant extract on clinical bacterial isolates. After incubation, the MBC value was calculated as the concentration at which no single colony of bacteria could be found.

RESULT AND DISCUSSION

In this study, two common plants namely, *Psidium guajava* and *Murraya koenigii* were tested for their antibacterial activity against selected human pathogens. 300ml of acetone extract for *Psidium guajava* and *Murraya koenigii* have been taken and the research have been carried out using the bacterias *Escherichia coli, Bacillus subtilis, Staphylococcus aureus, Enterobacter soli.*

In the method of agar well diffusion method, we had got,

The antibacterial activity of acetone extract of *Psidium guajava* for *Escherichia coli* at the concentrations of 50µl is 11 mm, 75µl is 12 mm, 100µl is 13 mm and 125µl is 15 mm. The antibacterial activity of acetone extract of *Psidium guajava* for *Staphylococcus aureus* at the concentrations of 50µl is 11 mm, 75µl is 12 mm and 100µl is 13 mm 125µl is 15 mm. The antibacterial activity of acetone extract of *Psidium guajava* for *Bacillus subtilis* at the concentrations of 50µl is 12 mm, 75µl is 13 mm and 100µl is 13 mm 125µl is 14 mm. *Bacillus subtilis*. The antibacterial activity of acetone extract of for *Enterobacter soli* at the concentrations of 50µl is 12 mm, 75µl is 13 mm, 100µl is 13 mm and 125µl is 14 mm.

The antibacterial activity of acetone extract of *Murraya koenigii* for *Escherichia coli* at the concentrations of 50µl is 4 mm, 75µl is 5 mm, 100µl is 6 mm and 125µl is 7 mm. The antibacterial activity of acetone extract of *Murraya koenigii* for *Staphylococcus aureus* at the concentrations of 50µl is 7 mm, 75µl is 8 mm, 100µl is 10 mm and 125µl is 10 mm. The antibacterial activity of acetone extract of *Murraya koenigii* for *Bacillus subtilis* at the concentrations of 50µl is 6 mm, 75µl is 7 mm, 100µl is 9 mm and 125µl is 11 mm. The antibacterial activity of acetone extract of *Murraya koenigii* for *Enterobacter soli* at the concentrations of 50µl is 4 mm, 75µl is 5 mm, 100µl is 6 mm and 125µl is 7.

In the method of Minimum Inhibitory Concentration the extract was serially diluted to give a concentration of 7.8, 3.9, 1.95, 0.975, 0.4875 and 0.24375 mg for 2ml in test tubes containing 2 ml sterile nutrient broth. The Minimum Inhibitory Concentration of *Psidium guajava* leaf extract for *Escherichia coli* is 10^{-4}.The Minimum Inhibitory Concentration of *Psidium guajava* leaf extract for *Staphylococcus aureus* is 10^{-2}.The Minimum Inhibitory Concentration of *Psidium guajava* leaf extract for *Bacillus subtilis* is 10^{-1}.The Minimum Inhibitory Concentration of *Psidium guajava* leaf extract for *Enterobacter soli* is 10^{-4}.

The Minimum Inhibitory Concentration of *Murraya koenigii* leaf extract for *Escherichia coli* is 10^{-3}. The Minimum Inhibitory Concentration of *Murraya koenigii* leaf extract for *Staphylococcus aureus* is 10^{-4}. The Minimum Inhibitory Concentration of *Murraya koenigii* leaf extract for *Bacillus subtilis* is 10^{-2}. The Minimum Inhibitory Concentration of *Murraya koenigii* leaf extract for *Enterobacter soli* is 10^{-3}. In the method of Minimum Bactericidal Concentration the MIC tubes are poured in the concentration of 1 ml in the nutrient agar plates. The Minimum Bactericidal Concentration of *Psidium guajava* leaf extract for *Escherichia coli* in 10^{-3}.The Minimum Bactericidal Concentration of *Psidium guajava* leaf extract for *Staphylococcus aureus* is 10^{-2}.The Minimum Bactericidal Concentration of *Psidium guajava* leaf extract for *Bacillus subtilis* is 10^{-3}.The Minimum Bactericidal Concentration of *Psidium guajava* leaf extract for *Enterobacter soli* is 10^{-4}.

The Minimum Bactericidal Concentration of *Murraya koenigii* leaf extract for *Escherichia coli* is 10^{-3}. The Minimum Bactericidal Concentration of *Murraya koenigii* leaf extract for *Staphylococcus aureus* is 10^{-2}. The Minimum Bactericidal Concentration of *Murraya koenigii* leaf extract for *Bacillus subtilis* is 10^{-3}. The Minimum Bactericidal Concentration of *Murraya koenigii* leaf extract for *Enterobacter soli* is 10^{-4}.

Table.1 Antibacterial activity of acetonic extracts of *Psidium guajava* and *Murraya koenigii*

Leaf extract	Concentration in µl	Inhibition zone in mm			
		Escherichia coli	*Bacillus subtilis*	*Staphylococcus aureus*	*Enterobacter soli*
Psidium guajava	Control	0	0	0	0
	50	11	12	11	12
	75	12	13	12	13
	100	13	13	14	13
	125	15	14	15	14
Murraya koenigii	Control	0	0	0	0
	50	4	6	7	4
	75	5	7	8	5
	100	6	9	10	6
	125	7	11	10	7

Table.2 Minimum Inhibition Concentration for acetone extracts of *Psidium guajava* and *Murraya koenigii*

Leaf extract	Minimum Inhibitory Concentration			
	Escherichia coli	*Bacillus subtilis*	*Staphylococcus aureus*	*Enterobacter soli*
Psidium guajava	10^{-4}	10^{-4}	10^{-4}	10^{-4}
Murraya koenigii	10^{-1}	10^{-1}	10^{-1}	10^{-1}

Table.3 Minimum Bactericidal Concentration for acetone extracts of *Psidium guajava* and *Murraya koenigii*

Leaf extract	Minimum Bactericidal Concentration			
	Escherichia coli	*Bacillus subtilis*	*Staphylococcus aureus*	*Enterobacter soli*
Psidium guajava	10^{-1}	10^{-1}	10^{-1}	10^{-1}
Murraya koenigii	10^{-1}	10^{-1}	10^{-1}	10^{-1}

III. CONCLUSION

Psidium guajava leaf extract shows the highest antibacterial activity against *Staphylococcus aureus* (15 mm at 125µl) and *Murraya koenigii* leaf extract shows the highest antibacterial activity against *Bacillus subtilis* (11 mm at 125µl). *Psidium guajava* leaf extract showed highest Minimum Inhibitory Concentration against *Escherichia coli and Enterobacter soli* (10^{-4}) and *Murraya koenigii* leaf extract showed highest Minimum Inhibitory Concentration against *Staphylococcus aureus* (10^{-1}). *Psidium guajava* leaf extract showed highest Minimum Bactericidal Concentration against *Enterobacter soli* (10^{-1}) and *Murraya koenigii* leaf extract showed highest Minimum Inhibitory Concentration against *Enterobacter soli*(10^{-1}).

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