Let's Get to the Root of Ginger!

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Introduction

Many experience problems with bloating that may be caused by food spoilage. This study aims to use ginger as a solution. Ginger has been shown to have properties that benefit our normal gastrointestinal flora (1). It has been shown to boost metabolism, reduce inflammatory effects on the body, and improve gastrointestinal health (1). Ginger has been shown to inhibit the growth of certain bacteria including *Escherichia coli (E.coli)* and *Staphylococcus aureus (S.aureus)* (1). If ginger has antimicrobial effects, then it may decrease bloating caused by bacterial induced food spoilage.

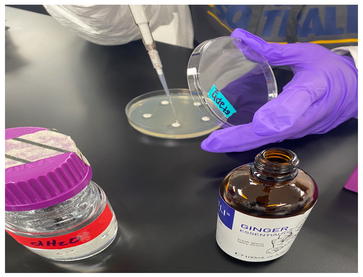


Figure 1. This figure shows the embedding of 3 disks with 10µL of ginger, and one of distilled water. Also shown is one Ciprofloxacin disk that is one of the control discs.

Materials and Methods

Essential Oils

Using therapeutic Grade Essential Oil Ginger (*Zingiber officinale*) 100% Pure and Natural purchased from Huiqili Supply Chain Technology Co. Ltd. (Guangzhou, China.

Bacterial Strains

The essential oils were examined for their effectiveness against Escherichia coli (*E. coli*) and Staphylococcus aureus (*S. aureus*) that were obtained from Carolina Biologicals (Burlington, North Carolina, USA).

Materials

BBL Blank Paper Discs (6mm) were purchased from Benton, Dickinson and Company (Sparks,
Maryland, USA) and were sterilized by autoclave.
Ciprofloxacin 5mg discs were purchased from Oxoid Ltd. (UK).
Muller-Hinton Agar was purchased from Sigma Aldrich (St. Louis, Missouri, USA)

Procedure for determining antimicrobial susceptibility

The spice used was Ginger (*Zingiber officinale*) 100% Pure and Natural Therapeutic Grade Essential Oil which was purchased from Huiqili Supply Chain Technology Co. Ltd. (Guangzhou, China).

Two Müeller-Hinton plates were inoculated using a sterile swab. One plate was *Escherichia coli* , the other *Staphylococcus aureus* . This was repeated for a total of four plates, two *Escherichia coli* and two *Staphylococcus aureus*. The lawn method was used for inoculation.

Four BBL Sensi-Discs were placed aseptically with tweezers. Tapping each disk down gently with the tweezers to ensure good contact with the plate surface and repeated with sterile tweezers each time until all plates had the same pattern of antimicrobial discs on them. Each plate had 3 disks embedded with 10µL of ginger, 2 control disks: one with ciprofloxacin and the other with 10µL of distilled water.

After inoculation, the plates were incubated at 37° C, for a total of 5 days.

After the incubation period, the zone of inhibition was measured with a metric ruler in millimeters.

Results

The antimicrobial activity of ginger essential oil against *Staphylococcus aureus (S. aureus)* and *Escherichia coli (E. coli)* was determined by measuring the zone of inhibition. For the bacteria to be sensitive, its zone of inhibition must measure >21 millimeters. If it is 16-20 millimeters, then it is intermediate and resistant is <15 millimeters (2). *S. aureus* was sensitive to ciprofloxacin (30 mm), and resistant to ginger (15 mm). *E. coli* was intermediate to ciprofloxacin (20 mm), and resistant to ginger (10 mm). We hypothesized that ginger would be an effective antimicrobial agent against *S. aureus* and *E. coli*. This hypothesis was disproven as ginger did not have a strong antimicrobial effect so it may have a weak to no effect on bloating.

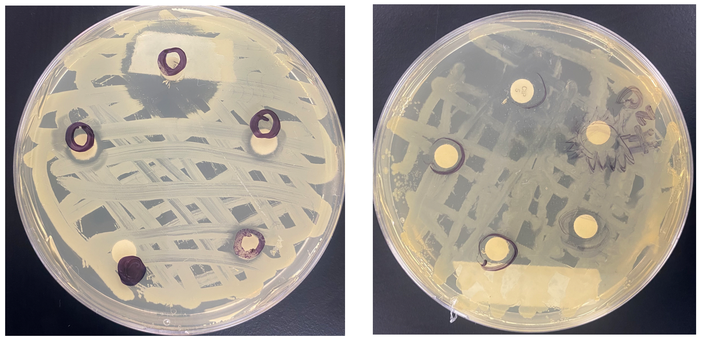
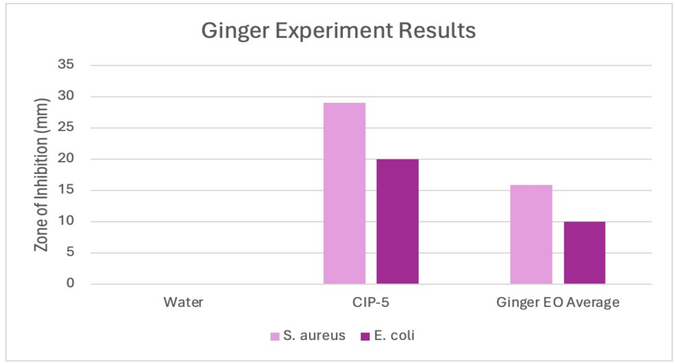


Figure 2. This Figure shows our results. (L) *Escherichia coli* (R) *Staphylococcus aureus.*

Disk	*S. aureus*	*E. coli*
Water	0	0
CIP-5	29	20
Ginger EO Average	15.83	10

Table 1. Collective data from *S. aureus* and *E. coli* and average of the zones of inhibition.

Data



Graph 1. Average measurements of the zones of inhibition of each plate's paper discs.

Discussion

Escherichia coli was intermediate to ciprofloxacin (20 mm) and resistant to ginger (10 mm). *Staphylococcus aureus* was sensitive to ciprofloxacin (30 mm) and resistant to ginger (15 mm). This displays that ciprofloxacin had a greater effect on combatting both bacteria, *S. aureus* and *E. coli*, than the use of ginger essential oil. Our results indicate that ginger may be an ineffective antimicrobial agent against *Staphylococcus aureus* and *Escherichia coli*. Future research could consist of using a larger volume of ginger essential oil to observe if the zone of inhibition is increased.

Literature Cited

1. Nadifah, F., & Sari, R. M. (2016). *The effect of ginger (Zingiber officinale) and green tea (Camellia sinensis) against bacteria growth on soymilk*.

2. Finazzo, S., & Obenauf, S. (2022). *Laboratory Manual for Microbiology Fundamentals: A Clinical Approach*. McGraw-Hill Education.

Acknowledgments

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