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A Study on the Antibacterial Activity of certain Plant Extracts

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ABSTRACT

Petroleum ether extract of the leaves of plants such as *Acalypha indica, Achyranthes aspera, Aegle marmelos, Andrographis paniculata and Leucas aspera* were screened for antibacterial activity against three selected bacteriae i.e *Escherichia coli, Staphylococcus aureus and Proteus spp.* The mixed plant extracts were also screened for synergistic effect against the three selected bacteriae. Among the five individual plants tested a higher degree of antibacterial effect was exhibited by the leaves of *A. marmelos, L. aspera, and A. paniculata. E.coli* was susceptible to the extracts of all the five individual plants. The zone of inhibition was higher when the plates were incubated for 48h than for 24h. Among the mixtures of extracts tested, higher synergistic efficacy was observed in the mixtures of *A. marmelos + A. paniculata, A. marmelos + L. aspera* and *A. marmelos + A. indica* at 24h and 48h against *E.coli.*

Key words: Plant extracts, Antibacterial activity, *Escherichia coli* and Synergistic efficacy.

INTRODUCTION

Plants have long history of medicinal and antibiotic usage, dating back to 4000BC (Nickel, 1959). Medicinal and aromatic plants constitute a major source of natural organic compounds widely used in medicines, food products, cosmetics and paints that are of importance in everyday life. More than 2000 medicinal plants were found to be existing in India and out of this about 500 varieties are used in Siddha and Ayurvedic medicine. The study supports the view that several ethanomedicinal plants might be useful as antimicrobial agents resulting in the development of novel drugs for many centuries through ethno pharmacology (Heinrich, 2000; Heinrich and Simon, 2001). Ethanol extracts of *Terminalia balleria, Garcinea gummigulla, Anisomeles malabarica, Aegle marmelos*, *Alangiumsa lurifolium and Zigibus jujube* showed antibacterial activity against *Bacillus subtilis, Staphylococcu auerus* and *Eschericia coli (*Anderson *et.al.,* 1997).

MATERIAL AND METHODS

Collection of sample

Plants such as *Acalypha indica, Achyranthes aspera, Aegle marmelos, Andrographis paniculata and Leucas aspera* were selected and the leaves were used for the study.

Preparation of solvent extract

The leaves of the selected five plant species were separately washed, shade dried and crushed. The powder was subjected to extraction by Soxhlet method using petroleum ether at 60-80°C for 8 hours. The resulting petroleum ether crude extracts were concentrated to a paste and stored in air tight containers for further use

Collection of test organisms

Three bacterial cultures such *as Eschericia coli, Staphylococcus aureus and Proteus* spp were collected from Bose laboratory, Madurai, Tamil Nadu, India and were used as test organisms.

Antibacterial Activity (Kirby – Bauer disc diffusion technique)

Antibacterial activity of the leaf extracts were tested against the three bacterial cultures using Nutrient agar medium. Nutrient agar plates were prepared and the cultures were spread individually on the plates. Antibiotic discs were prepared using Whattman No 1 filter paper. The discs of 6mm dia was dipped in extract, dried for 15minutes and placed on bacterial culture swabbed plates and the plates were incubated at 37°C for 24hrs. Zone of inhibition around the disc indicates the susceptibility of the test organism. The following mixed plant extracts were also screened for synergistic effect against the three selected bacteria using the Kirby – Bauer disc diffusion method for 24 hours and 48 hours. Plant extract mixtures tested are:

a) A. marmelos + L. aspera(1:1)
b) A. marmelos + A. paniculata, (1:1)
c) A. marmelos + A. indica(1:1)
d) A. marmelos + A. aspera(1:1)

RESULTS AND DISCUSSION

Medicinal and aromatic plants constitute a major source of natural organic compounds widely used in medicines (Dobhal, 1994). Hence the ethno botanical approach is being applied to the search for new drugs. The antibacterial activity of the five selected plant leaves were tested against three organisms(*E.coli, S. aureus and Proteus* spp*)* at two different incubation period i.e 24 and 48h and the results are tabulated in Table 1 and 2 respectively. The 24hrs antibacterial activity of the five selected plant extracts indicating the zone of inhibition of growth reveals that *E.coli* is susceptible against all the five plants extracts tested at both 24 and 48h incubation period and it was followed by *S. aureus* and *Proteus* sp. Similar result was observed by Anderson *et.al,* (1997) in *E. coli* with the ethanol extracts of *Aegle marmelos*.In the present study among the four mixtures tested for the antibacterial activity against the three bacterial strains the zone of inhibition was higher for *E.coli* in all the four plant mixtures tested at 24 and

Table 1: Antibacterial activity of the five selected plant extracts indicating the zone of inhibition of growth (in cm) at 24 hours

Test Microorganisms	Petroleum ether extracts of Plants tested				
	Aegle marmelos	***Leucas aspera***	***Andrographis paniculata***	***Acalypha indica***	***Achyranthes aspera***
Escherichia coli	1.20	1.25	1.20	1.10	1.00
Proteus species	0.75	0.85	0.80	0.70	0.65
Staphylococcus aureus	0.85	1.00	0.90	0.80	0.85

Table 2: Antibacterial activity of the five selected plant extracts indicating the zone of inhibition of growth (in cm) at 48 hours

Test Microorganisms	Petroleum ether extracts of Plants tested				
	Aegle marmelos	***Leucas aspera***	***Andrographis paniculata***	***Acalypha indica***	***Achyranthes aspera***
Escherichia coli	1.40	1.30	1.25	1.20	1.15
Proteus species	1.00	1.10	0.90	0.85	0.75
Staphylococcus aureus	1.00	1.25	1.10	1.15	1.00

48h(Table3 and Table 4) and it was followed by *S.aureus and Proteus sp.*

The study shows that there is scope for using the selected plants for the treatment of the bacterial species tested and plant mixtures are better than the individual plants.

Table 4: Synergistic efficacy of Aegle marmelos with the other four selected extracts against the test bacteria indicating zone of inhibition of growth in cm (48h)

Test Microorganisms	Plant mixtures tested			
	***Aegle marmelos* + Leucas aspera**	***Aegle marmelos* + *Andrographis* paniculata**	***Aegle marmelos* + *Acalypha* indica**	***Aegle marmelos* + *Achyranthes* aspera**
Escherichia coli	1.65	1.80	1.50	1.30
Proteus species	1.20	1.50	1.00	1.10
Staphylococcus aureus	1.25	1.40	1.35	1.25

Table 3: Synergistic efficacy of Aegle marmelos with the other four selected extracts against the test bacteria indicating zone of inhibition of growth in cm (24h)

Test Microorganisms	Plant mixtures tested			
	***Aegle marmelos* + Leucas aspera**	***Aegle marmelos* + *Andrographis* paniculata**	***Aegle marmelos* + *Acalypha* indica**	***Aegle marmelos* + *Achyranthes* aspera**
Escherichia coli	1.50	1.60	1.40	1.10
Proteus species	0.90	0.95	0.90	0.80
Staphylococcus aureus	1.20	1.20	1.25	1.15

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