

Antibacterial activity of essential oils from the leaves of *Adiantum capillus - veneris* Linn.

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ABSTRACT This paper reports on the antibacterial activity of the essential oils from the leaves of *Adiantum capillus-veneris* Linn. A lemon yellow colored essential oil of 0.55% v/w was extracted from the leaves by hydrodistillation. The essential oil exhibited maximum inhibitory activity against *Salmonella typhi*. Mild antibacterial activity was detected for *Pseudomonas* species., *Klebsiella pneumoniae* and *Streptococcus pyogenes*.

(*Adiantum capillus - veneris* Linn., Adiantaceae, Essential oil, Antibacterial activity)

INTRODUCTION

Although the medicinal value of the pteridophytes have been known to man for more than 2,000 years, compared to the angiosperms, they have found very little application in modern chemotherapy. Research on the antibiotic activity of the ferns and fern allies are still in their infancy.

Adiantum capillus - veneris Linn., (Adiantaceae) a delicate fern, introduced from America, common in Tamil Nadu (Nilagris Hills), Western Himalaya ascending up to 2,500 m in Manipur and Bihar. We recently collected this fern from Aluthakanni River, Tenkasi. In traditional medical practice, extracts from the of pinnae and veins are used in treatment of cough, throat diseases, visual tumors and menstrual complaints (Guhabakshi *et al.* 1999). A thorough search of literature revealed that very little work has been done on the chemical constituents of ferns and fern allies. The chemical substances such as 21-OH-adiantone, isoquercitrin kaemferol, letuol, triterpenoids, 3 α -4 α -poxylficane, and flavones were isolated from ferns (Irudayaraj, 1998). May (1978) reported the presence of main constituents of tannic acid, gallic acid and traces of essential oils. In the present study, the essential oil from the leaves of *Adiantum capillus - veneris* Linn. is subjected to antibacterial tests using the cup method.

MATERIALS AND METHODS

A. capillus - veneris Linn., Sp. Pl. 2, 1096, 1753; Clarke, Trans. Linn. Soc. Lond., Bot., 1, 453, 1880; Nayar, Bull. Natl. Bot. Gdns. No. 52:25, 1961.

A. capillus-veneris Linn. is a common fern growing at marshy and shady places, sometimes forming extensive patches along the banks of streams.

Plants were collected on March 15, 2002 from Aluthakanni River, Tenkasi, Tirunelveli Dt, Tamil Nadu, India. Fresh leaves of *A. capillus-veneris* Linn. were subjected to steam distillation for three hours, using a Clevenger type apparatus (Fournier, 1986) to obtain essential oils. The extracted oils were subjected to the test of sterility and were found to be free of microorganisms.

The essential oils extract of *A. capillus - veneris* Linn. was tested for its antibacterial activity against five randomly selected bacterial strains adopting the agar cup method. The bacterial strains such as *Staphylococcus aureus*, *Salmonella typhi*, *Pseudomonas* sp., *Klebsiella pneumoniae* and *Streptococcus pyogenes* were locally isolated and used in the antibacterial assays. All the bacteriae were grown on standard nutrient agar and in nutrient broth at 37°C for 24 and 48 hrs.

Then different concentrations (v/w) of essential oils were pipetted out into agar cups. One cup was kept as control, which was filled with acetone. The bacterial plates were incubated for 48 hrs at 37°C. The zones of inhibition of bacterial growth were used as a measure of antibacterial activity of the essential oils of the fern. Four replicates for each concentration were performed.

RESULTS AND DISCUSSION

The colour of the essential oils from the leaves of *A. capillus - veneris* was lemon yellow and the oil yield was 0.55% v/w. The antibacterial activity exhibited by the various concentrations of essential oils of *A. capillus - veneris* is given in (Table 1) in terms of their zones of inhibition. Among the gram – negative bacteria, *Salmonella typhi* was the most sensitive to the treatment of essential oils from the leaves of *A. capillus -*

veneris. Similarly the aqueous extracts of several fern species i.e., *Asplenium dalhousiae*, *Microlepia speluncea* var. *pubero*, *Dryopteris cochleata*, *D. crenata*, *D. odontoloma*, *D. ramose* and *Lygodium flexuosum* when similarly tested, showed antisalmonella activity (Banerjee *et al.* 1980). *Klebsiella pneumoniae* and *Streptococcus pyogenes* were resistant and the inhibitory zones were of the smallest in diameter. Comparable results were reported by Banerjee (1974) who showed moderate activity of *Adiantum capillus - veneris* against *Staphylococcus aureus*. The essential oils of *A. capillus - veneris* leaves was inactive against *Staphylococcus aureus*.

The present investigation on the antibacterial activity of the essential oils from the leaves of *A. capillus - veneris* may serve as a guide in the selection of plants for further work on the isolation and elucidation of the active compounds with antibacterial activity.

Table 1. Antibacterial activity of essentials oils from leaves of *Adiantum capillus-veneris* Linn.

Bacterial Strain	Diameter of inhibition zone (mm)			
	12mg Test sample	26mg Test sample	36mg Test sample	44mg Test sample
<i>Salmonella typhi</i>	20	24	28	32
<i>Staphylococcus aureus</i>	-	-	-	-
<i>Pseudomonas species</i>	4	6	10	12
<i>Klebsiella pneumoniae</i>	3	5	7	10
<i>Streptococcus pyogenes</i>	6	8	12	16

(-) Negative zone of inhibition

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REFERENCE

- Banerjee, R.D. (1974). Studies on antibiotic activity of bryophytes and pteridophytes. Ph D Thesis, University of Kalyani, Kalyani, India.
- Banerjee, R.D. and Sen, S.P. (1980). Antibiotic activity of Pteridophytes. *Eco. Bot* 34: 284-298.
- Fournier, G., Paris, M., Dumitresco, S.M., Pages, N. and Boudene (1986). Contribution to the study of *Plectranthus fruticosus* leaf essential oil. *Planta Med*: 486-488.
- Guhabaskhi, D.N., Sensarma, P. and Pal, D.C. (1999). A Lexicon of Medicinal Plants in India, Darbari off set, PVT, LTD, Dixone Lane, Culcutta 1: 54.
- Irudayaraj, V. and Patric Raja, D. (1998). Phytochemical studies on Indian ferns. *Indian Fern J.* 15: 149-168.
- May, L.W. (1978). The economic uses and associated folklore of ferns and allies. *Bot Rev.* 44: 491-538.