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Bioprospecting On Different Medicinal Plants Explored To Antimicrobial Activity And Phytochemical Constituents

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Abstract

The Present Investigation Was Focused To Evaluate Different Criteria With Five Different Medicinal Plants Like *Azadirachtaindica, Lawsoniainermis, Mentha Arvensis, Murraya Koenigii,* And *Oscimum Sanctum* Were Screened To Assess Its Antimicrobial Activity Against Both Human And Phytopathogenic Microorganisms Compared With Acetone, Chloroform, Ethanol And Methanol Extract. In Order To Elucidate Bioactive Compounds, The Phytochemical Analysis Revealed Presence Of Alkaloids, Carbohydrates, Glycosides, Steroids, Flavonoids, Triterpenoid, Proteins, Amino Acids, Saponins, Tannins And Phenolic Compounds In The Obtained Plant Extracts. The Results Impart A Significant Piece Of Information Concerning The Antimicrobial Potential Against Different Human Pathogens, Which Attributes Plants As Rich Source Of Antimicrobial Agents.

Keywords: *Azadirachtaindica, Lawsoniainermis, Mentha Arvensis, Murraya Koenigii,* And *Oscimum Sanctum*

Introduction

There Are Abundant Sources Of Antimicrobial Molecules In Medicinal Plants. To Treat Variety Of Diseases, A Wide Variety Of Medicinal Plants And Its Extracts Were Used As They Have Potential Antimicrobial Activity [1]. For Several Herbal Industries, Some Of These Bioactive Molecules Are Screened And Sold As Raw Materials On The Market. The Presence Of Certain Chemical Components Such As Phenols, Tannins, Saponins, Alkaloids, Steroids, Flavonoids And Carbohydrates Has Been Shown To Be Consistent With The Antimicrobial Function Of Plants. In Order To Meet Basic Health Needs In Developing Countries, Traditional Medicinal Methods, Especially The Use Of Medicinal Plants, Still Play A Vital Role [2-5].

This Study Investigated The Efficacy Of Five Medicinal Plant And Its Extracts Against Human Pathogenic Bacteria And Fungi And The Preliminary Phytochemical Properties Of These Plants, Including *Azadirachta Indica, Lawsonia Inermis, Menthe Arvensis, Murrayako Enigii* And *Oscimum Sanctum.*

2. Materials And Methods

2.1 Collection Of Plant Material.

Five Different Species Of Medicinal Plants Belonging To Different Families Were Collected From The Garden Of Bethesda Hospital, Ambur, Tamil Nadu, India. The Fresh Leaves Of *Azadirachta Indica, Lawsonia Inermis, Menthe Arvensis, Murraya Koenigii,* And *Oscimum Sanctum* Were Collected. In Addition, All The Chemicals Were Purchased From Sigma Aldrich, First Class Analytical Grade.

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2.2 Preparation Of Plant Extracts:

Based On Their Growing Order Of Polarity, 50g Of Shade-Dried And Coarsely Powdered Plant Material Were Successively Extracted With 250 Ml Each Of Acetone, Chloroform, Ethanol And Methanol Were Performed Under Shaking Incubator At 37^0c For 24-48 H. Later, The Extracts Obtained Were Filtered With Whatman No. 1 Filter Paper And Filtrate Was Evaporated To Dryness Using The Rotary Evaporator To Obtain Crude Extract. Extracts Were Processed At 4^oc In Airtight Chamber Bottles After Full Solvent Extraction For Further Assays [6].

3. Antimicrobial Assay:

3.1. Determination Of Antibacterial And Antifungal Activity:

In The Study Of Anti-Bacterial And Anti-Fungal Activity, A Total Of Two Bacterial Strains Viz. *Staphylococcus Aureus, Escherichia Coli* And Two Fungal Strains Viz. *Aspergillus Fumigatus, Rhizopus Sp*. Were Used. From Coconut Mould And Bread Mould Samples, The Bacterial And Fungal Strains Were Isolated. In Mueller-Hinton Agar (Mha), The Bacterial Strains Were Grown, While In Potato Dextrose Agar, The Fungal Strains Were Grown. Disc Diffusion Method (Kirby-Bauer Method) Was Used For Antibacterial And Antifungal Activity Against The Selected Pathogens. Various Extractions Were Tested Against These Bacterial And Fungal Cultures Of *Azadirachta Indica, Lawsoniai Nermis, Menthe Arvensis, Murrayako Enigii*. On The Surface Of The Mueller Hinton Agar And Potato Dextrose Agar Plates, Discs Impregnated With 50 Ml Of Each Extract Were Placed Separately On The Surface. The Plates Were Incubated For 24 Hours At 37°C. The Antimicrobial Potency Of The Test Samples Was Measured In Millimeters By Determining The Diameter Of The Inhibition Areas [7-9].

4. Phytochemicals Analysis

In Order To Demonstrate The Existence Of Phytoconstituents Such As Alkaloids, Carbohydrates, Flavonoids, Glycosides, Steroids, Triterpenoids, Proteins, Amino Acids, Saponins, Tannins And Phenolic Compounds Etc., Acetone, Chloroform, Ethanol And Methanol Leaf Extracts Were Subjected To Preliminary Qualitative Phytochemical Study [10].

5. Result And Discussion:

The Antibacterial And Antifungal Activities And Phytochemical Analysis Of *Azadirachta Indica, Lawsonia Inermis, Menthe Arvensis, Murraya Koenigii* And *Oscimum Sanctum* Against Various Strains Including *E.Coli* And *S.Aureus* And Fungal Strains Such As *Aspergillus Fumigatus* And Rhizopus Spp. Were Reported In The Present Study, And The Phytochemicals Properties And Extracts Of These Strains Were Investigated[11-14].

5.1. Antibacterial Activity Of Some Medicinal Plants Against Human Pathogenic Bacteria

Five Medicinal Plants With Four Separate Solvents, Namely Acetone, Chloroform, Ethanol And Methanol Extracts, Have Been Evaluated For Antibacterial Activity Against Bacteria That Are Responsible For Human Diseases. Antibacterial Activity Against Both *Escherichia Coli* And *Staphylococcus Aureus* Bacteria Was Demonstrated In Five Plants With Leaf Extracts. Antibacterial Activity Against *Escherichia Coli* Was Demonstrated By All Five Plants Extract: Viz., *Azadirachta Indica, Lawsoniai Nermis, Murrayakoe Nigii, Menthaar Vensis* And *Ocimum Sanctum* Solvent Extracts. Similarly, All Solvent Extracts Of *Azadirachta Indica* Have Been Shown Increased Antibacterial Activity Against *Staphylococcus Aureus*, And The

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Antibacterial Activity Of The Test Bacteria Inhibition Zone Has Been Shown In Table 5.1. The Obtained Results Were Interpreted With Available Literature [15,16].

Table 5.1. Antibacterial Activity Of Medicinal Plants Against Human Pathogenic Bacteria.

Plant Name	Solvent Extract	Human Pathogenic Fungi (Zone Of Inhibition In Mm)	
		Aspergillus Spp.,	*Rhizopus Spp.,*
Azadirachta Indica	Acetone	5	3
	Chloroform	Nil	6
	Ethanol	18	9
	Methanol	Nil	11
Lawsoniai Nermis	Acetone	Nil	11
	Chloroform	Nil	16
	Ethanol	10	2
	Methanol	10	11
Mentha Arvensis	Acetone	19	Nil
	Chloroform	12	10
	Ethanol	15	11
	Methanol	17	5
Murraya Koenigii	Acetone	1	1
	Chloroform	Nil	3
	Ethanol	12	10
	Methanol	11	7
Oscimum Sanctum	Acetone	11	5
	Chloroform	11	Nil
	Ethanol	1	1
	Methanol	13	Nil

5.2. Antifungal Activity Of Some Medicinal Plants Against Human Pathogenic Fungi

Five Medicinal Plants With Four Distinct Solvents, Namely Acetone, Chloroform, Ethanol And Methanol Extracts, Have Been Tested For Antimicrobial Activity Against Fungal Panels Responsible For Human Diseases. Antifungal Activity Against *Aspergillus Fumigatus* And Rhizopus Spp., The Solvent Extracts Of *Menthaar Vensis* And *Oscimum Sanctum*, Has Been Shown In Five Different Plant Extracts. Similarly, All Solvent Extracts Of *Azadirachta Indica*, *Lawsonia Inermis* And *Murraya Koenigii* Were Shown To Have Antifungal Activity Against Rhizopus Spp. Similarly, Effective Antifungal Activity Was Shown Against Rhizopus Spp. The Antifungal Activity Was Reported In Table 5.2 And It Was Compared With Available Literature [17] With The Zone Of Inhibition Against The Test Fungi.

Table 5.2. Antifungal Activity Of Medicinal Plants Against Human Pathogenic Fungi

			Inference

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S.No.	Phytochemicals	Observation	Acetone	Chloroform	Ethanol	Methanol
1	Alkaloids	Cream Color Precipitate	Present	Present	Present	Present
2.	Carbohydrates	Purple To Violet Ring And Reddish Brown Precipitate	Present	Present	Present	Absent
3.	Flavonoids	Intense Yellow Color Changes To Colorless	Present	Present	Present	Present
4.	Glycosides	Rose Pink To Cherry Red	Present	Present	Present	Absent
5.	Steroids &Triterpenoids	Red Color Appears Lower Layer And Yellow Color At The Top Layer	Present	Absent	Present	Present
6.	Proteins & Amino Acids	White Precipitate Turns To Red. Purplish Violet And Formation Of Pink.	Present	Present	Present	Present
7.	Saponins	Stable Forth Formation At Upper Layer	Present	Absent	Present	Absent
8.	Tannins & Phenolic Compounds	Forms White Precipitate.	Absent	Absent	Present	Present

The Presence Of Some Phytocompounds Was Revealed By Qualitative Phytochemical Analysis Of Five Medicinal Plants With Different Solvent Extracts.

The Presence Of Alkaloids, Carbohydrates, Flavonoids, Glycosides, Steroids, Triterpenoids, Proteins, Amino Acids And Saponins Was Revealed In The Acetone Extract Of *Azadirachta Indica*. The Chloroform Extract Of *Azadirachta Indica* Revealed The Presence Of Alkaloids, Carbohydrates, Flavonoids, Glycosides, Proteins, And Amino Acids, While Tannins And Phenolic Compounds Were Absent. In Contrast, There Were No Steroids, Triterpenoids, Saponins, Tannins And Phenolic Compounds. The Presence Of *Azadirachta Indica* Ethanol Extracts In All The Test Solvents Was Revealed. Alkaloids, Flavonoids, Steroids, Triterpenoids, Proteins, Amino Acids, Tannins And Phenolic Compounds Are Present In The Methanol Extracts Of *Azadirachta Indica*, Whereas Carbohydrates, Glycosides And Saponins Are Absent (Table 5.3) [18].

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Table 5.3. The Phytochemical Analysis Of *Azadirachta Indica*

S.No.	Phytochemicals	Observation	Inference			
			Acetone	Chloroform	Ethanol	Methanol
1	Alkaloids	Cream Color Precipitate	Absent	Absent	Present	Present
2.	Carbohydrates	Purple To Violet Ring And Reddish Brown Precipitate	Absent	Absent	Present	Present
3.	Flavonoids	Intense Yellow Color Changes To Colorless	Present	Absent	Present	Present
4.	Glycosides	Rose Pink To Cherry Red	Present	Absent	Present	Present
5.	Steroids &Triterpenoids	Red Color Appears Lower Layer And Yellow Color At The Top Layer	Present	Absent	Present	Present
6.	Proteins & Amino Acids	White Precipitate Turns To Red. Purplish Violet And Formation Of Pink.	Present	Absent	Present	Present
7.	Saponins	Stable Forth Formation At Upper Layer	Present	Absent	Present	Absent
8.	Tannins & Phenolic Compounds	Forms White Precipitate.	Present	Absent	Present	Present

The *Lawsoniai Nermis* Acetone Extract Revealed The Presence Of Alkaloids And Carbohydrates In All Solvents. The Chloroform Extract Revealed The Absence Of Solvents In All The Extracts. The Presence Of Ethanol Extracts Was Revealed In All Test Solvents. The Presence In All Solvents Was Revealed By The Methanol Extracts Whereas There Is No Saponin Table 5.4 [19].

Table 5.4. The Phytochemical Analysis Of *Lawsonia Inermis*

S.No.	Phytochemicals	Observation	Inference			
			Acetone	Chloroform	Ethanol	Methanol
1	Alkaloids	Cream Color Precipitate	Present	Present	Present	Present
2.	Carbohydrates	Purple To Violet Ring And Reddish Brown Precipitate	Present	Present	Present	Present

3.	Flavonoids	Intense Yellow Color Changes To Colorless	Absent	Present	Absent	Absent
4.	Glycosides	Rose Pink To Cherry Red	Absent	Absent	Absent	Present
5.	Steroids &Triterpenoids	Red Color Appears Lower Layer And Yellow Color At The Top Layer	Absent	Present	Absent	Present
6.	Proteins & Amino Acids	White Precipitate Turns To Red. Purplish Violet And Formation Of Pink.	Present	Present	Absent	Present
7.	Saponins	Stable Forth Formation At Upper Layer	Absent	Present	Absent	Present
8.	Tannins & Phenolic Compounds	Forms White Precipitate.	Present	Absent	Present	Absent

The Presence Of Alkaloids, Carbohydrates, Proteins, Amino Acids, Tannins And Phenolic Compounds Was Revealed By The Acetone Extract *Menthaar Vensis*. Whereas There Were No Flavonoids, Glycosides, Steroids, Triterpenoids, And Saponins. While Glycosides, Tannins And Phenolic Compounds Were Absent, The Chloroform Extract Of *Menthaar Vensis* Revealed The Presence Of Alkaloids, Carbohydrates, Tannins And Phenolic Compounds In All The Solvents. The Ethanol Extracts Revealed Alkaloids, Carbohydrates, Tannins And Phenolic Compounds. In Contrast, There Were No Flavonoids, Glycosides, Steroids, Triterpenoids, Proteins, Amino Acids And Saponins. The Presence Of Alkaloids, Carbohydrates, Glycosides, Steroids, Triterpenoids, Proteins, Amino Acids And Saponins Is Revealed By The Methanol Extracts. Flavonoids, Tannins And Phenolic Compounds Are Present And Missing (Table 5.5) [20-21].

Table 5.5. The Phytochemical Analysis Of *Mentha Arvensis*

S.No.	Phytochemicals	Observation	Inference			
			Acetone	Chloroform	Ethanol	Methanol
1	Alkaloids	Cream Color Precipitate	Present	Absent	Absent	Absent
2.	Carbohydrates	Purple To Violet Ring And Reddish Brown Precipitate	Present	Absent	Present	Absent
3.	Flavonoids	Intense Yellow Color Changes To Colorless	Present	Absent	Present	Absent
4.	Glycosides	Rose Pink To	Present	Present	Present	Absent

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		Cherry Red				
5.	Steroids &Triterpenoids	Red Color Appears Lower Layer And Yellow Color At The Top Layer	Present	Absent	Present	Absent
6.	Proteins & Amino Acids	White Precipitate Turns To Red. Purplish Violet And Formation Of Pink.	Present	Absent	Present	Absent
7.	Saponins	Stable Forth Formation At Upper Layer	Present	Absent	Present	Absent
8.	Tannins & Phenolic Compounds	Forms White Precipitate.	Present	Absent	Present	Absent

The Presence Of *Murrayako Enigii* Acetone Extract In All The Test Solvents Has Been Revealed. The Presence Of Only Glycosides Was Disclosed By The Chloroform Extract And Steroids, Triterpenoids, Saponins, Tannins And Phenolic Compounds Were Absent, While Alkaloids, Sugars, Flavonoids, Glycosides, Proteins And Amino Acids Were Absent. The Alkaloid Absence And Presence In All Test Solvents Is Revealed By The Ethanol Extracts. The Absence Of The Methanol Extracts Of *Murrayako Enigii* In All Solvents Was Revealed. (Table 5.6) [22].

Table 5.6. The Phytochemical Analysis Of *Murraya Koenigii*

S.No.	Phytochemicals	Observation	Inference			
			Acetone	Chloroform	Ethanol	Methanol
1	Alkaloids	Cream Color Precipitate	Present	Present	Present	Present
2.	Carbohydrates	Purple To Violet Ring And Reddish Brown Precipitate	Absent	Absent	Present	Present
3.	Flavonoids	Intense Yellow Color Changes To Colorless	Absent	Absent	Present	Present
4.	Glycosides	Rose Pink To Cherry Red	Absent	Absent	Present	Absent
5.	Steroids &Triterpenoids	Red Color Appears Lower Layer And Yellow Color At The Top Layer	Absent	Present	Present	Absent
6.	Proteins & Amino Acids	White Precipitate Turns To Red. Purplish Violet And Formation Of Pink.	Absent	Present	Absent	Present

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7.	Saponins	Stable Forth Formation At Upper Layer	Absent	Absent	Present	Present
8.	Tannins & Phenolic Compounds	Forms White Precipitate.	Present	Absent	Present	Present

Oscimum Sanctum's Acetone Extract Indicated The Presence Of Alkaloids, Tannins And Phenolic Compounds. Whereas There Were No Carbohydrates, Flavonoids, Glycosides, Steroids, Proteins, Triterpenoids, Amino Acids And Saponins. Chloroform Extract Showed The Presence Of Alkaloids, Hormones, Triterpenoids, Proteins And Amino Acids. Whereas Carbohydrates, Saponins, Tannins, Flavonoids, Glycosides And Phenolic Compounds Were Missing. *Oscimum Sanctum's* Ethanol Extracts Showed The Presence Of Proteins And Amino Acids In All Of The Test Solvents. The Existence Of All The Solvents Was Revealed By The Methanol Extracts, There Is No Glycosides, Steroids And Triterpenoids (Table 5.7) [23 -25].

Table 5.7. The Phytochemical Analysis Of *Oscimum Sanctum*

Plant Name	**Solvent Extract**	**Human Pathogenic Bacteria (Zone Of Inhibition In Mm)**	
		Escherichia Coli	*Staphylococcus Aureus*
Azadirachta Indica	Acetone	17	2
	Chloroform	12	17
	Ethanol	15	4
	Methanol	5	12
Lawsonia Inermis	Acetone	15	Nil
	Chloroform	8	4
	Ethanol	14	Nil
	Methanol	7	5
Mentha Arvensis	Acetone	17	16
	Chloroform	11	3
	Ethanol	12	2
	Methanol	15	Nil
Murraya Koenigii	Acetone	6	2
	Chloroform	3	12
	Ethanol	12	6
	Methanol	16	Nil
Oscimum Aanctum	Acetone	15	Nil
	Chloroform	5	Nil
	Ethanol	16	Nil
	Methanol	15	Nil

6. Conclusion

It Is Believed That, This Investigation Will Lead To The Establishment Of Some Compounds That Could Be Used To Formulate New And More Potent Antimicrobial Drugs Of Natural Origin. There Are Ongoing Studies To Classify The Bioactive Compound And Determine The Mechanisms Of Action Of Extracts Of *Azadirachta Indica, Lawsoniai Nermis,*

Murrayako Enigii, *Menthaar Vensis*, *Ocimum Sanctum* Leaves On Some Human Disease-Related Species.

There Is A Need For Further Research To Determine The Chemical Identity Of The Bioactive Compounds Responsible For The Antimicrobial Activity Observed. Natural Plant-Derived Bactericides And Fungicides, In Particular With Antibacterial And Antifungal Activity, Can Be A Source Of New Alternative Active Compounds And Some Phytochemical Analysis Is Obtained From Medicinal Plants, Which Helps To Recognize The Existence Of Chemicals On Certain Plants. The High Proportion Of Active Extracts In The Tested Plants, Selected On The Basis Of Available Ethno-Botanical Data, Confirms The Validity Of This Approach To Plant Species Selection In The Search For A Particular Activity.

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Conflict Of Interest

The Creators Reported No Irreconcilable Situation. This Report Doesn't Contain Any Investigations With Human Or Creature Subjects Experienced By Any Of The Authors.

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