

Antibacterial activity of *Abutilon bidentatum* (Hochst.) Leaves

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ABSTRACT

In our present study, we carried out the antibacterial activity of the plant *Abutilon bidentatum* Hochst., which is a cosmopolitan genus belonging to the family of Malvaceae. Different parts of this plant are in use to treat various ailments in ethnomedicine especially its leaves have been used for treating infections. We studied the anti bacterial activity of the extracts prepared from the dried leaves of *A. bidentatum* Hochst, using agar-well diffusion method against both gram positive and gram negative microorganisms. Among all the extracts the ethanolic extract of the leaves showed significant ($P < 0.001$) antibacterial activity comparable to the standard penicillin potassium and streptomycin sulphate against selected gram positive and gram negative bacteria.

Keywords: *A. bidentatum*, Antibacterial activity, agar-well diffusion method.

INTRODUCTION

Malvaceae is a cosmopolitan family with 88 genera and more than 2300 species distributed in tropical, subtropical, and temperate regions. *Abutilon* is one of the important genus of this family (Nasir *et al*, 1979). Various species of the genus *Abutilon* used in indigenous medicines for the treatment of various ailments (Bagi *et al*, 1985; Rahuman *et al*, 2008). Among this, *Abutilon bidentatum*, is an under shrub and distributed in India, Pakistan, Tropical Africa, China and Arabia. The only reference available in the literature on this species describes the presence of cholestane derivative (Jain *et al*, 1996). No information in the literature was found concerning its possible antibacterial activity. However, some experiments have shown antibacterial activity on some other species of genus *Abutilon* (Robert, 1986; Muhammad, 2009; Arulsamy, 2009).

The present study was carried out to determine the antibacterial activity of different extracts of the leaves on gram positive and gram negative micro organisms against penicillin potassium (20 units/ml) and streptomycin sulphate (25 µg/ ml).

MATERIALS AND METHODS

Collection of plant materials

The leaves of *A. bidentatum* used in this study were collected from Khultabad Road, Aurangabad district (M.S.) India, Accession no. 7779, voucher specimen deposited in Department of

Botany Dr. Babasaheb Ambedkar Marathwada University, Aurangabad. The leaves were shade dried and powdered. Two hundred grams of the powder were successively extracted with different solvents and the extractive values were calculated.

Reagents and chemicals

Standard drugs Penicillin potassium and streptomycin sulphate were collected from Government of Science Institute and Y. B. Chavan Pharmacy College, Aurangabad. Peptone, beef extract and all other chemical grade were obtained in the Department of Botany, Dr. Babasaheb Ambedkar Marathwada University, Research Laboratories, Aurangabad.

Preparation of the extracts

Different extracts of the dry powdered leaves were prepared by successive continuous hot percolation using Soxhlet extractor with different solvents like petroleum ether, acetone, Hexene, methanol and water. All the extracts were filtered and evaporated to dryness under reduced pressure and stored in the refrigerator for future use.

Evaluation of antibacterial activity

The antibacterial activity was carried out by the agar well diffusion method using Muller Hinton agar plates (Nair and Chanda, 2004). Petroleum ether, acetone, Hexene, methanol extract and water extract were dissolved in dimethyl sulphoxide (250 mg/10ml).

Streptomycin sulphate (25, µg/ml) and Penicillin potassium (20 units/ml) were used as standards for gram positive bacteria and gram negative bacteria respectively. 0.1ml of the samples was added to each cup. The zones of inhibition produced by the extracts were compared with the standards.

Statistical analysis

The results obtained were analyzed statistically using student test and any $p < 0.001$ considered significant (Mungikar, 2003).

RESULTS

The extractive values of different solvents were tabulated in Table 1. The methanolic extract of *A. bidentatum*

was found to produce significant ($P < 0.001$) anti bacterial activity, than the other extracts, against the gram positive organisms like *Bacillus subtilis*, *Staphylococcus aureus*, *Sarcina leuka*, *Bacillus megatherium* and gram negative organisms like *Escherichia coli*, *Pseudomonas aeruginosa*, *Proteus vulgaris*, *Shigella sonnie*, when compared with the standard antibiotics, Penicillin potassium and Streptomycin sulphate are tabulated in Table 2 and 3. The petroleum ether extract did not produce any significant antibacterial activity ($P > 0.05$) when compared with standards.

Table 1: Extractive Values of Different Solvents of *A. bidentatum*

Sr. No.	Extract	Extractive Value (%) W/W
1	Petroleum ether	1.21
2	Acetone	1.35
3	Hexene	2.11
4	Methanol	4.26
5	Water	2.80

Table 2: Antibacterial Activity of Leaf Extracts of *A. bidentatum* Gram Positive Organisms

Sr. No.	Name of organism	Agar-well Diffusion (Zone of Inhibition in mm)					
		Pet. ether	Acetone	Hexene	Methanol	Water	Penicillin
1	<i>B. Subtilis</i>	--	12.0 \pm 0.8*	14.0 \pm 0.5*	22.3 \pm 1.2**	13.5 \pm 0.7*	24.1 \pm 1.1**
2	<i>S. Aureus</i>	--	14.5 \pm 0.5*	12.2 \pm 0.7*	20.4 \pm 1.0**	9.5 \pm 0.4	23.0 \pm 1.0**
3	<i>S. Leuka</i>	10.2 \pm 0.5	11.0 \pm 0.3*	8.2 \pm 0.4	18.1 \pm 0.6**	10.3 \pm 0.4*	23.6 \pm 0.9**
4	<i>B. Megatherium</i>	10.8 \pm 0.6	10.0 \pm 0.2	14.0 \pm 0.8*	22.5 \pm 1.1**	12.0 \pm 0.5*	22.5 \pm 0.9**

Values are expressed as mean \pm SEM, N= 6, * $P < 0.01$ & ** $P < 0.001$ when compared to control

Table 3: Antibacterial Activity of Leaf Extracts of *A. bidentatum* Gram Negative Organisms

Sr. No.	Name of organism	Agar-well Diffusion (Zone of Inhibition in mm)					
		Pet. ether	Acetone	Hexene	Methanol	Water	Streptomycin
1	<i>E. Coli</i>	--	14.2 \pm 0.5*	15.5 \pm 0.9*	20.4 \pm 1.2**	13.0 \pm 0.5*	23.0 \pm 1.2**
2	<i>P. Aeruginosa</i>	--	14.4 \pm 0.5*	12.2 \pm 0.6*	19.0 \pm 1.0**	14.2 \pm 0.6*	23.4 \pm 1.0**
3	<i>P. Vulgaris</i>	--	15.5 \pm 0.5*	12.2 \pm 0.4	21.5 \pm 1.2**	12.3 \pm 0.5*	22.5 \pm 1.0**
4	<i>S. Sonnie</i>	10.0 \pm 0.6	13.0 \pm 0.4*	14.0 \pm 0.4*	22.1 \pm 1.0**	8.2 \pm 0.3	24.3 \pm 1.2**

Values are expressed as mean \pm SEM, * $P < 0.01$ & ** $P < 0.001$ when compared to control

DISCUSSION

The results of the agar-well diffusion method showed that the crude methanolic extracts of *A. bidentatum*. exhibits antimicrobial activity against the gram positive organisms such as *B. Subtilis*, *S. Aureus*, *S. Leuka*, *B. Megatherium* and gram negative organisms *E. coli*, *P. Aerugenosa*, *P. Vulgaris*, *S. Sonnie* with a maximum diameter of zone of inhibition ranging from 22.3 mm followed by 20.4 upto and 18.1 mm, 22.5 mm, 20.4 mm, 19.0 mm, 21.5 mm and 22.1 mm respectively. It has produced a comparable activity similar to the standard antibiotics taken for the study.

Further, this study suggests that the isolation of the active principle responsible for the

activity will reveal one or more novel antibacterial agents.

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LITERATURE CITED

- Arulsamy EP, Boovizhikannan T, Arunkanth C, Satchidanandam SK, Murugesan K and Ramadoss K, 2009.** Antibacterial activity of various extracts of *Abutilon indicum* (L.) Sweet leaves. *Journal of Pharmacy Research*, 2(8):1324-1325.
- Bagi MK, Kalyani GA, Denis TJ, Kumar KA and Kakrani HK, 1985.** A preliminary pharmacological screening of *Abutilon indicum*: II Analgesic activity. *Fitoterapia*, 56: 169-171.
- Jain R, Jain SC and Arora R, 1996.** A new cholestane derivative of *Abutilon bidentatum* Hochst. and its bioactivity. *Pharmazie*, 51: 253.
- Muhammad Akram Kashmiri, Sammia Yasmin, Mushtaq Ahmad and Ayesha Mohy-ud-Din, 2009.** Characterization, Compositional Studies, Antioxidant and Antibacterial Activities of Seeds of *Abutilon indicum* and *Abutilon muticum* Grown Wild in Pakistan. *Acta Chim. Slov.*, 56: 345-352.
- Mungikar AM, 2003.** *Biostatistical Analysis*. Saraswati Printing Press, Aurangabad.
- Nair R, Chanda SV, 2004.** Antibacterial activity of some medicinal plants of Sourashtra region. *J. of Tiss. Res.*, 4:117-20.
- Nasir E, Ali SI, 1979.** *Flora of West Pakistan, Malvaceae*, Department of Botany, University of Karachi, 130: 69-72.
- Robert J Kremer, 1986.** Antimicrobial Activity of Velvetleaf (*Abutilon tbeophrasti*) Seeds Weed Science. 34:617-622.
- Rahuman A, Gopalakrishnan G, Venkatesan P, Geeta K, 2008.** Isolation and identification of mosquito larvicidal compound from *Abutilon indicum* (Linn.) sweet. *Parasitol, Res.*, 102: 981-988.
- Sammia Yasmin, Muhammad Akram Kashmiri & Kalsoom Anwar, 2011.** Screening of aerial parts of *Abutilon bidentatum* for hepatoprotective activity in rabbits. *Journal of Medicine Plants Research*, 5 (93): 349-353.