

Antibacterial Activity and Safety Assessment of *Agrimonia eupatoria* Ethanolic-Aqueous Extract

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INTRODUCTION

Antibiotic resistance has been a major challenge since the early days of antibiotic use. Plant-derived compounds represent a promising approach to addressing this problem, as plants possess a broad array of structurally diverse secondary metabolites with documented biological activities. One such plant from the Rosaceae family, *Agrimonia eupatoria*, has been used in traditional medicine, and its active compounds have been associated with various pharmacological effects. Reported activities of *A. eupatoria* extracts include antimicrobial, antioxidant, anti-inflammatory, anticancer, and hepatoprotective properties.

METHODS

The antibacterial activity of the extract of *A. eupatoria* was determined using the MIC test. The inhibition of biofilm formation was assessed by staining the biofilm biomass with crystal violet. Cytotoxicity was evaluated on normal human fetal fibroblasts (MRC-5) using the MTT assay.

CONCLUSION

The extract exhibited **notable antibacterial and mild antibiofilm activity**, with a favorable selectivity index towards bacteria over MRC-5 cells. These results support further investigation into potential of the extracts/pure bioactive constituents as antimicrobial agents.

RESULTS

The highest level of **biofilm inhibition** of biofilm formation was observed with *S. aureus* MRSA with a reduction of up to 85.40%, followed by *S. aureus* (63.67%) and *L. monocytogenes* (62.24%). In contrast, an increase in biofilm biomass was observed for *S. flexneri*.

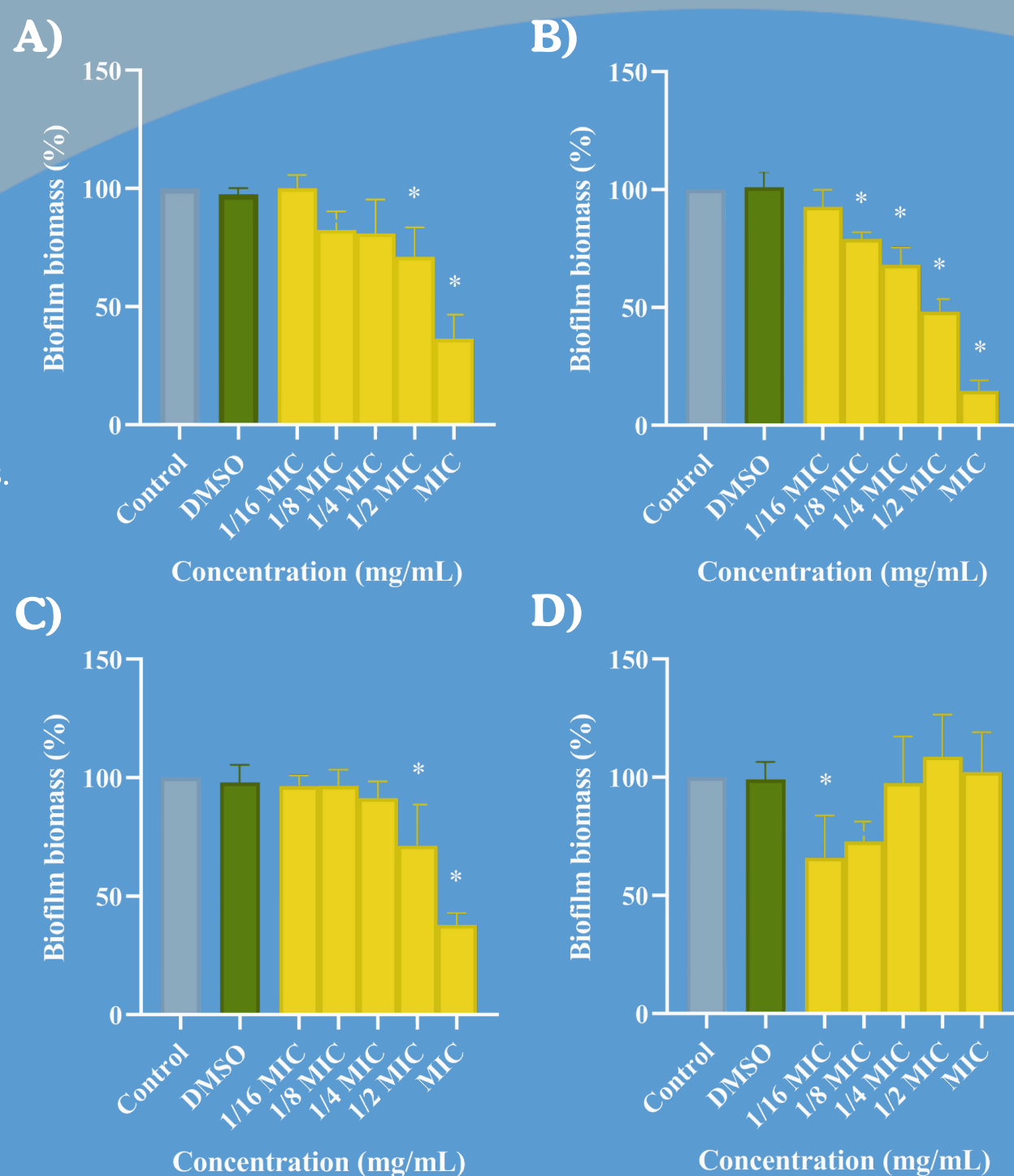


Figure 1. Antibiofilm effect of *A. eupatoria* extract towards: **A)** *S. aureus* ATCC 29213, **B)** *S. aureus* MRSA ATCC 43300, **C)** *L. monocytogenes* ATCC 19111 and **D)** *S. flexneri* ATCC 9199

In the **MIC assay**, *A. eupatoria* extract showed **significant activity** against *Staphylococcus aureus*, *Staphylococcus aureus* MRSA, *Listeria monocytogenes*, and *Shigella flexneri*, with MIC values of 0.31 mg/mL for all strains.

Table 1. Antimicrobial potential of *A. eupatoria* extract

| Strain/tested substances | A. eupatoria extract mg/mL | | Streptomycin µg/mL | |
|----------------------------|-------------------------------|-------|-----------------------|------|
| | MIC | MBC | MIC | MBC |
| Staphylococcus aureus | 0.31 | 1.25 | 6.25 | 12.5 |
| Staphylococcus aureus MRSA | 0.31 | 1.25 | 6.25 | 12.5 |
| Listeria monocytogenes | 0.31 | 2.5 | 6.25 | 12.5 |
| Shigella flexneri | 0.31 | 0.625 | 3.12 | 6.25 |

AIM

The aim of this study was to investigate the antimicrobial and antibiofilm activity, as well as the selective toxicity of *Agrimonia eupatoria* 70% aqueous-ethanolic extracts.

The **selectivity index** (SI_M) was calculated as the logarithmic ratio between the cytotoxicity ($IC_{50}=1.5$ mg/mL) and the minimum inhibitory concentration ($MIC=0.31$ mg/mL).

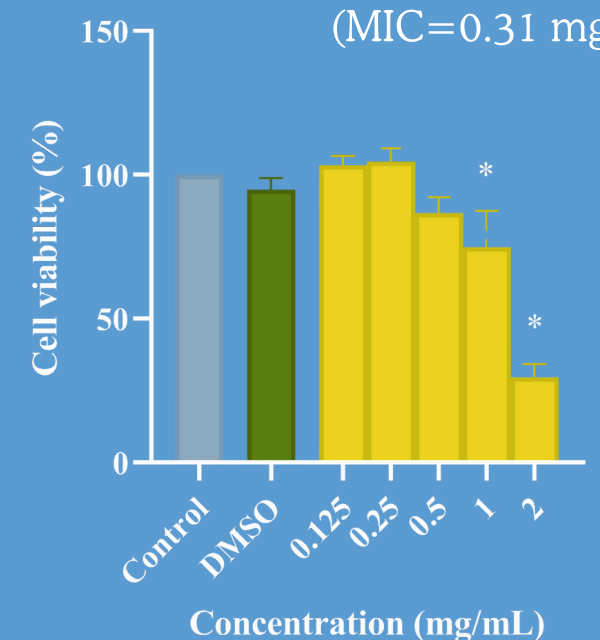


Figure 2. Cytotoxicity of *A. eupatoria* extract evaluated on MRC-5

Positive values obtained ($SI_M=0.68$) indicates a **higher selectivity** of the extract against bacteria compared to normal human fetal lung fibroblasts (MRC-5).

