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Antimicrobial Activity of Different Solvent Extracts of *Cucumis dipsaceus* Leaves and Fruits Against Selected Pathogenic Bacteria

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Abstract: *The present study evaluates the antimicrobial potential of Cucumis dipsaceus leaves and fruits using extracts prepared with methanol, ethanol, ethyl acetate, and hexane. Antimicrobial activity was assessed against four pathogenic bacteria Staphylococcus aureus, Pseudomonas aeruginosa, Klebsiella pneumoniae, and Escherichia coli using the agar well diffusion method at concentrations of 30, 50, and 70 µl. Among leaf extracts, ethanol and ethyl acetate exhibited comparatively higher inhibition, with E. coli showing maximum sensitivity (up to 16 mm). Methanolic and hexane extracts displayed moderate activity. Fruit extracts demonstrated stronger antimicrobial potential than leaves, particularly with ethanolic and ethyl acetate extracts, producing inhibition zones up to 18 mm against E. coli and 16 mm against K. pneumoniae. Overall, the results indicate that Cucumis dipsaceus, especially its fruit extracts, possesses promising broad-spectrum antimicrobial properties, supporting its potential use in developing plant-based antibacterial agents.*

Keywords*:* *Cucumis dipsaceus*, antimicrobial activity,solvent extracts, pathogenic bacteria, zone of inhibition

I. INTRODUCTION

Medicinal plants have long been recognized as invaluable sources of bioactive compounds with significant therapeutic properties (1,2). Their role in combating microbial diseases has gained renewed attention due to the alarming rise of antibiotic-resistant pathogens (13). As conventional antibiotics lose effectiveness, the scientific community increasingly explores plant-derived antimicrobials that are potent, safer, affordable, and environmentally sustainable (11). These natural alternatives contain diverse phytochemicalssuch as flavonoids, alkaloids, tannins, terpenoids, and phenolic compoundsthat exhibit broad-spectrum antimicrobial activity (8).

Cucumis dipsaceus, a member of the family Cucurbitaceae, is one such plant with strong ethnomedicinal relevance. Although traditionally used for nutritional and therapeutic purposes, it remains scientifically underexplored compared to other cucurbit species (8). Previous studies on related cucurbits have demonstrated notable antimicrobial potential, highlighting the importance of further evaluating *Cucumis dipsaceus*(6) Understanding the antibacterial properties of this plant is crucial, given its traditional uses and the rising demand for natural antimicrobial agents (3,4).

The present study investigates the antimicrobial activity of *Cucumis dipsaceus* using methanol, ethanol, ethyl acetate, and hexane extracts to capture a wide range of phytochemical constituents. Solvent polarity plays a major role in determining the types and quantities of compounds extracted, making comparative evaluation essential for identifying the most active phytochemical groups (12). The study assesses the activity of both leaves and fruits against clinically important bacterial strains, aiming to provide a comprehensive understanding of the plant's antimicrobial potential.

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II. MATERIALS AND METHODS

2.1 Collection and Preparation of Plant Material

Fresh leaves and fruits of *Cucumis dipsaceus* were collected, washed, shade-dried for 10–15 days, and powdered using a mechanical grinder, following standard plant-processing protocols (12).

2.2 Preparation of Solvent Extracts

Approximately 25 g of leaf and fruit powder were subjected to Soxhlet extraction using methanol, ethanol, ethyl acetate, and hexane, as recommended for phytochemical recovery in Cucurbitaceae species (8). Extracts were concentrated using a rotary evaporator and stored at 4°C.

2.3 Test Microorganisms

Four pathogenic bacterial strains—*Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Klebsiella pneumoniae*, and *Escherichia coli*—were selected based on their clinical significance and frequent use in antimicrobial plant-extract studies (11).

2.4 Antimicrobial Assay

Antibacterial activity was evaluated using the agar well diffusion method, a widely accepted assay for assessing plant-based antimicrobial agents (7). Wells were filled with 30 µl, 50 µl, and 70 µl of each extract, incubated at 37°C for 24 hours, and inhibition zones were measured in millimetres.

III. RESULTS

3.1 Antimicrobial Activity of Leaf Extracts

The methanolic leaf extract showed moderate antibacterial activity, with *E. coli* showing the highest sensitivity (15 mm at 70 µl). Ethanolic leaf extract exhibited better inhibition than methanol, with *S. aureus* (12 mm) and *E. coli* (13 mm) responding strongly. Ethyl acetate showed strong inhibition against *E. coli* (16 mm) and moderate activity against remaining bacteria. Hexane leaf extract exhibited the lowest antimicrobial effect, though *E. coli* still showed up to 14 mm inhibition.

Antimicrobial Activity of methanolic extract of *Cucumis dipsaceus* leaves.

Name of microorganism	**Zone of inhibition (mm)**		
	30 µl	**50 µl**	**70 µl**
S. *aureus*	04	06	07
P. *aeuroginosa*	03	04	06
K. *pneumonia*	07	08	10
E. *coli*	11	13	15

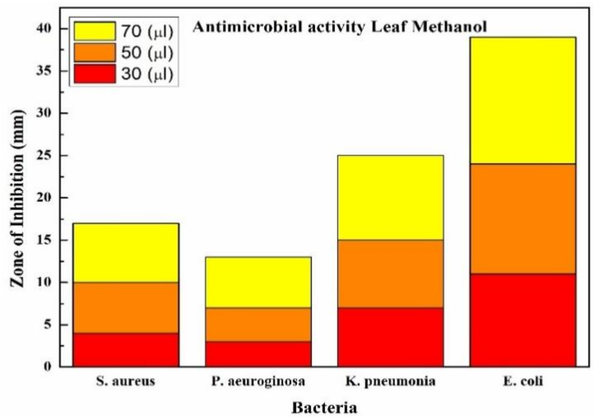

Table 1, Figure 1: Antimicrobial Activity of methanolic extract of *Cucumis dipsaceus* leaves.

Antimicrobial Activity of ethanolic extract of *Cucumis dipsaceus* leaves.

Name of microorganism	**Zone of inhibition (mm)**		
	30 µl	**50 µl**	**70 µl**
S. *aureus*	08	10	12
P. *aeuroginosa*	05	06	07
K. *pneumonia*	07	08	10
E. *coli*	9	12	13

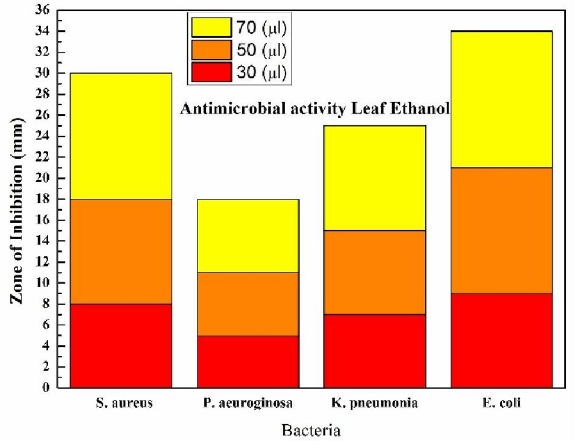

Table 2, Figure 2: Antimicrobial Activity of ethanolic extract of *Cucumis dipsaceus* leaves.

Antimicrobial Activity of ethyl acetate extract of *Cucumis dipsaceus* leaves.

Name of microorganism	**Zone of inhibition (mm)**		
	30 µl	**50 µl**	**70 µl**
S. *aureus*	05	07	08
P. *aeuroginosa*	07	08	10
K. *pneumonia*	06	08	09
E. *coli*	13	14	16

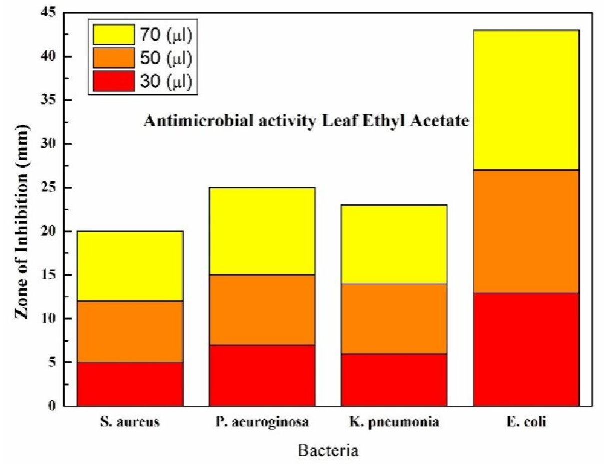

Table 3, Figure 3: Antimicrobial Activity of ethyl acetate extract of *Cucumis dipsaceus* leaves.

Antimicrobial Activity of Hexane extract of *Cucumis dipsaceus* leaves.

Name of microorganism	Zone of inhibition (mm)		
	30 µl	50 µl	70 µl
S. *aureus*	03	05	07
P. *aeuroginosa*	04	06	07
K. *pneumonia*	06	08	09
E. *coli*	11	12	14

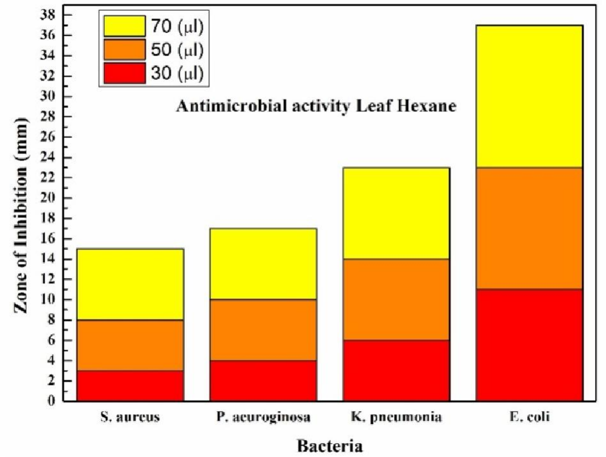

Table 4, Figure 4: Antimicrobial Activity of Hexane extract of *Cucumis dipsaceus* leaves

3.2 Antimicrobial Activity of Fruit Extracts

Fruit extracts demonstrated superior antibacterial activity compared to leaf extracts. Methanolic fruit extract showed moderate inhibition (up to 11 mm against *K. pneumoniae*). Ethanolic fruit extract displayed strong antibacterial activity, especially against *E. coli* (16 mm) and *P. aeruginosa* (14 mm). Ethyl acetate fruit extract was highly effective, with inhibition zones up to 18 mm against *E. coli*. Hexane fruit extract also exhibited strong inhibition against *K. pneumoniae* (16 mm) and *E. coli* (17 mm), indicating the presence of potent non-polar bioactive compounds.

Antimicrobial Activity of methanolic extract of *Cucumis dipsaceus* fruit

Name of microorganism	Zone of inhibition (mm)		
	30 µl	50 µl	70 µl
S. *aureus*	07	09	10
P. *aeuroginosa*	06	07	09
K. *pneumonia*	08	09	11
E. *coli*	07	09	10

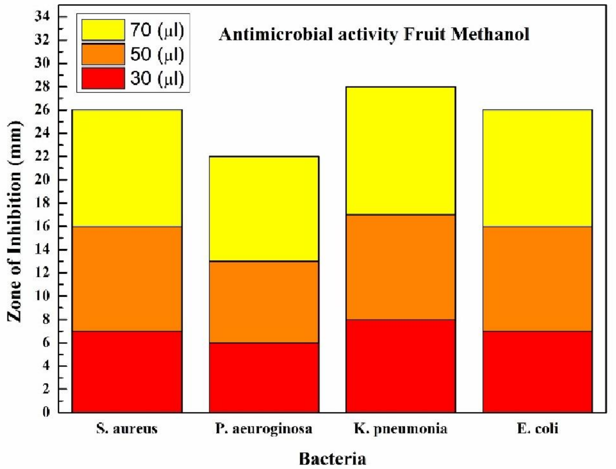

Table 5, Figure 5: Antimicrobial Activity of methanolic extract of *Cucumis dipsaceus* fruit

Antimicrobial Activity of ethanolic extract of *Cucumis dipsaceus* fruit

Name of microorganism	Zone of inhibition (mm)		
	30 µl	50 µl	70 µl
S. *aureus*	09	11	13
P. *aeuroginosa*	08	10	14
K. *pneumonia*	09	11	13
E. *coli*	11	14	16

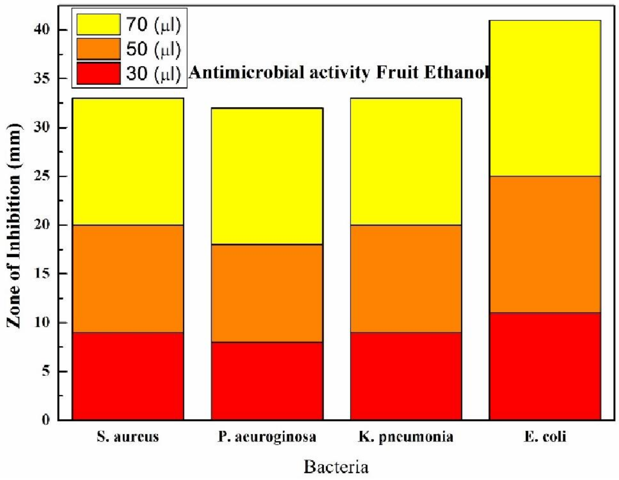

Table 6, Figure 6: Antimicrobial Activity of ethanolic extract of *Cucumis dipsaceus* fruit

Antimicrobial Activity of ethyl acetate extract of *Cucumis dipsaceus* leaves.

Name of microorganism	Zone of inhibition (mm)		
	30 µl	50 µl	70 µl
S. *aureus*	10	11	14
P. *aeuroginosa*	05	07	11
K. *pneumonia*	08	09	11
E. *coli*	15	16	18

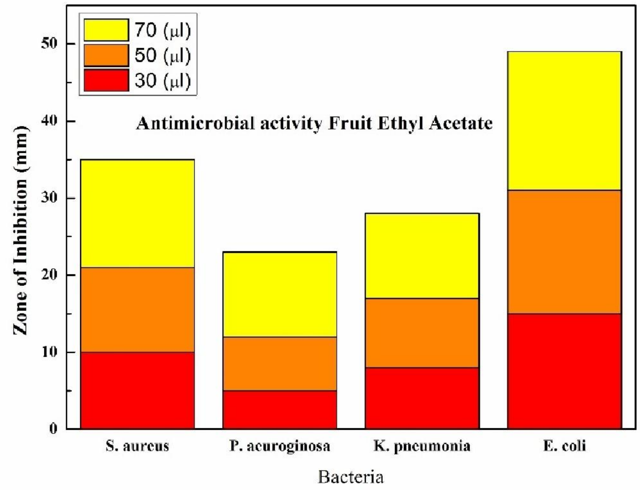

Table 7, Figure 7: Antimicrobial Activity of ethyl acetate extract of *Cucumis dipsaceus* fruit

Antimicrobial Activity of Hexane extract of *Cucumis dipsaceus* fruit

Name of microorganism	**Zone of inhibition (mm)**		
	30 µl	**50 µl**	**70 µl**
S. *aureus*	07	10	13
P. *aeuroginosa*	09	13	15
K. *pneumonia*	13	15	16
E. *coli*	14	16	17

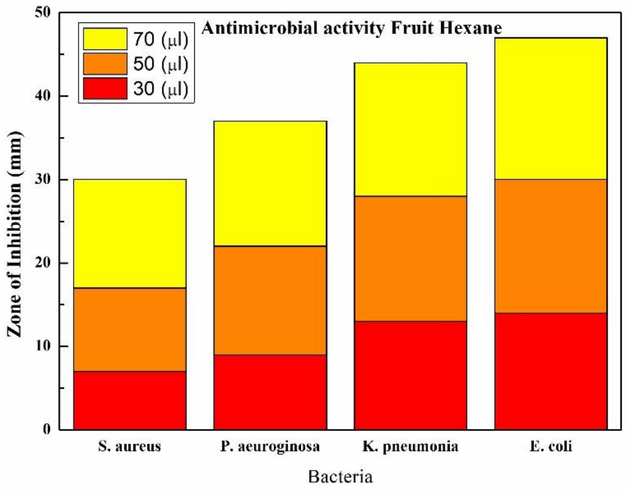

Table 8, Figure 8: Antimicrobial Activity of Hexane extract of *Cucumis dipsaceus* fruit

IV. DISCUSSION

The antimicrobial results clearly demonstrate that solvent polarity played a decisive role in extracting bioactive compounds from *Cucumis dipsaceus*, as commonly observed in phytochemical research (12). Ethanolic and ethyl acetate extracts, both semi-polar in nature, exhibited the highest antimicrobial activity for both leaves and fruits. This indicates efficient extraction of moderately polar phytochemicals such as flavonoids, alkaloids, tannins, phenolics, and glycosidesgroups widely recognized for their broad-spectrum antibacterial properties (9, 11). The strong inhibition observed against *Escherichia coli* and *Klebsiella pneumoniae* suggests that the extracts possess broad-spectrum potential, particularly against Gram-negative bacteria, which are often more resistant due to their outer membrane barrier (10, 13).

Across solvents, fruit extracts consistently produced higher antibacterial activity than leaf extracts. This is likely due to the higher accumulation of phytoconstituents such as flavonoids, terpenoids, sterols, and phenolic compounds in fruits, as previously reported in Cucurbitaceae fruits including *Cucumis prophetarum* and *Cucumis africanus* (7, 12). Interestingly, the appreciable antimicrobial activity shown by the hexane fruit extract highlights the role of non-polar constituents, particularly terpenoids, fatty acids, and sterols, which are known to disrupt bacterial membranes and impair cellular integrity (5).

These findings are consistent with earlier reports demonstrating that Cucurbitaceae species contain diverse antimicrobial phytochemicals capable of inhibiting both Gram-positive and Gram-negative pathogens (8). Overall, the study confirms that *Cucumis dipsaceus* possesses significant antibacterial activity. In particular, the fruit extracts-especially ethanolic and ethyl acetate-emerge as promising natural antimicrobial sources, supporting their potential application in developing plant-based antibacterial formulations (11).

V. CONCLUSION

The present study profoundly demonstrates the promising antimicrobial potential of *Cucumis dipsaceus*, with both leaf and fruit extracts showing inhibitory effects against the tested bacterial pathogens. Among the plant parts investigated, the fruit extracts exhibited comparatively stronger antibacterial activity than the leaf extracts, indicating a higher concentration or better availability of bioactive compounds in the fruits. The solvent systems used also played a crucial

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role in determining the efficiency of extraction. Ethanolic and ethyl acetate extracts consistently produced the highest zones of inhibition, while Methanolic extracts showed moderate activity. Hexane extracts displayed the least, which further supports the predominance of polar bioactive constituents.Among the bacterial strains tested, *Escherichia coli* and *Klebsiella pneumoniae* were the most susceptible, reflecting the strong bacteriostatic potential of *Cucumis dipsaceus* against Gram-negative pathogens. This is particularly significant given the rising prevalence of antibiotic-resistant Gram-negative bacteria. The findings therefore reinforce the potential of *Cucumis dipsaceus* as a valuable source of natural antibacterial agents that could be utilized in developing effective herbal formulations.

REFERENCES

[1]. Aboaba, O. O., Smith, S. I., &Olude, F. O. (2006). Antibacterial effect of edible plant extracts on *Escherichia coli* O157:H7. Pakistan Journal of Nutrition*,* *5*(4), 325–327.

[2]. Cowan, M. M. (1999). Plant products as antimicrobial agents. Clinical Microbiology Reviews, *12*(4), 564–582.

[3]. Dash, G. K., & Murthy, P. N. (2011). Phytochemical and antimicrobial screening of *Cucurbita maxima* seeds. International Journal of Pharmaceutical Sciences Review and Research, *7*(1), 31–35.

[4]. Doughari, J. H. (2012). Phytochemicals: Extraction methods, basic structures, and mode of action. In Phytochemicals – A global perspective of their role in nutrition and health (pp. 1–32). IntechOpen.

[5]. Maria, V., Adeyemi, T., & Lopez, R. (2025). A systematic review on natural products with antimicrobial potential against WHO priority pathogens. European Journal of Medical Research, *30*(1), 1–15.

[6]. Niveditha, V., & Pramila, R. (2018). GC–MS profiling and antibacterial activity of *Cucumis dipsaceus* fruit extracts. Journal of Pharmacognosy and Phytochemistry*,* *7*(5), 2801–2806.

[7]. Rasha, S., El-Sayed, M., & Fahmy, H. (2021). Antibacterial and antioxidant activity of extracts and isolated compounds from *Cucumis prophetarum*. BMC Chemistry*,* *15*, Article 60.

[8]. Reddy, S., Kumar, A., & Devi, P. (2013). Nutritional composition and antioxidant properties of *Cucumis dipsaceus* leaf extracts. International Journal of Pharmaceutical Sciences and Research, *4*(12), 4650–4656.

[9]. Sharma, A., Patel, V. K., & Chaturvedi, A. N. (2009). Varying solvent effects on antibacterial activity of medicinal plant extracts. Journal of Natural Products, *2*, 29–34.

[10]. Sharma, P., Jha, A. B., Dubey, R. S., &Pessarakli, M. (2012). Reactive oxygen species, oxidative damage, and antioxidative defense in plants under stress. Journal of Botany, *2012*, 1–26.

[11]. Singh, A., Sharma, M., & Verma, P. (2021). Antimicrobial activities and phytochemical screening of selected medicinal plants against multidrug-resistant microbes. Journal of Herbal Medicine*,* *25*, 100404.

[12]. Unuofin, J. O., Lebelo, S. L., & Oladipo, T. A. (2019). Phytochemical, antioxidant and antimicrobial evaluation of *Cucumis africanus* extracts. Asian Pacific Journal of Tropical Biomedicine*,* *9*(3), 103–109.

[13]. Williams, J., Parker, L., & Smith, D. (2019). Plant-derived antimicrobials: Mechanisms and applications. Antimicrobial Resistance & Infection Control*,* *8*, 1–10.

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