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Screening of medicinal plant *Tinospora cordifolia* L. for antibacterial potential against some Pathogens

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Abstract

The present work was conducted to determine the antimicrobial activity of stem and leaf extract of some indigenous medicinal plants against some human pathogenic strains like *Staphylococcus aureus, Bacillus, Escherichia coli,* and *Pseudomonas.* Leaf and stem parts of the medicinal plant Gulvel (*Tinospora cordifolia* L.) was extracted in different solvents like Ethanol, Methanol, Dimethyl sulfoxide and Distilled water. In vitro antibacterial activity was performed by the agar disc diffusion method. The results obtained revealed that most susceptible Gram-positive bacteria was found to be *Staphylococcus aureus*, while the most sensitive Gram-negative bacteria was *Escherichia coli* as well as *Pseudomonas* spp. for stem extract of Gulvel.

Key words : *Tinospora cordifolia* L., Antimicrobial activity, Medicinal plants, Agar disc diffusion method.

From the Long time ago, in Ayurveda Plant extracts were used for the treatment of diseases. Medicinal plants represent a rich source of antimicrobial agents. Number of countries used medicinal Plants in medicines and a source of many potent and powerful drugs. Different parts of medicinal plants like roots stem, leaves and flowers are used as raw drugs and they possess varied medicinal properties[6,8]. Medicinal plants are believed to be important source of new chemical substances with potential therapeutic effects[7]. For the treatment of various diseases, including asthma, gastrointestinal symptoms, skin disorders, respiratory and urinary problems, and hepatic and cardiovascular disease medicinal plants were used traditionally[9,10]. The medicinal value of plants like antimicrobial, anti-cancer, anti-inflammatory, anti-diabetic, antioxidant, anti-diuretic and etc. mainly depends on the secondary metabolites and the most important bioactive compounds of plants are alkaloids, saponins, flavonoids, tannins, sterols and phenolic compounds[4,5]. Thus these plants synthesize a diverse array of biologically active compounds[2,3]. Plant-based antimicrobial compounds have great therapeutic potential as they have lesser side effects as compared with

synthetic drugs and also little chance of developing of resistance. According to the World Health Organization (WHO), medicinal plants would be the best source to obtain a variety of drugs[11].

Therefore present study has been carried out to study the antimicrobial activity of indigenous medicinal plant *Gulvel* (*Tinospora cordifolia* L.) collected from Shahada region against *Staphylococcus aureus*, *Bacillus* spp., *E. coli* and *Pseudomonas aeruginosa* by agar disc diffusion method.

Plant collection :

The fresh and healthy leaves of the medicinal plant namely Gulvel (*Tinospora cordifolia* L.) was collected from various areas of Shahada-Nandurbar District, Maharashtra and identified and authenticated after critical examination in laboratory. Leaves and stem part of the plant was used to study its antimicrobial activity.

Preparation of plant extract :

Fresh matured leaves and stems (25 gm) of the collected plant was washed thoroughly with sterile distilled water and dried under shade. Plant leaf sample and stem were cut into small pieces and crushed in a mortar with 15 ml of sterilized Distilled Water, Ethanol, Methanol and Dimethyl Sulphoxide respectively. The extract was centrifuged in sterile centrifuge tubes to remove broken tissues. Supernatant of leaf and stem extract was transferred into sterile test tubes to study its antibacterial activity.

The antibacterial activity of extract was evaluated using two strains of Gram-Positive and two strains of Gram-Negative bacteria. The bacterial strains used for the study of antimicrobial activity were *Staphylococcus aureus*, *Bacillus* spp., *E. coli* and *Pseudomonas* spp. The pure culture of each bacterial strain was suspended in nutrient broth and incubated for 24 h at 37°C. Sterile Nutrient agar (NA) medium was used for testing the antibacterial activity.

Determination of antibacterial activity :

The antimicrobial activity of medicinal plant parts-leaf extract and stem extract was determined by the agar disc diffusion method[1]. 0.1 ml of the freshly grown culture of test organisms were aseptically introduced and spread on the surface of sterile Nutrient agar plate. For the agar disc diffusion method, sterile filter paper discs (6mm) were soaked in each medicinal plant extract prepared in sterile distilled water, ethanol, methanol, and dimethyl sulphoxide and placed at the surface of nutrient agar plates previously inoculated with the different test organisms. Control of the same solvent with the paper disc was kept as a positive control and the paper disc soaked in Distilled water was used as a negative control. Plates were incubated at 37^0C for 24-48 hours. Antibacterial activity was evaluated by measuring the diameter of the zone of inhibition against the tested bacterial pathogens.

The present work was carried out to investigate the antimicrobial activity of Gulvel (*Tinospora cordifolia* L.) against some human pathogenic microorganisms. Two Gram Positive organisms like *Staphylococcus aureus*, and *Bacillus* spp., and two Gram Negative organisms like *E. coli* and

Table-1. Antimicrobial activity of Leaf and stem extract of Gulvel (*Tinospora cordifolia* L.) against human pathogens

S. No.	Plant part	Solvents	*S. aureus*	*Bacillus* spp.	*E. coli*	*Pseudomonas* spp.
			Zone of inhibition (mm)			
1	Leaf extract	Methanol	6.2	5.0	7.7	6.4
2	Stem extract		7.5	6.5	8.67	6.9
3	Leaf extract	Ethanol	4.2	3.4	7.9	4.8
4	Stem extract		6.1	5.6	6.3	5.3
5	Leaf extract	DMSO	8.0	6.5	6.9	5.7
6	Stem extract		9.0	7.6	8.9	7.8
7	Leaf extract	Aqueous Extract	3.2	3.4	3.6	3.8
8	Stem extract		2.2	4.2	4.9	4.9

Pseudomonas spp. were selected for this study. The antimicrobial activity of leaf extract and stem extract was observed against these selected pathogens. Results obtained revealed in the following table indicated that better antimicrobial activity was observed with stem extract of the part as compared to leaf extract. Gulvel stem extract had better antimicrobial potentials. The maximum activity was observed against *Staphylococcus aureus* and *E. coli* and *Pseudomonas* spp.

Results given in Table-1 show that maximum zone of growth inhibition(8.9 mm) was observed with stem extract of plant against Gram negative isolate *E. coli* and 9.0 mm against Gram positive isolate *Staphylococcus aureus* when dimethyl sulphoxide was used as a solvent for extraction, followed by a 7.8mm zone of inhibition with *Pseudomonas* spp. While a very less zone of growth inhibition (5.0mm) was observed with leaf extract against *Bacillus* spp. when methanol was used as a solvent. Stem extract was found to be more effective against *E. coli* followed by *Pseudomonas* and *S. aureus* in antimicrobial properties. As compared to ethanol, methanol was found to be more effective solvent for extraction.

The antimicrobial activity of medicinal plant may be due to the presence of important phytochemical constituents in plants that inhibited the growth of pathogenic microbes. Results obtained revealed that as compared to aqueous extract of the plant, an extract in dimethyl sulphoxide as well as methanol followed by ethanol have better antimicrobial activity with leaf and stem extract of plant.

The medicinal plant extract has been effectively used as a promising alternative to synthetic drugs in recent medicine. Antimicrobial activity of Gulvel (*Tinospora cordifolia* L.) was studied against four different pathogenic bacteria. Results obtained revealed that stem

extract of plant have effective potentials against microbes as compared to leaf extract.

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