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IN VITRO ANTIBACTERIAL EVALUATION OF *DHANYAKA (CORIANDRUM SATIVUM LINN.) FRUIT AGAINST STAPHYLOCOCCUS AUREUS*

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ABSTRACT

Background: Ayurveda emphasizes *Padachatushtaya* (four pillars of therapeutics), where *Dravya* (medicinal substance) plays a key role in managing diseases. *Dhanyaka* (*Coriandrum sativum Linn*.) is a popular culinary and medicinal herb noted in Ayurvedic texts for treating *Shwasa* and *Kasa* (respiratory diseases). It is recognized for its *Krimighna* (antimicrobial) properties. With rising antimicrobial resistance, it has become crucial to scientifically validate the use of traditional medicinal plants. **Aim:** To evaluate the in vitro antibacterial activity of *Dhanyaka (Coriandrum sativum Linn.)* fruit against *Staphylococcus aureus* using the agar well diffusion method. **Materials and Methods:** An in vitro experimental study was conducted using *Staphylococcus aureus* MTCC 737. Authenticated *Dhanyaka (Coriandrum sativum Linn.)* fruits were tested for antibacterial activity using the agar well diffusion assay. Test samples were prepared at concentrations of 50 mg/mL and 100 mg/mL. Gentamicin (5 µL/mL) served as the positive control, while dimethyl sulfoxide (DMSO) acted as the negative control. Zones of inhibition (ZOI) were measured after incubating the plates at 37°C for 18–24 hours. **Results:** The test drug showed antibacterial activity against *Staphylococcus aureus*, with ZOI values of 18 mm at 50 mg/mL and 20 mm at 100 mg/mL. Gentamicin produced a ZOI of 26 mm, while DMSO showed only the well diameter of 8 mm, indicating no antibacterial

activity. **Conclusion:** The findings indicate that *Dhanyaka (Coriandrum sativum Linn.)* has significant antibacterial activity against *Staphylococcus aureus* in a concentration-dependent manner. This study provides initial scientific evidence that supports the traditional Ayurvedic use of *Dhanyaka (Coriandrum sativum Linn.)* and suggests the need for further research, including phytochemical and clinical studies.

KEYWORDS: Ayurveda, *Dhanyaka*, *Coriandrum sativum*, Antibacterial Activity, *Krimighna*, *Staphylococcus aureus.*

INTRODUCTION

Ayurveda takes a holistic approach to health and disease management. *Dravya* (medicinal substance) is central to restoring health and alleviating illness among the four pillars of therapeutics (*Padachatushtaya*).[1] *Dravyaguna Vigyana* offers a structured way to understand the pharmacodynamic and therapeutic properties of medicinal plants and forms the basis for their scientific validation.[2]

Dhanyaka (Coriandrum sativum Linn.), from the Apiaceae family, is widely used as both a food ingredient and a medicinal herb. Classical Ayurvedic texts describe its properties as *Deepana* (appetizer), *Pachana* (digestive), *Rochana* (increase appetite), *Grahi* (absorbent), and *Mutrala* (diueretic). Various Nighantus highlight its use in conditions like *Shwasa* (respiratory diseases), *Kasa* (respiratory diseases), *Jwara* (pyrexia), *Trishna* (thirst), and *Krimi Roga* (microbial/ worm infestation).

The rapid rise of antimicrobial resistance is a significant global public health issue. Overuse and misuse of antibiotics have led to resistant microbial strains. This has spurred interest in identifying effective plant-based antimicrobial agents as safer and sustainable alternatives. *Staphylococcus aureus* is a Gram-positive bacterium linked to skin, soft tissue, and respiratory infections. It is also known for its ability to resist multiple antimicrobial agents.[3] Previous studies on *Coriandrum sativum* have found bioactive compounds such as terpenoids, tannins, flavonoids, and alkaloids, many of which have antimicrobial properties.[4,5]

With traditional Ayurvedic references to *Dhanyaka (Coriandrum sativum Linn.)* for *Krimi* (microbial),[6,7,8] *Shwasa* [6,7,8] and *Kasa* (respiratory diseases) [6,7,9] and increasing evidence

of its antimicrobial potential, this study aims to evaluate its antibacterial activity against *Staphylococcus aureus.*

AIM AND OBJECTIVES

Aim: To evaluate the in vitro antibacterial activity of *Dhanyaka (Coriandrum sativum Linn.)* fruit against *Staphylococcus aureus*.

OBJECTIVES

1. To authenticate and standardize *Dhanyaka (Coriandrum sativum Linn.)* fruits through organoleptic and microscopic evaluation.
2. To assess the antibacterial activity of *Dhanyaka (Coriandrum sativum Linn.)* against *Staphylococcus aureus* MTCC 737.
3. To compare the antibacterial effect at different concentrations using the agar well diffusion method.

MATERIALS AND METHODS

Study Design: In vitro experimental study.

Collection and Authentication of Drug: The fruits of *Dhanyaka* (*Coriandrum sativum Linn*.) were obtained and authenticated in the Department of Dravyaguna, Dayanand Ayurvedic College, Jalandhar. Voucher specimens were kept for future reference.

Table 1: Macroscopic description of *dhanyaka (Coriandrum sativum Linn.)* fruit/seed.[10]

Part of *Dhanyaka* fruit/ seed	Characteristics
Fruit	Globular
Diameter	2-3mm
Colour	Brownish-yellow
Primary ridges	10
Seconday ridges	Inconspicuous, 8
Endosperm	Coelospermous
Odour	Aromatic


Fig. 1(a), 1(b): coriander seeds.

Microscopic examination of the transverse section of the fruit under trinocular microscope shows:[10]

1. Pericarp and mesocarp tissue (honey-brown tissue masses)
2. Vittae (oil ducts) (rounded cavity like structure)
3. Sclerenchymatous mesocarp cells (thickened dark cell walls)
4. Endosperm/ parenchymatous tissue (irregular polygonal cells)
5. Carpophore/vascular elements (fibrous strands)

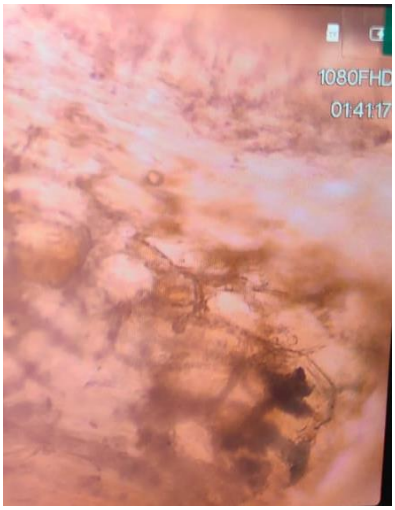


Fig. 2: T.S of dhanyaka (Coriandrum sativum Linn.) under trinocular microscope.

Test Microorganism: *Staphylococcus aureus* MTCC 737.

Laboratory: The antibacterial study was carried out at S.R. Labs and Research Centre, Jaipur, Rajasthan, an AYUSH-approved (AYUSH DTL/03) and ISO 9001:2015 certified laboratory.

Preparation of Inoculum: The microbial inoculum was prepared in peptone saline to reach approximately 1×10^8 CFU/mL. Viable counts were confirmed after incubation and freshly prepared suspensions were used within 24 hours.

Antibacterial Assay: Antibacterial activity was evaluated using the agar well diffusion method on Mueller–Hinton agar.

Experimental Groups

Group	Sample	Concentration
1	Gentamicin (Positive Control)	5 µL/mL
2	*Dhanyaka (Coriandrum sativum Linn.)* Fruit Powder	50 mg/mL
3	*Dhanyaka (Coriandrum sativum Linn.)* Fruit Powder	100 mg/mL
4	DMSO (Negative Control)	—

After inoculation, wells of 8 mm diameter were made, and 100 µL of each test sample was added to the respective wells. Plates were incubated at 37°C for 18–24 hours. Antibacterial activity was assessed by measuring the zone of inhibition around each well.

Results - Zone of Inhibition Against Staphylococcus aureus.

Sample	Concentration	Zone of Inhibition (mm)
Gentamicin	5 µL/mL	26
Dhanyaka (Coriandrum sativum Linn.) Fruit Powder	50 mg/mL	18
Dhanyaka (Coriandrum sativum Linn.) Fruit Powder	100 mg/mL	20
DMSO	—	8

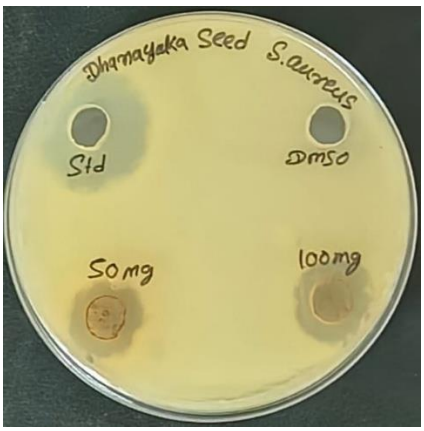
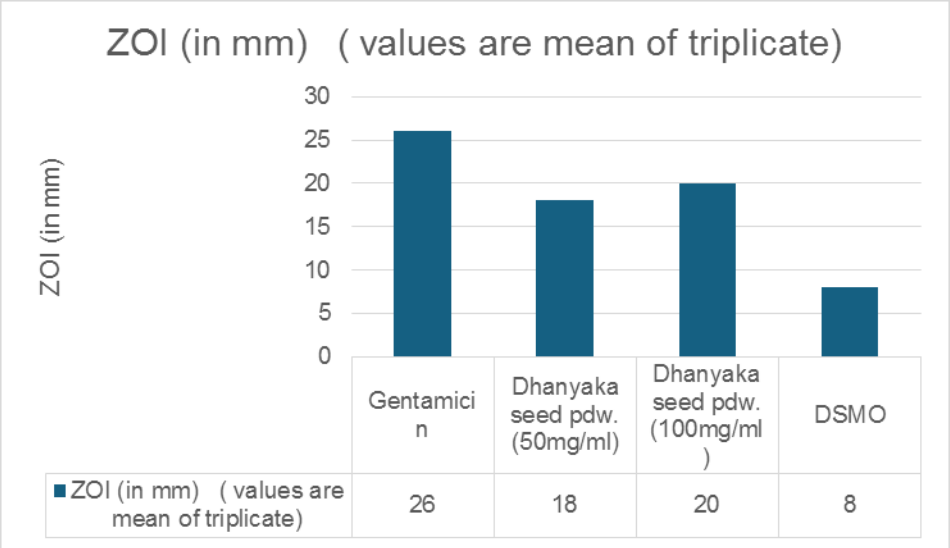


Fig. 3: Zone of inhibition (ZOI) on agar plate.



Graph 1: Result Of ZOI Of *Dhanyaka* in Agar Diffusion Method.

The results show that *Dhanyaka (Coriandrum sativum Linn.)* displayed measurable antibacterial activity against *Staphylococcus aureus*. The antibacterial effect increased with concentration, with 100 mg/mL showing a greater zone of inhibition than 50 mg/mL.

DISCUSSION

This study confirmed significant antibacterial activity of *Dhanyaka* (*Coriandrum sativum Linn*.) against *Staphylococcus aureus.* While Gentamicin showed the highest antibacterial activity, the test drug provided notable zones of inhibition at both concentrations.

The concentration-dependent increase in antibacterial activity suggests sufficient quantities of bioactive compounds are present, leading to enhanced effects at higher concentrations.

From an Ayurvedic standpoint, *Dhanyaka's (Coriandrum sativum Linn.) Katu* (pungent), *Tikta* (bitter), and *Kashaya* (astringent) *Rasa* (taste) are traditionally linked to its *Krimighna* (antimicrobial) action. Its *Ushna Virya* (hot potency) may also help reduce the growth of harmful microbes.

Phytochemical studies have identified terpenoids, tannins, flavonoids, alkaloids, and glycosides in Coriandrum sativum. Terpenoids and tannins are known to disrupt bacterial cell membranes, change permeability, and inhibit microbial growth. These mechanisms may explain the antibacterial activity noted in this study.

These findings support the classical Ayurvedic uses of *Dhanyaka (Coriandrum sativum Linn.)* for *Krimi* (microbial), *Shwasa* and *Kasa* and provide initial scientific evidence of its antimicrobial potential.

FUTURE SCOPE

Future studies should include

- Multiple microbial strains, including resistant pathogens.
- Determining minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC).
- Isolating and characterizing active phytochemicals.
- Conducting in vivo pharmacological studies.
- Performing clinical trials for therapeutic validation.

CONCLUSION

The current in vitro investigation showed that *Dhanyaka* (*Coriandrum sativum Linn*.) has antibacterial activity against *Staphylococcus aureus*. The effect was concentration-dependent, with higher concentrations leading to more significant bacterial growth inhibition. These results provide scientific backing for the traditional Ayurvedic use of *Dhanyaka* as a *Krimighna* drug. However, thorough pharmacological, toxicological, and clinical studies are needed to confirm its therapeutic effectiveness and safety for clinical use.

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Conflict of Interest

The authors declare no conflict of interest.

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