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IN *VITRO* ANTIMICROBIAL ACTIVITY OF EXTRACTS OF PLANTS OF GENUS *SIDA* LINN

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ABSTRACT

India has rich plant diversity. The people in India are using these plants for medicinal purposes. This practice is common in countries like Africa, China Brazil also. The drugs obtained from variety of plants are used in various traditional as well as modern practices. Sida is one of such medicinally potential genus of plants. Although various species under this genus are clinically important, their comparative antimicrobial studies are not studied so far. Various extracts of S.acuta, S.cordifolia, S.rhombifolia were tested against various bacteria and fungi. The MIC were also calculated. The activity of extracts of S.acuta were very significant.

Keywords: *Plant diversity, Genus Sida, antimicrobial study, MIC, S.acuta etc.*

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INTRODUCTION

India has got rich heritage of medicinal knowledge. Common people are having knowledge of medicinal uses of plants. since ancient times people in India are practicing Ayurvedic medicine systems for treatment of diseases. This system consists of various plant parts or their products. In overall world, use of herbal medicines is ever increasing. These medicines are also important in modern methods of therapy.[1] The people in countries like Africa, China, Brazil are also practicing herbal medicines. This knowledge of clinical use of plant parts or products is very common in people of rural area. This knowledge of ethnomedicine is very rich source of information about plants. Near about 13000 plant species are medicinally important worldwide. 3500 plant species in India are useful as a source of crude drug. Near abut 2500 plants are ethnomedicinally important. Out of it, Genus *Sida* is one of the important groups of plants. Many plants of genus *Sida* are used by people. They are very commonly used in various ayurvedic preparations. Near about 100 species of *Sida* are observed. In view of this immense medicinal importance of *Sida,* antimicrobial activity of plant extracts is very significant.[2] Three species of *Sida* i.e. *S. acuta, S. cordifolia and S. rhombifolia* were studied for antimicrobial activity. This study is important for utilization of these plants in dermatological

application. The literature review shows importance of plant in treatment of eczema, wrinkles, aging etc.

In Ayurveda, *S.cordifolia* is very commonly used which is commonly known as Bala. It is used for treatment of pulmonary tuberculosis, cystitis, strangury, haematuria, cyinary & heart diseases, gonorrhea, nervous disorders etc. It is also used in Parkinson's disease. Another plant *S.rhombifolia* is known as Mahabala. This plant is having great hepato protective activity. This plant is used as a substitute to *S. cordifolia*. *S. acuta* is third important plant taken for study. It is very common weed which is also useful in Ayurveda. It is used in the treatment of malaria, diarrhoea, asthama, headache, cold, fever, skin diseases, and facial paralysis etc.[3]

The genus *Sida* belongs to family malvaceae. The plants are mostly weeds which are observed road side, costal areas, forests, fields etc. The plants from genus *Sida* contain various chemical constituents. They are studied so far by various workers. The chemical constituents are varied according to species .Ecdysterone, fatty acids, heraclinol, β-sitosterol, acanthoside β-daucoglycoside, cryptolepine ,quindoline, cyclopropenoid mucilage, phytosterol , ecdysterone[4] are present in *S.acuta* . β-phenylethylamine, vasicine, vasicinone, betaine, methylethalamine, tryptophan, methyl ester, vasicinol choline, ephedrine are present in *S. rhombifolia.* Flavonol C glycosides, aspargin, phytosterol[5], mavalic acid, palmitic acid, stearic acid[6], cryptolepine are present in *S. cordifolia*. Cyclopropanoid fatty acids are present in seed oil of *S. acuta and S. rhombifolia. S. rhombifolia* is also containing heradenol, acanthaside, phytoecdysterol[7]. This indicates chemical and clinical potential of plant, however antimicrobial activities of plants are not studied so far[8]. So this study is undertaken. It is also applicable in dermatological & cosmetic uses of these plants. Present article deals with study of antimicrobial activity of various parts of plants of genus *Sida.*

MATERIALS AND METHODS:

Three plant species viz. *S.acuta, S. cordifolia and S.rhombifolia,* were collected in the month of October and November from Egatur's costal area of Chennai (TN), Khadki area of Pune and rural area of Pune district respectively. The plant *S. cordifolia* was authenticated from Prof. Jayaraman, Plant Anatomy Research Center, Chennai. *S.rhombifolia and S.acuta* were authenticated from Agharkar Research Institute, Pune. Voucher specimens are kept in Department of Pharmacognosy, of Lokseva College of Pharmacy, Phulgaon, Pune, for future references. Leaves, roots, stems were obtained from collected plants. They are shade dried, powdered using grinder mixer. The powdered material is packed in air tight container until use. Then the powdered drug is successively extracted with soxhlet apparatus by using solvents like chloroform, ethanol, methanol, petroleum ether, acetone.[9] The extracts were phytochemically screened for presence of various chemical constituents.[10,11,12]

Antimicrobial activity:

The extracts were used to study their effect on growth of microorganisms. The microorganisms were obtained from Pharmaceutical Microbiology Laboratory, Lokseva college of Pharmacy, Phulgaon, Pune. Table 1 shows the microorganisms used for study.

Table 1. Microorganisms used in study

Sr.No.	Microorganisms	Strain no.
1	*Staphylococcus aureus*	MTCC 96
2	*Bacillus subtilis*	MTCC 1790
3	*Escherchia coli*	MTCC 119
4	*Psuedomonas auregenosa*	MTCC 2581
5	*Aspergillus niger*	MTCC 2798
6	*Candida albicans*	MTCC 227

The microorganisms used include various gram +ve and gram -ve bacteria and fungi. The microorganisms were enriched and then serially diluted. 10^{-7} concentrations were used for the study. The nutrient agar was used for bacterial

culture and Sabouraud dextrose agar was used for fungal culture as a nutrient medium. Agar well diffusion method was used for the study. The extracts were dissolved separately in DMSO[13]. The well of size 10 mm were prepared by aluminum borer[14]. Then 0.1 ml of each extract was added in each plate. One plate was added with 0.1 ml of DMSO and Gentamycin 10 mcg/ml and Griseofulvin 30 mcg/ml as control and standard reference. Then the plates were refrigerated for 30 min and then incubated for 18 hrs at 30^0C. After incubation the zones of inhibition were observed. The diameters of zones were measured. Minimum inhibitory concentrations were also determined[15,16,17,18,19,20]. The zones of inhibition and MIC are provided in Table 3 and 4 respectively.

Table 2: Antimicrobial activity of different extracts of *S.acuta*

Sr No.	Microorganisms	Acetone	Chloroform	Ethanol	Pet. Ether	DMSO	Std.Drug
1	*S. aureus*	15	30	30	12	10	32
2	*B. subtilis*	18	18	24	13	10	28
3	*E. coli*	20	28	24	-	10	30
4	*P. auregenosa*	11	20	17	-	10	30
5	*A. niger*	-	24	14	28	10	19
6	*C. albicans*	16	15	10	22	10	23

Table 3: Antimicrobial activity of different extracts of *S. cordifolia*

Sr.No.	Microorganisms	Acetone	Chloroform	Ethanol	Pet. Ether	DMSO	Std. Drug
1	*S. aureus*	17	20	40	14	10	32
2	*B. subtilis*	16	14	20	16	10	28
3	*E. coli*	22	28	15	-	10	30
4	*P. auregenosa*	12	18	28	-	10	30
5	*A. niger*	12	-	16	22	10	19
6	*C. albicans*	14	12	14	18	10	23

Table 4: Antimicrobial activity of different extracts of *S. rhombifolia*

Sr.No.	Microorganisms	Acetone	Chloroform	Ethanol	Pet. Ether	DMSO	Std. Drug
1	*S. aureus*	12	12	28	18	10	32
2	*B. subtilis*	16	10	14	12	10	28
3	*E. coli*	18	18	16	-	10	30
4	*P. auregenosa*	12	18	22	16	10	30
5	*A. niger*	14	14	22	20	10	19
6	*C. albicans*	16	24	14	16	10	23

RESULT AND DISCUSSION:

The phytochemical analysis and antimicrobial activity of various extracts of plants of genus *Sida* was performed. The phytochemical study revealed presence of carbohydrates, alkaloids, saponins, fixed oils, steroids in the extracts. The tests have shown better results. A result of preliminary phytochemical analysis (Table No.5) shows that, secondary metabolites like alkaloids, tannins, flavonoids, steroids, saponins and glycosides are present almost in all six different solvent extracts.

Table 5. Preliminary Phytochemical Analysis

Species→ Solvent→	*S. cordifolia*						*S. rhombifolia*						*S. acuta*					
	PE	B	C	A	E	W	PE	B	C	A	E	W	PE	B	C	A	E	W
Alkaloids	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Tannins	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Flavonoids	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Steroids	+	+	-	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+
Saponins	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Glycosides	+	-	-	+	+	+	+	+	+	-	+	+	+	+	+	-	+	+

Steroids were appeared to be absent in chloroform and acetone extract of *S. cordifolia* and *S. rhombifolia* respectively. Whereas glycosides were absent in benzene and chloroform extract of *S. cordifolia* and in acetone extract of both *S. rhombifolia* and *S. acuta*. Results from the present investigation showed that *S. cordifolia, S. rhombifolia* and *S. acuta* are very rich in secondary metabolites, even though the phytochemical analysis of the three plants revealed some differences in their constituents.

The antimicrobial activity was performed in the form of zones of inhibitions against various bacteria and fungi. The activity found was very significant. The zones of inhibition obtained by extracts of *S. acuta* were very specific as compared to extracts of *S. cordifolia* and *S. rhombifolia*. The zones of inhibition of petroleum ether, acetone, chloroform, ethanol extracts of *S. acuta* were found 12 to 30 mm against bacteria and 10 to 28 against fungi. The zones of inhibition different extracts of *S. cordifolia* found 12 to 40 mm against bacteria and 12 to 22 mm against fungi and that of extracts of *S. rhombifolia* 12 mm to 28 mm against bacteria and 14 to 24 mm against fungi. The MIC of all extracts of three plants were also determined. It varied from 0.20 to 0.45 against bacteria and fungi. The activities were compared with standard antibacterial and antifungal agents i.e. gentamycin and grisefulvin. From above result, it is clearly observed that *S.acuta* shows noticeable antimicrobial activity against bacteria and fungi. It indicates that the chloroform and ethanol extracts of *S.acuta* contains strong antimicrobial substances. The acetone and petroleum ether extracts also possess antimicrobial activity. The ethanol and chloroform extracts of *S. cordifolia* has shown significant antimicrobial activity. The acetone and petroleum ether extracts has also shown powerful activity against bacteria and fungi.

The extracts of *S. rhombifolia* have also shown variant activity on microbial growth. Among all the acetone and chloroform extracts of *S.acuta* shows more significant activity.

CONCLUSION:

The study reported significant antimicrobial activity. The constituents present in extracts possess powerful activity. This indicates importance of constituents of these plants from genus *Sida* as antimicrobial agent. The activity is against all gram +ve and gram –ve bacteria and fungi also. The study indicates importance of these compounds for prevention of microbial contamination. This effect can be correlated with application of it, against dermatological microbial infections which are common. These effects may be used for designing and development of material for dermatological applications. This study also indicates significance of herbal drugs in the modern practices. These drugs can be studied, analyzed on perspective of modern science. This information can be used to prepare data base. The ethnomedicinal information regarding Genus *Sida* may be also used for it. However further studies

are needed to evaluate the activities of various plants of genus *Sida.*

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