

Abstract

In this study, fungal endophytes were isolated and studied for medicinal use from *Juniperus Virginiana*, widely known as the Juniper plant. A *Juniperus Virginiana* sample was taken from the salt marsh at Salem State University. Antibacterial properties of stem, berry, and leaf sections were tested against *Escheria Coli*, *Staphylococcus Aureus*, *Pseudomonas Aureus*, and *Vibrio Parahaemolyticus*. LC-MS was used to examine the extracts further. Many molecules were collected from the LC-MC and their medicinal properties were analyzed.



Introduction

The *Juniperus Virginiana* plant has been used for medicinal purposes throughout time.^{3,4} The Juniper plant has had a long history of containing natural substances that have been known to have antibacterial, antiviral, and antifungal properties.⁵ The Juniper plant has also been known to have anti-diabetic, anti-inflammatory, anti-cancer properties.^{1,2,3,4} The plant has a very diverse pool of properties built within its chemical makeup. In this research, endophytes from different parts of the plant were studied to determine inhibition of four strains of bacteria. The metabolites from the endophytes were extracted and investigated using LC-MS to look at key chemical components that could be used in medicinal practices. Through this research, many compounds were found that have been known to help with medicinal uses, as well as the endophytes showing inhibition with four different strains of bacteria.

Experimental Methods

Sampling

Juniper samples were taken on February 9, 2022, at Salem State University's Pickman River Salt Marsh. For endophyte growth, portions of the stem, berry, and leaf were washed with water, bleach, and ethanol before being placed on a Potato Dextrose Agar (PDA) plate.

Extraction and Identification of Endophyte Metabolites

The endophytes were transferred to broth and allowed to grow for 4 weeks. Extracts of the broth were performed with ethyl acetate to isolate metabolites produced by the endophytes. Extracts were run on the LC-MS and identified using masslynx software.

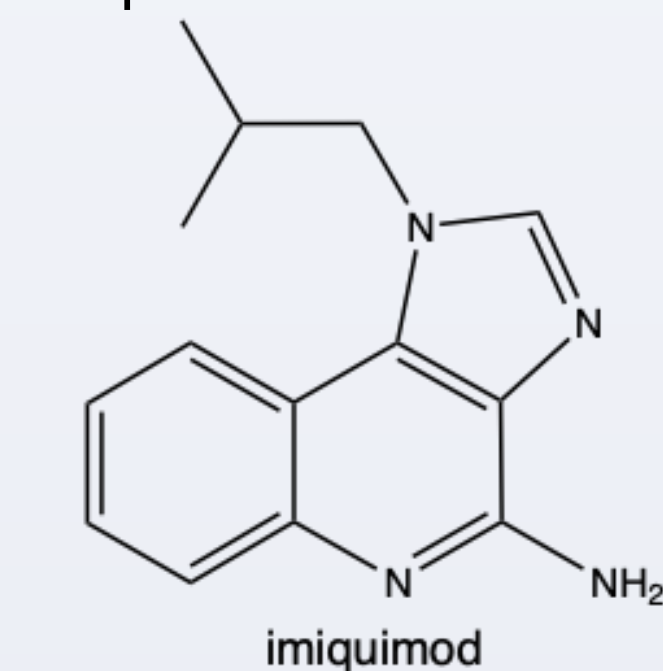
Bioactivity Test

Inhibition against *E.coli*, *Staphylococcus*, *Pseudomonas*, and *Vibrio* was examined on each extracted endophyte.

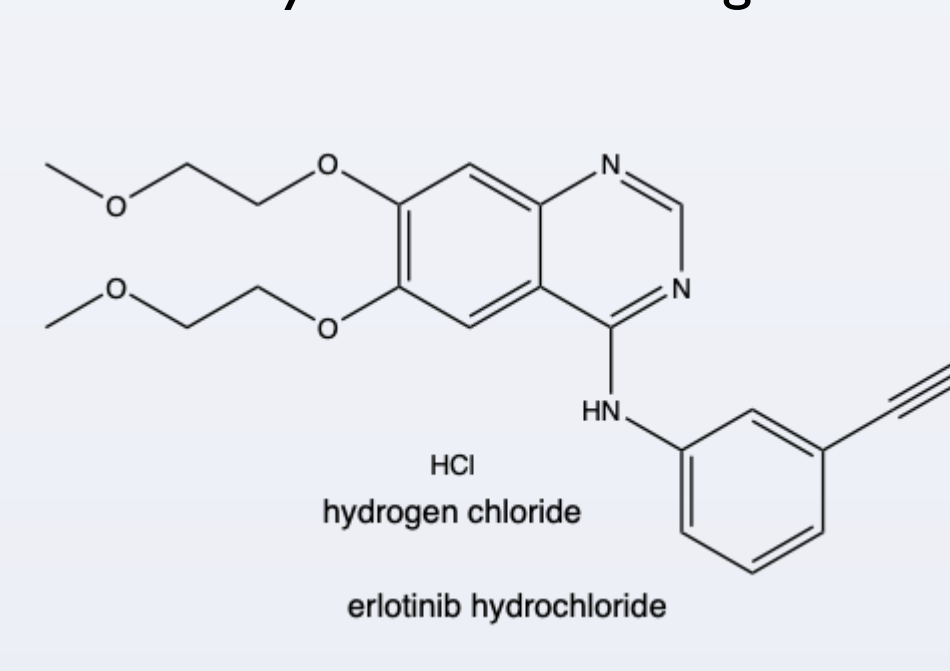
LC-MS Results

Anti-cancer

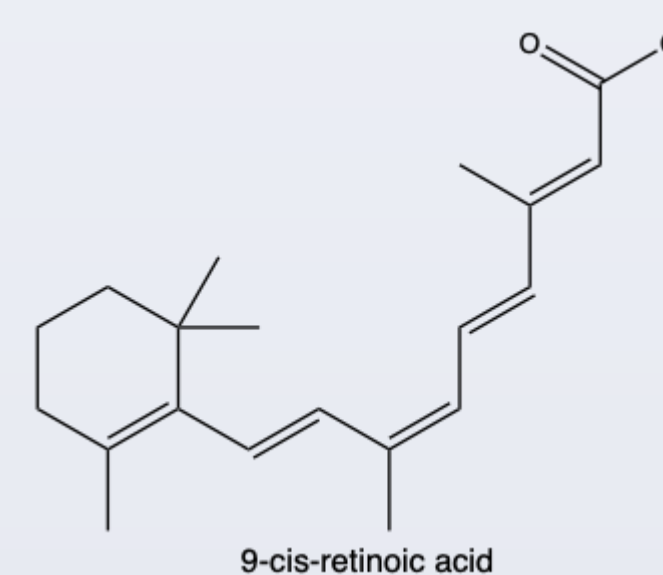
Imiquimod: Skin cancer



Erlotinib Hydrochloride: Lung cancer

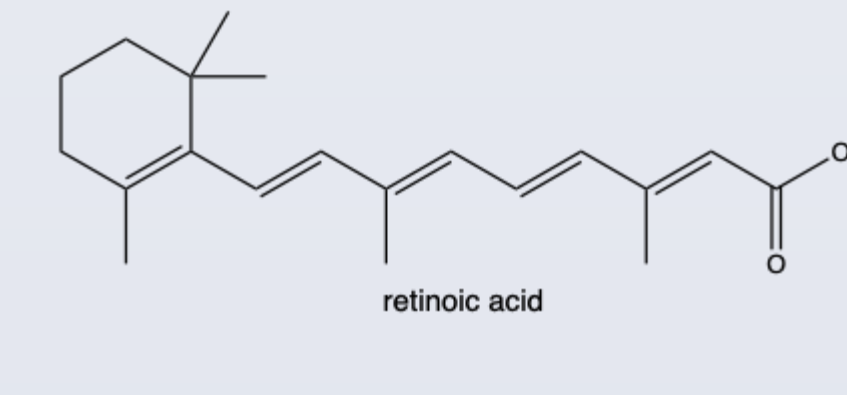
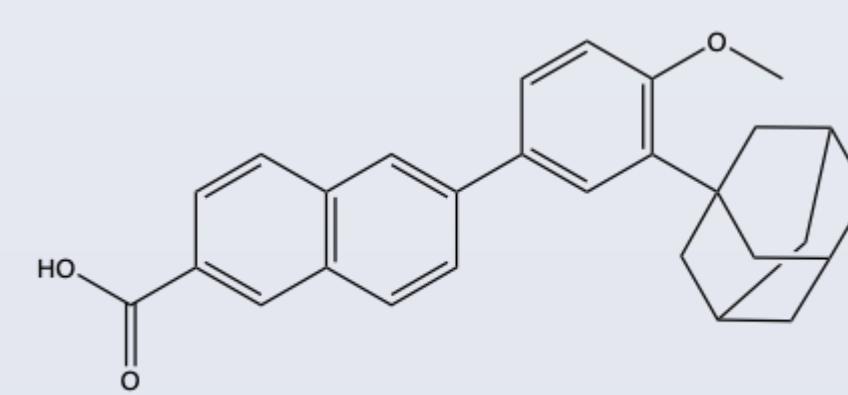


9-Cis Retinoic Acid: Cancer tumor suppressor

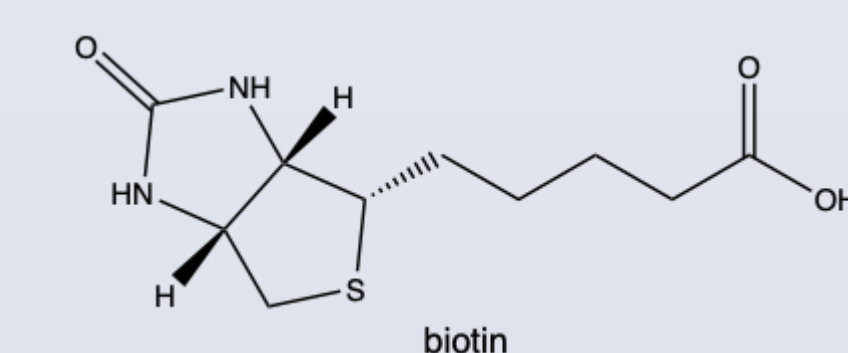


Anti-inflammatory

Adapalene and Retinoic Acid: Used to treat acne

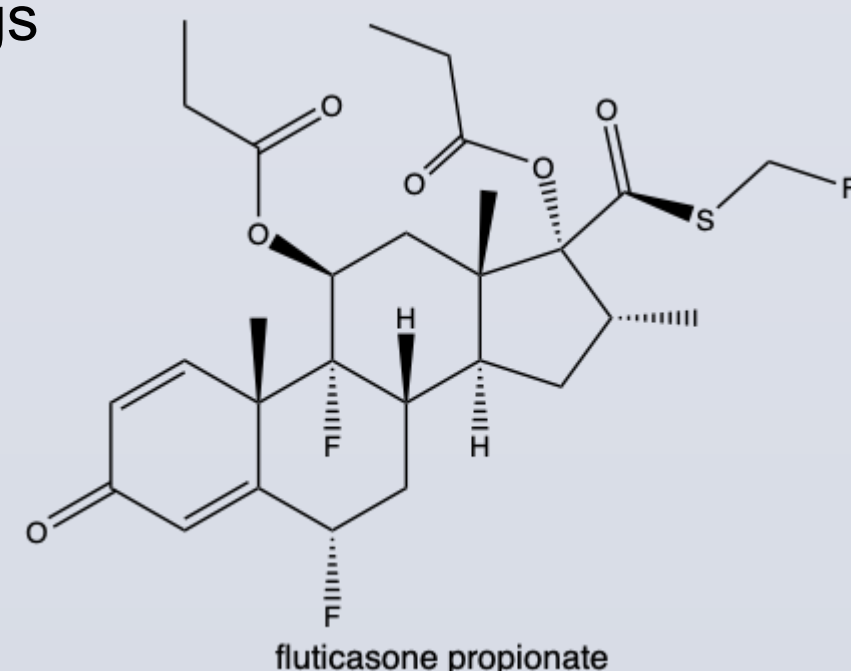
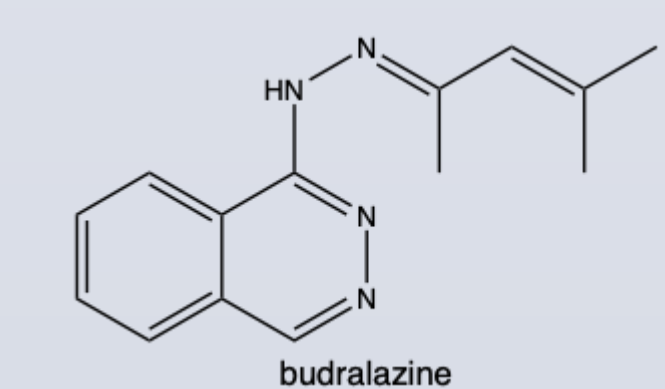


Biotin: Used to help the body convert food into energy, helps keep skin, eyes, liver and nervous system healthy



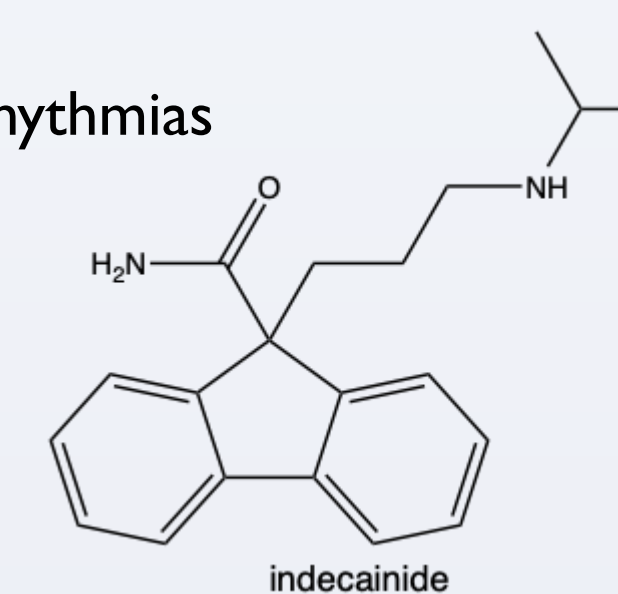
Respiratory System

Budralazine & Fluticasone Propionate: Both used to treat Asthma/inflammatory lungs

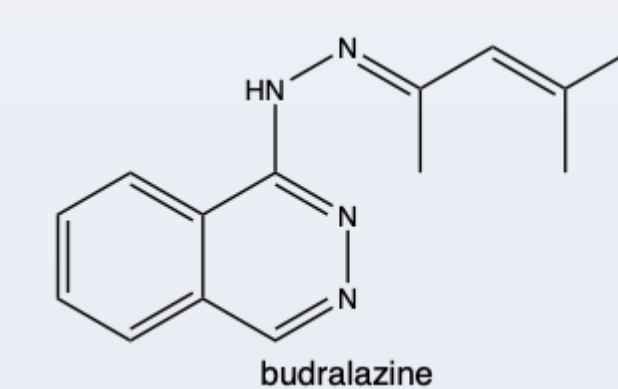


Cardio

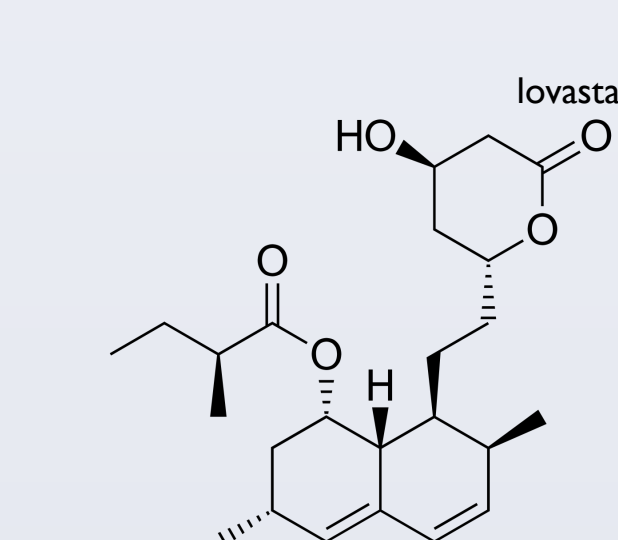
Indecainide: Used for treatment for dysrhythmias



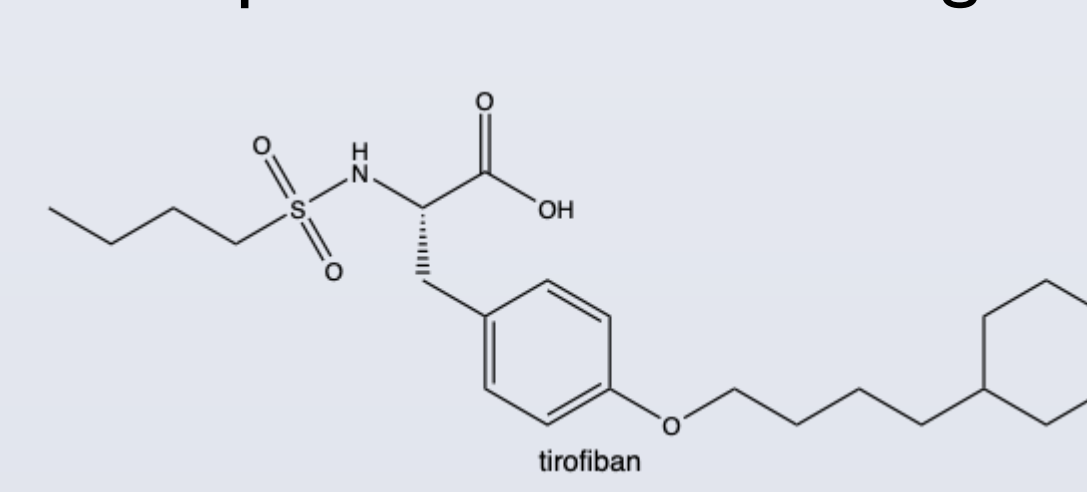
Budralazine: Used for treatment of acute or chronic vascul



Lovastatin: Cholesterol lowering agent

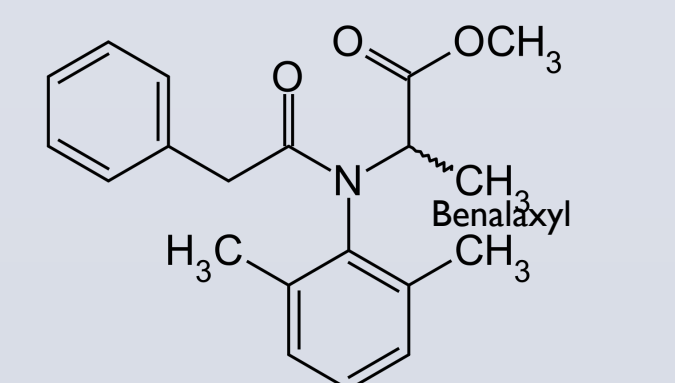
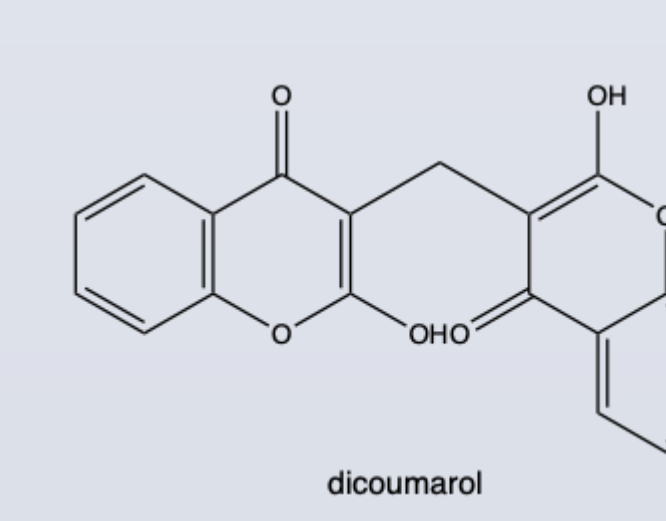
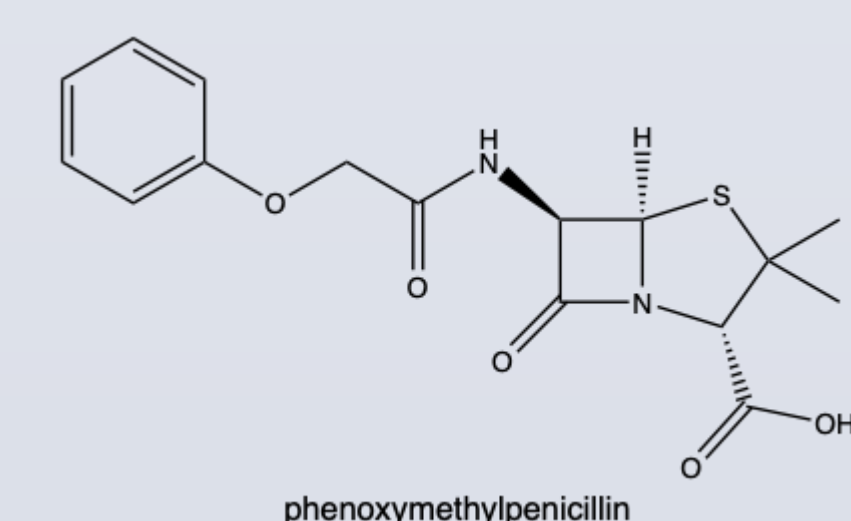


Tirofiban: blocks platelets from forming blood clots



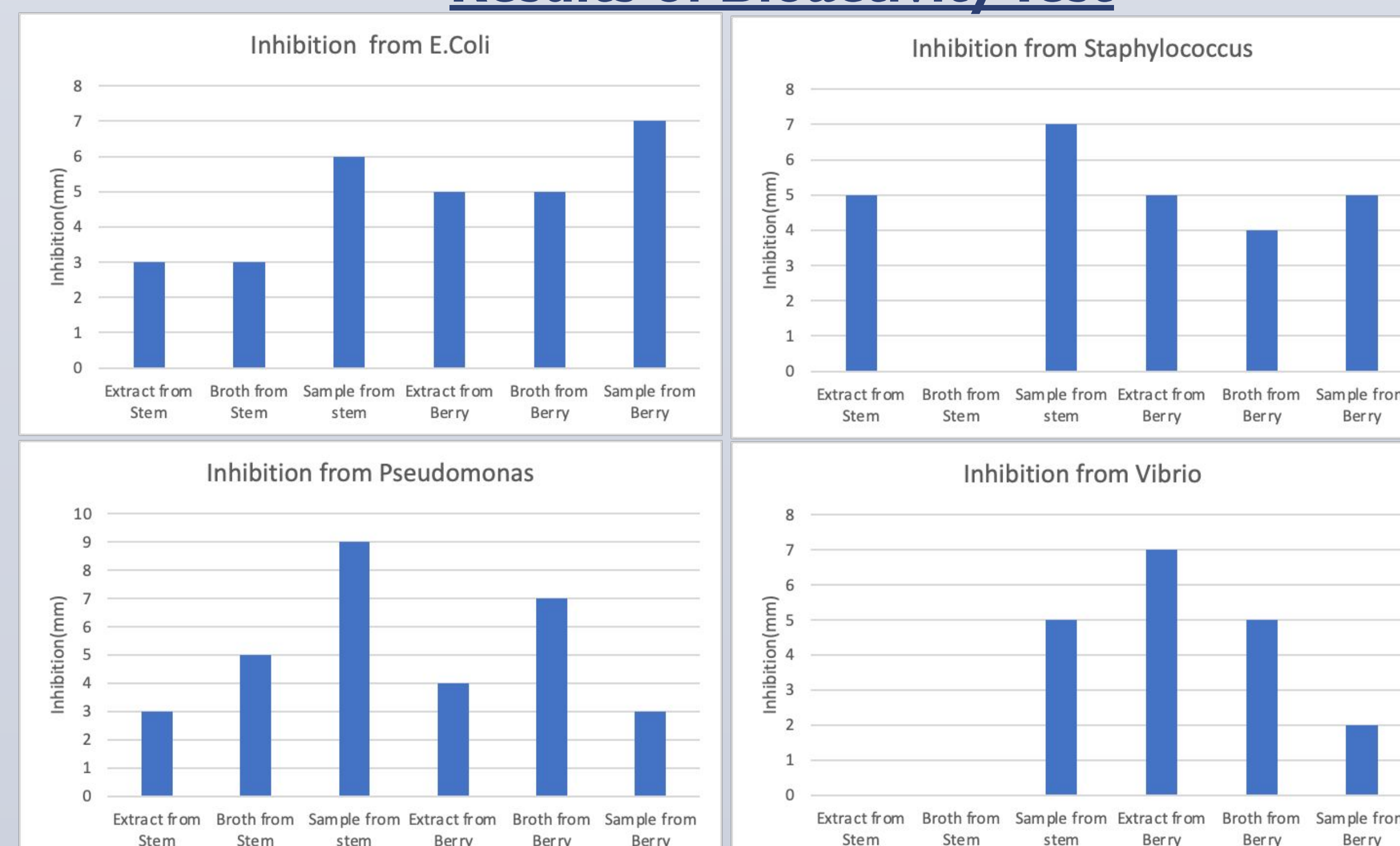
Antibacterial

Phenoxymethylpenicillin & Dicoumarol: Both used for antibacterial purposes



Benalaxyl: Used for antibacterial and antifungal purposes

Results of Bioactivity Test



Discussion & Conclusion

After careful investigation, the *Juniperus Virginiana* plant was shown to have the possibility of containing many of the compounds that have been used for medicinal purposes. Some of these compounds include imiquimod and 9-cis-retinoic acid which could have anti-cancer properties.⁴ Compounds that were detected and are found to be used to fight bacteria include, dicoumarol, and phenoxymethylpenicillin.⁵ Adapalene and biotin were also detected and could be used for treatments of Inflammation.² Overall, it was detected that many compounds could be used for the treatments of diabetes and cancer as well as bacterial, viral, and fungal infections.^{1,2,3,4,5} When looking at these compounds, the chemicals with the highest abundances were displayed in five categories. These categories are made up of current and common practices in the medical community. The findings support prior research and medicinal uses. This research concludes that the endophytes that were found in the Juniper plant contain medicinal properties Juniper is known for. The Juniper plant has been used to treat these ailments and it just may be that it is effective because of the endophyte metabolites producing these useful compounds. The endophytes that come from the Juniper plant could be used to help the medical community. With further research, the Juniper plant and its endophytes could be used to find its full potential in medicine and could make positive changes in people's lives everyday.



References

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