

Abstract

In this research study, fungal endophytes were isolated and analyzed for its medicinal uses from *Juniperus Communis*, commonly known as *Juniper*. A sample of *Juniperus communis* was collected from the Salt Marsh located at Salem State University. Sections of the stem, berry, and leaf were tested against *E.coli*, *Staphylococcus*, *Pseudomonas*, and *Vibrio* to determine any antibacterial properties. Further examination of extracts were analyzed using LC-MS. Twenty constituents were recovered and analyzed for their medicinal capabilities.



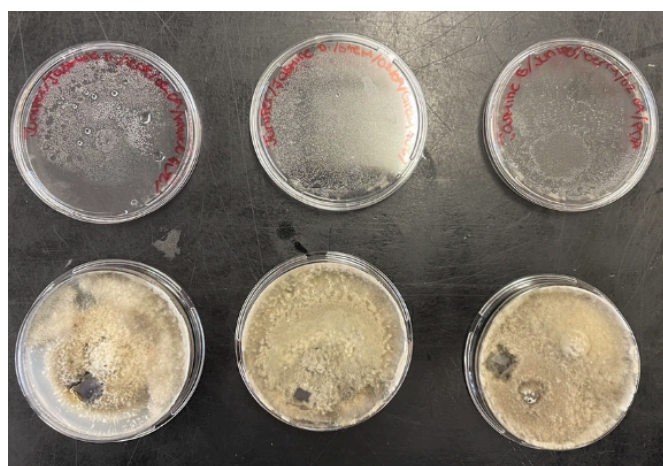
Introduction

For centuries, medicinal plants have been used as a source of medicine. Studies in clinical research show a greater value of herbal medicine in the treatment for many diseases.¹ The *Juniperus communis* is a small evergreen shrub that is commonly found in Asia, Europe, and North America.² Natural products recovered from the extract of Juniper were found having compounds with capabilities in food, cosmetic industries, and therapeutic uses. In traditional Turkish medicine, the berries are used as an antiseptic, anti-inflammatory, and to treat gastrointestinal problems.^{2,4} In North America, the berry has been used as an anorexigenic agent in the treatment of diabetes.⁴ Other beneficial health effects reported for juniper include hepatoprotective, neuroprotective, anti-fertility and chronice renal diseases.² This study is looking at the *Juniperus communis* to determine is the endophytes contained within this plant are responsible for any of these medicinal properties.

Experimental Methods

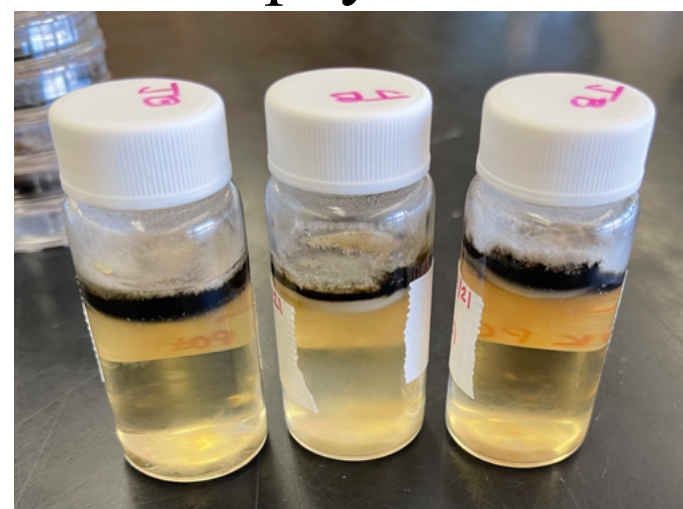
Sampling

The samples of Juniper occurred on January 26,2021 in the Pickman River Salt Marsh located at Salem State University. Portions of the stem, berry, and leaf were washed with water, bleach, and ethanol then placed onto a Potato Dextrose Agar (PDA) plate for endophyte growth.



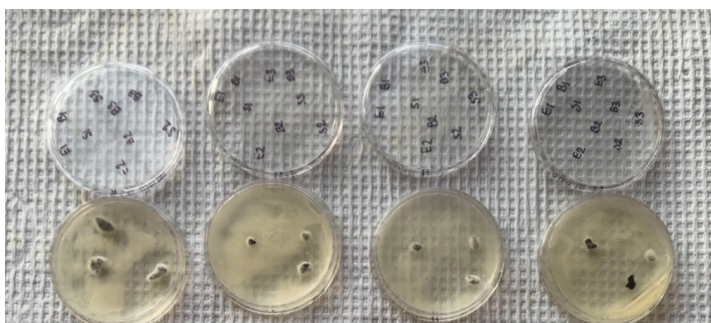
Extraction of Endophyte Metabolites

After a month of endophyte growth, the endophytes were then extracted and stored in a PCR tube.



Bioactivity Test

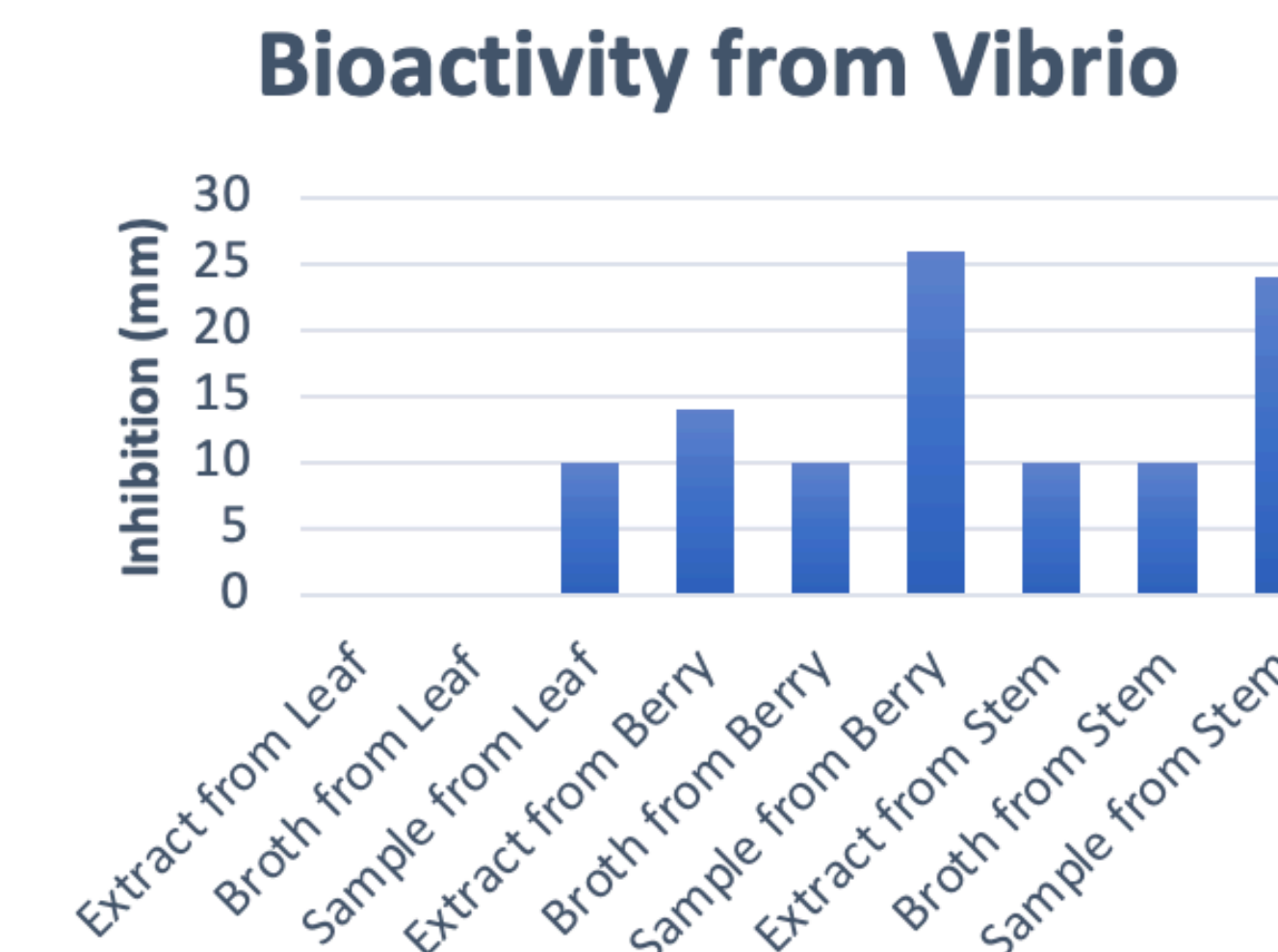
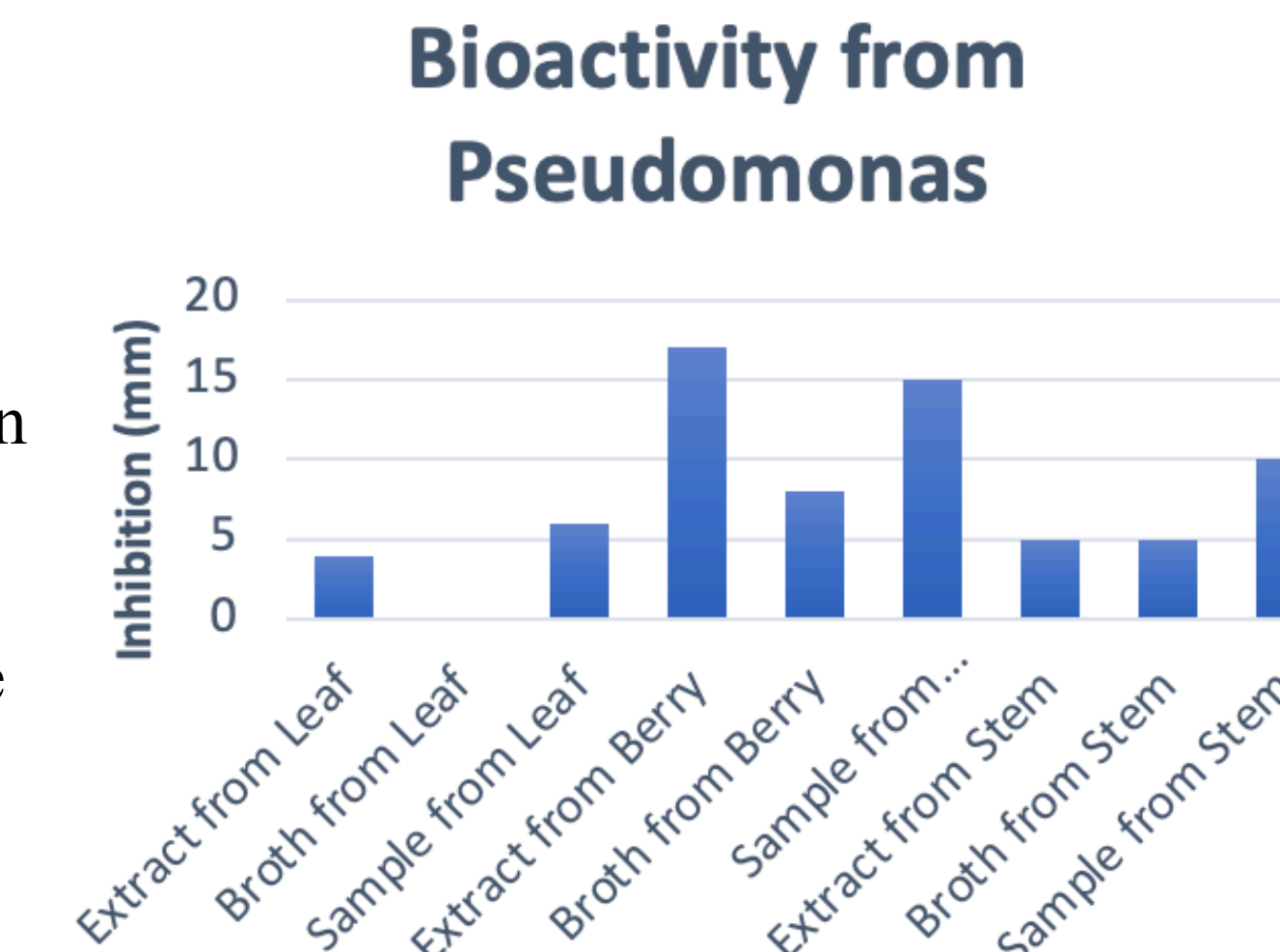
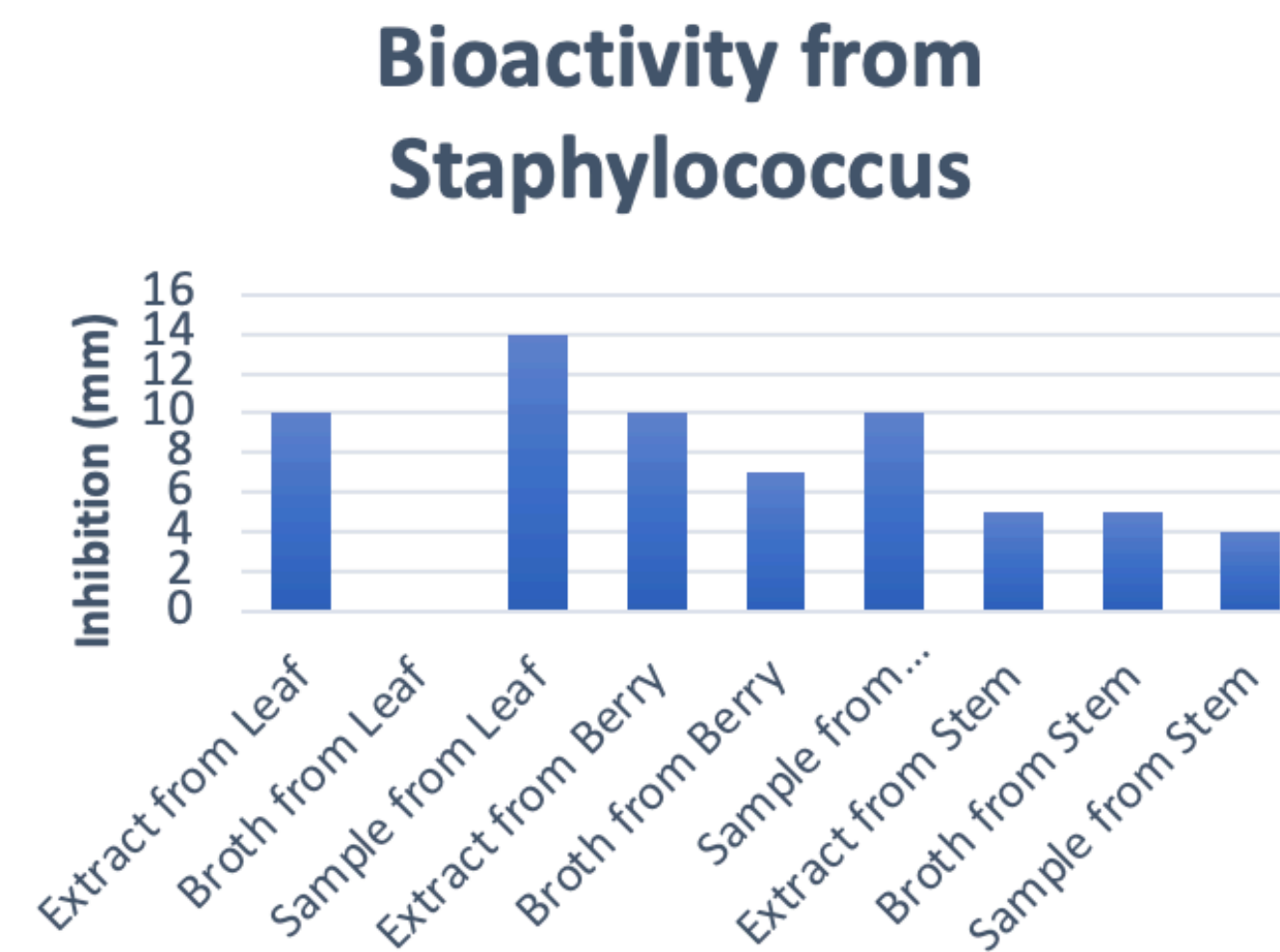
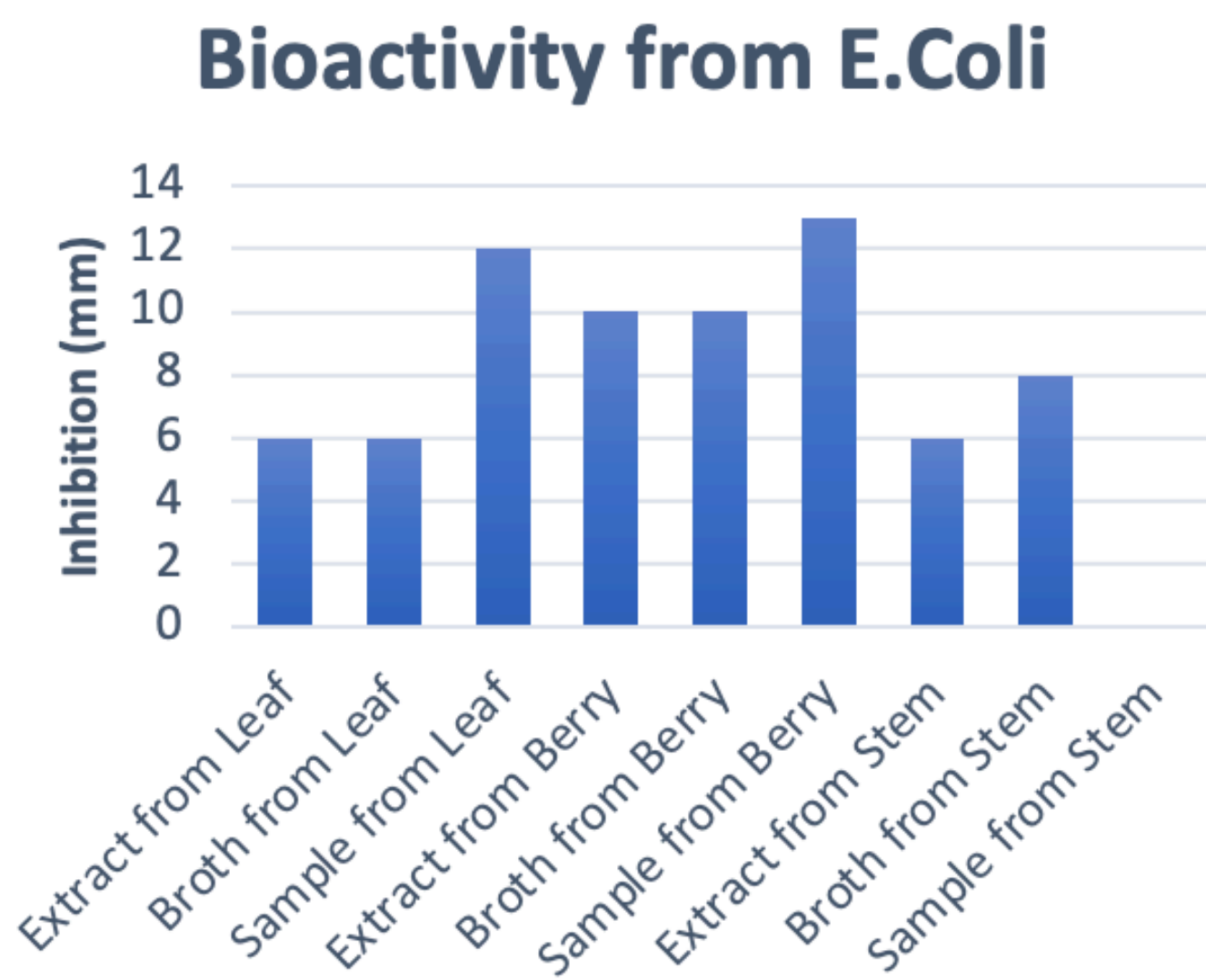
Each extracted endophyte was tested for inhibition against *E.coli*, *Staphylococcus*, *Pseudomonas*, and *Vibrio*. Each plate was left to incubate for 24 hours.



Identification of Metabolites

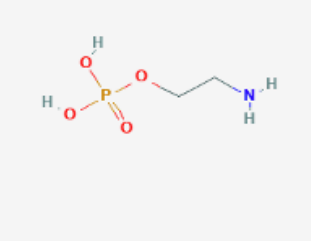
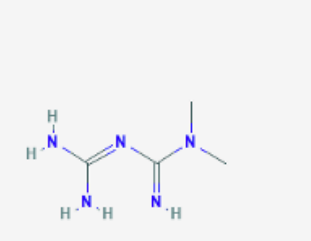
The endophyte extracts were tested through the LC/MS in order to determine the medicinal compounds within the endophytes.

Results of Bioactivity Test

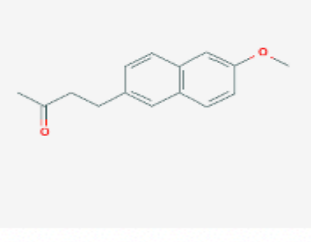
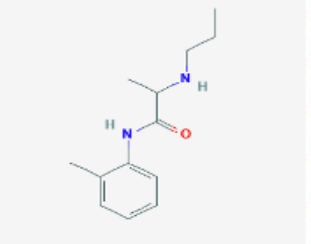
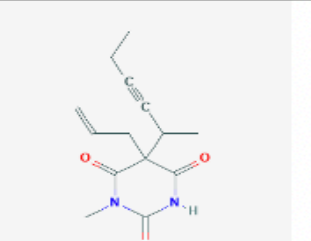
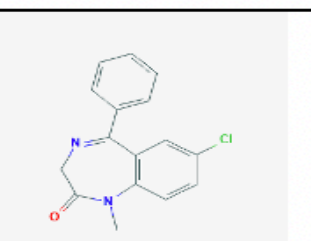
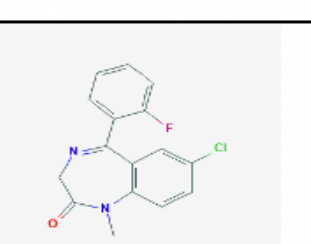
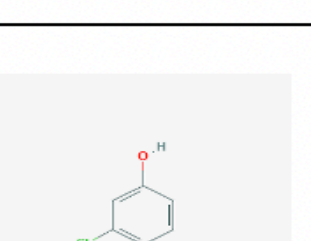


LC/MS Data

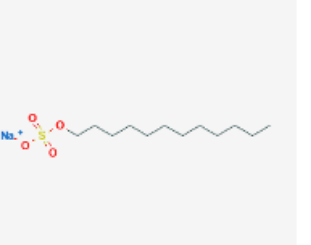
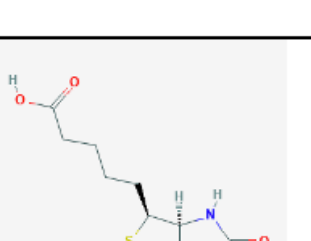
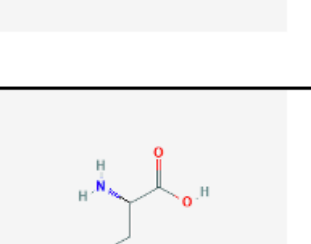
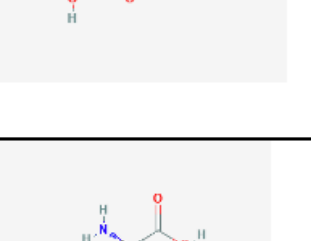
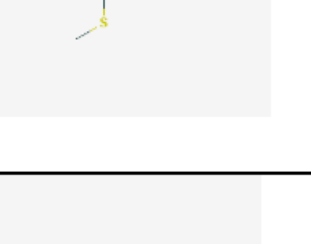
Cancer

Samples	Common Name	Uses	Structure
Stem (gray fuzz)	Phosphoryl ethanolamine	Used for cancer treatment	
Stem (gray fuzz)	Metformin	Used as an anti-inflammatory and cancer prevention treatment.	

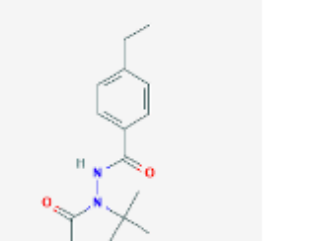
Pain

Samples	Common Name	Uses	Structure
Berry	<u>Nabumetone</u>	Used to relieve pain, swelling, and tenderness	
Berry	Prilocaine	Used as a topical anesthetic	
Berry	Methohexital	Used as an anesthetic	
Leaf (gray fuzz), Berry	Diazepam	Used as a muscle relaxant	
Leaf (gray fuzz), Berry	Fludiazepam	Used as a skeletal muscle relaxant	
Stem (gray fuzz)	3-chloropehol	Used as an antiseptic for animals	

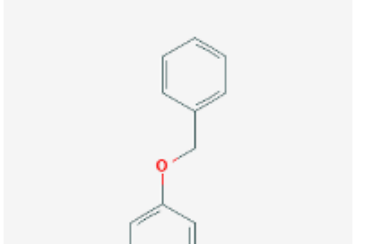

Food Additives & Dietary Supplements

Samples	Common Name	Uses	Structure
Stem (gray fuzz)	Sodium dodecyl Sulfate	Used as a food additive	
Berry	Biotin	Used as a nutrient and dietary supplement targeting hair loss, pregnancy, weight loss.	
Stem (gray fuzz)	Glutamic acid	Used to make food additives, pesticides, medicines, and hair products.	
Stem (gray fuzz)	Methionine	Promotes hair and skin growth. Used as an antioxidant.	
Stem (gray fuzz)	Sodium dodecyl Sulfate	Used as a food additive	

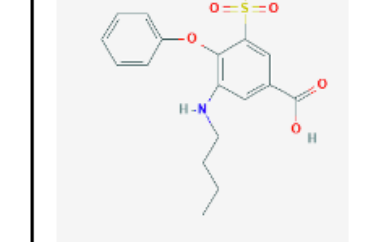
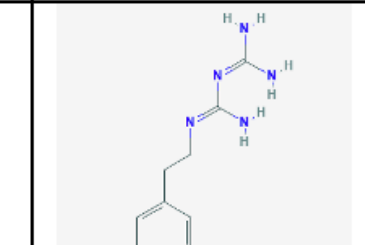
Pesticides

Samples	Common Name	Uses	Structure
Berry	Tebufenozide	Used as a pesticide against caterpillars	

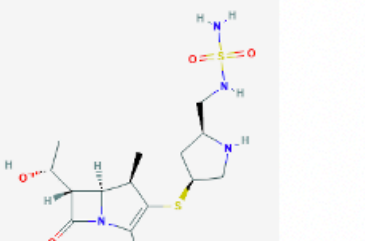
Skin

Samples	Common Name	Uses	Structure
Berry	Monobenzone	Used as a topical drug for medical depigmentation	
Leaf (gray fuzz), Berry, Stem (gray fuzz)	Ethyl cyanoacetate	Used for general adhesives and binding agents.	

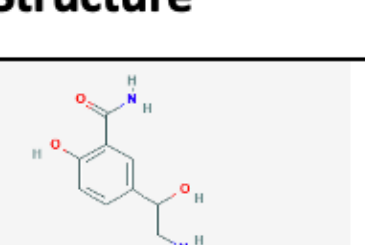
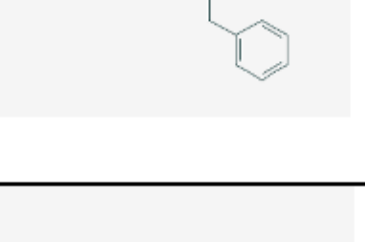
Diabetes & Cardio

Samples	Common Name	Uses	Structure
Berry	Bumetanide	A diuretic used to reduce extra fluid in the body caused by heart failure	
Stem (gray fuzz)	Phenformin	Used as an antidiabetic drug	

Bacterial Infections

Samples	Common Name	Uses	Structure
Berry	<u>Doripenem</u>	Used as an antibiotic for the treatment of aerobic gram-negative bacterial infections	

Blood Pressure & Anxiety

Samples	Common Name	Uses	Structure
Berry	Labetalol	Used to treat high blood pressure	
Stem (gray fuzz)	Butethal	Sedative used to treat anxiety	

Discussion & Conclusion

The twenty obtained constituents found in *Juniperus Communis* show that this plant in fact has antibiotic, anti-inflammatory, anti-cancer, food, cosmetic, and antidiabetic properties. Most compounds were detected from the juniper berry which supports history of Juniper as an herbal medicine because essential oil extracted form the berry was used to treat wounds, bladder infections, diabetes, muscle aches, and even combat cancer.^{1,2,3,4} Results from the bioactivity test for the endophyte extract found within the berry showed strong inhibition towards *E.coli*, *Staphylococcus*, *Pseudomonas*, and *Vibrio*. This study supports that the endophytes found in *Juniperus communis* may have more medicinal properties than the juniper berry itself due to its traditional uses and its recovered constituents. Further research needs to be carried out in order to confirm its medicinal and pharmaceutical uses.



References

1. Raina, Rajinder et al. “Potential of *Juniperus communis* L as a nutraceutical in human and veterinary medicine.” *Heliyon* vol. 5,8 31 Aug. 2019
2. Bais, Souravh et al. “A Phytopharmacological Review on a Medicinal Plant: *Juniperus communis*.” *International scholarly research notices* vol. 2014 634723. 11 Nov. 2014, doi:10.1155/2014/634723
3. P.S. Chatzopoulou, S.T. Katsiotis.; Chemical investigation of the leaf oil of *Juniperus communis* L. *Journal of Essential Oil Research.*, Vol. 5 **1993**, pp. 603-607
4. Fernandez, A., Edwin, C.I.; The therapeutic properties of *Juniperus communis* L.: antioxidant capacity, bacterial growth inhibition, anticancer and toxicity *Pharmacognosy Journal.*, Vol. 8 **2016**, pp. 273-280