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ANTIBACTERIAL ACTIVITY OF ETHNOMEDICINAL PLANTS OF IRULARS OF WESTERN GHATS

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ABSTRACT: The present study report deals with the medicinal plants used by the irular tribal people of Coimbatore against pyogenic infections. Five different plants like *Abutilon indicum, Datura metel, Lantana Camaro, Tridax procumbens* and *Leucas aspera* were collected and their antimicrobial activity were tested against bacteria such as *Staphylococcus aureus, Streptococcus pyogenes, Bacillus anthracis, Pseudomonas aeruginosa, Escherichia coli, Shigella dysenteriae, Salmonella typhi, Klebsiella pneumonia, Proteus vulgaris and fungi such as Aspergillus niger, Mucor rouxii, Fusarium solani, and Penicillium chrysogenum.* All the plants showed antimicrobial activity. Among these *Abutilon indicum, Datura metel, Lantana Camaro* showed good zone of inhibition against the test organisms. *Datura metel* showed high zone of inhibition. The extracts of *Datura metel* showed lowest Minimal inhibitory concentration. Phytochemical analysis showed the presence of alkaloids, flavonoids, saponins and phenols.

INTRODUCTION: India is one of the twelve mega-biodiversity countries of the World having rich vegetation with a wide variety of plants with medicinal value. Particularly in the developing countries like India, herbal medicines have good values in treating many diseases [1-2]. The fact that the tribes all over the world owning their own culture based on that they developed their own system of medical practices, which are being ethno-medicines, there are numerous herbs available in their surroundings and that herbs are being used by tribal community as food and medicine for curing their diseases they have been continued to live in forest environment since from many generations and developed their own knowledge on flora and fauna of the forest that are known as folk or indigenous knowledge.

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Large sections of the Indian population still rely on traditional herbal medicine [3]. It has been reported that about 64% of the total world population is using traditional medicine to satisfy their health care needs [4].

MATERIALS AND METHODS:

Collection of Plant Material:

Medicinal plants were collected from fields of tribal area at Siruvani hills near Coimbatore.

Extraction procedure:

The fresh leaves were collected washed with sodium hypochloride and rinsed twice with distilled water [5]. Then the leaves were air dried under shade. Dried leaves were powdered and extracted with solvents like petroleum ether, benzene, chloroform, ethanol and methanol using soxhlet apparatus. All the extracts were poured into sterile dry petri plates and the solvents were evaporated. The sediments were scrapped off, weighed and dissolved in DMSO.

Antimicrobial activity: The antimicrobial activity of the plant extracts were done by agar well diffusion method.

Test organisms:

Test organisms are *Staphylococcus aureus, Streptococcus pyogenes, Bacillus cereus, Pseudomonas aeruginosa, Escherichia coli, Shigella dysenteriae, Salmonella typhi, Klebsiella pneumonia, Proteus vulgaris Aspergillus niger, Mucor rouxii, Fusarium solani, Penicillium chrysogenum*

Agar well diffusion method:

Agar well diffusion method is done to detect the antimicrobial activity. Sterile Muller Hinton Agar (MHA) plates were used for sensitivity testing. The test cultures were incubated at 37^0C for 24 hours and swabbed onto the MHA plates. Then wells were prepared to load different concentration like 30, 40, 50, 60 µl for bacteria and 50, 60, 70, 80 µl for fungi extract. DMSO and a standard antibiotic gentamycin and amphotericin served as control. The plates were allowed to stand at room temperature for 30 minutes and incubated in upright position at 37^0C for 24 hours. The diameters of the zone of inhibition (ZOI) were measured with a ruler. The measurement is recorded [6-8].

Minimal inhibitory concentration:

Crude extract of the plants are serially diluted. 2.5 ml of nutrient broth is added to equal volume of the extract and serially diluted. This makes the two fold dilution of the extract (1:2, 1:4, 1:8, 1:16 and 1:32). 0.1 ml of the test culture was added to the serially diluted tubes and each dilution is plated on to the nutrient agar plates and then the tubes and plates were incubated and results are noted [6, 9-10]. Medicinal properties of plants normally depend on the presence of certain phytochemical principles such as alkaloids, flavonoids, sterols, saponins, glycosides, tannins and phenols which are the Bioactive compounds responsible for the antimicrobial property. The reconstituted extracts were examined for the presence of these compounds. Phytochemical screening was performed using standard procedures[11-12].

RESULTS:

Plant Collection and Extraction:

The percentage yield of different plant extracts using soxhlet apparatus (10g of plant sample) were tabutaled (**Table 1**)

TABLE 1: YIELD OF PLANT EXTRACTS IN DIFFERENT SOLVENTS

S.No	Solvents	Percentage Yield Of Plant Extacts (G)				
		Abutilon indicum	*Datura metel*	*Lantana Camaro*	*Leucas aspera*	*Tridax procumbens*
1	Petroleum ether	1.29	1.61	1.39	1.63	1.42
2	Benzene	1.12	1.42	1.48	1.32	1.01
3	Chloroform	1.07	1.32	1.10	1.17	1.39
4	Ethanol	1.44	1.09	1.18	1.12	1.11
5	Methanol	1.11	1.11	1.21	1.01	1.29

Antimicrobial Activity:

Agar well diffusion method:

The results were shown in **Table 2** and **3.** The ethanol and methanolic extract of *Abutilon indicum* showed moderate zone of inhibition and the ethanolic and methanolic extracts of Lantana Camaro and Datura metel showed good zone of inhibition against the test oraganisms. The test organisms inhibited were shown in the **Table 2** & **3.** The methanolic and ethanolic extracts of Datura metel showed good zone of inhibition against all test organisms except *Proteus vulgaris*. In fungi *Aspergillus niger, Mucor rouxii* and *Penicillium chrysogenum* were inhibited. The results were shown in **Table 4** and **5**. The ethanol extract of the plants exerted greater antibacterial activity than the other extracts[13-14].

TABLE 2: ANTIMICROBIAL ACTIVITY OF PLANT EXTRACTS

Sl. No.	ORGANISMS	Zone of Inhibition In mm in dm																							
		Abutilon indicum								*Tridax procumbens*								*Leucas aspera*							
		Ethanol(µl)				Methanol(µl)				Ethanol (µl)				Methanol(µl)				Ethanol(µl)				Methanol(µl)			
		30	40	50	60	30	40	50	60	30	40	50	60	30	40	50	60	30	40	50	60	30	40	50	60
1	*Staphylococcus aureus*	10	11	11	12	10	10	11	12	-	-	-	-	-	-	-	-	10	11	11	12	9	10	10	11
2	*Streptococcus pyogenes*	11	12	12	13	12	12	13	14	9	9	10	11	10	11	11	12	9	10	11	11	10	10	11	12

3	*Bacillus cereus*	10	11	12	12	10	10	11	11	8	8	9	10	8	9	9	10	-	-	-	-	-	-	-	-
4	*Pseudomonas aeruginosa*	10	10	11	11	11	12	12	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	*Escherichia coli*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10	11	11	12	9	10	10	11
6	*Shigella dysenteriae*	-	-	-	-	-	-	-	-	7	8	8	9	6	7	8	8	11	11	12	13	10	11	11	12
7	*Salmonella typhi*	-	-	-	-	-	-	-	-	9	10	10	11	9	10	10	11	-	-	-	-	-	-	-	-
8	*Klebsiella pneumonia,*	8	8	9	10	9	10	10	11	9	9	10	10	10	10	11	12	-	-	-	-	-	-	-	-
9	*Proteus Vulgaris*	9	10	11	11	10	11	12	13	-	-	-	-	-	-	-	-	9	9	10	11	8	9	9	10

\- No zone of inhibition

TABLE 3: ANTIMICROBIAL ACTIVITY OF PLANT EXTRACTS

Sl.No.	ORGANISMS	Zone of inhibition (mm in dm)																	
		Lantana Camaro								*Datura metel*									
		Ethanol (µl)				Methanol(µl)				Ethanol(µl)				Methanol(µl)				Gentamicin	DMSO
		30	40	50	60	30	40	50	60	30	40	50	60	30	40	50	60		-
1	*Staphylococcus aureus*	15	16	16	17	16	16	17	18	17	19	23	23	17	20	20	21	1.6	
2	*Streptococcus pyogenes*	14	16	17	17	15	15	16	17	16	19	19	20	19	19	20	22	1.7	-
3	*Bacillus cereus*	16	17	17	18	14	15	15	16	17	20	20	21	18	18	19	20	1.8	-
4	*Pseudomonas aeruginosa*	18	19	19	20	18	18	19	20	20	21	22	23	20	20	21	21	1.5	-
5	*Escherichia coli*	-	-	-	-	-	-	-	-	16	18	18	20	21	23	23	25	1.9	-
6	*Shigella dysenteriae*	-	-	-	-	-	-	-	-	20	20	21	22	20	20	21	22	1.8	-
7	*Salmonella typhi*	15	16	16	17	14	15	15	18	17	18	18	19	18	18	19	19	1.7	-
8	*Klebsiella pneumonia,*	16	17	18	18	13	14	15	16	24	25	25	26	24	24	25	26	1.9	-
9	*Proteus vulgaris*	14	16	16	17	12	13	13	14	-	-	-	-	-	-	-	-	1.6	-

No zone of inhibition

TABLE 4: ANTIFUNGAL ACTIVITY OF PLANT EXTRACTS

S. No	Organisms	Zone of inhibition (mm in dm)																
		Lantana Camaro								*Datura metel*								
		Ethanol (µl)				Methanol(µl)				Ethanol(µl)				Methanol(µl)				DMSO
		50	60	70	80	50	60	70	80	50	60	70	80	50	60	70	80	-
1	*Aspergillus niger,*	-	-	-	-	-	-	-	-	13	13	14	15	12	13	13	14	
2	*Mucor rouxii,*	9	10	10	11	10	10	11	12	12	14	14	15	13	14	15	16	-
3	*Fusarium solani,*	10	11	11	12	8	10	11	11	14	14	15	16	18	18	19	20	-
4	*Penicillium chrysogenum*	-	-	-	-	-	-	-	-	12	12	13	14	13	14	14	15	-

TABLE 5: ANTIFUNGAL ACTIVITY OF PLANT EXTRACTS

S. No.	Organisms	Zone of inhibition (mm in dm)																							
		Abutilon indicum								*Tridax procumbens*								*Leucas aspera*							
		Ethanol (µl)				Methanol(µl)				Ethanol(µl)				Methanol(µl)				Ethanol(µl)				Methanol(µl)			
		50	60	70	80	50	60	70	80	50	60	70	80	50	60	70	80	50	60	70	80	50	60	70	80
1	*Aspergillus niger,*	10	10	11	12	11	11	12	12	13	13	14	15	12	13	13	14	-	-	-	-	-	-	-	-
2	*Mucor rouxii*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	*Fusarium solani,*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4	*Penicillium chrysogenum*	-	-	-	-	-	-	-	-	11	12	12	13	12	13	14	14	-	-	-	-	-	-	-	-

no zone of inhibition

Minimal Inhibitory Concentration:

The lowest concentration of dilution that inhibits the growth varied according to organism. The minimal inhibitory concentration of *Lantana camaro* to inhibit the growth of *Staphylococcus aureus* is 1:4 (50mg/ml) dilution, whereas for other organisms like *Pseudomonas aeruginosa Streptococcus pyogens, Bacillus cereus Salmonella typhi, Klebsiella pneumonia Escherichia coli* and *Shigella sonnei* it is 1:8 (25mg/ml) dilution. For fungi it is 1:4(50mg/ml)

The ethanolic and methanolic extract of *Datura metel* showed lowest concentration that inhibits the growth of pathogenic organisms at a dilution of 1:8 (25mg/ml) dilution and for fungi 1:4(50mg/ml).

Phytochemical Analysis:

Ethanolic extracts of *Datura metel* showed the presence of alkaloids, flavonoids, saponins, phenols, glycocides. Methanolic extracts showed the presence of alkaloids, flavonoids, saponins, sterols and tannins. These results were similar to the results observed by Tahiya et al., 2014[15].

CONCLUSION: In the present study *Lantana Camaro* and *Datura metel* showed good zone of inhibition against test organisms the methanol and ethanol extracts showed good results than other solvents. Among this *Datura metel* showed high zone of inhibition. The MIC showed strong antimicrobial and antifungal activity at lowest concentration. Phytochemical analysis showed the presence of alkaloids, flavonoids, tannins, phenols and glycosides. These phytochemical compounds are responsible for the antimicrobial activity. As a result these plants can be used to treat pyogenic infections.

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