

# Medicinal Properties found in *Juniperus communis*

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## Abstract

*Juniperus communis* is a common tree found in the Northern Hemisphere. Its berries are known to be used in the making of gin and essential oils. With a long history of medicinal uses, a study was conducted to investigate the plant's bioactivity and medicinal properties. Parts of *Juniperus communis* were collected from the Old Creek Salt Marsh in Salem, Massachusetts. Twenty compounds with medicinal uses and properties were identified.

## Introduction

*Juniperus communis* grow in bushes, shrubs, and small treelike figures. Their leaves are needlelike and have blue berries.<sup>1</sup> They are used in flavoring meats and sauces, alcohols such as gin, and medicines. They have been found to have many medicinal properties. Their berries are known to have anti-inflammatory, anticancer, antioxidant, and antibacterial properties. They are helpful in fighting against gastrointestinal issues and can be used as a diuretic. Native Americans used them as an appetite suppressant and in the treatment of diabetes.<sup>2</sup>

Endophytes are found in plants and are known to have medicinal properties as well. In this study, the *Juniperus communis* plant is examined to determine whether the endophytes found in them have such similar medicinal properties.

## Experimental Methods

- Samples were retrieved at Old Creek Salt Marsh.
- Different parts of the sample were grown on PDA plates.
- Growth on PDA plates were put into broth for a month and then extracted.
- Extracts, broths, and sample pieces were tested for antibacterial activity.
- Extracts were put through an LC-MS to look for potential medicinal properties.

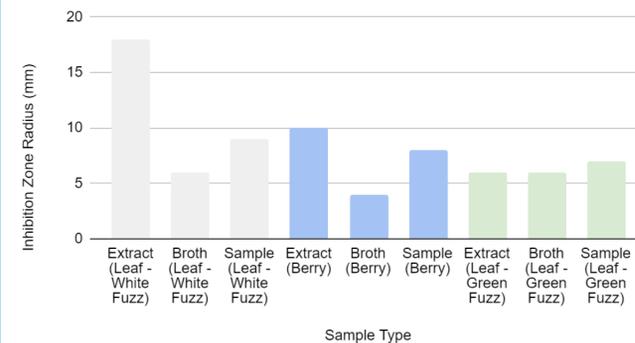
From left to right: inhibition in *e. coli*, *pseudomonas*, *staphylococcus aureus*, and *vibrio*.



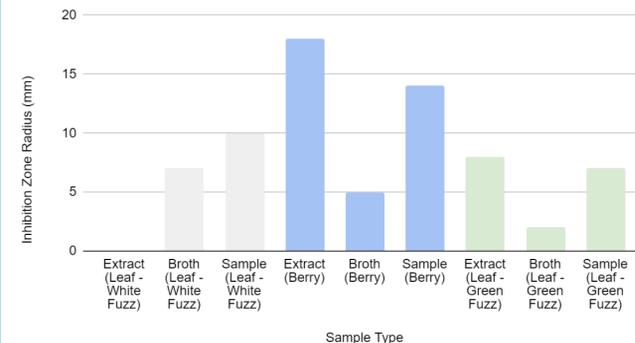
## Results

### Bioactivity

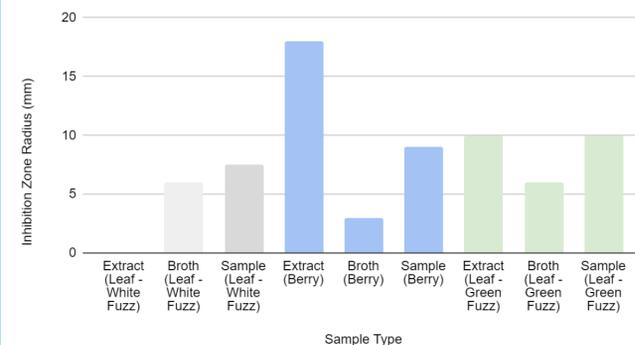
#### Inhibition of Escherichia Coli



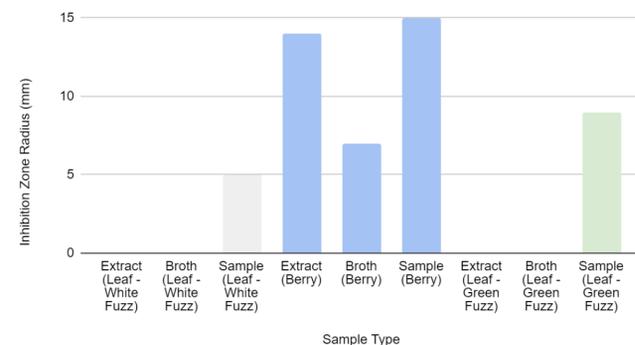
#### Inhibition of Pseudomonas



#### Inhibition of Vibrio



#### Inhibition of Staphylococcus Aureus



### Medicinal Uses of Juniper

#### Cardiovascular

Name	Sample	Uses	Structures
Taurine	Leaf (white fuzz) Berry Leaf (green fuzz)	Used in treatment for: congestive heart failure, high blood pressure, high cholesterol, cystic fibrosis, and to prevent the buildup of plaque in the arteries.	
Succimer	Leaf (white fuzz) Berry	Heavy metal chelating agent used to treat lead and heavy metal poisoning.	
Lime Acetate	Leaf (white fuzz) Berry	Chelating agent used as a hydrate to treat excess phosphate in the blood in patients with kidney disease.	
Deferoxamine	Leaf (white fuzz) Berry Leaf (green fuzz)	Iron chelating agent used to treat transfusion related chronic iron overload.	
Metirosine	Leaf (white fuzz) Berry	Antihypertensive agent used to treat high blood pressure.	
Pyrocatechuic acid	Leaf (white fuzz) Berry	Iron chelating agent.	
Boronic acid	Leaf (white fuzz) Berry	Proteasome inhibitor used for treatment in blood cancers (multiple myeloma and lymphoma).	
Metformin	Leaf (white fuzz) Berry	• antidiabetic and antihyperglycemic agent used for treatment of type 2 diabetes • reduces cholesterol and triglyceride levels	

#### Muscular

Name	Sample	Uses	Structures
Ropinirole	Leaf (white fuzz) Berry	Anti-dyskinesia agent used in the treatment of movement disorders: Parkinson disease and Restless Legs Syndrome.	
Nabumetone	Leaf (white fuzz) Berry Leaf (green fuzz)	A non-inflammatory used to relieve the symptoms of rheumatoid arthritis or osteoarthritis.	

#### Nervous

Name	Sample	Uses	Structures
Anileridine	Leaf (white fuzz) Berry	pain reliever	
Chlorhexadol	Leaf (white fuzz) Berry	sedative used typically for short-term treatment of insomnia, induce sleep before surgery, pain relief, and alcohol withdrawals	
Riluzole	Leaf (white fuzz) Berry	• A neuroprotective agent used for therapy of ALS. • A myorelaxant which are compounds that have can relax skeletal muscle	
Diethyltryptamine	Leaf (white fuzz) Berry	A neuromodulator used traditionally in South American culture for psychological disorders.	

#### Integumentary (Skin)

Name	Sample	Uses	Structures
Phosphoethanolamine	Leaf (white fuzz) Berry	• antitumor and anticancer drug used in preclinical trials in Brazil. • shown to inhibit skin cancer	
Fluorouracil	Leaf (white fuzz) Berry	An antimetabolite which used to treat actinic or solar keratoses and skin cancer	

#### Digestive

Name	Sample	Uses	Structures
(s)-tartaric acid	Leaf (white fuzz) Berry Leaf (green fuzz)	• Naturally occurring alpha hydroxy acids used in skincare for cleansing and exfoliating. • Digestive aid • Antioxidant and anti-inflammatory properties.	
Amlexanox	Leaf (white fuzz) Berry Leaf (green fuzz)	Anti-inflammatory drug used to treat ulcers.	

All structures obtained from <https://pubmed.ncbi.nlm.nih.gov/> or <http://www.chemspider.com/>

#### Endocrine

Name	Sample	Uses	Structures
Propacil or propylthiouracil	Leaf (white fuzz) Berry	Has antithyroid properties used in the therapy of hyperthyroidism and Graves disease.	

#### Respiratory

Name	Sample	Uses	Structures
Ethionamide	Leaf (green fuzz)	A nicotinamide derivative of vitamin B3 with antibacterial activity used to treat tuberculosis.	

From left to right: examples of plating of sample on PDA plate, growth on plate, and broth.



## Discussion and Conclusions

The endophytes in the *Juniperus communis* were found to have similar medicinal properties as the plant. From this research, the endophytes extracted from the leaves and berries of *Juniperus communis* showed compounds that had medicinal uses in cardiovascular, muscular, endocrine, respiratory, digestive, integumentary, and nervous system.

The test results for the endophytes' inhibition against *Escherichia coli*, *Staphylococcus Aureus*, *Pseudomonas*, and *Vibrio* showed that the berry had the highest antibacterial activity. It was the only part of the plant that showed inhibition against all strains of bacteria tested. The endophytes found in the berry were also found in all but 1 compound (Ethionamide) that were identified through LC-MS for their medicinal uses. Although no new medicinal uses were discovered for the endophyte that the plant did not already exhibit, it may be that the plant's properties are originating in endophytes rather than the plant itself. This is a relationship that could be explored for further research as endophytes could be easily grown in the lab for use.

## References

1. Fernandez; I.E.Cock. The Therapeutic Properties of *Juniperus Communis* L.: Antioxidant Capacity, Bacterial Growth Inhibition, Anticancer Activity and Toxicity. *Pharmacognosy Journal* **2016**, 8(3), 273–280.
2. S. Bais; N.S. Gill; N. Rana; S. Shandil. A Phytopharmacological Review on a Medicinal Plant: *Juniperus communis*. *ISRN Otolaryngology* **2014**, 1–6.

