
Antimicrobial Activity of Crude Stem Extracts of Some Medicinal Plants against Skin Disease Causing Microbes from Chhattisgarh Region

Surbhi Dubey and Dr. Shweta Sao

Department of Life Science, Dr.C.V. Raman University kargi road kota,Blaspur (C.G.)

Abstract

Plants as an ancient and traditional medicinal cure have served as models in drug development against skin diseases. Stem extracts of *Curcuma longa*, *Zingiberofficinale*, *Curcuma angustifolia*, and *Aloe barbedensis* were selected and were tested against skin pathogenic organisms like *Staphylococcus aureus*, *Enterococcus faecalis*, *Pseudomonasaruginosa* and *Candida albicans*. The Ethyl acetate from all the selected extracts has shown good activity with *candida albicans*. All the plant extracts have not shown antibacterial activity with the tested microbes at 20µl against skin disease causing microbes. Standards have shown better antibacterial and antifungal activities. The aqueous extracts of *Aloe barbedensis* and *Curcuma angustifolia* has shown better antibacterial and antifungal activities at 50µl against skin disease causing microbes. Further experimentations regarding the mechanism of control against skin pathogens has to be conducted.

Keywords

Stem extracts, skin disease causing microbes, antimicrobial activity

INTRODUCTION

From the past few decades, science has become an emerging field in the medicinal plants, both as antimicrobial pharmacological drugs as well as source for natural compounds that act as anti-infection agents [1]. India has a rich flora of medicinal plants that are widely distributed throughout the country. In the present Scenario, plants play an important role in Ayurveda, traditional and pharmacological benefits towards health care and there is a necessity to search for novel and active antimicrobial compounds [2]. Plants and herbs are the source of phenolic compounds. Plants exert therapeutic properties that can synthesize secondary metabolites like alkaloids, saponins, steriods, terpenols, tannins, Glycosides, resins, flavonoids, Volatile oils, etc.

In the ancient times, Egyptians [3] were the first humans used the principles of medicinal plants in a systematic way. More than 750 formulas were taken from plants in papyrus of Ebers (1700 A.C). In Mesopotamia and Egypt, the tradition to use the plants to cure diseases first discovered by Greek Scientist Hippocrates 450 C. The ayurvedic and traditional medicine healers from different countries like India, Egypt, China, Europe, Africa, etc., use plant preparations individually or combinations to treat various kinds of diseases.

Plants have been the basis for medical therapy through much of human life, and such traditional medicine is still widely practiced today. India is known for its rich flora and fauna, diverse climatic zones and wealth of living ethnomedicinal tradition [4]. Hence there is a need to understand the antimicrobial compounds from medicinal plants of Chhattisgarh and the resistance mechanisms involved in pathogenic microbes.

Plants traditionally have served as models in drug development. The production of medicines for health care and the pharmacological treatment of diseases began with the use of herbs [5]. Stem extracts of *Curcuma longa*, *Zingiberofficinale*, *Curcuma angustifolia*, and *Aloe barbedensis* were selected and were tested against skin pathogenic organisms – *Staphylococcus aureus*, *Enterococcus faecalis*, *Pseudomonasaruginosa* and *Candida albicans*. The antibacterial activities of these medicinal plants were investigated. Antibacterial and Antifungal activities of various plant extracts were compared with commercially available antibiotics.

The antimicrobial potential of the above plant extracts were seen against the test organism using agar well diffusion technique.

Materials and Methods

Collection of plant material

Stems of *Curcuma longa*, *Curcuma angustifolia*, *Zingiberofficinale* and *Aloe barbedensis* were collected from Bilaspur and Ambikapur districts of Chhattisgarh.

Preparation of Extracts

Freshly harvested stems of four different plants were collected, washed and air dried in the shade (room temperature). The desiccated plant stems were grinded to powder and about 150gms of the dehydrated plant material were used for the extraction. Nearly 30g of air dried powder were taken in 200ml of aqueous, methanol, ethanol, ethylacetate separately, plugged with cotton wool and then kept on orbital shaker for 48 hours with 150rpm at room temperature. The extracts were filtered with whatmann no 1 filter paper and collect the supernatant. Then solvent evaporated through rotavapour and make the final volume one-fourth of the original volume and stored at the 4°C in air tight containers.

Microorganisms

Microbes from ATCC (American Type Culture Collection), USA have been used in the present study. Several bacteria used in the current research work are *Enterococcus faecalis* (ATCC29212) and *Staphylococcus aureus* (ATCC25923) belong to gram positive bacteria, *Pseudomonas aeruginosa* (ATCC15442), belong to gram negative bacteria. Fungi used in the work are *Candida albicans* (ATCC10231).

Antimicrobial Activity Using Zone Method

Antimicrobial activity has been conducted based on zone method. The medium used in this experimentation are Muller-Hinton Agar (HiMedia Pvt. Ltd., Mumbai., India) for bacteria grown at 37°C for 24 hours and fungi in Sabourand Dextrose Agar (Hi Media Pvt. Ltd., Mumbai., India) at 25°C for 48 hours. The freshly prepared nutrient broth has been prepared and inoculated the broth cultures. The broth was inoculated into growth medium. The growth medium has prepared in the petriplates. Wells of 8mm size were made in the growth media with sterile borer. Nearly 20µl or 50µl of extracts or standards were added to the wells of growth media. The MHA (Muller-Hinton Agar) plates of bacteria were incubated at 37°C for 24hrs. The Sabourand Dextrose Agar plates were incubated using micro pipette at 25°C for 72 hours for fungi. After incubation diameter of zones of inhibition was measured using Hi Media zone reader in mm.

Results and Discussion

Plant extracts were screened for the better activity against skin disease causing microbes like *Staphylococcus aureus*, *Enterococcus faecalis*, *Pseudomonas aeruginosa* and *Candida albicans*. The extracts at 20µg/ml were added in the wells and the results were mentioned in table 1.

Table 1: Antimicrobial activity of extracts at 20µl against skin disease causing microbes

Microorganism	<i>Aloe barbedensis</i>				<i>Curcuma longa</i>				<i>ZingiberOfficinale</i>				<i>Curcuma angustifolia</i>				Standard
	M	E	EA	A	M	E	EA	A	M	E	EA	A	M	E	EA	A	
<i>Staphylococcus aureus</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+++
<i>Enterococcus faecalis</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+++
<i>Pseudomonas aeruginosa</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+++
<i>Candida albicans</i>	-	-	+	+	-	-	+	-	-	-	+	-	-	-	+	+	++

Note: M-Methanol; E-Ethanol; EA-Ethylacetate; A-Aqueous; Standard- Fluconazole for fungi and Gentamycin for bacteria; +-shows antimicrobial activity; -- No activity

The Ethyl acetate of all extracts has shown good activity with *candida albicans*. All the extracts have not shown antibacterial activity with the tested microbes. Standards have shown better antibacterial and antifungal activities. Aqueous extracts of *Aloe barbedensis* and *Curcuma angustifolia* has shown better activity.

Due to having importance in the aqueous extracts as better pharmaceutical products, further aqueous extracts at 50µl against skin disease causing microbes were tested (Table 2).

Table 2: Antimicrobial activity of aqueous extracts at 50µl against skin disease causing microbes

Microorganism	Antimicrobial activity with well size of 10mm (zone size is in mm including well size)				
	<i>Aloe barbedensis</i>	<i>Curcuma longa</i>	<i>Zingiber Officinale</i>	<i>Curcuma angustifolia</i>	Standard
<i>Staphylococcus aureus</i>	26	--	--	20	20
<i>Enterococcus faecalis</i>	33	20	12	24	25
<i>Pseudomonas aeruginosa</i>	40	--	15	16	30
<i>Candida albicans</i>	18	24	--	18	20

The aqueous extracts of *Aloe barbedensis* and *Curcuma angustifolia* has shown better antibacterial and antifungal activities at 50µl against skin disease causing microbes.

Plants are the basis for medical treatments through much of human history, and such traditional medicine is still widely practiced today [6, 7]. India is known for its rich flora and fauna, diverse climatic zones and wealth of living ethnomedicinal tradition..Hence there is a need to understand the antimicrobial compounds from medicinal plants of Chhattisgarh and the resistance mechanisms involved in pathogenic microbes (Table 3).

Table 3: The Plants with medicinal uses and the essential compounds

S.No.	Scientific Name	Common Plant Name	Family	Uses and Treatment	Essential compounds	References
1	<i>Curcuma longa</i>	Turmeric(English) Haladi (hindi)	<i>Zingiberaceae</i>	Antispasmodic, Anti-inflammatory, liver disorders, Anti-HIV, Anticancer, Anti-oxidant, Anorexia, Skin diseases, Rheumatism, Sinusitis, Urinary diseases.	Curcumin, 1,7 bis hydroxyl 3-methoxyliene, 1,6 heptadine, 3,5 diene Curcuminoid Terpenoids, Phenols, Sesquiterpenes, Ar. turmulone, Curone	[8,9,10]
2	<i>Zingiber officinale</i>	Ginger(English) Aadrak (Hindi)	<i>Zingiberaceae</i>	Diarrhea, Nausea caused by Cancer, HIV, Cholesterol Lowering, Anti-thrombotic, Anti-inflammatory, Arthritis, Rheumatism, Constipation, Anti- apoptotic, Hyperglycemia	Zingerone, Oleoresin, 6-gingerol, 6-shogaol, 8-gingerol, and 10- gingerol	[11,12,13,14]
3	<i>Aloe barbedensis miller</i>	Aloe Vera(English) Ghritakumari (Hindi), kalabanda (Telugu).	<i>Liliaceae</i>	Dermatology, Anti-septic, Anti-Ageing, Anti-Tumour, Psoriasis Vulgaris, Genital herpes, Skin Burns, Type 2 Diabetes, HIV Infection, Ulcerative Colitis, Mucositis, Acne Vulgaris, Constipation, Eczema, Gastrointestinal disorders, Immune System Enhancers	Anthroquinones, aloxin, Barbaloin	[15,16,17]
4	<i>Curcuma angustifolia</i>	Tikhur	<i>Zingiberaceae</i>	Gastrointestinal disorder, chest and lungs.	Alpha amorphene, Naphalenediol, trans-nerolidol, acid butyl ester	[18,19]

Conclusion

The Ethyl acetate of all extracts has shown good activity with *candida albicans*. All the extracts have not shown antibacterial activity with the tested microbes. Standards have shown better antibacterial and antifungal activities. Aqueous extracts of *Aloe barbedensis* and *Curcuma angustifolia* has shown better activity. The aqueous extracts of *Aloe barbedensis* and *Curcuma angustifolia* has shown better antibacterial and anti fungal activities at 50µl against skin disease causing microbes. Further experimentations regarding the mechanism of control against skin pathogens has to be conducted.

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