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ANTIBACTERIAL POTENTIAL EVALUATION OF RHIZOME EXTRACTS OF *BERGINIA CILIATA* (HAW.) STERNB.

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ABSTRACT

Bergenia ciliata (Haw.) Sternb. was collected in the vicinity of Kumaun Himalaya, Uttarakhand, India. The fresh roots of plant were air-dried and chopped. This material was extracted with hexane, chloroform, methanol and sterile distilled water. The organic as well as aqueous extracts were tested for antimicrobial activity using the disc diffusion technique against 8 animal and plant pathogenic bacteria i.e. *Bacillus subtilis*, *Staphylococcµus aureus*, *Esherichia coli*, *Proteus vulgaris*, *Erwinia chrysanthimi*, *Xanthomonas phaseoli*, *Agerobacteriaum tumefaciens* and *Xanthomonas campestris*. Chloroform, methanol and aqueous fractions of *B. ciliata* showed activity against all tested bacteria. *P. vulgaris* was found to be most sensitive to the tested extracts. A weak antibacterial activity was demonstrated by hexane fraction. In majority of tests, the extracts of *B. ciliata* were found more effective than ampicillin (10µg) and erythromycin (15µg).

KEY WORDS: *Bergenia ciliata*, Plant extracts, Antibacterial activity

INTRODUCTION

There is a continuous and urgent need to discover new antimicrobial compounds with diverse chemical structures and novel mechanisms of action because there has been an alarming increase in the incidence of new and re-emerging infectious diseases. Another big concern is the development of resistance to the antibiotics in current clinical use (Rojas, 2003).

Higher plants produce hundreds to thousands of diverse chemical compounds with different biological activities (Hamburger and Hostettmann, 1991). Thus, they have been used in the treatment of various human diseases for thousands of years all over the world. Similarly, some plants have been used by rural people in the Himalaya for the treatment of several diseases, including microbial infections for emetic and strengthening effects. Most of the plants used for medicinal purpose have been identified, and their uses are well documented and described by different authors (Nadkarni, 1876; Dastur, 1985; Saradamma, 1990), but the efficacy of many of these plants is yet to be verified. Moreover, natural plant extracts have been tested in the laboratory against bacteria and fungi.

Natural plant products yield extracts with antineoplastic, antimicrobial, antifungal and antiviral activities (Lau, 1993). The first compound with antimicrobial activity was found in the 1930s (Goodman, 1991). Since that period the development and use of these substances have increased because of the appearance of resistant strains (Zinhener and Mear, 1972). Attention has turned to natural antimicrobial agents in recent years (Daferera, 2003). There have been many investigations on the antifungal, antibacterial (Elgayyar et al., 2001), and antiviral (Vander Berghe and Vietinck, 1991) preparations and individual compounds isolated from natural sources.

Berginia ciliata (Haw.) Sternb. (Saxifragaceae) is an ethnobotanically useful plant. In this study, we investigated the antimicrobial activity of different fractions of the plant and the activity is compared with standard antibiotics.

MATERIALS AND METHOD

Plant material was collected in October, 2005 from Nainital, India and authenticated by Dr. YPS Pangtey, Department of Botany of the University. A voucher specimen was deposited in the herbarium of the Department.

Underground part (rhizome) of the plant was air dried and powdered in an electric grinder. Fine powdered plant materials were subjected serially to hexane, chloroform, methanol and water. After extraction, each extract was passed through Whatman filter paper No.1. The filtrate was concentrated on a rotary evaporator under vacuum at 20^0 C and stored at 4^0 C for further use.

Microorganisms (*Escherichia coli* MTCC No.40, *Bacillus subtilis* MTCC No.121, *Proteus vulgaris* MTCC No.426, *Staphylococcus aureus* MTCC No.87, *Agrobacterium tumefaciens* MTCC No. 609, *Xanthomonas campestris* MTCC No. 2286 obtained from Institute of Microbial technology, Chandigarh, India and *Erwinia chrysanthmi* and *Xanthomonas phaseoli* were obtained from plant pathology department, G.B. Pant University of Agriculture, Pantnagar, India.

Antibacterial activity testing was done following disc diffusion method (Bauer et al., 1966; Cruickshank, 1968). Gentamycin (10mg), Erythromycin (15mg) and Ampicilin (10mg) were used as positive control. Respective solvents were used as the negative control.

RESULTS

The results of present study is summarized in table-1. Antibacterial investigation on *B. ciliata* rhizome showed that out of four extracts, chloroform, methanol and aqueous extract are active against all the tested strains.

Inhibition by hexane extract was found significant only against *E. chrysanthimi* (zoi= 10mm) and *P. vulgaris* (zoi = 12mm) whereas it was less active against *S. aureus* and *X. campestris* (zoi = 8mm), and *X. phaseoli* (zoi = 7mm) and did not show any activity against *B. subtilis*, *E. coli*

Table 1. Antibacterial activity of different extracts of *B. ciliata*

Microorganisms	Inhibition zone (mm)[a]\						
	H	C	M	W	G	E	A*B. subtilis*
(+ve)	na	10	18	19	20	10	na
S. aureus (+ve)	8	9	15	13	13	8	na
E. chrysanthimi (-ve)	10	8	20	18	16	8	na
E. coli (-ve)	na	9	17	13	16	9	7
P. vulgaris (-ve)	12	12	14	14	12	na	8
X.phaseoli (-ve)	7	0	12	8	11	na	na
A.tumefaciens (-ve)	na	10	14	11	9	na	7
X. campestris (-ve)	8	12	9	12	14	7	na

a= values are average of triplicates; H,C,M,W = hexane, chloroform, methanol and aqueous extract respectively; Z, E,A = gentamicin, erythromycin and ampicillin; na = not active .

and *A. tumefaciens*. Chloroform extract was found active against all the tested strains but showed a low activity against *E. chrysanthemi* and *X. phaseoli* (zoi =8mm) and *E. coli* and *S. aureus* (zoi = 9mm). Significant activity was observed against *B. subtilis* and *A. tumefaciens* (zoi= 10mm) and *P. vulgaris* and *X. campestris* (zoi = 12mm). It is evident from table 1 that methanol extract was significantly active against all the strains except *X. phaseoli* (zoi= 9mm). The highest activity was recorded for *E. chrysanthemi* (zoi= 20mm), followed by *B. Subtilis* (18mm) and *E. coli* (17mm). Aqueous extract showed a significant activity against all strains used except *X. phaseoli*. Clear zone diameter for this fraction was recorded 19, 18, 14, 12and 11mm against *B. subtilis, E. crysanthimi, P. vulgaris, X. campestris, A. tumefaciens* respectively, whereas inhibition zone of 13mm each was found for *S. aureus* and *E. coli*.

DISCUSSION

In this study, the antimicrobial influence of the fractions extracted from *B. ciliata* against different bacteria, all the four extracts of rhizome showed varied degree of activity against both Gram-positive and Gram-negative bacteria. All the tested bacteria were found least susceptible to hexane extract followed by chloroform fraction. Highest level of antibacterial activity was presented by methanol and water extracts of both parts. In general the activity shown by methanol and water extracts was found to be almost similar with the highest concentration of the standard (gentamicin-20µg), however, it was very high as compared to the other two standard antibiotics used i.e. ampicillin and erythromycin. As there are reports on the widespread resistance to ampicillin, the chloroform, methanol and aqueous fractions of the plant can be used instead of ampicillin.

In recent years, although technology and medicine have developed extensively, due to decreases in natural richness and drawbacks, some countries have made it obligatory to use natural products for many goals (Erturk et al., 2006). Thus, like in other countries in the world, in India too the plants known by people are picked and used for the treatment of various diseases (Meckes et al., 1997).

As a consequence of this study, we will try to isolate the compounds causing the antimicrobial activity present in *B. ciliata*. A further study is planned to examine in detail the properties of compounds of fractions.

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