

sensitivity and the percent range of error (95% level confidence limit) calculated from 5 replicate readings containing ¼ of upper Beer's limit are incorporated in Table 2. The molar absorptivity and sandell's sensitivity values show the sensitivity of both the methods, while the precision is confirmed by % COV (coefficient of variance) values included in Table 1, which are less than 2%. The analysis results of marketed formulations are in good agreement with the reported method<sup>3</sup>, which is also a spectrophotometric method for estimation of ethamsylate. The reproducibility, repeatability and accuracy of these methods were found to be good, which is evidenced by low standard deviation. The percent recovery obtained (98.5-98.9 for method A and 99.7-99.9 for method B) indicates non-interference from the common excipients including lactose used in the formulation. Thus these methods developed in the present investigation are

simple, sensitive, accurate and precise and can be successfully applied for the routine estimation of ethamsylate in pharmaceutical dosage forms.

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## Antibacterial Activity of Aerial Part Extracts of *Achyranthes bidentata* Blume

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*Achyranthes bidentata* Blume belonging to the family Amaranthaceae was investigated for antibacterial activity against *Bacillus subtilis* (NCM-2439), *Staphylococcus aureus* (NCIM-2492), *Pseudomonas aeruginosa* (NCIM-2053) and *Escherichia coli* (NCIM-2068) organisms, using agar diffusion method. The petroleum ether, chloroform, methanol and aqueous extracts showed significant antibacterial activity. Our findings offer experimental support to the therapeutic claims on this herb as useful against bacterial infections.

India is one among the countries in the world today where ancient systems of medicine such as Ayurveda, Siddha and Unani have been in practice for many years. In common, all the above-mentioned systems of medicine are directly or indirectly depend upon the natural resources such as plants, animals and minerals. There is massive wealth available in these medical systems, but what comes in the way of making these systems of medicines globally acceptable is the lack of standardized products, lack of reliable

production techniques and the absence of pharmacological proof of concept for these drugs<sup>1</sup>. The plant *Achyranthes bidentata* Blume (Family: Amaranthaceae) is a small herb widely found in western ghat areas of Emerald, Edakkadu, about 30 Km away from Ooty, the capital town of Nilgris District. This plant is claimed to have good medicinal value and is widely used as an antitumour, antispasmodic and cytotoxic<sup>2,3</sup> in the native systems of medicine.

The Ariel parts of the plant were collected in the month of November and cleaned to remove the debris. The plant

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was collected in the presence of a botanist who identified and authenticated the plant using available literature. The plant parts were dried at room temperature for 10 d and coarsely powdered with the help of a hand-grinding mill and the powder was passed through sieve No. 60. The powder of aerial parts of *Achyranthes bidentata* Blume was extracted separately by continuous hot extraction process using a Soxhlet apparatus with different solvents ranging from non-polar to polar. After extraction, the extracts were concentrated under reduced pressure in tared vessel. The marc of crude drug powder was then once again subjected to successive extraction with other solvents and the extractive values were calculated with reference to the air-dried drug. The antibacterial activity of the extract was studied systematically against four different strains of bacteria (two gram positive and two gram negative) by agar cup-plate method<sup>4,5</sup>. The bacteria used were *Bacillus subtilis*, *Staphylococcus aureus*, *Pseudomonas aeruginosa* and *Escherichia coli*. The extracts were dissolved with 0.5% CMC solution to make 10 mg/ml solution. A reference standard was also prepared by dissolving ampicillin in water for injection (10 mg/ml). The medium was sterilized by autoclaving at 120° (15 lb/in<sup>2</sup>). About 30 ml of molten nutrient agar medium inoculated with the respective strain of bacteria (6 ml of inoculum to 300 ml of nutrient agar medium) was transferred aseptically into each sterilized petri plate (10 cm diameter). The plates were left at room temperature to allow solidification. In each plate 3 wells of 6 mm diameter were made with a sterile borer. Accurately 0.2 ml of the test solution was added to the cups aseptically and labeled accordingly. After incubation of the plates at 37±1° for 24 h, the diameter of the zone of inhibition surrounding each of the wells was noted. Simultaneously control was maintained employing 0.2 ml of CMC sodium solution (0.5%) to observe the solvent effect.

TABLE 1: EXTRACTIVE VALUES OF THE PLANT *ACHYRANTHES BIDENTATA* BLUME

Solvent	Extractive values(%)
Petroleum ether	2.54
Chloroform	5.56
Methanol	14.42
Aqueous	6.75

The plant *Achyranthes bidentata* Blume belonging to the family Amaranthaceae was taken for the study and dried aerial parts were extracted with various solvents by continuous hot extraction process using soxhlet apparatus. The extractive values were presented in Table 1. The antibacterial study was carried out by agar diffusion technique in particular cup-plate method against gram negative and gram positive organisms. The plant demonstrated significant activity against all the specific organisms tested, *B. subtilis*, *S. aureus*, *P. aeruginosa* and *E. coli*. The antibacterial activity of the aerial part of the plant *Achyranthes bidentata* Blume against various organisms was given in Table 2. These results reveal that the plant possessed very good antibacterial activity against the four organisms tested. From the Table 2 it can be concluded that all the extracts have significant antibacterial activity against all the organisms. Methanol extract, which showed the best antibacterial activity, was still less effective than the reference standard ampicillin. Further studies aimed at isolation and purification of phytoconstituents may yield a few more compound, with greater antibacterial activity.

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TABLE 2: DATA SHOWING THE ANTIBACTERIAL ACTIVITY OF AERIAL PARTS OF *ACHYRANTHES BIDENTATA* BLUME

Extracts	Zone of inhibition (mm)			
	<i>B. subtilis</i>	<i>S. aureus</i>	<i>E. coli</i>	<i>P. aeruginosa</i>
Petroleum ether	17.3	19.2	19.1	18.9
Chloroform	19.8	20.9	19.3	20.0
Methanol	20.0	21.2	21.0	22.0
Aqueous	15.1	14.0	13.8	12.6
Ampicillin	29.0	29.0	27.0	29.2
Solvent	0	0	0	0

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## Microwave Assisted Synthesis and Antimicrobial Screening of 2-Aryl-5H-3-(3',5'-dichloro-2-benzo(b)thiophenylamino)-4-thiazolidinones

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The synthesis of some new potentially bioactive 4-thiazolidinone has been undertaken. The required 2-(substituted benzalhydrazinocarbonyl)-3,5-dichloro-benzo(b)thiophene(2) was prepared by reaction of 2-hydrazinocarbonyl-3,5-dichloro benzo(b)thiophene(1) with different aryl aldehyde. The compounds (2) on cyclocondensation with thioglycolic acid under micro wave irradiation as well as in a conventional way yielded the corresponding 4-thiazolidinones (3). The structures of synthesized compounds were deduced on the basis of their elemental analyses and spectral analyses (IR and <sup>1</sup>H NMR). The synthesized compounds were evaluated for their antimicrobial activity.

4-Thiazolidinones have been extensively explored for their wide biological and industrial applications<sup>1-3</sup>. A series of 2-Aryl-5H-3-(3',5'-dichloro-2-benzo(b)thiophenylamino)-4-thiazolidinone (3) have been synthesized by cyclocondensation of 2-(substitutedbenzal hydrazinocarbonyl)-3,5-dichlorobenzo(b)thiophene (2) with thioglycolic acid under microwave irradiation as well as conventional heating. The schiff's bases (2) were prepared by reaction of 2-hydrazinocarbonyl-3,5-dichlorobenzo (b)thiophene (1) with different aryl aldehyde. The reaction time has been brought down from hours to minutes with improved yield using microwave irradiation (MWI).

Recently reported studies on the use of domestic microwave oven for the synthesis of heterocycles<sup>4,7</sup>, showed that it is safe, rapid and convenient methodology, keeping in view the substantial reduction in the reaction time with improved yield, some new 4-thiazolidinone derivatives prepared

under MWI using a domestic microwave oven as well as in a conventional way.

Melting points were taken in open capillary tubes and are uncorrected. IR spectra (KBr) (cm<sup>-1</sup>) were recorded on a Shimadzu-8400 FTIR spectrophotometer and <sup>1</sup>H NMR spectra were recorded on a Bruker spectrometer (300 MHz) using TMS as an internal standard (chemical shift in δ ppm). The purity of the compounds was checked on silica gel coated plates.

To synthesize 2-hydrazinocarbonyl-3,5-dichloro-benzo(b)thiophene (1) a solution of 3,5-dichlorobenzo (b)thiophene-2-carbonyl chloride (2.65 g, 0.01 mol) in ethanol and hydrazine hydrate (0.5 g, 0.01 mol) was refluxed on water bath for 5-6 h. The product was isolated and recrystallized from ethanol to give (1). Yield 68%, m.p. 212°. IR (KBr) (cm<sup>-1</sup>): 3286 (NH-), 1624 (C=O), 796 (C-S-C), 777 (C-Cl). NMR (δppm): 8.3 (s,1H,-NH); 7.9 (s,1H,Ar-H<sub>1</sub>); 7.65 (dd,1H,Ar-H<sub>2</sub>); 7.45 (dd,1H,Ar-H<sub>3</sub>).

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