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Assessing the Antimicrobial Activity of Gemmotherapy Extracts

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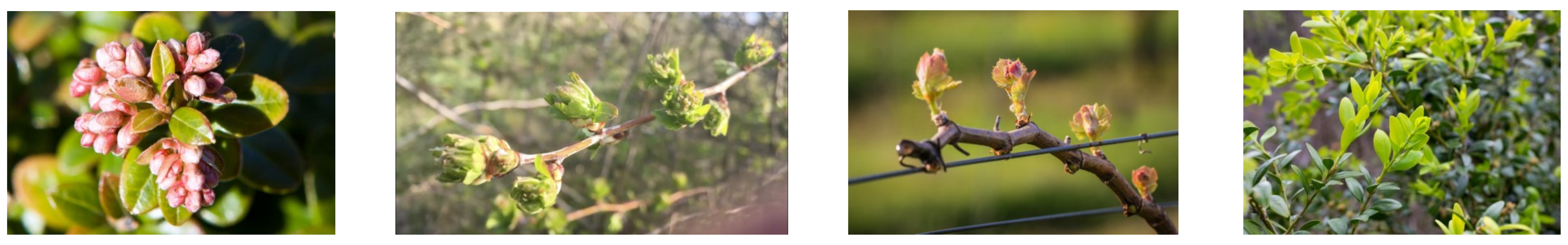
INTRODUCTION & AIM

Antibiotic resistance is a growing global health concern, highlighting the need for novel antimicrobial agents. **Gemmotherapy extracts (GTE)** — derived from buds and young shoots rich in secondary metabolites, enzymes, hormones, trace elements, cytokines — may offer a more potent alternative to traditional fruit extracts. This study investigates the **antimicrobial activity** of **8 bud extracts** against **14 microorganisms** using **agar diffusion (AD)** and **broth microdilution (BM)** methods, and analyzes their **polyphenol, flavonoid**, and **antioxidant** content.

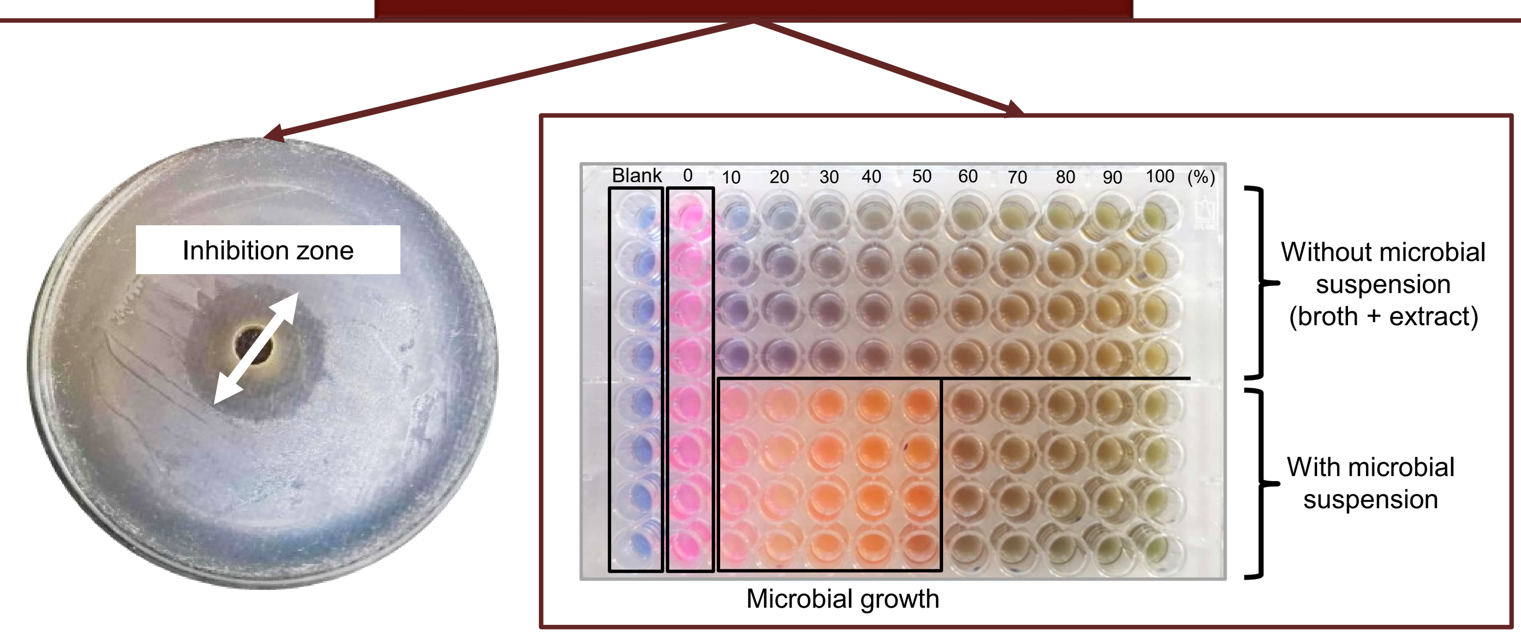
Hippophae rhamnoides L. (Hrh) — *Prunus spinosa* L. (Psp) — *Rubus idaeus* L. (Rid) — *Rosa canina* L. (Rca)



Vaccinium vitis-idaea L. (Vv-i) — *Crataegus oxyacantha* L. (Cox) — *Vitis vinifera* L. (Vvi) — *Buxus sempervirens* L. (Bsv)

METHOD

Antimicrobial tests



ADM

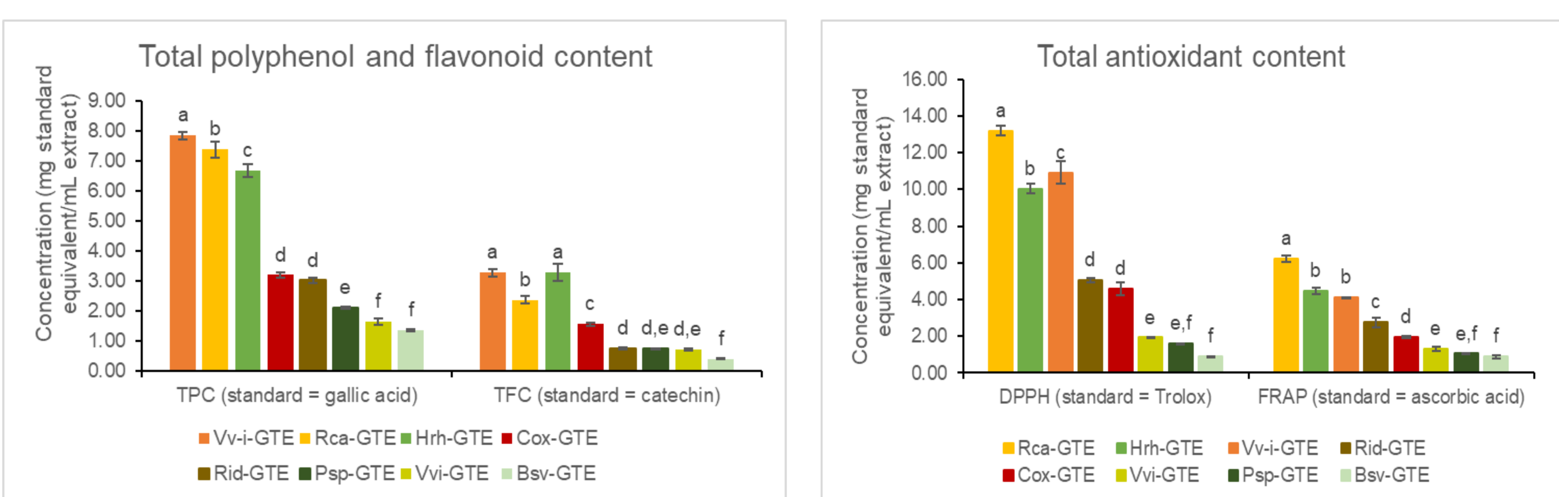
Measuring the size of the inhibition zones → Indicator of antimicrobial effects

BMM

Determination of minimum inhibitory (MIC) and minimum bactericidal concentrations (MBC) using resazurin-based viability assay and spread plate method.

RESULTS & DISCUSSION

Analytical results



Values with different letters (a–f) within one method are statistically different at $p < 0.05$, according to Tukey's test.

Figure 1. Total polyphenol, flavonoid and antioxidant content of GTEs

Agar diffusion method

Table 1. Minimum concentration of the extract (%) that produces a visible inhibition zone

Microorganisms	Rid GTE	Psp GTE	Hrh GTE	Rca GTE	Vv-i GTE	Cox GTE	Bsv GTE	Vvi GTE
Bacillus cereus B.00076	nd	70	40	10	30	50	nd	100
Enterococcus faecalis B.01054	nd	nd	50	50	30	60	nd	nd
Listeria monocytogenes wild strain	nd	nd	100	10	40	nd	nd	nd
Staphylococcus aureus B.01055	70	70	40	20	10	20	nd	nd

nd – not detectable

	Gram-negative bacteria	Yeasts	Molds
Resistant microorganisms:	• *Escherichia coli* B.00200 • *Salmonella enterica* subs. *enterica* B.00834 • *Pseudomonas aeruginosa* B. 01064	• *Saccharomyces cerevisiae* Y.00481 • *Candida albicans* wild strain	• *Aspergillus niger* F.00071 • *Aspergillus ochraceus* F.00850 • *Aspergillus flavus* F.00048 • *Penicillium expansum* F.00601 • *Penicillium citrinum* F.00815

Broth microdilution method

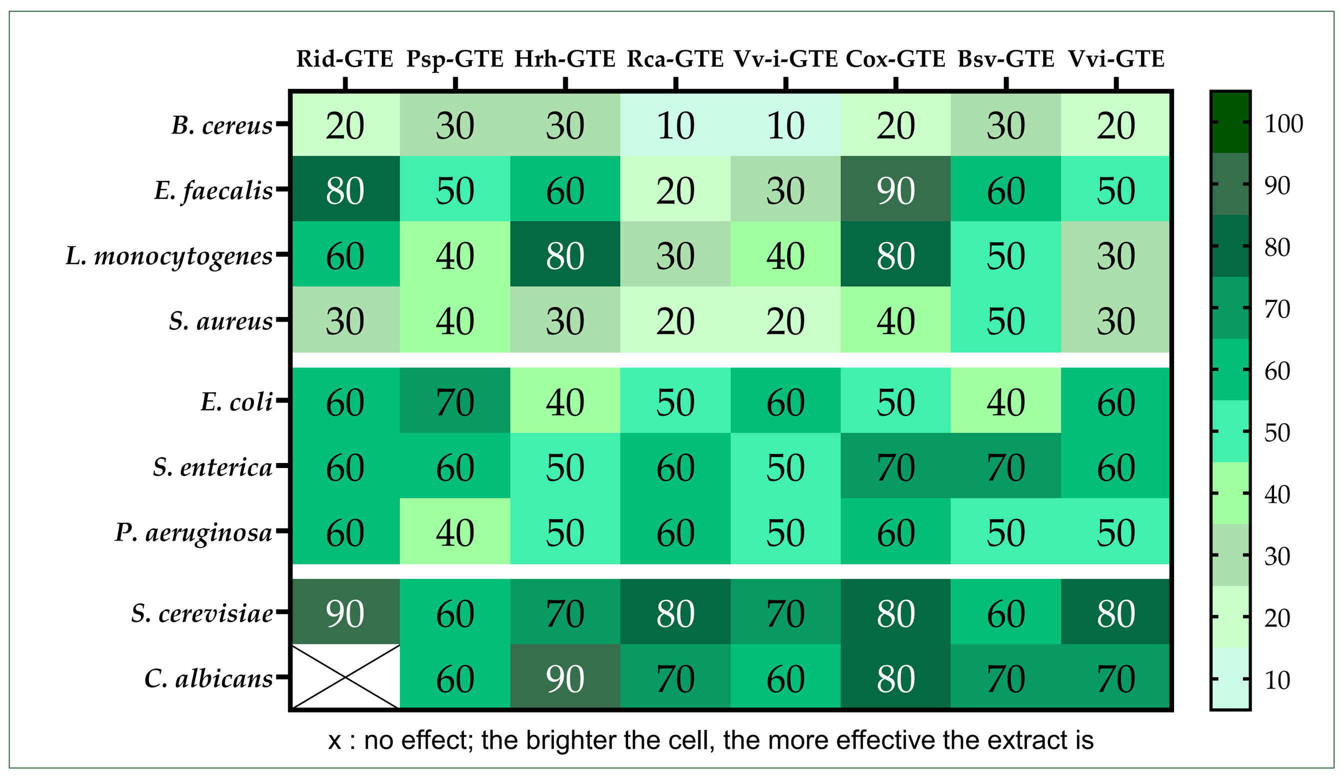


Figure 2. Minimum inhibitory concentrations (%)

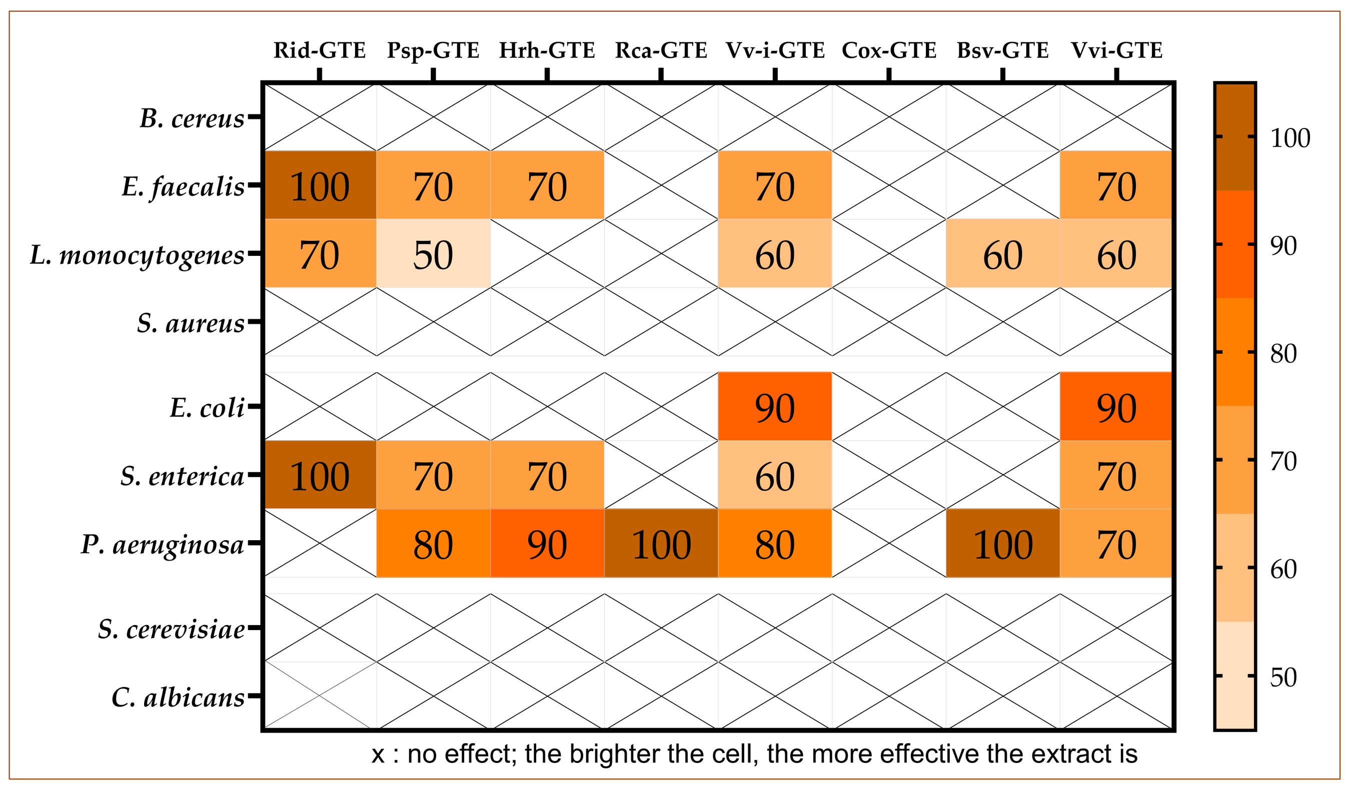


Figure 3. Minimum bactericidal concentrations (%)

CONCLUSION

The examined extracts exhibit antimicrobial effects and may serve as useful adjuncts to antibiotic therapies.

Extracts of dog rose, lingonberry, and sea buckthorn exhibit the highest antioxidant and polyphenol contents and effectively inhibit the growth of most bacterial strains as determined by the AD and MIC methods.

FUTURE WORK

Assessing the antimicrobial activity of mixed GTEs.

Assessing nutrigenomic effects in diabetic and leaky gut animal models.