



## Antimicrobial Activity of Medicinally Important Plant - *Cissus quadrangularis* Linn against some Pathogenic Bacteria

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### ABSTRACT

The plants *Cissus quadrangularis* was collected from kolli hills, Namakkal DT, Tamilnadu. The plant stems were collected and it was dried for room temperature (37 °C) for 10-15 days. The dried stems were grinded as course powder then the powder was filled in soxhlet apparatus. Crude extracts were prepared from that powder using different solvents like Petroleum ether, isopropyl alcohol, ethyl acetate and ethanol. The antimicrobial activities of the extracts were tested against four microorganisms. The antimicrobial activities of *Cissus quadrangularis* stem extracts were assessed by the presence or absence of inhibition zones and zone diameter values. The Kirby – Bauer method is used for the antimicrobial activity of *Cissus quadrangularis* stem extracts. Among the four crude extracts of *Cissus quadrangularis*, the Petroleum ether and Ethyl acetate showed good antimicrobial activity against all the tested microorganisms, Ethanol showed moderate inhibition activity, and Isopropyl alcohol showed least antimicrobial activity against all organisms.

**Keywords:** *Cissus quadrangularis*; Antimicrobial; Petroleum ether; Ethyl acetate; Kirby – Bauer

### INTRODUCTION

The plant *Cissus quadrangularis* Linn is an indigenous medicinal plant of India. It is also known as *vitis quadrangularis*. It certainly belongs to family vitaceae. This is distributed throughout India particularly in tropical regions. The plant was chiefly known as edible stemmed vine in English, perandi in Tamil. It is freshly cactus like, jointed climber, tendrils simple, leaves simple or lobed, cordate, serrate, dentate, flowers or small, greenish white, bisexual and tetramerous. Calyx is cup shaped, fruits globose or obovoid fleshy berries, succulent, very acrid, dark purple to black and stem is buff colored with greenish ting [1].

It has been prescribed in Ayurvedic and siddha as an alternative traditional medicine. It has anthelmintic, dyspeptic, digestive, tonic, analgesic in eye and ear diseases, and in the treatment of irregular menstruation and asthma. The whole plant is used in oral re-hydration, while the leaf, stem and root extracts are important in the management of various ailments [2].

The stout, fleshy stem is traditionally used for the treatment of gastric, bone fracture, skin infections, constipation, eye diseases, piles, anemia, asthma, irregular menstruation, burns and wounds. The leaves and young shoots are alternatives for hemorrhoids and some bowl infections. The stem juice is solely used for scurvy, irregular menstruation and for asthma. *Cissus quadrangularis* is also having fracture healing, antimicrobial activity, antiulcer, antioxidative, antiosteoporotic, gastro protective, cholinergic activity and cardiovascular diseases. It has also antiviral activity against many important viruses such as herpes simplex virus (HSV), feline imunodificidncy virus, coxsackie virus, influenza virus, Para influenza virus, respiratory syncytial virus [3].

## MATERIALS AND METHODS

### Plant collection

The medicinal plant *Cissus quadrangularis* was collected from kolli hills, Namakkal DT, Tamilnadu.

### Test microorganisms and microbial culture

Four bacterial strains were utilized in this study namely *Escherichia coli* (MTCC 2844), *Proteus mirabilis* (MTCC 9242), *Staphylococcus aureus* (MTCC 9886) & *Bacillus subtilis* (MTCC 8141). The cultures were obtained from the MTCC, Chandigarh, India.

### Methods

#### Preparation of plant extracts

Stems of plant *Cissus quadrangularis* were collected from kolli hills Namakkal. Collected plant material was shade dried and grinder with 2mm diameter mesh. The powdered plant materials (50g) were extracted successively with 200ml of petroleum ether, isopropyl alcohol, ethanol and ethyl acetate by using soxhelt extractor for 48 hours at a temperature not exceeding the boiling point of the solvent. The residues obtained were stored in a freezer at -80<sup>0</sup>c until further tests [4].

#### Disc diffusion method/Kirby – Bauer method

Willy Kirby, A.W Bauer and their colleagues developed it in the early 1960's at the university of Washington medical school.

Muller Hinton Agar medium was prepared by using clean sterile conical flask and kept it for sterilization. After sterilization, the medium was poured into the sterile Petri plates and allowed to solidify. The bacterial culture was inoculated in the peptone water and kept in the shaker for 7 – 8 hours. Then, the culture was swabbed on the surface of the Muller Hinton Agar medium by using sterile cotton swabs. The sample was added in to the sterile disc, this kept in hot plate different concentration (100µg, 200µg, 300µg, 400µg, 500 µg). Then, the plates were incubated in to the incubator for 24 hours at 37<sup>0</sup>C.

## RESULTS

The result clearly shows that the plant *Cissus quadrangularis* stem extract exist antimicrobial activity. The antimicrobial activity of *Cissus quadrangularis* stem extracts were assessed by the presence or absence of inhibition zones and zone diameter values. The Kirby – Bauer method is used for the antimicrobial activity test of *Cissus quadrangularis* stem extracts. Among the four crude extracts of *Cissus quadrangularis*, the Petroleum ether and Ethyl acetate showed good antimicrobial activity against all the tested microorganisms, Ethanol showed moderate inhibition activity, and Isopropyl alcohol showed least antimicrobial activity against all organisms. The growth inhibitory effect of *Cissus quadrangularis* extracts against four pathogenic microorganisms are represented in Table 1-4.

Table 1: Antibacterial activity of various extracts of *Cissus quadrangularis* against *E.coli*.

Microorganism	Extract	Concentrations(µg/µl)				
		100µg	200µg	300µg	400µg	500µg
<i>E .coli</i>		<b>Zone of inhibition(mm)</b>				
	Ethanol	15	18	17	18	20
	Ethyl Acetate	21	21	23	25	25
	Isopropyl Alcohol	18	19	21	22	23
	Petroleum Ether	16	20	21	22	27

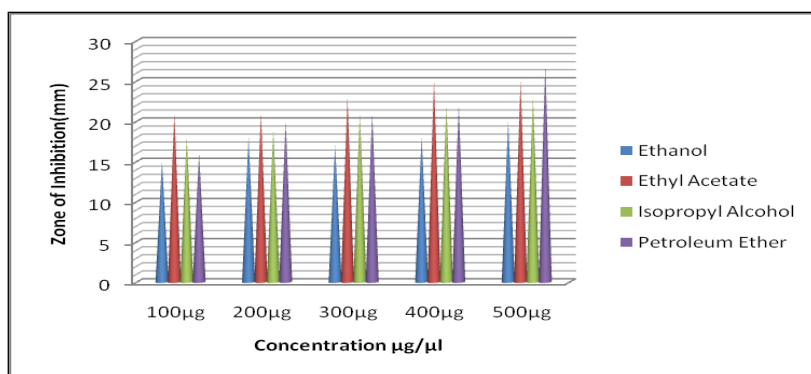


Figure 1: Antibacterial activity of various extracts of *Cissus quadrangularis* against *E. coli*

Table 2: Antibacterial activity of various extracts of *Cissus quadrangularis* against *Proteus mirabilis*

Microorganism	Extract	Concentrations(µg/µl)				
		100µg	200µg	300µg	400µg	500µg
<i>Proteus mirabilis</i>		Zone of inhibition(mm)				
	Ethanol	12	14	16	16	18
	Ethyl Acetate	14	17	17	18	19
	Isopropyl Alcohol	11	11	12	12	13
	Petroleum Ether	12	14	17	14	21

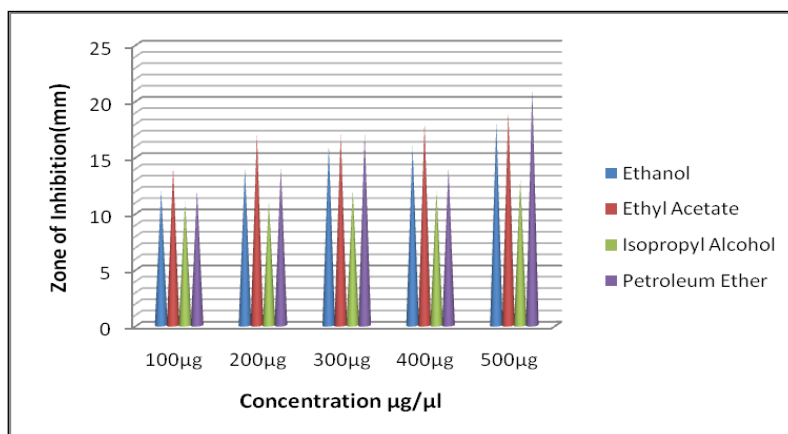


Figure 2: Antibacterial Activity of various extracts of *Cissus quadrangularis* against *Proteus mirabilis*

Table 3: Antibacterial activity of various extracts of *Cissus quadrangularis* against *Staphylococcus aureus*

Microorganism	Extract	Concentrations(µg/µl)				
		100µg	200µg	300µg	400µg	500µg
<i>Staphylococcus aureus</i>		Zone of inhibition(mm)				
	Ethanol	13	16	15	17	18
	Ethyl Acetate	16	18	17	19	20
	Isopropyl Alcohol	12	13	12	13	14
	Petroleum Ether	16	18	17	19	20

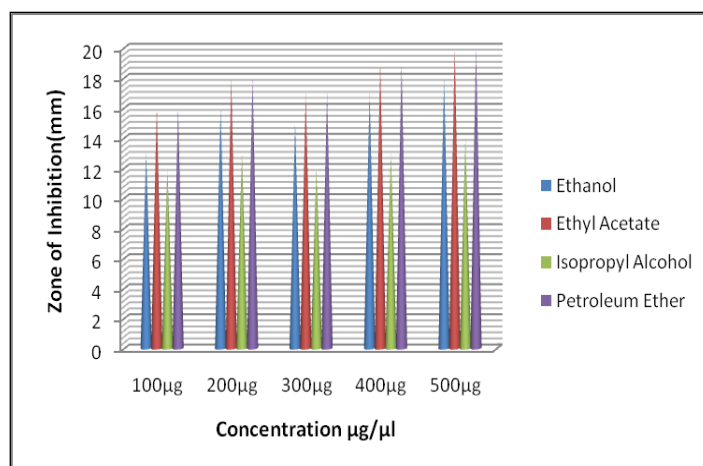


Figure: 3 Antibacterial activities of various Extracts of *Cissus quadrangularis* against *Staphylococcus aureus*

Table 4: Antibacterial activity of various extracts of *Cissus quadrangularis* against *Bacillus subtilis*

Microorganism	Extract	Concentrations(µg/µl)				
		100µg	200µg	300µg	400µg	500µg
<i>Bacillus subtilis</i>		Zone of inhibition(mm)				
	Ethanol	14	16	16	19	20
	Ethyl Acetate	18	20	18	17	20
	Isopropyl Alcohol	11	13	14	13	17
	Petroleum Ether	15	16	18	17	18

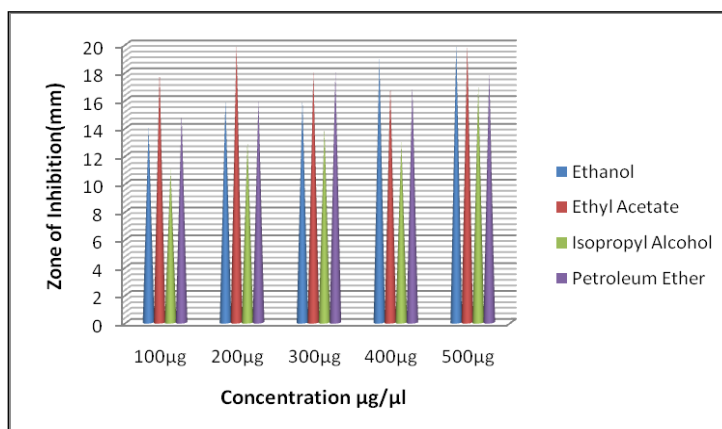


Figure: 4 Antibacterial activities of various extracts of *cissus quadrangularis* against *Bacillus subtilis*

## DISCUSSION

The evolution and spread of antibiotic resistance, as well as the evolution of new strains of disease causing agents, are of great importance to the global health community. Our ability to effectively treat disease is fully dependent on the development of new pharmaceuticals, and one potential source of novel drugs are traditional medicine. This study clearly explored the antibacterial properties of *Cissus quadrangularis*. The ethyl acetate stem extract of *Cissus quadrangularis* exhibited high activity against *E.coli*, *Proteus mirabilis*, *staphylococcus aureus*, and *Bacillus subtilis* in different concentrations (21-25mm). The petroleum ether extract exhibited high activity against *E.coli* (16-27mm), *Staphylococcus aureus* (16-20mm). The isopropyl alcohol extract exhibited high activity against *E.coli* (18-23mm) and showed low activity against *staphylococcus aureus*, *Proteus mirabilis*, and *Bacillus subtilis*. The ethanol extract exhibited optimum activity against all organisms, petroleum ether and ethanol extracts displayed broad spectrum of activity.

*Cissus quadrangularis* stem extracted with five solvents (Petroleum ether, chloroform, ethyl acetate, ethanol and aqueous extract) were tested for antimicrobial activities against *Escherichia coli*, *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Proteus mirabilis*, *Penicillium sp*, *Mucor sp*, *Aspergillus Niger* and *Candida albicans* by disc diffusion method. Among the five extracts, aqueous extract showed maximum antibacterial and antifungal activity against *Pseudomonas aeruginosa* and *Mucor sp*, Chloroform and ethyl acetate extracts were ineffective against *Proteus mirabilis* and *Penicillium sp*, [5].

The invitro antibacterial activity of different extracts of *Cissus quadrangularis* Linn (Vitaceae) against some Gram-negative and Gram-positive bacteria, were investigated. The methanol and ethyl acetate extract showed high activity against the bacteria tested [6]. Extracts of *Cissus quadrangularis* L. were tested for antioxidant activity by beta-carotene linoleic acid model and also by 1, 1-diphenyl-2-picrylhydrazyl model. The ethyl acetate extract and methanol extract of both fresh and dry stems further exhibited antimicrobial activity against Gram-positive bacteria, including *Bacillus subtilis*, *Bacillus cereus*, *Staphylococcus aureus*, and *Streptococcus species*. The results of the study have some implications in the use of *Cissus quadrangularis* as an antibacterial agent and also as an antioxidant in several applications. [7].

### CONCLUSION

The results of this study have shown that the stem extracts of *Cissus quadrangularis* have great potential as antimicrobial agents in the treatment of infectious organisms. Further detailed investigation of the active components of the plant for the exact mechanism of action will contribute greatly to the development new pharmaceuticals.

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