Indian Herbs a potential source of antimicrobial drugs as Non-antibiotics

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Abstract- New sources of antimicrobial drugs need to be identified to combat multidrug resistance problem in pathogenic bacteria. Plant extract and phytochemicals demonstrating anti-microbial action needs to be exploited in modern phytomedicine as Non-antibiotics and in combinational therapy.

The present investigation reveals the scientific evaluation of the root of *Hemidesmus indicus (*anantamool*)* against pathogenic bacteria and it is suggested that this plant could be exploited in the management of infectious diseases caused by the test pathogenic bacteria and *Candida albicans* in the human system.

The *in vitro* antibacterial activity of 3 different extracts (Hexane, Methanol and Aqueous) was performed. The most active extract was found to be the hexane extract showing the maximum zone of inhibition of 22 mm against *Staphylococcus Aureus* followed by *E.coli* (18mm) and *Candida Albicans* (18mm).

Key words: *Hemidesmus Indicus*, antibacterial/ anticandidal activity, bioactive compound

Introduction

Infectious disease are the world's leading cause of premature deaths, killing almost 50 000 people every day. Infections due to variety of bacterial etiologic agents such as pathogenic *Escherichia coli, Salmonella* spp., *and Staphylococcus aureus* are most common. In recent years drug resistance to human pathogenic bacteria has been commonly reported from all over the world (Piddock and Wise, 1989; Singh et al 1992 and Mulligen et al; 1993). With the continuous use of antibiotics micro-organism have become resistant. In addition to this problem, antibiotics are sometimes associated with adverse effects on host which include hypersensitivity, immunosuppressant and allergic reactions (Lopez et al.2001 and Idsoe et al.1968).This has created immense clinical problems in the treatment of infectious diseases (Davis 1994). Therefore, there is a need to develop alternative antimicrobial drugs for the treatment of infectious diseases; one approach is to screen local medicinal plants for possible antimicrobial properties. Plant materials remain an important recourse to combat serious diseases in the world. According to WHO (1993), 80% of the world's population is

dependent on the traditional medicine and a major part of the traditional therapies involves the use of plant extracts or their active constituents. Yet a scientific study of plants to determine their antimicrobial active compounds is a comparatively new field.

Since ancient times, herbs and their essential oils have been known for their varying degrees of antimicrobial activity (Shelef 1983; Zaika 1988; Beuchat and Golden 1989 and Juven et al.1994). In recent times, the search for potent antibacterial agents has been shifted to plants. Most plants are medicinally useful in treating disease in the body and in most of cases the antimicrobial efficacy value attributed to some plants is beyond belief. Claims of effective therapy for the treatment of dysentery ,diarrhea, respiratory disorders, skin diseases, syphilis, fever, leprosy, eye diseases and kidney and urinary disorders by traditional herbalist in India have prompted our interest in the scientific investigation of such herbal medications (Mukherjee, 1953; Chopra et al; 1956; Kritikar and Basu,1980; Anonymous,1986 and Nadkarni,1989).Conservative estimates suggest that about 10% of all flowering plants on earth have at one time, been used by local communities throughout the world but only 1% have gained recognition by modern scientists. There are about 120 plant-based drugs prescribed worldwide and they come from just 95 plant species. Approximately 250,000 species of flowering plants and only 5000 have had their pharmaceutical potential assessed. The treatment of infectious diseases with antimicrobial agents continues to present problems in modern-day medicine with many studies showing a significant increase in the incidence of bacterial resistance to several antibiotics (Kunin 1993). Due to increased resistance of many microorganisms towards established antibiotics, investigation of the chemical compounds within traditional plants has become desirable (Anonymous 1986). There are many published reports on the effectiveness of traditional herbs against Gram-positive and Gram-negative microorganisms, basic health needs in the developing countries.

One possible approach is to screen/unexplored Indian medicinal bioactive plants extracts for their potential to be used against multi resistant bacteria. India has one of the world's richest flora with about 120 families of plants comprising 1,30,000 species and about 119 secondary plant metabolites are used globally as drugs. The WHO reported that 80% of world population rely chiefly on traditional medicines/herbs for primary healthcare have steadily increased worldwide in the recent years. Keeping in view this study is designed to evaluate the antimicrobial activity of *Hemidesmus Indicus.*

Material and Methods

Collection of plant materials

Hemidesmus Indicus roots were collected from the Himalaya Wellness Company Dehradun India .The collected plant material was identified by the department of Pharmacognosy, Himalaya Wellness Company Dehradun. Roots were washed under the running tap water 2-3 times and once with sterile distilled water and dried under shade and then homogenized to fine powder and stored in air tight container till further use.

Preparation of solvent root extraction

The method of Alade and Irobi, (1993) was adopted for preparation of plant extracts with little modifications.

The dried 25 g powdered root soaked separately in 100 ml Hexane, methanol, and aqueous .Each solvents were kept in separate flasks with powdered sample were kept in a rotating shaker for 3 days. The extracts were filtered through whatman Filter paper No.1 and the extracts were reduced to half of its original volume. The organic solvents were concentrated in vacuum using rotary evaporator, while aqueous extract was dried using water bath.

Culture media

The media used for antibacterial test was Soyabean Casein Digest Agar/broth of Hi Media Pvt. Ltd. Bombay, India.

Inoculum

The bacteria were inoculated into soyabean casein digest agar /broth and inoculated and incubated at 37 ℃ for 4 h and the suspension was checked to provide approximately 10^5CFU/ml.

Microorganisms

The antibacterial activity of the extract and the essential (bioactive compound) were tested individually on G+ve and G-ve bacterial strains .All bacterial strains were obtained from IMTECH, Chandigarh India. The G+ve strain used was *Staphylococcus aureus MTCC 737 and* G-ve bacterial strains were *E.coli MTCC 1687; Psuedomonas aeruginosa MTCC 1688* and *Salmonella enteric MTCC 3858.and Candida albicans MTCC 3017.*

Determination of antibacterial / anticandidal activity

The agar well diffusion method (Perez et al; 1990) was modified. Soyabean casein digest agar (SCDA) was used for bacterial cultures. The culture medium is inoculated with the microorganisms suspended in soyabean casein digest broth. A total of 8mm diameter wells were punched into agar and filled with plant extracts and solvent blank s(distilled water, hexane and methanol as the case may be).Standard antibiotic was simultaneously used as positive control. The plates were then incubated at 37°C for 18 h. The antibacterial / anticandidal activity was evaluated by measuring the inhibition zone diameter observed. Wells were filled with 0.1 ml of 20 mg/ml concentration of each sample (2 mg/well).Bioactivity was determined by measuring Diameter of Inhibition Zones (DIZ) in mm.

Results and Discussion

Among all the tested extracts hexane extract was found to have maximum zone of 22mm against *Staphylococcus aureus* (Table-1; Figure-1 and 2, Plate-1) followed by *E.coli* (18mm), *Candida albicans* (18mm), *Pseudomonas aeruginosa* (16mm) and *Salmonella enteric* (15mm).

The significant antimicrobial effect of *Hemidesmus Indicus* against all the pathogen confirmed that the compound present in the crude extract are responsible for the effective antimicrobial activity.

Table- 1 Antimicrobial activity of *Hemidesmus indicus* root extract

S.No.	**Test microorganisms**	**Diameter of zone of inhibition(mm)**			
		Hexane extract	Methanol extract	Aqueous extract	**+VE Control Ciprofloxacin 30µg/ml**
1.0.	*Staphylococcus aureus MTCC 737*	22	16	NAD	25
2.0.	*E.coli MTCC 1687*	18	14	NAD	21
3.0.	*Pseudomonas aeruginosa MTCC 1688*	16	12	NAD	22
4.0.	*Salmonella enterica MTCC 3858*	15	13	NAD	21
5.0.	*Candida albicans MTCC 3017*	18	16	NAD	----

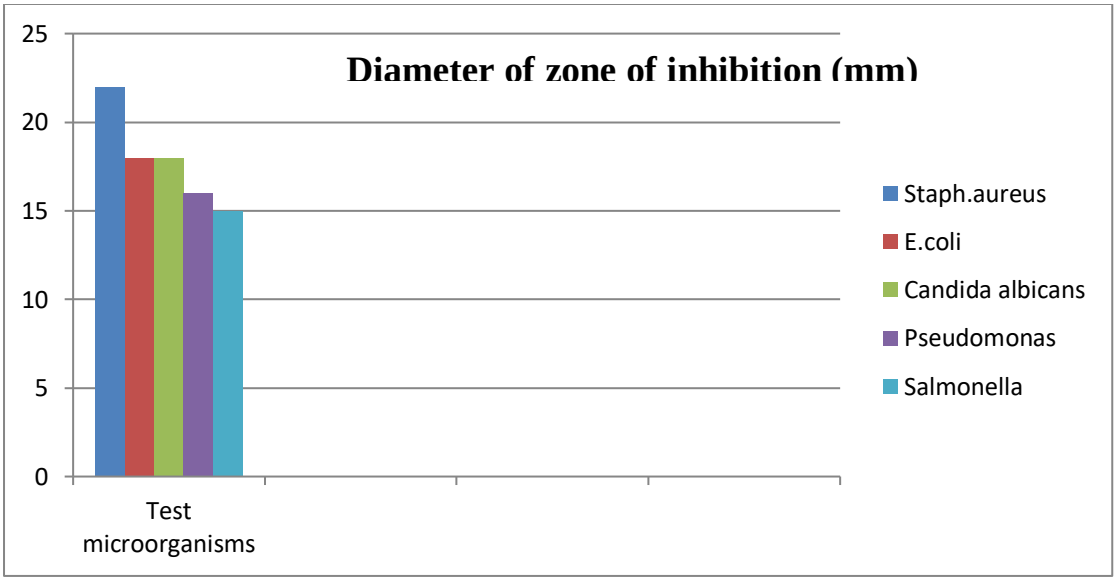

Figure-1 Susceptibility of test microorganisms against Hexane extract of *Hemidesmu sindicus* in **the form of diameter of zone of inhibition (mm).**

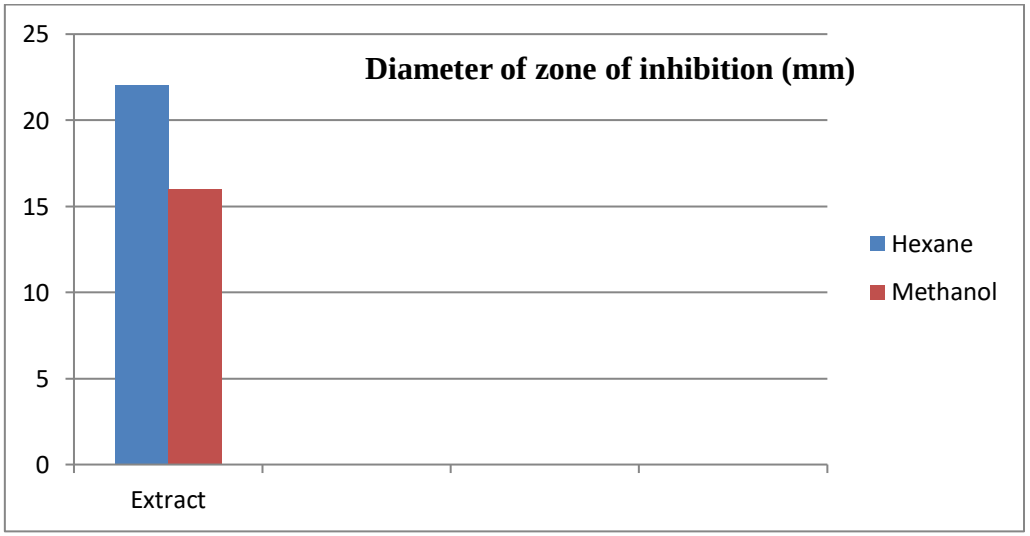

Figure-2 Antimicrobial efficacy of Hexane and Methanol extract of *Hemidesmus indicus* **in the form of Diameter of zone of inhibition**

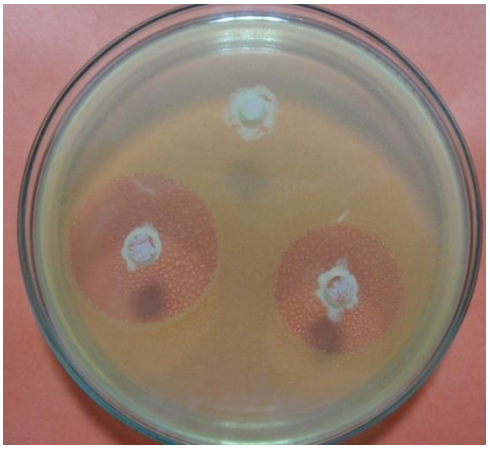

Plate-1 Antibacterial activity of Hexane extract against *Staph. aureus* **(MTCC 737)**

The traditional therapeutic indications of *Hemidesmus Indicus* studied appear to have a fairly good degree of correlation with their antimicrobial activity. The herb *Hemidesmus Indicus* appear to have broad spectrum of action, it could be useful in antiseptic, disinfectant formulations and in chemotherapy .The antibacterial activities of the herb is particularly noteworthy, considering the importance of these organisms in infections.

Disclaimer Statement

Authors declare that no competing interest exists. The products used for this research are commonly used products in research. There is no conflict of interest between authors and producers of the products.

References

Alade, P. I. and Irobi, O. N. Antimicrobial activities of crude leaf extracts of *Acalypha wilkensiana*. *Journal of Ethno pharmacology*, 1993, 39:171-174.

Anonymous. Assay for anti-malarial and amoebicidal activities. Methods in Plant Biochemistry, Bd. Academic Press Limited, Great Yarmouth, Norfolk, 1986, pp. 135–152.

Beuchat, L R. and Golden, D A. *J. Food Technol.*, 1989, 43:134-142.

Chopra, R. N.; Nayar, S. L. and Chopra, I.C. *Glossary of Indian Medicinal Plants*, C.S.I.R., New Delhi, India, 1956.

Davis, J. Inactivation of antibiotics and the dissemination of resistance genes. *Science*, 1994, 264:375-382.

Idose, O.; Guthe, T.; Willeox, R.; Deeweck, A. L. Nature and extent of penicillin side reaction with particular sequences to fatalities from anaphylactic shock. Bulletin of WHO, 1968, 38:159-188

Juven, B. J.; Kanner, J.; Schved, F. and Weisslowicz, H.J. *Appl. Bacteriol*., 1994, 76:626-631

Krithikar, K. R. and Basu, B. D. *Indian Medicinal plants*, Vol. 1-4, Bishen singh Mahendra Pal Singh, Dehradun, India

Kunin, C. M.; *J. Internal Medicine*, 1993, 118(7), pp. 557–561

Lopez, A.; Hudson, J.B. and Towers, G.H.N. *J. Ethno pharmacology*, 2001, 77:189-96

Mulligen, M. E., Kauffman, C. A. and Yu, V. L. *American Journal of medicine*, 1993, 94: 3 13-28.

Mukherjee, B. *The Indian pharmaceutical codex*, Vol. II, Indigenous drugs. CSIR,New Delhi, India, 1953.62-69

Nadkarni, A. N. *Indian Materia. Medica.*, Vol. I, Popular Book Depot, Bombay, India, 1989.

Perez; Cristina; Anesini; Claudia. In vitro antimicrobial activity of Argentine folk medicinal plants against *Salmonella typhi. Journal of Ethno pharmacology*, 1994, 44:41-46.

Piddock, K.J.V. and Wise, R. *Journal of Antimicrobial chemotherapy*, 1989, 23:475-83.

Shelef, L A. *J. Food Safety*, 1983, 6:29-44.

Singh, M.; Chaudhry, M. A.; Yadava, J. N. S. and Sanyal, S. C. *J. Antimicrobial Chemotherapy*, 1992, 29:159-68

Stevens, M. J. and Olsen, S. C. "Comparative analysis of using MTT and XTT in colorimetric assays for quantitating Bovine neutrophil Bactericidal activity. *Journal of immunological methods*, 1993, Vol. 157, No.1-2, 225-231.

World Health Organization (WHO). Summary of WHO guidelines for the assessment of herbal medicines. *Herbal Gram.*, 1993, 28;13-14.

Zaika, L. *J. of Food Safety*, 1988, 9: 97-118.