



A Study on Determination of Antibacterial Activity of Madhunaashini (*Gymnema sylvestre*)

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Abstract

The main purpose of the current study was to evaluate the antibacterial activities of ethanolic and aqueous leaf extracts of Madhunaashini (*Gymnema sylvestre*). Leaves of *G. sylvestre* was subjected to successive solvent extraction by continuous hot extraction (Soxhlet) with water and ethanol. The extracts were dissolved in dimethyl sulfoxide (DMSO) before testing the antibacterial activity. The antibacterial activity of leaf extracts *G. sylvestre* for *Proteus mirabilis*, *E. coli* and *Pseudomonas aeruginosa* was determined by agar well diffusion technique. Results revealed that the zone of Inhibition of *G. sylvestre* for ethanolic & aqueous extracts was for *P. mirabilis* and *E. coli* was found to be 17 mm & 14 mm and 17 mm & 14 mm respectively, *P. aeruginosa* exhibited the zone of Inhibition as 8 mm for ethanolic extract In addition, ethanolic extract of *G. sylvestre* exhibited antibacterial activity (27 mm) against *P. mirabilis* which is at par with that of standard antibiotic Streptomycin (18.5 mm). In conclusion, study findings confirmed that the ethanolic extract of *G. sylvestre* exhibited antibacterial activity at par with that of standard antibiotic streptomycin. Therefore, current study supplies as a scientific evidence-based report for the traditional use of *G. sylvestre* as an antibacterial agent.

Keywords

Antibacterial activity, *Gymnema sylvestre*, *P. mirabilis*, *E. coli*, *P. aeruginosa*

INTRODUCTION

The naturopathic treatment for diseases has been explored extensively since ancient times and gaining momentum in the present scenario. Indian flora accounts for about 45,000 plant species out of which several thousands have pharmacological

significance [1]. Plants are a great concern for drug discovery exploration and a major source of our modern medicine. About 25% of modern medicines are derived from a plant source and merely 5-15% of plants have been Investigated for their medicinal use [2]. Nowadays, natural plants, herbal medicines, phytomedicines and functional foods are extensively studied by scientists all over the world which resulted with the lucrative therapeutic potentials such as antidiabetic [3-6], antiobesity and lipid lowering [16], anti-inflammatory [7], and antibacterial activities (8).

Among the potential medicinal plants, *Gymnema sylvestre*, belongs to the family of Apocynaceae and is traditionally used for the treatment of various diseases. The leaves of gurmar are of tremendous medicinal importance due to its unique property to directly mask the tongue's ability to taste sweet foods; at the same time suppresses glucose absorption from the intestine. This is the reason it is known in Hindu word as "gurmar" or "destroyer of sugar" [1], Aroa and Kaur assayed the antibacterial activity of certain spices and revealed that spices have a great potential to be used as antibacterial agents [9]. Bagchi et al reported that seeds of *Coprophilous* plants are effective in subsiding the pathogenic organisms of animals as well as humans; Furthermore, with water solubility and *nonpoisonous* nature of seeds of *Coprophilous* plants are proven to be a potential source of antimicrobial drugs [10]. On screening eight *Nigerian* medicinal plants used traditionally in the treatment of infectious diseases in both humans *and* animals as antibacterial activity, *Angejiossus schimperi* and *Anocardium occidentale* exhibited significant activity against *Escherichia coli* and *Pseudomonas aeruginosa* [11]. The results of antibacterial screening of six Moroccan medicinal plants showed that n-butanol extract of *Calotropis Procera* was most effective against the eight pathogenic bacteria tested [12].

Plants have been used for the treatment of various diseases all over the world before the advent of modern clinical drugs and are known to contain substances that can be used for therapeutic purposes or as precursors for the synthesis of useful drugs [13]. Thus over 50% of these modern drugs are of natural products of origin and as such play an important role in drug development in the pharmaceutical industry [14]. Infectious diseases are the number one cause of death world-wide and in tropical countries it accounts for approximately 50% of deaths. This may be due to poverty and increasing incidence of multiple drug resistance organisms.

G. Sylvestre (Asclepladaceae) is a large tropical vine native to central and western India. There is a growing demand for *G. sylvestre* leaves in pharmaceutical trade. the

active compound gymnemic acid was extracted from leaves and used widely as an anti-diabetic, anti-sweetener and anti-hypercholesterolemia. It also has stomachic, diuretic and cough suppressant properties [15]. Literature study evidenced the traditional usage of *G. sylvestre* in pharmaceutical industry. However, reports on antibacterial activity of *G. sylvestre* are scarce. With this background current study was aimed to evaluate the antibacterial activity of *G. sylvestre* against pathogenic microorganism.

MATERIALS AND METHODS

Plant material: The leaves of *G. sylvestre* were collected from local provinces at Chikkaballapura District of Karnataka State.

Extract preparation

Leaves of *G. sylvestre* was washed thoroughly under running tap water, dried on paper. Dried leaves were coarsely powdered and subjected to successive solvent extraction by continuous hot extraction (Soxhlet). The extraction was done with different solvents in their increasing order of polarity such as water and ethanol. Each time the material dried and later extracted with other solvents. All the extracts were concentrated by distilling the solvent in a rotary flash evaporator. The extracts were preserved in airtight containers and stored at 4-5°C until further use. The extracts were dissolved in dimethyl sulfoxide (DMSO) before testing for the antibacterial activity [16].

Pathogenic microorganisms

The multiple antibiotic resistant pathogenic microorganisms viz. *Escherichia coli*, *Proteus mirabilis*, and *Pseudomonas aeruginosa* were isolated from clinical samples of local hospital in and around Chikkaballapura district headquarter and confirmed by various microscopic evaluation like Gram's staining [17]. Motility, capsule, and spore formation as per the procedure prescribed by Collins and Lyne [18]. All the bacterial pathogens were further confirmed by suitable biochemical tests and used for antimicrobial activity studies [19].

Antibacterial activity

The antibacterial activity of leaf extracts of *G. sylvestre* was determined by agar well diffusion technique. Muller Hinton agar plates were spread with an overnight culture of each bacterial strain. The well was made by sterile standard cork borer and 100mg/ml solution of extract added to each well. Then bacterial plates incubated at 37°C for 24 hours after which diameter of zones of inhibition were measured (mm) by using Hi Antibiotic Zone Scale-C (Himedia). Each assay was performed in triplicate and means

values are reported. Standard antibiotic strip of streptomycin (100 mg/disc) for each bacterium along with DMSO were used as positive and negative controls respectively.

Results and Discussion

Plants have played a pivotal role for mankind mainly as food and medicine. Medicinal plants have been used for many centuries for human diseases because they contain bioactive components of therapeutic value because of their antimicrobial properties and they contain secondary metabolites such as alkaloids, phenol compounds, etc.[20]. Countries like India have been using crude plants as medicine since Vedic period.

The dried leaf powder of *G. sylvestre* was subjected to successive solvent extraction in their increasing order of polarity such as hot water and ethanol. The extracts were concentrated and dissolved in DM50 for determination of the antibacterial activity [16]. Pathogenic microorganisms like *P. mirabilis*, *E. coli* and *P. aeruginosa* and their zone of inhibition was compared with standard antibiotic streptomycin. The zone of inhibition of *G. Sylvestre* for ethanolic and aqueous extracts was for *P. mirabilis* & *E. coli* was found to 17 mm & 14 mm and 17 mm & 14 mm respectively. *P. aeruginosa* exhibited the zone of inhibition 8mm for ethanolic extract. Among the leaf extracts of *G. Sylvestre*, ethanolic extracts showed excellent antibacterial activity than aqueous extracts. Further it was observed that ethanolic extracts of *G. Sylvestre* possess antibacterial activity (17 mm) against *P. mirabilis* which is equal to that of standard antibiotic Streptomycin (183 mm). The results of antibacterial activity of *G. Sylvestre* were represented in Table 1.

Table1: Antibacterial activity of leaf extracts of G.sylvestre

S.No.	Bacterial Strains	Leaf extracts of G.sylvestre		
		Ethanolic extract	Aq. Extract	Streptomycin
		Zone of inhibition (mm)		
1.	E.coli	15.00	11.00	23.00
2.	P.mirabilis	17.00	14.00	18.50
3.	P.aeruginosa	8.00	-	21.00

Plants are sources of very potent and powerful drugs with antibacterial properties 121,221 Antibacterial assay of Zulu medicinal plants showed that methanolic extracts of *Chelanthes vivid's*, *Oloscovea dregeanum*, *Dioscarea sivistica* and *Mollanthis cosniasus* exhibited activity against both Gram positive and Gram-negative bacteria (23). Samy and Ignadmuthu screened 30 Indian folk medicinal plants used by traditional healers using disc diffusion method. Among them, the leaf extracts of *Cassia occidentalis* and *Cassia comkulata* exhibited significant broad-spectrum antibacterial activity against *Bacillus subtilis* and *Staphylococcus aureus* (24). In the present study, antibacterial activity of solvent extracts of leaves of *G. sylvestre* was evident due to clear zone of inhibition against test organisms like *E. Coll*, *S aureus* and *Kiebsiella Sp*. the antibacterial activity of *G. Sylvestre* was due to different class of phytochemicals in different proportions.

Literature reports evidenced antibacterial activities of *G. sylvestre*. Saumendru reported that *G. sylvestre* leaf extracts showed good prospects as an antibiotic herbal remedy since it was effective as herbal formulation for the treatment of microbe's related infections (25). Bhuvanewari *et al* reported that the methanol extracts in acidic range have good activity towards all the pathogens showing its broad spectrum nature (26). Furthermore, Satdive *et al* reported the antimicrobial effect of ethanolic extract of *G. sylvestre* against *S. pumMts*, *B. subtilis*, *P. aeruginosa* and *S. aureus 1271*. In summary, methanolic and ethanolic leaf extract of *G. sylvestre* possesses considerable antibiotic and antimicrobial activity.

CONCLUSIONS

The study findings confirmed that the ethanolic extract of Madhunaashini (*Gymnema sylvestre*) exhibited antibacterial activity at par with that of standard antibiotic streptomycin. Therefore, current study supplies as a scientific evidence-based report for the traditional use of *Gymnema sylvestre* as an antibacterial agent.

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