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Research Article

ANTIBACTERIAL ACTIVITY OF *MALACHRA CAPITATA* L.

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ABSTRACT
The present study deals with the antimicrobial activity of ethanol extracts of leaf, stem and root of *Malachra capitata* L. which were tested against *Micrococcus sp, Bacillus subtillis, Escherichia coli, Pseudomonas aerogenosa* and *Salmonella typhimurium*. The antimicrobial activity of the plant extract was tested by well diffusion assay described by Bauer & Kirby (1966) with minor modifications and thereby measuring the zone of inhibition (ZOI). The stem and root extracts of *Malachra capitata* were active against all the test organisms while the leaf extract was effective against *Micrococcus* species and *Escherichia coli* only.

Keywords: *Antibacterial Activity, Malachra Capitata, Well Diffusion Assay, Zone of Inhibition*

INTRODUCTION
India is the largest producer of medicinal herbs and is appropriately called the botanical garden of the world (Ahmedulla and Nayar, 1999). In recent years, secondary plant metabolites, previously with unknown pharmacological activities, have been extensively investigated as a source of medicinal agents (Krishnaraju *et al.,* 2005).
A special feature of higher angiospermic plants is their capacity to produce a large number of organic chemicals of high structural diversity. The use of plant extracts or phytochemicals can be of great significance in antimicrobial treatments. In the last few years a number of studies have been conducted in different countries to prove such efficiency. Many plants have been used because of their microbial properties, which are due to compounds synthesized as secondary metabolites. These secondary metabolites like phenolics, tannins and their chemical components are the active molecules, which have antimicrobial properties (Jansen *et al.,* 1987; Saxena *et al.,* 1994). Problem of microbial resistance is growing in plants and animals and therefore, to reduce this problem more research studies are needed to find out the therapeutic agent.
The antimicrobial activity of *Malvaceae* members were well documented in the literature. These include *Sida cordifolia* (Kalairasan, 2010), *Sida spinosa* (Selvadurai, 2011), *Sida acuta* (Karou *et al.,* 2007), *Thespesia populnea* (Saravana *et al.,* 2009), *Malachra capitata* is naturalised and occurs almost throughout the drier parts of India, along roadsides, wastelands near habitations, dumping grounds and swampy areas. The leaves are considered to be anthelmintic and the roots are useful for rheumatism and lumbago. It is also used in fever, pectoral and vermifuge (Sivarajan and Pradeep, 1996).
The test organisms used in this study are associated with various forms of human infections. *Escherichia coli* cause septicemias and can infect the gall bladder, surgical wounds, skin lesions and the lungs. Infection caused by *Salmonella typhimurium* is a serious public health problem in developing countries and represents a constant concern for food industry (Mastroeni, 2002). *Bacillus subtillis* is a Gram-positive bacterium found in soil and on vegetation. They can contaminate food and may cause food poisoning. *Pseudomonas aerogenosa* is a Gram-negative bacterium cause urinary tract infection, respiratory system infection, dermatitis, soft tissue infections and gastrointestinal infections. *Micrococcus* species are Gram-positive bacteria and are generally thought of as harmless bacteria, but there have been rare cases of *Micrococcus* infections in HIV positive patients.

MATERIALS AND METHODS
Preparation of Extract*:* - 1 gm powder of plant material was mixed with ethanol and allowed to stand for 4 hrs. The extract was filtered and the filtrate was dried. The residue was dissolved in ethanol as per the conc. of 1 mg/ml.

Preparation of Nutrient Medium: **-** Nutrient broth medium was used to culture the bacteria for experiment. 38 gm of Muller Hinton Agar powder was added to 1000 ml of distilled water. The medium was sterilized by autoclaving at 15 lbs pressure for 15 min.
Different bacterial stains were used for the screening are: -
Gram +ve → *Micrococcus sp, Bacillus subtillis*
Gram –ve → *Escherichia coli, Pseudomonas aerogenosa, Salmonella typhimurium*
Pure culture of some bacteria, like *Salmonella typhimurium* (2501), *Pseudomonas aerogenosa* (2036) and *Escherichia coli* (2685) were obtained from National Collection of Industrial Microorganisms (NCIM), Pune. While *Micrococcus sp*. and *Bacillus subtillis* were obtained from Hislop School of Biotechnology (HSB), Hislop College, Nagpur.
Preparation of Inoculum: **-** Two or three morphologically similar isolated colonies were picked up from pure culture with the help of sterile platinum loop and inoculated in 5 ml of sterile nutrient broth. It was incubated for 4 to 6 hours at 37ºC as the growth of bacterium would be in logarithmic phase.
Inoculation: **-** The well diffusion method described by Bauer & Kirby (1966) was employed with minor modifications. The technical detail of this method as modified by NCCLS (2002) is used for this study. Plates were inoculated within 15 minutes of preparation of the suspension so that the density does not change. A sterile cotton wool swab was dipped into the suspension and surplus removed by pressing and rotating the swab firmly against the side of the tube above the fluid level. The medium was inoculated by even streaking of the swab over the entire surface of the medium three times, rotating the plate at an angle of 60º after each application. Finally swab was passed round the edge of the agar surface. Then the plates were allowed to set. Three wells were created using 5 mm cork borer. In this well 100 µl of the plant extract was filled. For positive control, Streptomycin was poured in the well and for negative control solvent (ethanol) was filled in the well.
Incubation: **-** Plates were incubated at 37ºC overnight.
Reading: **-** The diameters of the zone of inhibition were measured in millimetres. The results were documented with the help of table.

RESULTS AND DISCUSSION

Antibacterial activity of the plant extracts was determined against selected bacteria showing activities (Table 1). The highest inhibition zone recorded in stem and root extract against *B.subtillis* i.e. 11 mm and 10 mm respectively. Root extract also showed maximum inhibition zone against *Micrococcus sp.* and *E.coli* i.e. 10 mm and 9 mm respectively. Leaf extract had no activity against *B. subtilis, P. aerogenosa* and *S. typhimurium.* Stem and root showed no activity against *S. typhimurium.* The stem and root extracts of *Malachra capitata* were active against all the test organisms while the leaf extract was effective against *Micrococcus* species and *Escherichia coli* only. *Malachra capitata* has no antibacterial activity against *Salmonella typhimurium*
Some plant extracts were investigated for their antibacterial activity against Gram-positive and Gram-negative bacteria to verify their ethno medicinal use in treatment of microbial infections. The ethanolic and methanolic leaf extract of *Sida cordifolia* (Malvaceae) showed significant inhibitory action against *Pseudomonas aerogenosa* (Kalairasan, 2010). The antimicrobial activity of ethanolic extract of whole plant of *Sida spinosa* L. (Malvaceae) against *Staphylococcus aureus, Bacillus subtilis, Pseudomonas aeruginosa, Escherichia coli, candida albicans* and *Aspergillus niger* was investigated to verify its claimed ethno medicinal use in the treatment of microbial infections. The results suggested that the whole plant extract showed antimicrobial activity (Selvadurai, 2011). Ethanolic extract of whole plant of *Sida spinosa* showed antimicrobial activity which supports the traditional use of this plant as antiseptic (Selvadurai, 2011). The antimicrobial screening of *Sida acuta* revealed that many compounds might be responsible for the activity of the plant. Karou *et al.,* (2007) found that the methanolic extract of *Sida acuta* had a significant activity on *Staphylococcus aureus, Escherichia coli,Bacillus subtilis* and *Mycobacterium phlei,* however the extract was not active on *Streptococcus faecalis, Klebsiella pneumonia, Salmonella typhimurium, Pseudomonas aeruginosa* and *Candida albicans.* The same findings

were confirmed in another study using methanolic extract and with similar microorganisms (Rajakaruna *et al.*, 2002).

Conclusion

In conclusion, the results of the present study support the folkloric usage of this plant and suggest that the plant extracts possess compounds with antimicrobial properties. The antibacterial study of the plant extracts demonstrated that folk medicine can be as effective as modern medicine to combat pathogenic microorganisms.

Table 1: Screening of *Malachra capitata* for antibacterial activity

Bacterial strain	**Zone of inhibition in mm along without well diameter (5mm)**		
	Leaf extract	**Stem extract**	**Root extract**
Micrococcus sp	5 mm	7	10
Bacillus subtillis	0	11	10
Escherichia coli	7	9	9
Pseudomonas aerogenosa	0	3	3
Salmonella typhimurium	0	0	0

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REFERENCES

Ahmedulla M and Nayar MP (1999). *Red Data Book of Indian Plants: Calcutta, Botanical Survey of India* (4).

Bauer AW and Kirby WM (1966). Antibiotic susceptibility testing by a standardized single disc method. *American Journal of clinical Pathology* **45** 493-496.

Jansen AM, Sheffer JJC and Svendsen B (1987). Antimicrobial activity of essential oils: A 1976-1985 literature review. Aspects on the test methods. *Plant Medica* **53** 395-508.

Kalairasan John AS (2010). Phytochemical screening and antibacterial activity of *Sida cordifolia* L. (Malvaceae) leaf extract. *International Journal of Medicobiological Research* **1**(2) 94-98.

Karou SD, Nadembega W and Ilboudo DP (2007). *Sida acuta* Burm. A medicinal plant with numerous potencies. *African Journal of Biotechnology* **6**(25) 2953-2959.

Krishnaraju AV, Rao TVN and Sundaraju (2005). Assessment of bio activity of Indian medicinal plants using Brine Shrimp (*Aiternaria salania*) lethality assay. *International Journal of Applied Science and Engineering* **2** 125-134.

Mastroeni P (2002). Immunity to systemic *Salmonella* infections. *Current Molecular Medicine* **2**(4) 393-406.

National Committee for Clinical Laboratory Standard (2002). Performance standards for Antimicrobial Susceptibility Testing. Twelth information supplement M 100- S12. National Committee for clinical laboratory standards, Vilianova, PA, USA.

Rajakaruna N, Haris CS and Towers GHN (2002). Antimicrobial activity of plants collected from serpentine outcrops in Sri Lanka. *Pharmaceutical Biology* **40** 235-244.

Sarvanakumar A, Venkateshwaran K and Vanitha J (2009). Synergistic activity of methanolic extract of *Thespesia populnea* (Malvaceae) flowers with oxytetracycline. *Journal of Bangladesh Pharmaceutical Society* **4** 13-16.

Saxena G, McCutcheon AR, Farmer S, Towers GHN and Hancock REW (1994). Antimicrobial constituents of *Rhus glabra. Journal of Ethnopharmacology* **42** 95-99.

Selvadurai S, Senthamarai R, Kirubha T and Vasuki K (2011). Antimicrobial activity of ethanolic extract of the whole plant of *Sida spinosa* (Malvaceae). *Journal of Natural Product and Plant Resources* **1**(2) 36-40.

Sivarajan VV and Pradeep AK (1996). *Malvaceae of Southern Peninsular India- A Taxonomic Monograph* 165.