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ANTIMICROBIAL ACTIVITY OF *HENCKELIA HUMBOLDTIANA* (GARDNER) A.WEBER & B.L. BURTT (*DIDYMOCARPUS HUMBOLDTIANA* (GARDNER) LEAF EXTRACTS AGAINST HUMAN PATHOGENS

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ABSTRACT

Antimicrobial activity of leaf extract of *Henckelia humboldtiana* (Gesneriaceae) was studied using different solvents like chloroform, acetone, ethanol and aqueous against 13 bacterial strains. The antimicrobial activity was determined by disc diffusion method. Out of the four extracts used, ethanol and aqueous extracts were found to be highly active against most of the bacterial strains while acetone extract was less active, while the chloroform extract was found to be nil or negative action against all the 13 test microorganism. The data clearly proves that the crude extract of *Henckelia humboldtiana* exhibit strong inhibitory action against most of the test bacterial pathogens.

Keywords: *Henckelia humboldtiana*, Inhibitory Action, Antimicrobial Activity

INTRODUCTION

Since ancient times, plants have been valuable sources of natural products for maintaining human health and especially in the last decade, they have contributed for the intensive studies for natural therapies. At present, the screening of phytochemicals for pharmaceutical purposes has gradually increased in many countries. According to the World Health Organization (WHO), medicinal plants would be the best source to obtain a variety of drugs. About 80% of population from developed countries use traditional medicine, which has compounds derived from medicinal plants **[1].** On the other hand, diseases have increased to a great extent and resistance to antibiotics has become an ever-increasing therapeutic problem **[2].** Scientific studies reveal that natural products of higher plants possess biocompounds of antimicrobial value with

possibly novel mechanisms of action against the diseases **[3, 4**]. They are effective in the treatment of infectious diseases while simultaneously mitigating many of the side effects that are often associated with synthetic antimicrobials **[5].** The present study of antimicrobial activity in *Henckelia humboldtiana* (*Didymocarpus humboldtiana* – synonym) will pave away to discovery of drugs of therapeutic values.

MATERIALS AND METHOD

Collection and Identification of Plant Material

The plant material was collected from the Palni hills of the Western Ghats, Tamilnadu on 11/05/2014. The taxonomic identification of the plant was carried out by S. John Britto, Director, The Rapinat Herbarium and centre for molecular systematic, St. Joseph's College, Tiruchirappalli. A voucher specimen was deposited at the centre (RHT 65282).

Ethnomedicinal Uses

Whole parts of this plant, stem bark of *Pongamia pinnata* and leaf of *Abutilon indicum* are ground into a paste and applied topically on affected places to heal wounds **[6].**

Plant Extraction

The leaves were shade dried at room temperature and ground into powder. The serial extraction method was followed. First the 10 gm. of plant powder was dissolved in 70ml of chloroform solvent and then it was kept in a rotary shaker for 3 days. The suspension was filtered by using filter paper of pore size 0.2µm. The antimicrobial study was carried out using the crude extract. The same procedure was followed for solvents like acetone, ethanol and aqueous media.

Test Microorganisms

13 bacterial strains were used in this study: *Staphylococous aureus* (MTCC # 3163), *Escherichia coli* (MTCC# 199), *Klebsiella pneumoniae* (MTCC # 3040), *Pseudomonas aeragenosa* (MTCC # 2474), *Salmonella paratyphi* (MTCC # 734*), Vibrio cholerae* (ATCC # 14104), *Enterobacter aerogenes* (MTCC # 2990), *Streptococous pneumoniae* (ATCC # 7066), *Bacillus subtilis* (MTCC # 441), *Bacillus cereus* (ATCC # 4342), *Proteus vulgaris* (MTCC # 1771), *Proteus mirabilis* (MTCC # 1429) and *Serratia marcescens* (MTCC # 2645*).* These pathogenic microorganisms were obtained at Rapinat Herbarium and centre for molecular systematic, St. Joseph's College Tiruchirappalli, Tamilnadu. All the test bacterial strains were maintained on nutrient agar media at 4°C.

Determination of the Antimicrobial Activity: Disc Diffusion Method

Kirby-Bauer method (1950) was followed for disc diffusion assay **[7].** The antimicrobial activity was screened by using Mueller Hinton Agar (MHA) obtained from

Himedia (Mumbai). The MHA plates were prepared by pouring 20 ml of molten media into sterile petriplates. The plates were allowed to solidify and 0.1 % inoculum suspension was swabbed uniformly. The loaded discs were placed on the surface of medium and the compound was allowed to diffuse for 5 min and the plates were kept for incubation at 37°C for 24 h. *Streptomycin* (10µg/ml) was used as positive control. At the end of incubation period, inhibition zones formed around the disc and the zones were measured. These studies were performed in triplicate.

RESULT AND DISCUSSION

The results obtained from the present study revealed that the leaf extracts of *Henckelia humboldtiana* possesses potent antibacterial activity against 11 out of 13 bacterial strains investigated viz. *Staphylococous aureus* (MTCC # 3163), *Escherichia coli* (MTCC# 199), *Klebsiella pneumoniae* (MTCC # 3040), *Pseudomonas aeragenous* (MTCC # 2474), *Salmonella paratyphi* (MTCC # 734), *Vibrio cholera* (ATCC # 14104), *Enterobacter aerogenes* (MTCC # 2990), *Streptococous pneumoniae* (ATCC # 7066), *Bacillus subtilis* (MTCC # 441), *Bacillus cereus* (ATCC # 4342), *Proteus mirabilis* (MTCC # 1429). While *Proteus vulgaris* (MTCC # 1771) and *Serratia marcescens* (MTCC # 2645) showed no antibacterial activity.

The bioactivity measured in terms of zone of inhibition exhibited by the four different extracts against the respective bacterial strains is presented in **Table 1 and Chart 1**. The ethanol extract of *Henckelia humboldtiana* showed the highest activity against *Staphylococus aureus* (16mm of clear zone) and least activity recorded in aqueous extract of four bacterial strains: *Klebsiella. pneumoniae, Pseudomonas aerogenosa, Vibrio cholerae* and *Enterobacter aerogenes* showing 7 mm. From the above results it can be concluded that the plant extract showed varying degree of antibacterial activity against most of the bacterial strains. Thus, *Henckelia humboldtiana* has great potential as antimicrobial agents and can be used in the treatment of infectious diseases caused by resistant microorganisms. Such screening and identification of various natural organic compounds present would possibly lead to the successful prediction of the active principles present and could further lead to drug development.

CONCLUSION

The medicinal plant *Henckelia humboldtiana* (*Didymocarpus humboldtiana* – synonym) of Gesneriaceae shows very good antibacterial activity against microorganism. It shows that the study medicinal plant which is used in traditional medicine has potentially effective

antimicrobial agents. Therefore, the study of *Henckelia humboldtiana* will further be very useful in the development of drugs and its therapeutic value.

Table 1: Disc Diffusion Method for Various Extracts of Leaves in *Henckelia humboldtiana*

Test microorganisms	Inhibition zones (mm)			
	Chloroform	Acetone	Ethanol	Aqueous
Staphylococous aureus	-	9	16	-
E. coli	-	8	13	10
Klebsiella pneumoniae	-	11	-	7
Pseudomonas aerogenosa	-	10	12	7
Salmonella paratyphi	-	10	8	8
Vibrio cholerae	-	-	11	7
Enterobacter aerogenes	-	11	9	7
Streptococcus pneumoniae	-	-	12	-
Bacillus subtilis	-	-	9	12
Bacillus cereus	-	12	-	9
Proteus valgaris	-	-	-	-
Proteus mirabilis	-	9	14	11
Serratia marcescens	-	-	-	-

(+) = Present, (-) = Absent

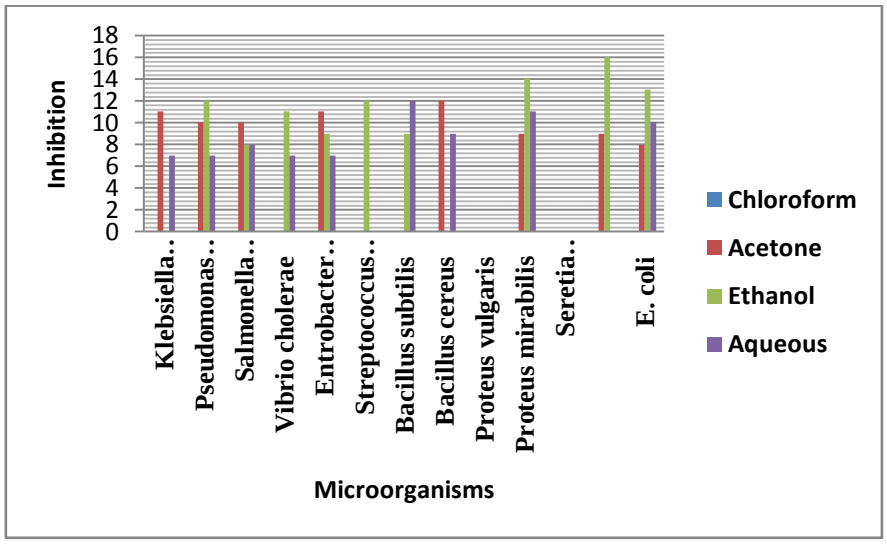
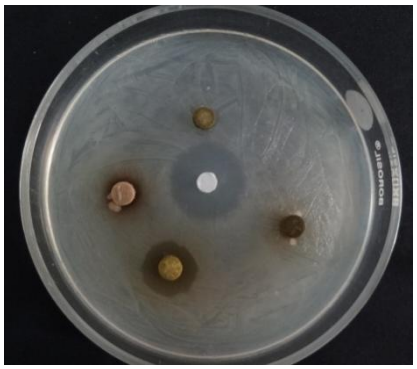
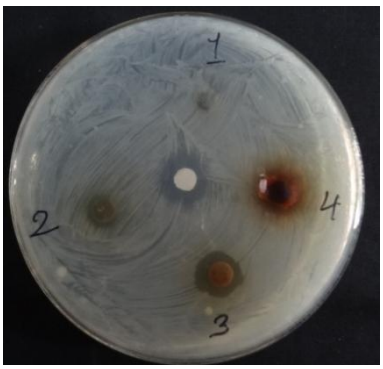


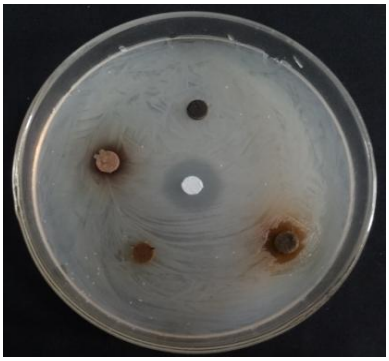
Chart 1: Antibacterial Inhibition Zones



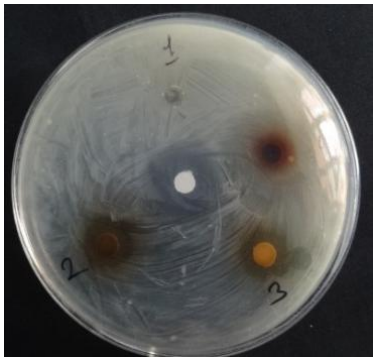
***Staphylococcus aureus* (MTCC # 3163)**



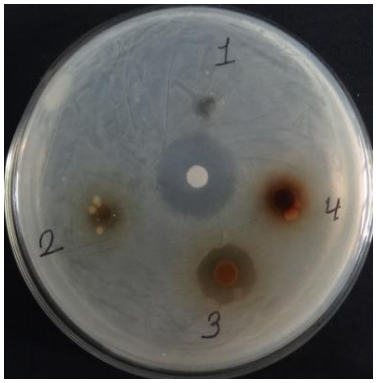
***E. coli* (MTCC# 199)**



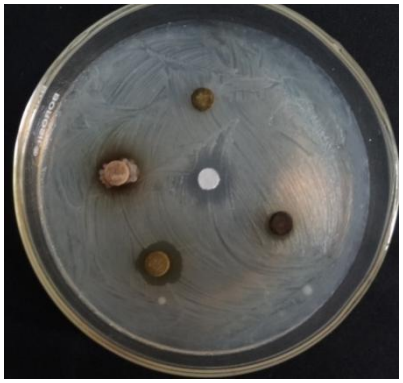
Klebsiella pneumoniae **(MTCC # 3040)**



Pseudomonas aerogenosa **((MTCC # 2474)**

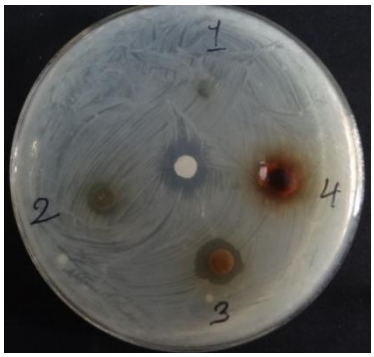


Salmonella paratyphi **(MTCC # 734)**

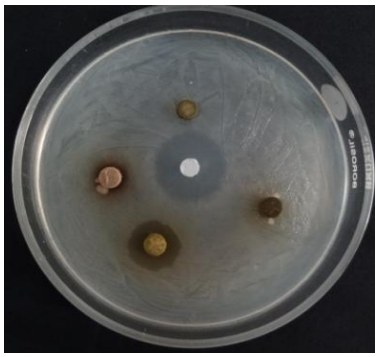


Vibrio cholerae **(ATCC # 14104)**

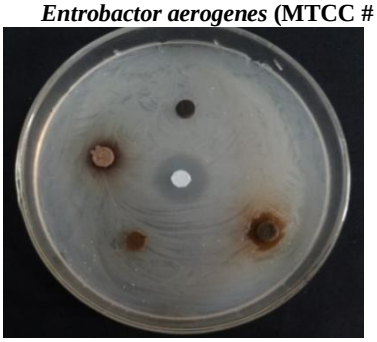
Plate 1: Antibacterial Inhibition in Various Leaf Extract of *Henckelia humboldtiana*



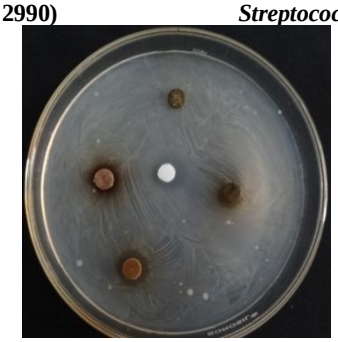
Entrobactor aerogenes **(MTCC # 2990)**



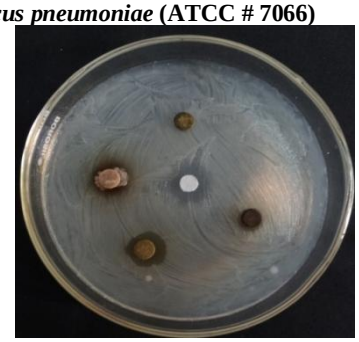
Streptococcus pneumoniae **(ATCC # 7066)**



Bacillus subtilis **(MTCC # 441)**



Bacillus cereus **(ATCC # 4342)**



Proteus mirabilis **(MTCC # 1429)**

Plate 2: Antibacterial Inhibition in Various Leaf Extract of *Henckelia humboldtiana*

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