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Antimicrobial Activity of some Ethnomedicinals plants used by Tribals of Mandla district Central India

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Abstract

Antimicrobial activity of 10 ethnomedicinal plant extracts were evaluated against nine bacterial Strains, *Bacillus subtilis, Staphylococcus aureus, Staphylococcus epidermidis, Enterococcus facalis, Escherichia coli, Klebsiella pneumonia, Pseudomona saeruginosa, Ervinia sp, Proteus vulgaris* and one fungal strain *Candida albicans*. The collected ethnomedicinal plants were used in folk medicine in the treatment of skin diseases, venereal diseases, respiratory problems and nervous disorders .Out of 10 plants, 6 plants exhibited antimicrobial activity against one or more of the tested microorganisms at three different concentrations of 1.25, 2.5and 5mg/disc.

Key-Words: Ethno-medicinal, Anti-microbial, Plant extracts, Zone of inhibition

Introduction

The evolution and spread of antibiotic resistance, as well as the evolution of new strains of disease causing agents, is of great concern to the global health community. Our ability to effectively treat diseases is dependent on the development of new pharmaceuticals, and one potential source of novel drugs is traditional medicine. Now-a-days, plants have been exploited as a powerful and potential source for medicinal drugs. Herbal drugs are mainly focused as an alternative source against manifestations caused by various micro-organisms due to the increasing resistance of existing antimicrobial agents (Borkotoky, 2013; Dhanalakshmi 2013)[1,2]. Infectious diseases are caused by pathogenic microorganism, such as bacteria, virus parasites or fungi. Diseases can spread, directly or indirectly, from one person to another. Infectious diseases are the second leading cause of death world wide. About one-fourth of all the medicines we use, come from rain forest plants However, scientific studies have been conducted only to a limited extent with few medicine plants. The development of bacterial resistance to presently available antibiotics has necessitated the search of new antibacterial agents. In rural and backward area of India, several plants are commonly used as herbal medicine for the treatment of infectious diseases. Four such plants commonly used by the people of the area were screened for potential antibacterial activity (Rawat, 2012).[3]

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Medicinal plants are an important therapeutic aid for various ailments. Scientific experiments on the antimicrobial properties of plant components were first documented in the late 19th century (Yadav, 2012)[4]. In India, from ancient times, different parts of medicinal plants have been used to cure specific aliments. Today, there is wides spread interest in drugs derived from plants. Natural antimicrobials can be derived from plants, animal tissues, or Microorganisms (Gordon and David, 2001)[5]. Rural communities in particular tribes of Mandla District, Madhya Pradesh, depend on plant resources mainly for herbal medicines, food, forage, construction of dwellings, making household implements, sleeping mats, and for fire and shade. The use of medicinal plants as traditional medicines is well known in rural areas of many developing countries. Fifteen plant species used in folk medicine to determine their antimicrobial activity (Table 1). In general, these plants are used in folk medicine in the treatment of skin disease, venereal diseases, respiratory problems and nervous disorders. The development of drug resistance in human pathogens against commonly used antibiotics has necessitated a search for new antimicrobial substances from other sources, including plants (Erdogrul, 2002)[6]. Screening of medicinal plants for antimicrobial activities is important for finding potential new compounds for therapeutic uses.

Material and Methods

Plants were selected for this study based on their medicinal uses. Fresh plant parts were collected from the tribal villages in Mandla District, Madhya Pradesh

in Jan April 2009. The ethnomedicinal data were obtained from tribal people, Vaidhyas, Ojhas, Village Pradhan and many other experienced informants giving knowledge of herbal drugs used by the different tribal people. Plant extracts were prepared by cold percolation method. The plant materials were dried under shade and ground into fine Powder. 50 g of dried powder was soaked in 300 ml hexane for 48 hours. The plant extracts were filtered through Whatman N0. 1 filter paper. The filtrates were dried until a constant dry weight of each extract was obtained. The residues were stored at 40 ^{0}C for further use. The remaining plant residue was dried and soaked in 300 ml, of methanol as above. The hexane and methanol extracts of 10 plants were screened against a total of 10 bacterial strains and one fungal strains. The test organisms were *Bacillus subtitis, Staphylococcus aureus, Staphylococcus epidermidis, Enterococcus faecalis, Escherichia coli, Klebsiella pneumoniae, Pseudomona aeruginosa, Ervinia sp, Proteus vulgaris* and one fungal strains *Candida albicans*. Stock cultures were maintained at 40^{0}C on slopes of nutrient agar. Active cultures for experiments were prepared and were incubated for 24 hrs at 37^o .The cultures were diluted with fresh nutrient broth achieve optical densities,2.0-10 ^{6} colony forming units for bacteria and 2.0-10 ^{5} spore/ml for fungal strains. Agar disc diffusion method (Bauer et al., 1966), was used to screen the antimicrobial activity. The test microbial strains were maintained on agar slants at 40^{0}C. The different concentrations of extracts (1.25, 2.5 and 5 mg/disc) were lodged on 6 mm sterile disc. The loaded disc was placed on the surface of medium and the compound was allowed to diffuse for 5minutes and the plates were kept for incubation at 37^{0}C for 24 hrs. At the end of incubation, inhibition zones formed around the disc. The results were obtained by measuring the zone of diameter.

Results and Discussion

Table -1 show that in *Abrus precatorius* Linn. local name Ratti Family Papilionaceae perennial climbers branches slender glabrous or sparsely silky leaves 10 to 20 opposite pair flower pink or white commonly in all forest range in district. *Buchnania lanzan* Sprengel local name achar Family Anacardiaceae medium size tree young branch clothed with silky hair leaves alternate thickly flower is panicle short than leaves its commonly distributed in all forest. *Acacia catechu* Willd local name Khair Family Mimosaceae a medium size tree with dark colour bark, young shoots dark brown or purple glabous stipulur spines hooked, shine brown or black leaves bipinnetly 10 to 20 pairs flowers yellow or cream coloured its distribution is common in forest in hilly tracts. *Aegle marmelos* (L) local name bel Family Rutaceae small or medium size deciduous tree bark grey while with longitudinal wrinkles flowers alternate greenish white fruit yellow when ripe its distribution in common in forest tree consist sacred. *Bauhania variegata* (Linn.) local name Kachnar Family Caesalpiniaceae a small crooked tree with dark brownish bark branchlet leaves ovate flower varied in colour pod oblong distinctly verticulae both end narrow hard dark brown or black seed. *Butea monosperma* (Lamk.) Taub. local name Palas Family Papilionaceae moderate size deciduous tree with regular branches and crooked trunk young tree silky pubescent leaves stipulate its distribution is commonly throughout the district. *Shorea robusta* Gaertn local name Sal Family Dipterocarpaceae is a large, deciduous tree up to 50 m tall and trees attain a height of about 18-32 m and girths of 1.5-2 m; bole is clean, straight and cylindrical, but often bearing epicormic branches Leaves simple, shiny, glabrous, about 10-25 cm long and broadly. Flowers yellowish-white, arranged in large terminal or axillary racemose panicles Fruit at full size about 1.3-1.5 cm long. *Cassia fistula* (Linn.) local name amaltas Family Caesalpinaceae known as golden showers tree is a medium size tree growing in 10-20 m leaves are deciduous long pinnate 3 to 8 pair leaflets flowers colour are yellow fruit legume.

Helicteres isora Linn. Local name Maror phalli Family Sterculiaceae some time called Indian screw tree is a sub deciduous shrub or small tree with grew coloured bark leaves simple or serrate margin scabrous above and pubescent beneath flowers solitary or cluster fruit greenish brown. *Sygyzium cumini* (L.) Skeels Local name Jamun Family Myrtaceae is a ever green tropical tree a fairly fast growing tree species its can reach height up to 30 m wood is strong and water resistant bark is rough and dark grey in colour leaves are simple or pinkish in colour when young changing in leathery flower is small 5mm diameter fruit is oblong or ovoid black at mature. Different available plants and their parts were screened for their antimicrobial activity. The results have been recorded in table 2, where names of the plants are arranged alphabetically and each name has the name of its family in parenthesis. Effect of three different concentration (1.5,2.5, 5 ug/disc) of 10 ethnomedicinal plants belong to different family for tested antimicrobial activity in Table 2a, and 2b. Amongst all the screened plant *A. precatorius* shows highest antimicrobial activity in *Staphylococcus eidermidis* followed by *Bacillus subtilis, Candida albicans ,Staphylocuccus aureus, Pseudomonas aeruginosa, Enterococcus aruginosa ,Escherichia coli, Klebsiella pneumoniae, Eruvinia sp.,Proteus vulgaris* did not show any activity in all the three concentration.

In *A. catechu Staphylococcus eidermidis* shows strongly antimicrobial activity followed by *Bacillus subtilis, Candida albicans, Pseudomonas aeruginosa, Staphylocuccus aureus, Enterococcus aruginosa, Escherichia coli, Klebsiella pneumoniae, Eruvinia sp., Proteus vulgaris,*did not show any activity. In *A. marmelos Bacillus subtilis* show strong antimicrobial activity followed by *Pseudomonas aeruginosa, Staphylococcus eidermidis, Staphylocuccus aureus and, Candida albicans, Enterococcus aruginosa ,Escherichia coli, Klebsiella pneumoniae, Eruvinia sp.,Proteus vulgaris* did not show any activity in all the three concentration. In *Shorea robusta* only two strain *Bacillus subtilis* and *Pseudomonas aeruginosa* show strong antimicrobial activity except , *Staphylocuccus aureus, Staphylococcus eidermidis, Enterococcus aruginosa, Escherichia coli, Klebsiella pneumoniae, Eruvinia sp.,Proteus vulgaris* did not show any activity. *Sygyzium cumini Pseudomonas aeruginosa* and *Bacillus subtilis* show strong antimicribal activity except all the strain. *Bauhania variegata, Buchnania lanzan* and, *Butea monosperma* plant did not show any antimicrobial activity amongst all the 10 strain. In *Cassia fistula* only *Candida albicans* show antimicrobial activity in all the three concentration. In *Helicteres isora, Klebsiella pneumoniae, Candida albicans, Pseudomonas aeruginosa* show strong antimicrobial activity. *Enterococcus aruginosa* show slight activity in 2.5,5 concentration and *Bacillus subtilis* show slight activity in 5 concentration similar result have been recorded by (Valsaray et al., 1997 [7]; Rajakaruna et al., 2002 [8] ; Parekh et al.,2005 [9] Bauer et al 1996 [10]; Prashant et al 2001 [11] and Yaday et al., 2012)[4].

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Table 1: Ethno medicinal important of the screened plants

Plant species	Family	Local name	Part used	Therapeutic use (Anjaria et al. 2002; Sriram et al. 2004)
***Abrus precatorius* Linn.**	Papilionaceae	Ratti	Root, Leaves, Seed	**Diuretic, Inflammations, Wound, Asthma, Leucoderma, Skin diseases, Stomatitis, Hyperpiesia.**
***Acacia catechu* Willd.**	Mimosaceae	Khair	Stems, and barks	**Conjunctivitis, Haemophtysis, Leprosy, Leucoderma, Diabetes, Anthelmintic.**
***Aegle marmelos* (L)**	Rutaceae	Bel	Root, Bark leaf, seed	**Diarrhoea, Constipation, worms ,Skin diseases, Cardic disease, High blood preasure.**
***Shorea robusta* Gaertn**	Dipterocarpaceae	Sal	Bark, Leaves and Resin	**Alexiteric, Ulcer, Anaemia, Factures, Obesity, Diarrhea, Dysentery, ear troubles.**
***Sygyzium cumini* (L.) Skeels**	Myrtaceae	Jamun	Barks,Leaves and seeds	**Acrid, Carminative, Diuretic, Anti bacterial, Diabetes, Leucorrhoea.**
***Bauhania variegata* (Linn.)**	Caesalpiniaceae	Kachnar	Root, Bark and Buds	**Alterative, Tonic, Astringent, Carminative, Laxative, Obesity.**
***Buchnania lanzan* Sprengel**	Anacardiaceae	Char	Fruits, leaves and bark	**Glandular swelling of neck, diarrhea, Intercostals pain.**
***Butea monosperma* (Lamk.) Taub.**	Papilionaceae	Palas	Flowers, leaves, barks,	**Flatulent, colic, cough, Diuretic, Snake bite, Herpes, Epilepsy, Arthritis.**
***Cassia fistula* (Linn.)**	Caesalpiniaceae	Amaltas	Roots Bark Pulp and flower	**Skin infection, Constipation and fever.**
***Helicteres isora* Linn.**	**Sterculiaceae**	**Marodphalli**	**Fruit and bark**	**Lactifuge, Scabies, Ulcer, Empyema, Diabetes, Dysentery, Wound.**

Table 2a: Antimicrobial activity of the hexane extracts of collected ethno medicinal plants

Plant species	*Bacillus, subtilis*			*Staphylococcus, aureus*			*Staphylococcus eidermidis*			*Enterococcus aruginosa*			*Escherichia coli*		
	1.5	2.5	5	1.5	2.5	5	1.5	2.5	5	1.5	2.5	5	1.5	2.5	**5**
***Abrus precatorius* Linn.**	12	17	18	12	14	16	18	19	22	13	15	19	13	15	**19**
***Acacia catechu* Willd.**	13	16	20	13	13	15	22	23	24	14	17	24	12	18	**20**
***Aegle marmelos* (L)**	14	16	20	14	15	16	13	15	18	15	16	20	13	15	**21**
***Shorea robusta* Gaertn**	13	15	24	12	16	20	14	19	24	14	19	23	12	18	**23**
***Sygyzium cumini* (L.) Skeels**	12	14	20	13	17	23	13	17	20	12	15	20	14	17	**21**
***Bauhania variegata* (Linn.)**	13	18	26	12	19	24	14	15	22	12	16	22	13	16	**20**
***Buchnania lanzan* Sprengel**	12	19	20	13	15	21	13	18	20	12	18	23	12	15	**23**
***Butea monosperma* (Lamk.) Taub.**	14	17	21	12	17	22	14	19	22	12	17	20	14	19	**21**
***Cassia fistula* (Linn.)**	13	17	24	13	19	24	13	18	24	14	16	20	12	15	**22**
***Helicteres isora* Linn.**	**12**	**17**	**20**	**14**	**17**	**20**	**12**	**17**	**20**	**14**	**15**	**22**	**13**	**17**	**20**

Table 2b: Antimicrobial activity of the hexane extracts of collected ethno medicinal plants

Plant species	*Pseudomonas aeruginosa*			*Klebsiella pnumoniae*			*Eruvinia sp*			*Proteus vulgaris*			*Candida albicans.*		
	1.5	2.5	5	1.5	2.5	5	1.5	2.5	5	1.5	2.5	5	1.5	2.5	**5**
***Abrus precatorius* Linn.**	11	13	15	12	14	19	12	15	19	13	18	26	14	15	**18**
***Acacia catechu* Willd.**	13	14	18	14	16	21	13	14	18	12	15	21	13	15	**20**
***Aegle marmelos* (L)**	12	17	20	13	17	23	14	16	18	13	17	24	14	16	**22**
***Shorea robusta* Gaertn**	13	15	20	15	18	19	13	15	23	14	18	20	13	17	**25**
***Sygyzium cumini* (L.) Skeels**	13	14	24	16	17	24	14	16	19	13	18	23	14	18	**20**
***Bauhania variegata* (Linn.)**	15	17	20	13	15	19	13	17	22	14	17	22	12	16	**24**
***Buchnania lanzan* Sprengel**	16	18	23	12	14	21	14	15	20	13	18	22	13	19	**22**
***Butea monosperma* (Lamk.) Taub.**	14	15	20	13	16	24	12	16	20	14	19	23	14	17	**20**
***Cassia fistula* (Linn.)**	13	15	22	14	18	20	13	15	24	15	17	20	16	18	**20**
***Helicteres isora* Linn.**	**17**	**14**	**17**	**12**	**13**	**14**	**12**	**17**	**20**	**12**	**14**	**22**	**14**	**16**	**18**

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