Effectiveness of Herbal Remedies and Combination Therapies Against Microbes

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Abstract

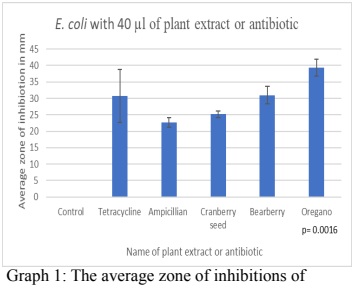
Bacteria is rapidly adapting to drugs and can become antibiotic resistant, meaning new ways to treat infections need to be found. This study looks at the antimicrobial effectiveness of four common plant extracts to common antibiotics against Escherichia coli and yeast, two common agents of UTIs to determine if these natural extracts could be used as a possible substitution or in combination with common antibiotics to treat these infections. Triplicate plates were prepared for a disc diffusion assay using an overlay and then incubated at 37 o C. A zone of inhibition were than measured and the data showed that uva-ursi (bearberry) and oregano were effective against E. coli and the addition of oregano to common antibiotic treatments further increased antimicrobial effectiveness. With only oregano and tetracycline & oregano were able to inhibit the growth. This indicates that some plant extracts and synergistic combinations are comparatively more effective than antibiotics. These findings support the belief that plant extracts can be as effective as antibiotics against bacteria.

Introduction

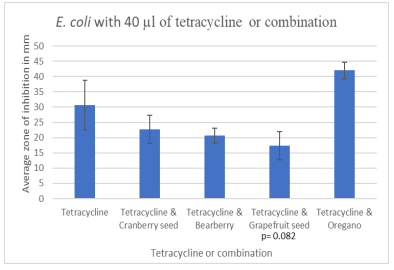
Before modern medicine came around traditional medicine was the only way to cure illnesses for 100's of years and still is used today just not to the same degree. Herbal remedies were used in the United States up until the 1960's and medicines available were almost all synthetic (Tyler 2000) This is when modern day antibiotics started to be found and used to treat humans. Antibiotics have been a great tool in fighting diseases, but now the human population is facing the problem of antibiotic resistance. Every year in the United States there are more than 2.8 million infections are caused by antibiotic resistant bacteria (CDC 2019). That indicates that other methods need to be tested as a temporary replacement for antibiotics. This study is looking at the possibility of using plant extracts and synergistic combination of antibiotic and plant extract to fight against microbes. This study is looking at the microbes yeast and *E. coli*. The antibiotics used were tetracycline for both microbes and ampicillin for only *E.* coli. The extracts being used were grapefruit seed, cranberry seed, oregano, and uva-ursi. It is believed that homeopathic remedies will be as effective as antibiotics against bacteria. Furthermore, it is believed that plant extracts and synergistic combinations will still inhibit the growth of yeast and E. coli.

Methods

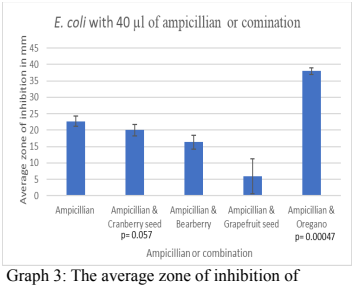
- About 100 Luria broth agar plates and 100 Neutral Sabouraud Dextrose agar plates were prepared
- A 50 broth/50 agar overlay was prepared for both LB and Sabouraud Dextrose
- Yeast and *E. coli* were put into tubes and 50/50 overlay was added
- The tubes were each poured over the plates
- Paper disk was added
  - Antibiotic, plant extract, or synergistic combination was added to paper disk
- Plates incubated for three days
- Zones of inhibition were measured and recorded
- Put plates back incubator for a week
- Agar with resistant *E. coli* colonies were taken from plates
- Process was repeated for the resistant *E. coli colonies*



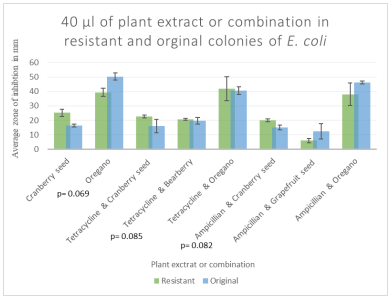
Graph 1: The average zone of inhibitions of antibiotics compared to plant extracts, standard deviation bars, and significant p-values.



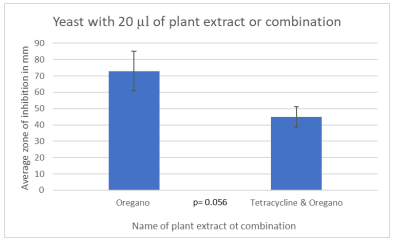
Graph 2: The average zone of inhibition of tetracycline compared to its synergistic combination counter parts, standard deviation bars, and significant p-values.



Graph 3: The average zone of inhibition of ampicillin compared to its synergistic combination counter parts, standard deviation error bars, and significant p-values.



Graph 4: The average zone of inhibition Plant extracts and synergistic combinations form the original set compared to the resistant, as well as standard deviation error bars and significant p-values.



Graph 5: The average zone of inhibition at 20 µl for oregano compared to tetracycline & oregano, standard deviation error bars and the p-value.

Results

- Antibiotics, plant extracts, and synergistic combinations that had no zone of inhibition were left out of the graphs
- Non significant p-values were also left out
- All graphs have standard deviation error bars and significant p-values on them
- Oregano, bearberry, tetracycline + oregano, ampicillin + bearberry, and ampicillin + oregano was effective against *E. coli*
- Oregano and tetracycline + oregano was effective against yeast
- Tetracycline + oregano, ampicillin + oregano, and ampicillin + bearberry were all combinations that seemed to have synergism
- All other combinations tried seemed to be antagonism

Discussion

After analyzing the data it was determined that oregano extract and synergistic combinations with oregano extract. This proved that the hypothesis was correct and plant extracts can be more effective then that of antibiotics. Tetracycline normally is not effective against yeast, but a study done proved that tetracycline will work agasint some strains of *Candida Albicans* using 150 µg/mL (McCool 2008) This study replicated results of similar studies. The reasoning for this is due to some of the mechanisms that plant extracts have these. An example is that cranberry seed extract doesn't allow microbes to adhere. While the results in the plate show that they could work, it is not know if they will work on humans. I would recommended consulting a Physician before trying these means. Especially because herbal remedy production does not have the regulations that medications do. This study helped gain more insight on the fact that more studies need to be done on the use of plant extracts in place of drugs sometimes. Using plant extracts as another way to treat infections before antibiotics or in combination with them could help lead to slowing down antibiotic resistance and finding new drugs to combat antibiotic resistant bacteria.

References

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