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ANTIBACTERIAL ACTIVITY OF SAUROPUS AND ROGYNOUS LEAF EXTRACTS AGAINST SOME PATHOGENIC BACTERIA

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ABSTRACT

Sauropus androgynous is a multivitamin plant. It is commonly known as Star gooseberry which belongs to the family Euphorbiaceae. It is native to South East Asia. The whole plant is widely used in traditional and folkloric systems of medicine. In traditional systems of medicine the plant is reported to possess beneficial effects as an antioxidant, anti cancerous, antifungal and anti septic. The present investigation is aimed to carryout antibacterial activities of the methanol, ethanol and aqueous extracts of *Sauropus androgynous* leaves against some Gram positive and Gram negative bacterial strains. To evaluate antibacterial activity, the agar diffusion assay was performed. Streptomycin was used as a reference antibiotic and the results were compared with the activity of methanol, ethanol and aqueous extracts of *Sauropus androgynous*. Methanol extract showed more antibacterial activity than aqueous extract. Methanol extract has exhibited significant antibacterial activity against all the six bacterial strains, while the aqueous extract showed moderate activity against *Salmonella typhimurium* and *Klebsiella pneumoniae.*

Keywords: *Sauropus androgynous,* antibacterial activity, *Klebsiella pneumonia, Salmonella typhimurium.*

INTRODUCTION

Sauropus androgunous is a shrubby plant of Euphorbiaceae family. It can grow up to 3 meter height. The leaves are simple, alternately arranged, lanceolate or oblong in shape. The upper surface of the leaf is dark green in colour while the lower surface is light green. The flowers are unisexual with the female appearing first before the male, small, in axillary clusters. The fruits are rounded capsules with six distinct partitions [Fig.-1]. The young branches and leaves are used as vegetables. Medicinal plant products were proved to be useful in minimizing the adverse effects of various chemotherapeutic agents as well as in prolonging longevity and attaining positive general health[1]. The increasing global interest in the medicinal potential of plants during the last few decades is therefore quite logical. Antibiotics since their introduction are one of the most important weapons in fighting against bacterial infections and have largely benefited human beings. Many pathogenic organisms are developing plasmid-mediated resistance to the prevailing drugs. Hence, there is a need for novel natural compounds that can be obtained from the plants or microorganisms. Plants, in particular, have been a source of inspiration for novel drug compounds since days immemorable. Plants serve as a reservoir of effective chemo-theraputants and provide valuable sources of natural products in the control of several bacterial diseases. Many studies indicate that plants contain bio-active compounds such as peptides, glycosides, alkaloids, saponins, terpenoids, flavonoids etc., with antimicrobial activity against bacterial, fungal and viral infections[2-4].

Medicinal plants have been used for centuries as remedies for human diseases because they contain components of therapeutic value[5]. About 80% of the world's population relies on plants and plant products for their healthcare. India represented by rich culture, traditions and natural biodiversity, offers a unique opportunity for drug discovery researchers[6]. The acceptance of traditional medicine as an

alternative form of health care and the development of microbial resistance to the available antibiotics has led to investigate the antimicrobial activity of medicinal plants. The increasing failure of chemotherapeutics and antibiotic resistance exhibited by pathogenic microbial infectious agents has lead to the screening of several medicinal plants for their potential antimicrobial activity[7]. Contrary to the synthetic drugs, antimicrobials of plant origin are not associated with side effects and have an enormous therapeutic potential to heal many infectious diseases. The potential for developing antimicrobials from higher plants appears rewarding as it will lead to the development of a phytomedicine to act against microbes[8].

Fig.-1: *Sauropus androgynous* habit with leaves and fruits

The use of plant compounds to treat infections is an old practice in a large part of the world, especially in developing countries where there is dependence on traditional medicine for a variety of diseases. Interest in plants with antimicrobial properties has revived as a result of current problems associated with the use of antibiotics[9].

India has a rich heritage of knowledge on plant based drugs both for use in preventive and curative medicines. A country like India is very much suited for development of drugs from medicinal plant as it is rich in biodiversity. The medicinal value of plants has assumed a more important dimension in the past few decades. This is largely due to the discovery that extracts from plants contain not only minerals and primary metabolites but also a diverse variety in recent years due to the growing cases of microbial resistance to the time honored antibiotics[10]. In recent years numbers of studies have been reported dealing with antimicrobial screening of extracts of medicinal plants[11,12]. A variety of compounds are accumulated in plants accounting for their constitutive antimicrobial activities[13]. In the present Study antibacterial activities of the methanol, ethanol and aqueous extracts of *Sauropus androgynous* leaves against three Gram positive and three Gram negative bacterial strains were carried out and discussed.

EXPERIMENTAL

Collection of Plant Material

The plant sample was collected from the Agasthiyamalai biosphere area of South Western Ghats region, Kalakkadu Mundanthurai Tiger Reserve Forest, Tirunelveli District, Tamilnadu. The Plant sample was washed thoroughly 2-3 times with running water and rinsed with sterile distilled water for removal of dust and soil particle. The fresh young leaves of this plant were used to study the antibacterial activity using different organic solvents methanol, ethanol and aqueous extract by using distilled water.

Preparation of Extract

The aqueous, ethanol and methanol extract of plant material was prepared by using as percolation method at room temperature. The extracts were filtered through a muslin cloth. Filtrate was then concentrated to one fourth of the original volume and used.

Culture used

Six bacterial strains were used for testing the antimicrobial activity of the *Sauropus androgynous.* Among the six organisms investigated, three were Gram positive namely *Bacillus cereus, Bacillus subtilus, Staphylococcus aureus* and the other three were Gram negative organisms namely Escherichia *coli, Klebsiella pneumoniae* and *Salmonella typhimurium*.

In-vitro Antibacterial Assay

The Disc diffusion method as illustrated by Bauer et al was used to determine the growth inhibition of bacteria by plant extract. Sterile Mueller Hinton agar media was poured into sterile petri dish and after solidification the 1 ml of bacterial culture were swabbed with a sterile cotton swab under aseptic condition. Sterile discs were prepared using Whatman No.1 filter paper of 5mm diameter was used in the study. 100 µl of plant extract was loaded in the disc and air dried. Then the discs were placed onto the surface of the medium. The plates were incubated at 37˚C for 24 hours to form the inhibition zones. The antibacterial activity was calculated by measuring the diameter of zone of inhibition in mm. The antibacterial activity showing zone of inhibition was compared with the standard Streptomycin as positive control.

RESULTS AND DISCUSSION

The antibacterial activity of the *Sauropus androgynous* leaf extract in methanol, ethanol and aqueous extract were carried out separately and the results were given in the Table-1, Table-2 and Table-3 respectively. The fatty acid content of the cotyledon of Sauropus was also analysed. The cotyledon contains about 18 to 20% of fatty acid content which can be used as a biofuel. The methanol leaf extract of *Sauropus androgynous* shows more inhibitory effect towards the gram positive bacteria when compared with the ethanol and aqueous leaf extract.

Table- 1: Anti microbial activity of *Sauropus androgynous* leaves in methanol extract

S.No	Bacterial Strains	Inhibition zone(mm)	Standard Streptomycin(mm)	Percentage of inhibition
Gram positive organism				
1	Bacillus cereus	12	16	75
2	Bacillus subtilis	7	15	47
3	Staphylococcus aureus	11	18	61
Gram negative organism				
1	Escherichia coli	6	13	46
2	Klebsiella pneumoniae	10	17	59
3	Salmonella typhimurium	15	19	79

Table- 2: Anti-microbial activity of *Sauropus androgynous* ethanol extract

S.No	Bacterial Strains	Inhibition zone(mm)	Standard Streptomycin(mm)	Percentage of inhibition
Gram positive organism				
1	Bacillus cereus	10	16	63
2	Bacillus subtilis	8	15	53
3	Staphylococcus aureus	12	18	67
Gram negative organism				
1	Escherichia coli	6	13	46
2	Klebsiella pneumoniae	7	17	41
3	Salmonella typhimurium	9	19	47

The methanolic leaf extract also shows more inhibitory effect against the gram negative bacteria when compare with the ethanolic and aqueous extract. The antibacterial activity of the leaf extract is due to the

presence of multi vitamins and peptides, glycosides, alkaloids, saponins, terpenoids, flavonoids etc. Since the aqueous leaf extract shows very low antibacterial activity the raw leaf can be taken freshly as greens as a medicine. The seeds contain fatty acid which is non toxic and it can be exploited for the production of potential Biofuel.

Table- 3: Anti-microbial activity of *Sauropus androgynous* leaves in aqueous extract

S.No	Bacterial Strains	Inhibition zone(mm)	Standard Streptomycin(mm)	Percentage of inhibition
Gram positive organism				
1	Bacillus cereus	9	16	60
2	Bacillus subtilis	7	15	48
3	Staphylococcus aureus	12	18	70
Gram negative organism				
1	Escherichia coli	5	13	45
2	Klebsiella pneumoniae	8	17	52
3	Salmonella typhimurium	10	19	55

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