Enhancing Traditional Medicine: Evaluating Ethanol Extraction of Navajo Tea (Thelesperma spp.) for Antimicrobial Efficacy Against E. Coli

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Overview:

- Background and research purpose
- Sample collection and methods
- Key results from each tests
- Meaning of findings
- Summary and future work

Figure 1- Navajo Tea from Red Valley, Arizona

Cultural Background

- Important to Dine Culture
- Déédh or ch'il ahwéédh
- Naturally boiled
- Navajo tea = traditional Diné medicine
- Used for colds, stomach issues, kidney problems
- Two species: T. megapotamicum & T. subnudum on Navajo Nation

Figure 2- Dine woman holding Navajo Tea

Luteolin in Navajo Tea – Structure & Function

- Luteolin is a natural flavonoid found in Navajo tea (Thelesperma species).
- It has a four-ring plant molecule structure made of carbon and oxygen.
- Its structure helps it act as a strong antioxidant and anti-inflammatory compound.
- It protects cells, tissues, and nerves from damage.
- It supports traditional uses of Navajo tea for joint pain, digestion, and kidney health.

Research Purpose

- Test Navajo tea extracts
- Check antimicrobial activity
- Focus on ethanol extracts
- Model bacteria: E. coli

Sample Collection

- Three plant collection sites

  Red Valley, AZ- Extract A

  Cottonwood, AZ - Extract B

  Crownpoint, NM- Extract C
- Dried and ground samples
- Prepared for extraction

Extraction Method

- One gram plant powder
- Mixed with ten mL ethanol
- Shaken twenty-four hours

at 120 rpm

- Filtered for clear extract

Figure:6: Navajo Tea broken into smaller size

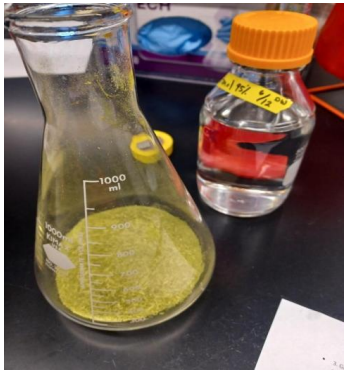


Figure:7 Grounded Tea and 95% Ethohal

Testing Methods

- Compared:

Control- E. Coli only

Treatment- E. Coli and Navajo Tea

- Disc diffusion on agar
- Broth dilution in tubes
- Measured MIC and CFU

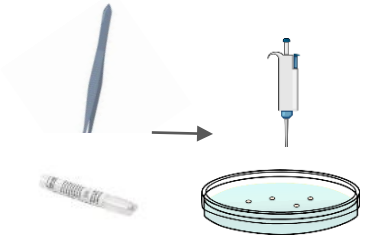


Figure 11; Disc. Diffusion Assay

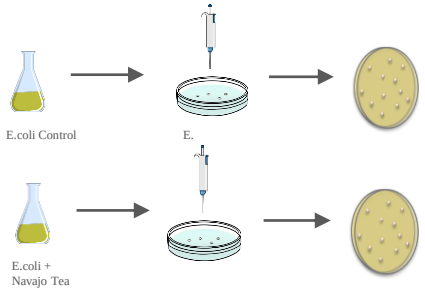


Figure 12:CFU Assay

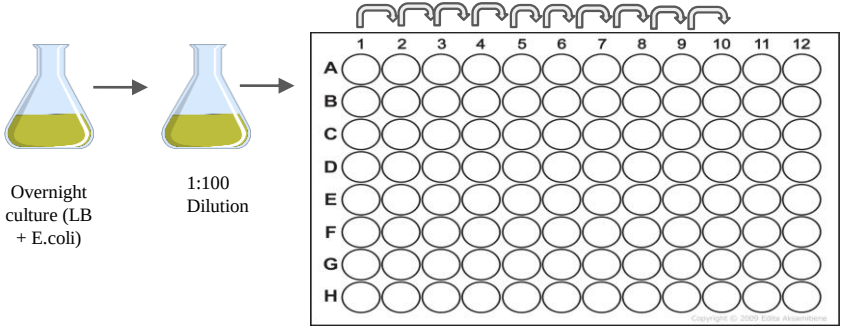


Figure 13: Broth dilution assay

Calculation

Count the target colonies on the duplicate dishes by the following equation:

$$\text{CFU / mL} = \frac{\text{Target colonies counted}}{\text{Actual volume of sample filtered, mL}}$$

CFU: Colony Forming Units

CFU/mL =500 * 10^8 CFU/ml or (500,000,000)

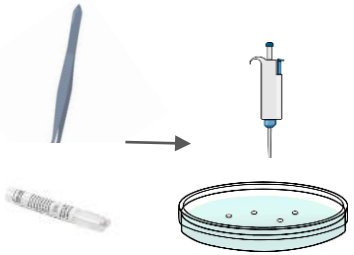
Extraction A,B,C =50 * 10^7 CFU/mL or (50,000,000)

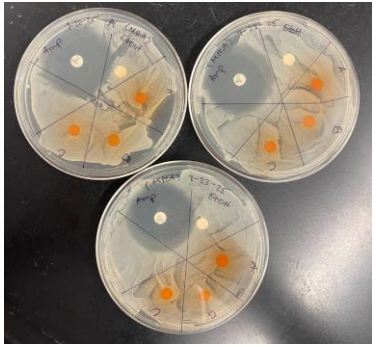
500-50 *100 =90%
500

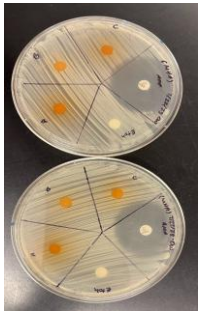
Extract A, B, C = 90% Reduction

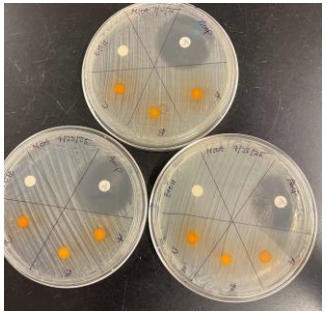
Disc Diffusion Results

- No inhibition zones seen
- Poor diffusion on agar
- Active compounds not spreading
- Solid media not effective



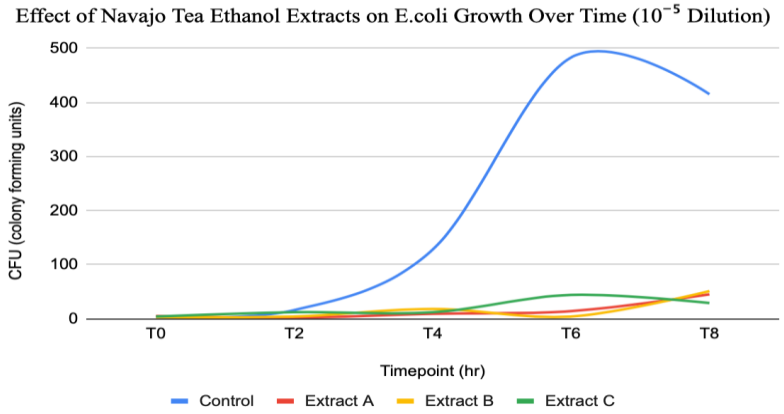


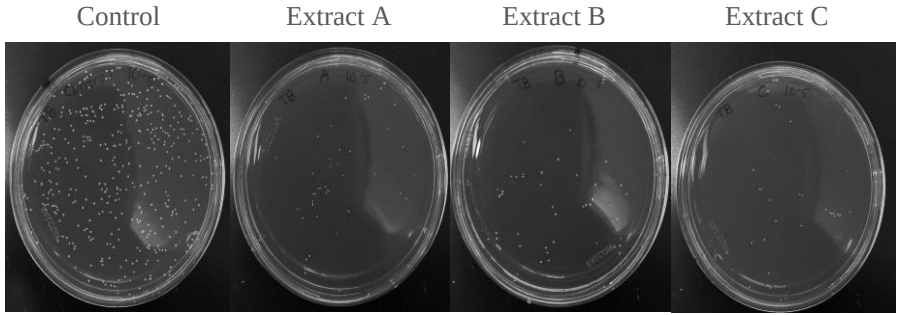




Broth Dilution Result

- Strong inhibition of Tea Extracts in liquid compared to control
- One-to-four dilution effective
- Significant reduction observed 10^{-5}





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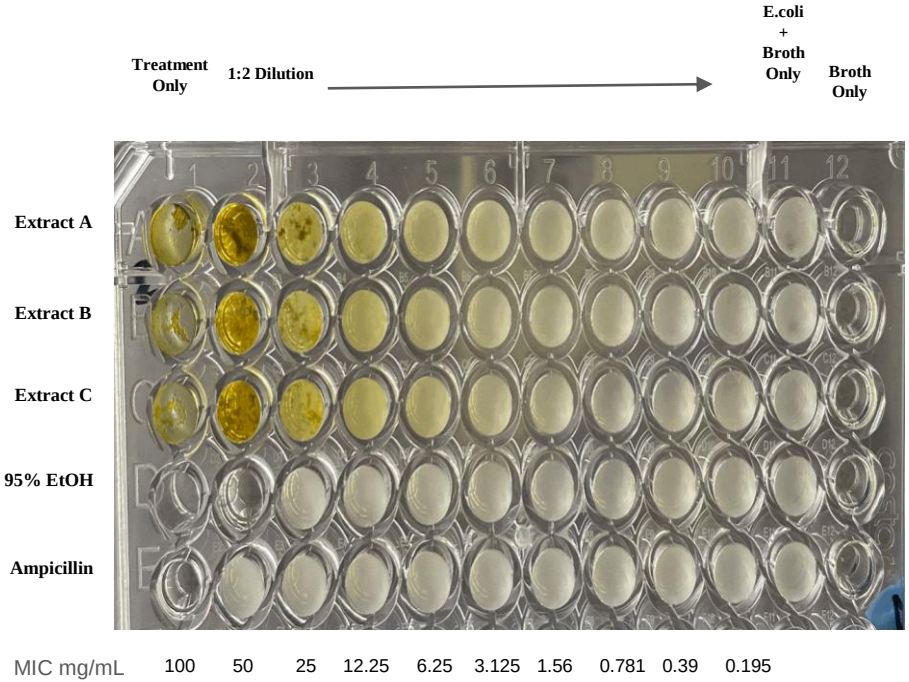
Minimum Inhibitory Concentration (MIC)

- Lowest concentration stopping growth
- No visible bacteria present at 50 mg /mL
- Shows extract strength level
- Found using broth dilution



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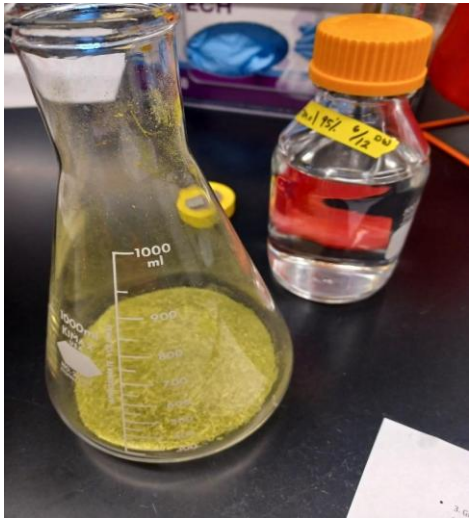
Meaning Of Results

- Extract works in liquid
- Does not work on agar
- Active compounds present
- Supports traditional use

Why Use Ethanol

- Better compound solubility
- Extracts more phytochemicals
- Works with microfluidics
- Good for future tests



Study Limits

- No agar inhibition seen
- Possible poor diffusion
- Need more testing methods
- Try combination therapies

Future Work

- Advanced testing methods
- Microfluidic chip studies
- Combine Navajo Tea with antibiotics
- Freeze dry to preserve integrity= Higher concentration
- Identify active compounds in growth stage
- Test samples for uranium and road constructions contamination

Conclusion

- Navajo tea inhibits bacteria
- Works well in liquid
- Supports cultural knowledge
- Strong base for research

Acknowledgement

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Any questions?