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Biological activity of aqueous extract of some medicinal plants

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ABSTRACT

In the study aimed at evaluating of antimicrobial activity of aqueous extracts of nine medicinal plants collected from Beed district, which is used widely as traditional medicine in treatment. The study carried-out to evaluate the potential antimicrobial activity against to five types of bacteria (Staphylococcusaureus, Salomellatyphimurium, Proteus vulglaris, Psedomanasaeruginosaand B.megaterium) of aqueous extracts from nine different plant samples (Feronialimonia, Bauhinia racemosa, Pongamiapinnata, Dalbeagiasissoo, Terminaliaarjuna, Ailanthus excelsa, Morindatinctoria, Moringaoleifera, Cordiadichotoma).Cylinder plate or cup plate method was performed to assess the antimicrobial activity of aqueous extract. The obtained results showed a potential effect as maximum zone of inhibition 10mm against B.megaterium and P.vulgaris.

Key words: Antibacterial activities, plant extracts, aqueous extract *Staphylococcus aureus.*

INTRODUCTION

For a long period of time, plants have been a valuable source of natural products for maintaining human health, especially in the last decade, with more intensive studies for natural therapies. Now days, the use of phytochemicals for pharmaceutical purpose has gradually increased in many countries. According to World Health Organization (WHO) medicinal plants would be the best source to obtain a variety of drugs. About 80% of individuals from developed countries use traditional medicine, which has compounds derived from medicinal plants [1].

Bioactive compounds are normally accumulated as secondary metabolites in all plant cells but their concentration varies according to the plant parts, season climate and particular growth phase. Leaf is one of the highest accumulated plant part of such compounds and people are generally preferred it for therapeutic, purposes some of the active compounds inhibit the growth of disease causing microbes either singly or in combination [2].

Medicinal plants have been tested for biological, antimicrobial and hypoglycemic activity. They have also tested for antiulcerogenic, antihelminthic, hepatoprotective, analgesic, antipyretic, antileishmania and insecticidal activities [3].The use of crude extracts of plants parts and phytochemicals, of known antimicrobial properties, can be of great significance in the therapeutic treatments. In recent years, a number of studies have been conducted in various countries to prove such efficiency. Many plants have been used because of their antimicrobial traits, which are due to the secondary metabolites synthesized by the plants. These products are known by their active substances like, phenolic compounds which are part of the essential oils, as well as in tannin. The screening of plant products for

antimicrobial activity has shown that the higher plants represent a potential source of novel antibiotic prototypes. There has been an increasing incidence of multiple resistances in human pathogenic microorganisms in recent years, largely due to indiscriminate use of commercial antimicrobial drugs commonly employed in the treatment of infectious diseases. This has forced scientist to search for new antimicrobial substances from various sources like the medicinal plants [4].

Plant produces a wide variety of secondary metabolites which are used either directly as precursors or as lead compounds in the pharmaceutical industry. It is expected that plant extracts showing target sites other than those used by antibiotics will be active against drug resistant microbial pathogens. However, very little information is available on such activity of medicinal plants and out of the 4, 00,000 plant species on earth, only a small number has-been systematically investigated for their antimicrobial activities [5]. Plants and plant based medicaments are the basis of many of the modern pharmaceuticals we use today for our various ailments. It is clear that the plant kingdom harbors an inexhaustible source of active ingredients invaluable in the management of much intractable disease [6]

Scientific investigations of medicinal plants have been initiated in many countries because of their contributions to health care. The primary benefits of using plant-derived medicines are relatively safer than synthetic alternatives, offering profound therapeutic benefits and more affordable treatment [7]. A lot of supplementary treatment strategies have been tried. Current social trends in health care show a definite movement towards the use of natural remedies like medicinal plants and away from chemotherapeutic regimens [8].Hence in the present study, an attempt has been made with the antimicrobial activity of extracts of certain selected medicinal plants on some human pathogenic bacteria.

MATERIALS AND METHODS

Collection of medicinal plants

The fresh leaves of *Feronialimonia, Bauhinia racemosa, Pongamiapinnata, Dalbeagiasissoo, Terminaliaarjuna, Ailanthus excelsa, Morindatinctoria, Moringaoleifera, Cordiadichotoma*are collected from Mahadeodara, District Beed.The fresh leaves were dried under shade, powdered and pass through 40 mesh sieve and stored in closed bottle for further use. The powder was extracted with different solvent such as water, ethanol, chloroform, acetone, petroleum ether by Soxhlet apparatus.

SCREENING OF ANTIMICROBIAL ACTIVITY

Bacterial and fungal strains: The test organisms were purchased from NCIM, NCL Pune. The organisms were sub-cultured in the media specified. The organisms, their ATCC code, media in which they are sub-cultured are given in Table No.1. Bacteria were incubated at 37 ^{0}C in incubator for 24 h. They were further stored at 4 ^{0}C in the refrigerator to maintain stock culture. Microorganisms with their ATCC Codes and media used for subculture are as follows [9].

Table: .1. ATCC code and media used for development of micro-organism

Sr. No.	Name of microorganism	ATCC Code	Media
1	*Salmonella typhimurium*	2501	Nutrient Agar
2	*Bacillus megeterium*	2087	Nutrient Agar
3	*Pseudomonas aeruginosa*	2200	Nutrient Agar
4	*Staphylococcus aureus*	2079	Nutrient Agar
5	*Proteus vulgaris*	2027	Nutrient Agar
6	*Aspergillusniger*	1196	Nutrient Agar

Cylinder-plate or cup-plate method:

All the sterilized materials were kept in the aseptic area in the Ultra-Violet laminar air flow. Bacterial suspensions (3ml) were then poured in the petriplates. As soon as nutrient agar attained 50 ^{0}C temperatures, 20 ml media was poured in to the petriplates containing bacterial suspension and plates were rotated to mix the suspension with media. When the agar got solidified bores were made in the plate with sterile borer of 8 mm diameter. In each plate six bores were made. Out of which one is meant for addition of standard, two for negative control of blank solvents of standard and sample and remaining three bores for addition of same concentrations of sample. 0.1 ml of sample was added in each cylinder. The plates were kept to allow diffusion at room temperature for three hours and then

incubated in the upright position in incubator at 37 ^{0}C for about 21 h for bacterial growth. The diameter of zone of inhibition was accurately measured for bacterial growth in each treated plate. The zone of inhibition of bacterial growth by the test solution was compared with the zone of inhibition by the standard at tested concentrations.

RESULTS AND DISCUSSION

In literature it has been indicated that medicinal plants are the backbone of traditional medicine [10] and the antibacterial activity of plant extract is due to different chemical agent in the extract, which were classified as active antimicrobial compounds [11]. Plants have the capacity to synthesize a diverse array of chemicals and understanding how phytochemicals function in plants may further our understanding of the mechanisms by which they benefit humans. In plants, these compounds function to attract beneficial and repel harmful organisms, serve as photoprotectants and respond to environmental changes. In humans, they can have complementary and overlapping actions, including antioxidant effects, modulation of detoxification enzymes, stimulation of the immune system, reduction of inflammation, modulation of steroid metabolism and antibacterial and antiviral effects [12].

Table: 2. Antibacterial activity of plants

Sample Name	*S. aureus*	*B. megaterium*	*S. typhimurium*	*P. vulgaris*	*P.aeroginusa*
Feronialimonia	8mm	10mm	_	5mm	4mm
Bauhiniaracemosa	_	_	_	2mm	_
Pongamiapinnata	_	_	_	10mm	_
Dalbergiasissoo	5mm	8mm	7mm	8mm	7mm
Terminaliaarjuna	9mm	6mm	_	7mm	7mm
Ailanthusexcelsa	_	_	_	_	_
Morindatinctoria	_	3mm	_	_	_
Moringaoleifera	_	_	_	_	_
Cordiadichotoma	5mm	4mm	_	7mm	5mm

Table: 3. Antifungal activity of plants

sample	Diameter of inhibition zone according to microorganism	
	A.niger	*A. flavus*
Feronialimonia	_	_
Bauhiniaracemosa	_	_
Pongamiapinnata	_	_
Dalbergiasissoo	_	_
Terminaliaarjuna	_	_
Ailanthusexcelsa	_	_
Morindatinctoria	_	_
Moringaoleifera	_	_
Cordiadichotoma	_	_

Fig.1.Antibacterial activity of, A1.*Feronialimonia,* A2. *Bauhinia racemosa, A3.Pongamiapinnata,* A4.*Dalbergiasissoo,* A5.*Terminaliaarjuna,* A6.*Ailanthus excelsa,* A7.*Morindatinctoria,* A8. *Moringaoleifera*and*A9.Cordiadichotoma*against*S. Aureus*

Fig.2.Antibacterial activity ofA1.*Feronialimonia,* A2. *Bauhinia racemosa,* A3.*Pongamiapinnata,* A4.*Dalbergiasissoo,* A5.*Terminaliaarjuna,* A6.*Ailanthus excelsa,* A7.*Morindatinctoria,* A8. *Moringaoleifera*andA9. *Cordiadichotoma* against *B. megaterium*

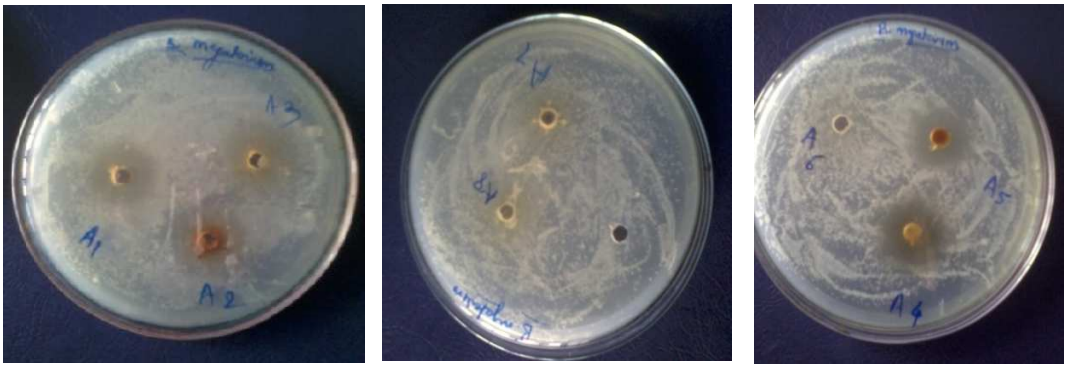

Fig.3.Antibacterial activity ofA1.*Feronialimonia,* A2. *Bauhinia racemosa, A3.Pongamiapinnata,* A4.*Dalbergiasissoo,* A5.*Terminaliaarjuna,* A6.*Ailanthus excelsa,* A7.*Morindatinctoria,* A8. *Moringaoleifera* and *A9.Cordiadichotoma*against *S. typhimurium*

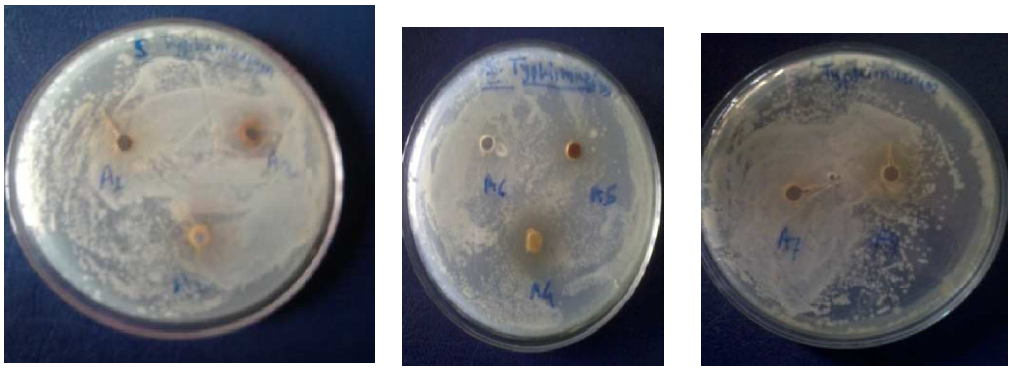

Fig.4.Antibacterial activity of A1.*Feronialimonia,* A2. *Bauhinia racemosa,* A3.*Pongamiapinnata,* A4.*Dalbergiasissoo,* A5.*Terminaliaarjuna,* A6.*Ailanthus excelsa,* A7.*Morindatinctoria,* A8. *Moringaoleifera*andA9. *Cordiadichotoma* against *P. vulgaris*

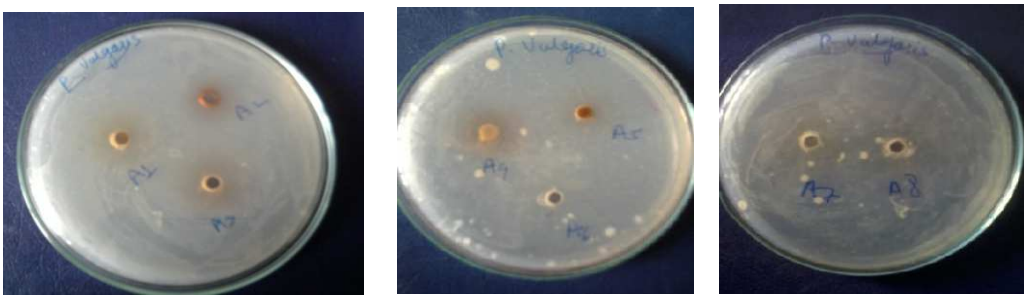

Fig.5.Antibacterial activity ofA1.*Feronialimonia,* A2. *Bauhinia racemosa,*A3.*Pongamiapinnata,* A4.*Dalbergiasissoo,* A5.*Terminaliaarjuna,* A6.*Ailanthus excelsa,* A7.*Morindatinctoria,* A8. *Moringaoleifera*andA9. *Cordiadichotoma* against*P. aeruginosa*

Fig.6.Antifungal activity ofA1.*Feronialimonia*,A2.*Bauhinia racemosa,* A3.*Pongamiapinnata,* A4.*Dalbergiasissoo,* A5.*Terminaliaarjuna,* A6.*Ailanthus excelsa,*A7.*Morindatinctoria,* A8. *Moringaoleifera*andA9. *Cordiadichotoma* against *A. nigar*

Fig.7.Antifungal Antibacterial activity ofA1.*Feronialimonia,* A2. *Bauhinia racemosa,*A3.*Pongamiapinnata,* A4.*Dalbergiasissoo,* A5.*Terminaliaarjuna,* A6.*Ailanthus excelsa,* A7.*Morindatinctoria,* A8. *Moringaoleifera*andA9. *Cordiadichotoma* against A. *flavus*

In antibacterial activity of aqueous extract of nine medicinal plants was screened individually by the presence or absence of zone of inhibition. Fig. 1 represents the antibacterial activity of selected plants against *S. aurous*. The figure showed that maximum of 9mm was recorded of *Terminal iaarjuna* against *S.aureus* where as the lowest activity of 5mm was seen of *Dalbergiasissoo and Cordiadichotoma*. The antibacterial activity of other plant extracts also significant, 10 mm for *Feronialimonia*and 3mm for *Morindatinctoria against B.megateriuum*. But in case of *S. typhimurium*, highest activity of 7mm was found for *Dalbergiasissoo*.Fig.4 represents antibacterial activity against *P. vulgaris* maximum activity 10mm of*Pongamiapinnata*and lower activity Bauhinia racemosa. Fig. 5 shows antibacterial activity against *P.aeroginosa*in which *Dalbergiasissoo*and *Terminaliaarjuna*higher activity7mm, while *Feronialimonia* lower activity of 4mm [Table.2].

In Fig.6 and Fig.7 represents antifungal activity of medicinal plants, nil for all plants [Table.3]. The success of the ethnobotanical approach to drugs discovery can no longer be questioned. Historical and current discoveries demonstrate its power [13]. A complete study conducted with the purpose of finding these chemicals is worthwhile. The optimal effectiveness of a medicinal plant may not be due to one main active constituent, but may be due to the combine action of different compounds originally in the plant [14].From this study we can conclude that this is a promising plant and the result confirms the use of this plant in traditional medicine for the treatment of infections.

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