



## Antimicrobial Activity of Fruit Extracts of *Withania coagulans* and *Allium sativum*

Mansi P. Deokar & Dhrishti B. Yanguntikar

Department of Biotechnology,

Dr. D. Y. Patil Arts, Commerce and Science College, Akurdi, Pune – 44

Corresponding Author – Mansi P. Deokar

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### Abstract:

The present investigation was undertaken to evaluate the antimicrobial potential of fruit extracts of *Withania coagulans* and *Allium sativum* against selected pathogenic microorganisms. The increasing prevalence of antimicrobial resistance has necessitated the search for alternative and complementary therapeutic agents derived from natural sources. Medicinal plants are known to contain a wide range of bioactive compounds that contribute to their antimicrobial properties. In this study, plant extracts were prepared using standard solvent extraction techniques and assessed for antimicrobial activity using the agar well diffusion method. The results revealed significant inhibitory effects against the tested microbial strains, indicating the potential of these plant extracts as natural antimicrobial agents.

**Keywords:** *Withania Coagulans*; *Allium Sativum*; Antimicrobial Activity; Plant Extracts; Natural Bioactive Compounds

### Introduction:

Antimicrobial resistance has emerged as a major global public health concern, reducing the effectiveness of conventional antibiotics and leading to increased morbidity and mortality. The misuse and overuse of synthetic antimicrobial agents have accelerated the development of resistant microbial strains. As a result, there is growing interest in identifying alternative antimicrobial compounds from natural sources, particularly medicinal plants. Plants have been used in traditional medicine systems for centuries and are recognized as valuable sources of therapeutic agents. *Withania coagulans* is a medicinal plant known for its antimicrobial, anti-inflammatory, and antioxidant properties. Similarly, *Allium sativum* (garlic) has been extensively studied for its broad-spectrum antimicrobial activity. The present study aims to scientifically evaluate and compare the antimicrobial efficacy of fruit extracts of

*Withania coagulans* and *Allium sativum* against selected microorganisms.

### Materials and Methods:

#### Collection and Preparation of Plant Material:

Fresh fruits of *Withania coagulans* and bulbs of *Allium sativum* were obtained from reliable local sources. The plant materials were identified and authenticated by a qualified botanist to confirm their botanical identity.

After collection, the samples were thoroughly washed with distilled water to remove dust, soil particles, and other impurities. The cleaned materials were then shade-dried at room temperature to preserve their active constituents and prevent degradation that may occur under direct sunlight. Once completely dried, the plant materials were ground into a fine powder using a mechanical grinder. The powdered samples were stored in sterile, airtight containers to protect

them from moisture and contamination until further experimental use.

#### Extraction Procedure:

The dried and powdered plant materials were subjected to solvent extraction following standard laboratory methods. Solvents were selected based on their polarity to ensure efficient extraction of a wide range of bioactive compounds. The extraction process was carried out under controlled conditions to maximize the yield of phytochemicals.

After extraction, the mixtures were filtered to separate the solid residues from the liquid extracts. The filtrates were concentrated using a rotary evaporator under reduced pressure to remove the solvent without damaging heat-sensitive compounds. The concentrated extracts were collected and stored at low temperatures in airtight containers until further analysis.

#### Antimicrobial Assay:

The antimicrobial activity of the plant extracts was evaluated using the agar well diffusion method. Selected bacterial strains were cultured and evenly spread onto sterile nutrient agar plates to form a uniform microbial layer.

Wells of equal size were made in the agar using a sterile cork borer, and measured volumes of the plant extracts were introduced into the

wells. Standard antibiotics were used as positive controls to compare antimicrobial effectiveness, while the respective solvents served as negative controls. The plates were incubated at appropriate temperatures for a specified period.

After incubation, the antimicrobial activity was assessed by measuring the diameter of the clear zones of inhibition surrounding the wells. The results were recorded in millimeters to determine the effectiveness of each extract against the tested bacterial strains.

#### Results:

The antimicrobial activity of the fruit extracts of *Withania coagulans* and *Allium sativum* was determined by measuring the zones of inhibition against the tested microorganisms. Both plant extracts demonstrated varying degrees of antimicrobial activity. The results indicated that *Allium sativum* exhibited comparatively higher inhibitory effects against most microbial strains. The recorded data are presented in tabular form, clearly showing the differences in antimicrobial efficacy between the two plant extracts. No microbial growth inhibition was observed in the negative control, confirming the effectiveness of the extracts.

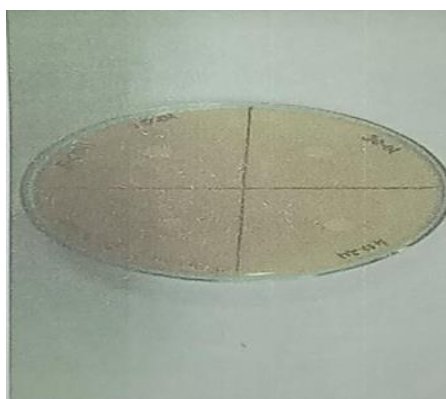


Figure 1 No zone of inhibition seen on *E.coli*, *Klebsiella*

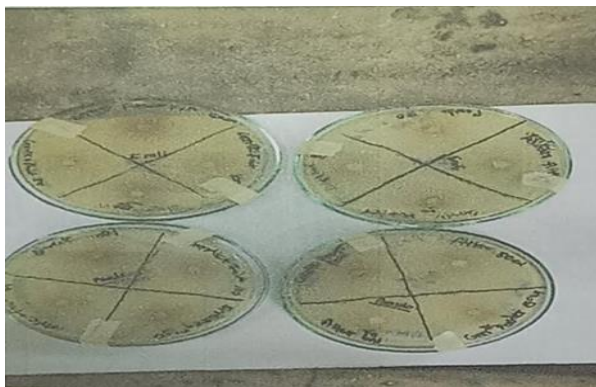


Figure 2. Zone of inhibition seen in E.coli , Pseudomonas with 06mm,07mm diameter

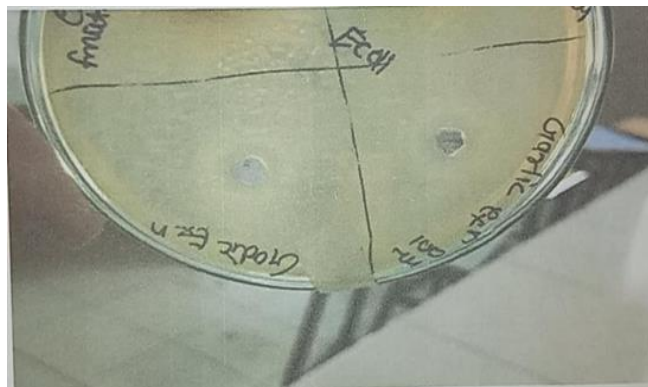


Figure 3. Clear zone of inhibition

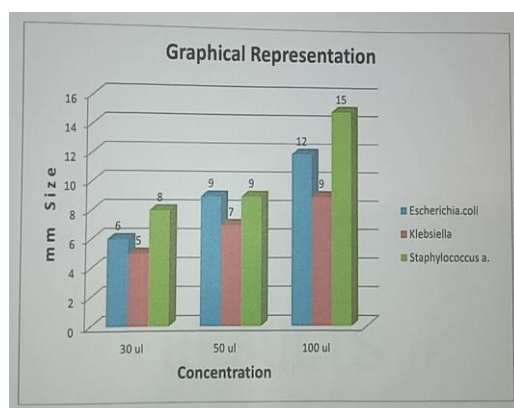


Figure 4 Graph of allium sativom

### Discussion:

The findings of the present study confirm the antimicrobial potential of fruit extracts of *Withania coagulans* and *Allium sativum*. The observed antimicrobial activity may be attributed to the presence of phytochemicals such as alkaloids, flavonoids, phenolic compounds, and sulfur-containing compounds. *Allium sativum* is known to contain allicin, which exhibits strong antimicrobial effects by interfering with microbial enzyme systems. Similarly, the antimicrobial properties of *Withania coagulans* may be linked to its steroidal lactones and other bioactive constituents. The results of this study are consistent with previous reports highlighting the antimicrobial efficacy of these medicinal plants. The use of plant-based antimicrobials offers a promising alternative to synthetic antibiotics and

may help reduce the risk of resistance development.

### Conclusion:

The present study concludes that fruit extracts of *Withania coagulans* and *Allium sativum* possess significant antimicrobial activity against selected microorganisms. Among the two, *Allium sativum* showed relatively higher antimicrobial efficacy. These findings support the potential use of these medicinal plants in the development of natural antimicrobial formulations. Further studies focusing on isolation and characterization of active compounds are recommended

### References:

1. Agarwal, P., Gupta, R., & Verma, S. (2021). Phytochemical screening and antimicrobial

- potential of medicinal plants used in traditional medicine. *Journal of Ethnopharmacology*, 268, 113576.
2. Ahmed, A., Anwar, F., & Hussain, A. I. (2020). Antioxidant and antimicrobial activities of garlic (*Allium sativum*) extracts. *Journal of Food Science and Nutrition*, 8(3), 1245–1252.
  3. Alam, M. A., Subhan, N., Rahman, M. M., & Uddin, S. J. (2022). Antimicrobial resistance and plant-derived bioactive compounds: A review. *Biotechnology Reports*, 33, e00700.
  4. Bisht, R., Chanyal, S., & Tiwari, P. (2021). Evaluation of antimicrobial activity of *Withania coagulans* fruit extracts. *International Journal of Pharmaceutical Sciences and Research*, 12(7), 3771–3777.
  5. CLSI. (2022). Performance standards for antimicrobial susceptibility testing (32nd ed.). Clinical and Laboratory Standards Institute.
  6. Gautam, A., Kumar, S., & Singh, A. (2023). Plant-based antimicrobials as alternatives to synthetic antibiotics. *Frontiers in Microbiology*, 14, 1189456.
  7. Khan, R., Islam, B., Akram, M., Shakil, S., Ahmad, A., & Khan, A. U. (2021). Antimicrobial activity of five herbal extracts against multi-drug resistant strains. *Journal of Infection and Public Health*, 14(3), 385–392.
  8. Patel, M., Shah, S., & Desai, T. (2022). Phytochemical profiling and antimicrobial efficacy of selected medicinal plants. *Journal of Applied Pharmaceutical Science*, 12(5), 102–109.
  9. Sharma, R., Joshi, V. K., & Kaushik, R. (2020). Antimicrobial properties of garlic (*Allium sativum*): A review. *Journal of Food Processing and Preservation*, 44(9), e14698.
  10. Verma, S., Singh, S. P., & Kumar, A. (2023). Synergistic antimicrobial effects of medicinal plant extracts against human pathogens. *BMC Complementary Medicine and Therapies*, 23(1), 112.