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Antimicrobial Activity of *Andrographis alata* (Vahl) Nees

[1]N. Yasothkumar, [2]K. Rajendran, [2]S. Shanmugam, [3]S. Venkatesh

[1]Department of Botany, Yadava College, Tiruppalai, Madurai – 625014, Tamil Nadu, India
[2]Post Graduate and Research Department of Botany, Thiagarajar College,
Teppakulam, Madurai – 625009, Tamil Nadu, India
[3]Post Graduate and Research Department of Botany, Saraswathi Narayanan College,
Perungudi, Madurai – 625022, Tamil Nadu, India

ABSTRACT
The medicinal properties of plants could be based on their pharmacological effects of the phytochemicals present in them. Hence plant derived antimicrobial properties have received considerable attention in recent years. In the present study, an attempt has been made to screen the antimicrobial potential of *Andrographis alata* (entire plant), against diseases causing bacterial and fungal pathogens. The results revealed that the methanol extract had an effective antimicrobial activity against all the tested microorganisms and the hexane extract had low antimicrobial activity. Further studies should be carried out to evaluate the other biological active potentials of *Andrographis alata*.

Keywords: Antimicrobial activity, *Andrographis alata*, Entire plant extracts.

1. INTRODUCTION
Microorganisms gain resistance to the existing drugs and cause undesirable side effects. Antimicrobial properties have been reported in a wide variety of plant extracts with goal to discover new chemical classes of antibiotics that could resolve these problems[1]. The plant derived compounds show broad-spectrum of biological activity against infection causing agents such as bacteria, fungi, protocists, protozoans, viruses and yeast[2,3]. The potential for developing antibiotics from higher plants appears rewarding, as it will lead to the development of phytomedicine. In this concern, the present study was aimed to evaluate the antimicrobial potential of entire plant extract of *Andrographis alata*.

2. MATERIALS AND METHODS
2.1. Preparation of extracts
Fresh plant samples of *Andrographis alata* (Vahl) Nees (Family: Acanthaceae; Local name: Periyaanangai) were collected from Karandamalai located in Dindigul district of Tamil Nadu, India. It is lies between 19.2849º N latitude and 78.2169º E longitude. The collected specimens were botanically confirmed and authenticated as per the data pertained in The Plant List[4]. 25 gram of air-dried plant parts was powdered and extracted with 250 ml of hexane, ethyl acetate and methanol separately. The extracts were then filtered and used directly for antimicrobial activity.

2.2. Procurement of microbial strains
Six pathogens such as *Bacillus cereus*, *Staphylococcus epidermidis*, *Escherichia coli*, *Salmonella paratyphi*, *Beauveria bassiana* and *Candida albicans* were obtained from Bose X-ray and Clinical Laboratory, Madurai, Tamil Nadu. Stock cultures were maintained at 4°C on slopes of nutrient agar. Active cultures for experiments were prepared by transferring a loopful of cells from the stock cultures to test tubes and were incubated without agitation for 24 hrs at 37°C.

2.3. Preparation of media (gram/litre)
Beef infusion : 300
Casein hydrolysate : 17.5
Starch : 1.5
Agar : 17

These ingredients were dissolved in 1000 ml distilled water; the pH was adjusted to 7.4 and sterilized at 121º C for 75 minutes.

2.4. Determination of antimicrobial activity
The microbial activity of the crude extract was determined in accordance with the agar well diffusion method[5]. 100 µl of cell suspension was spread on each petridish containing agar medium. Wells were bored onto the agar using a sterile 6 mm diameter cork borer. 20mg/ml of the crude extract was added into the wells and incubated at 37º C for 24 hrs. The plates were observed for zone of inhibition after 24 hrs. These effects were compared with streptomycin at a concentration of 10µg/ml.

3. RESULTS AND DISCUSSION

For the present study the antimicrobial activity of *Andrographis alata* extracts were tested against bacterial and fungal strains. The results showed that the methanol extract had an effective antimicrobial activity against all the tested microorganisms. The methanol extract produced the inhibition zone of 15±0.8 mm against *Beauveria bassiana* 14±0.4 mm against *Escherichia coli*, *Candida albicans*, 13±0.3 mm against *Salmonella paratyphi*, 11±0.3 mm against *Staphylococcus epidermidis* and 10±0.4 mm against *Bacillus cereus*. Meanwhile, the hexane extract had low antimicrobial activity against all the tested microorganisms (Table 1; Fig 1).

Table 1: Antimicrobial potential of *A. alata*

Strains	Zone of inhibition (mm)*			
	Streptomycin	Hexane extract	Ethyl acetate extract	Methanol extract
Bacillus cereus	21 ± 0.4	7 ± 0.4	9 ± 0.6	10 ± 0.4
Staphylococcus epidermidis	20 ± 0.4	7 ± 0.3	8 ± 0.2	11 ± 0.3
Escherichia coli	21 ± 0.1	10 ± 0.2	12 ± 0.4	14 ± 0.4
Salmonella paratyphi	22 ± 0.6	9 ± 0.7	11 ± 0.8	13 ± 0.3
Beauveria bassiana	21 ± 0.5	11 ± 0.4	11 ± 0.3	15 ± 0.8
Candida albicans	23 ± 0.3	8 ± 0.2	12 ± 0.5	14 ± 0.4

***Values are Mean ± Standard Error of triplicates**

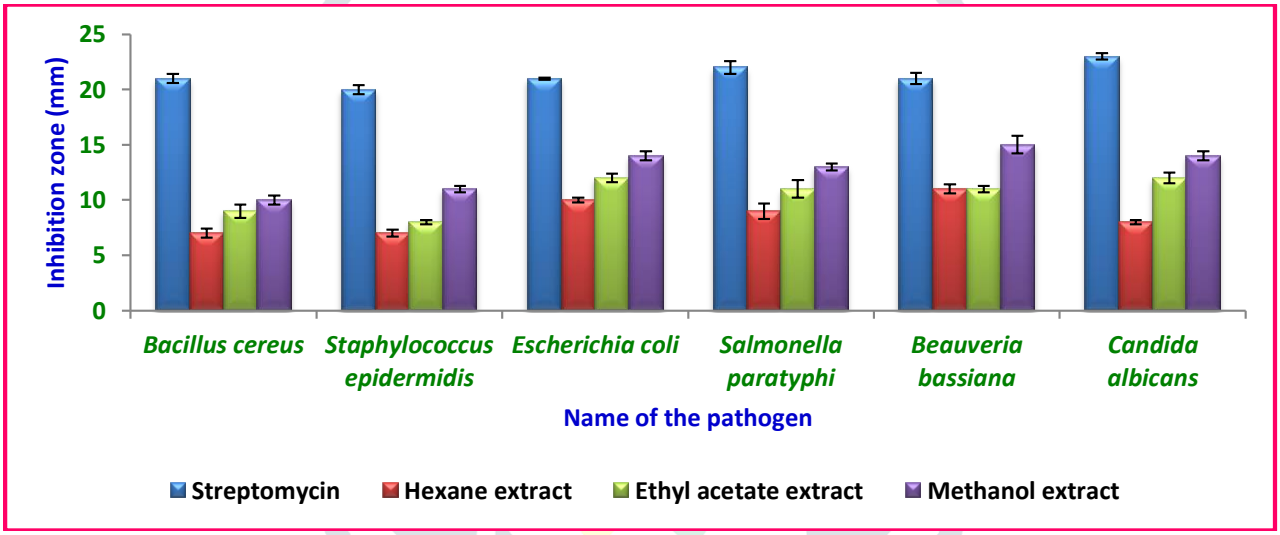

Figure 1: Comparative antimicrobial activity of *A. alata* against different pathogens

The present study revealed that the methanolic extracts demonstrated the highest antimicrobial activity when compared to the other solvents (hexane and the ethyl acetate). This may be due to the better solubility of the active components in methanolic solvent[6]. These results coincide with the previous works[7-11] and some of these observations have helped in identifying the active principle responsible for such activities and in the developing drugs for the therapeutic use in human beings.

4. CONCLUSION

Further research is needed for the evaluation of other biological active potentials like antioxidant, antidiabetic, anti-inflammatory activities of *Andrographis alata in vitro*. For this, large scale isolation and spectral techniques are required to isolate and identify a particular compound responsible for respective pharmacological action. The *in vivo* studies should also be carried out to describe the mechanism of action of these compounds in living systems using animal models.

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