

ANTIBACTERIAL ACTIVITY OF SILVER NANOPARTICLES OF *COLEBROOKEA OPPOSITIFOLIA* SMITH

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INTRODUCTION

The selected plant, *Colebrookea oppositifolia* Sm., is one of the most important plant of the family Lamiaceae. The other name of the plant in Garhwali language is *Bhinda* or *Bhindu* & Marathi is *Bhaman* or *dosul* and also known as *Indian Squirrel Tail* in English. *Colebrookea* is a monotypic genus of plants in Lamiaceae, first described in 1806. The plant has extensively medicinal potential and generally used in the traditional system of Indian medicine to cure epilepsy, urinary problems, dysentery, peptic ulcer, and hepatitis. It is also used as antimicrobial agent. The essential oil of *Colebrookea* possesses fungitoxic property. Furthermore work various part of plant like root, leaves, and stem are being extensively used as epilepsy, haemostatic, treat dermatitis, wounds, nose bleeds and leaves paste is utilize for wound healing. There are various folk medicine practicing communities such as nomadic Gujjars, Tharu, and Bhoxa in sub-Himalayan regions of India, from many decades and even now days.

Medicinal Uses

- *Colebrookea oppositifolia* can be used to treat dermatitis, nose bleeds, bleeding, coughing up blood and ringworms.
- In India, the leaves have been used in the treatment of wounds and bruises.
- Leaf juice can be used to treat fever and has been applied topically to ease headache. Leaves can also be made into a poultice to treat dysentery.
- Root extracts can be used as a remedy against epilepsy while the decoction of the roots is used to treat individuals with peptic ulcers.

MATERIALS AND METHOD

The plant was collected from hilly areas of gopeshwar, chamoli. It generally grow wild in the forest area and local. The plant was identified and authenticated from Botanical Survey of India, Dehradun.

Antibacterial Activity

Antibacterial activity refers to the process of killing or inhibiting the disease causing microbes. Various antibacterial agents are used for this purpose. Antibacterial may anti-bacterial, anti-fungal or antiviral. They all have different modes of action by which they act to suppress the infection.

Well diffusion method for antibacterial activity

This method depends on the diffusion of various extract from a well through a solidified agar layer petri dish so that the growth of inoculated bacteria is prevented entirely in circular zone around the prepared well containing plant extract using micropipette prepared nutrient agar plates and spreaded the bacterial culture (e.coli, salmonella typhi, b. subtills) on agar surface medium. Made wells on the surface of agar (6mm) with the help of cork borer and add the extract in the well. For the diffusion of plant in the agar, kept plates in refrigerator for 15 minutes. After the diffusion plates were incubated at 37⁰ C for 24 hour in incubator. observed the zone of inhibition after incubation period.

Method for Synthesis of Silver Nanoparticles

Silver nanoparticles are ultrafine particles of silver. The particles of size 10 to 100 nm large diameter & they have unique optical, electrical, and thermal properties. Due to their size these material may specially interact with human cell and tissues. Silver nanoparticle are preferred in various application including food packaging, wound healing, & plastic bags owing to its ability to destroy bacterial cell & weaken the cell membrane. Scientific research on nanoparticles is intense as they have many potential applications in medicine, physics, optics and electronics e.g. nanoparticles can be used to deliver a cargo such as anticancer drug or a cohort of radionuclide atoms to a targeted region of the body, such as tumor. The metal nanoparticles are synthesized by physical,

chemical and biological approaches. The biological synthesis of nanoparticles involves algae, actinomycetes, bacteria, fungi and plants. The Nobel metals like silver, gold, platinum, copper, zinc, and iron were used in synthesis of particles of nano size. The nanoparticle properties such as size, shape, composition, crystalline nature and structure determine their applications. In 1974, Prof. Norio Taniguchi, was first to introduce the nanotechnology.

Synthesis of silver nanoparticles by plants

Advantages

- Green synthesis and eco-friendly
- Can be used for large scale synthesis & Low cost
- No need to used high pressure, energy, temperature and other toxic chemicals.
- Not require any special culture preparation and isolation techniques.

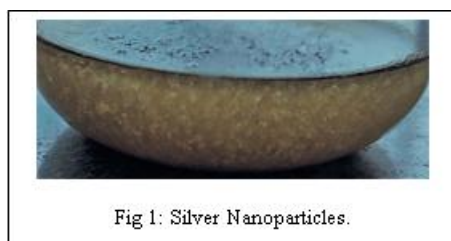


Fig 1: Silver Nanoparticles.

Table 1:

S. N.	Bacteria strain	Diameter of zone of inhibition (mm) Chloroform extract				Streptomycin (100 µl)
		A (20µl)	B (40µl)	C (60µl)	D (80µl)	
1	E.Coli	15	20	25	35	70
2	B. subtilis	15	20	25	35	60
3	S.typhi	0	10	20	25	65

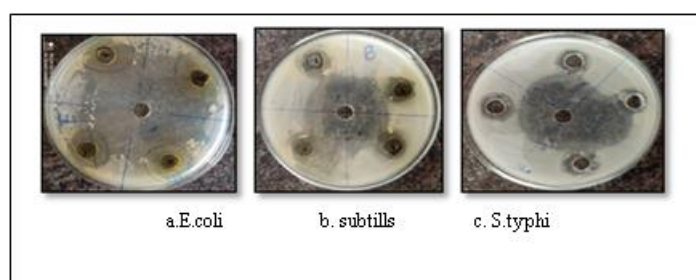


Fig. 2:

The antibacterial activity of the alcohol extracts was determined against different bacteria and the zone of inhibition is following the table:2 & fig:3.

Table 2:

S.N.	Bacteria strain	Diameter of zone of inhibition (mm) Alcohol extract				Streptomycin (100 µl)
		A (20µl)	B (40µl)	C (60µl)	D (80µl)	
1	E.Coli	10	15	25	30	70
2	B. subtilis	10	20	25	35	60
3	S.typhi	10	15	20	30	60



Fig: 3

The antibacterial activity of the pet. ether extracts was determined against different bacteria and the zone of inhibition is following the table:3 & fig:4.

Table 3:

S.N.	Bacteria strain	Diameter of zone of inhibition (mm) Pet-Ether extract				
		A (20µl)	B (40µl)	C (60µl)	D (80µl)	Streptomycin (100 µl)
1	E.Coli	15	20	30	38	60
2	B. subtilis	16	20	34	40	70
3	S.typhi	0	0	20	25	60

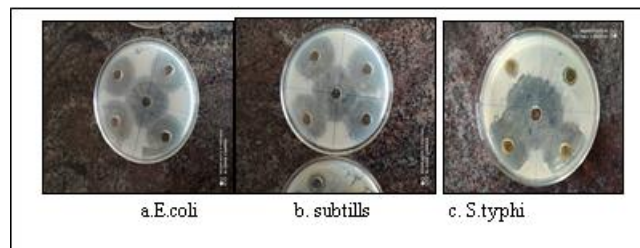


Fig. 4:

The antibacterial activity of the aqueous extracts was determined against different bacteria and the zone of inhibition is following the table:4 & fig:5.

Table 4:

S.N.	Bacteria strain	Diameter of zone of inhibition (mm) Aqueous extract				
		A (20µl)	B (40µl)	C (60µl)	D (80µl)	Streptomycin (100 µl)
1	E.Coli	0	0	20	25	60
2	B. subtilis	10	0	20	30	70
3	S.typhi	0	0	15	25	50

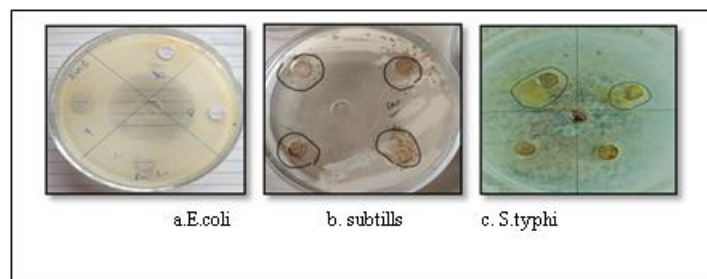


Fig. 5: Zone of Inhibition of antibacterial.

Antibacterial Activity Of Silver Nanoparticles Of Aqueous Colebrookea Oppositifolia Smith Extracts

The antibacterial activity of the Silver Nanoparticles (fig:7) of Aqueous Extracts was determines against

different bacteria and the zone of inhibition is following the table:5 & fig:6.

Table 5:

S.N.	Bacteria strain	Diameter of zone of inhibition (mm) silver nanoparticles				
		A (1mM)	B (2mM)	C (3mM)	D (4mM)	Streptomycin (100 µl)
1	E.Coli	10	15	10	35	70
2	B. subtilis	20	20	30	40	80
3	S.typhi	0	10	20	20	70

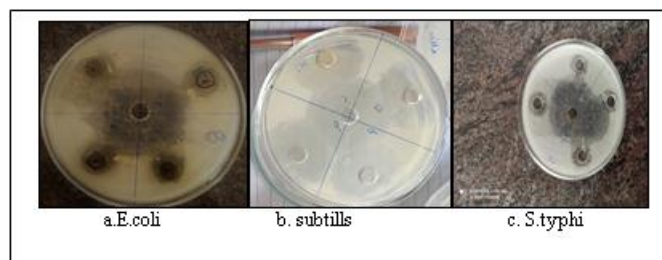


Figure 6: Antimicrobial potential of Silver nanoparticles of Aqueous extracts of *Colebrookea oppositifolia* smith against gram positive and gram negative of microbial organisms.

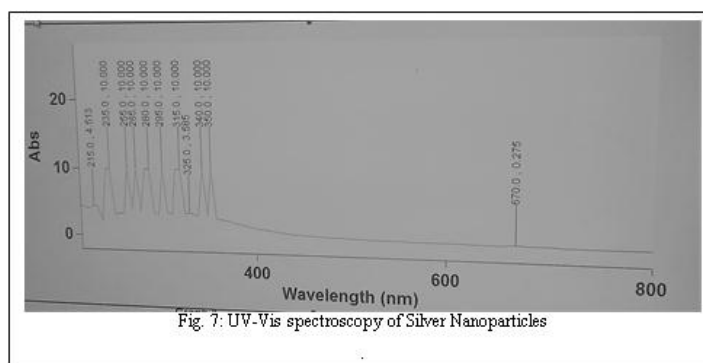


Fig. 7: UV-Vis spectroscopy of Silver Nanoparticles

DISCUSSION AND CONCLUSION

The *Colebrookea oppositifolia* smith is commonly traditional folklore herbal drugs used to treat various diseases such as epilepsy, coagulation, antibacterial, antifungal etc practicing by various communities such as Tharu, Boxa and Gujjars in Himalayan regions from many decades.

Different extract of plants were used in the study, and the three bacterial species used for the study such as E.coli, B. subtilis and S.typhi The study revealed the antimicrobial activity of different extract such as chloroform, alcohol, pet. Ether and aqueous. In the study the potent activity of the drugs showed in chloroform, pet. ether and alcohol against E.coli, B. subtilis but the efficacy of the drug against S.typhi is less than other. The nanoparticles of aqueous extract was prepared and the antibacterial effect with a very remarkable inhibition zone against the E.coli, B.subtilis, and S.typhi even better than some extracts.

Some solvents extracts revealed a good antibacterial effect against the E.coli, B.subtilis, and S.typhi. Therefore, evaluating the activities of these medicinal plants on in-vitro activities and further toxicological studies will be beneficial as it will help in formulating effective uses against infectious organisms and various diseases.

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