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Comparison study of antioxidant activity on oregano seeds and jalapeno

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ABSTRACT:

Antioxidants are chemicals that protect cells from damage caused by oxidation of other molecules. Oxidation is a chemical reaction in which electrons are transferred from molecules to oxidized substances. Oxidation reactions are known to produce free radicals. These free radicals are reactive molecules with one or more unpaired electrons in their outer shells. Once these are created, communication can begin. Antioxidants respond to free radicals, removing intermediates in chemical reactions and preventing other oxidative processes from oxidizing them. Oxidation reactions are necessary for life but can also be harmful. Plants and animals have complex systems consisting of different types of antioxidants, such as vitamin C and vitamin E, as well as enzymes such as catalase (CAT), superoxide dismutase (SOD), and different peroxidases. Oxidative stress causes many diseases in humans, such as cell necrosis, heart disease, cancer, neurological diseases, Parkinson's disease, Alzheimer's disease, inflammatory diseases, muscular dystrophy, liver failure, and even old age. Some antioxidants, such as vitamin B, beta-carotene, and vitamin C, cannot be produced by the human body and must be supplemented through food. Eating a diet rich in antioxidants is essential for overall health and reducing the risk of chronic diseases caused by oxidative stress. Many studies have shown that a diet rich in antioxidant foods such as fruits, vegetables, whole grains, and nuts may protect against conditions such as heart disease, cancer, and brain disease(1).

Oregano essential oil has long been known for its antibacterial, antifungal, and antiviral properties. However, current research shows that these herbs are powerful antioxidants, anti-inflammatory, anti-diabetic, and anti-cancer. The quality of this thyme essential oil will be of interest to the culinary, cosmetic, and pharmaceutical industries. The purpose of this book is to review the real evidence about oregano oil and its health benefits (2).

The pepper plant (Capsicum spp.) is native to the New World tropics. Native species such as jalapeño (Capsicum annuum cv. Jalapeño) are grown to thrive in local abiotic and biotic conditions. Chili pepper plants contain capsaicin, a phenolic substance found primarily in the placenta of fruits that can influence predators to Favor fruit-eating birds. Capsaicin content is affected by genetic and environmental factors such as humidity and fertility, temperature(3).

INTRODUCTION:

OREGANO:

Oregano, technically known as Origanum vulgare and sometimes called wild marjoram, is a flowering plant in the mint family, Lamiaceae. It originates from the Mediterranean region but has spread throughout the climatic zone of the northern hemisphere. Thyme is also an ornamental plant with many varieties produced according to different leaf colors, flower colors, and habits. Thyme has proven itself in folk medicine as a bacterial relaxant, immune system, and antioxidant that helps prevent cancer [(4)].

Additionally, the essential oil of this plant is used in aromatherapy and perfumes, especially in soaps. Other uses include preparing infusions with antispasmodic, sedative, carminative, expectorant, stomachic, and tonic properties to treat headaches, sore throats, colds, and digestive problems. Moreover, thanks to the reduction of free radicals and their antioxidant and cell protection effects in the body, vulgare content has been shown to have antioxidant activity in vitro. Free radical buildup within the body has been regarded as one of the considerations that contribute to the emergence of some aging-related disorders, making it worthwhile to find substances that can mitigate these. When it comes to a drug's pharmacological activity, the route of administration is crucial[(5)]. Because it provides the patient with greater comfort, oral administration is generally recommended. Throughout the particular instance of medicinal plants, the extracts' particle sizes can vary greatly, and the many chemical components that give them their activity might be altered by gastrointestinal digestion, which changes pH and involves enzymes. Due to these factors, the pharmacokinetics and pharmacodynamics of these drugs may be significantly affected by oral administration. In vitro, models can be used in the laboratory to simulate the effects of digestion on the chemical processes of various extracted materials. Check its latest pharmacological properties in vivo and in vitro. The examination of DPPH% free radical scavenging activity is the most commonly used in vitro method for antioxidant quantification. However, C. elegans is a popular and useful in vivo model because it is inexpensive, easy to use, reproducible, and molecularly similar to humans.[(6)]

Kingdom	Plantae

Division:	Magnoliophta
Class:	Magnoliopsid
Genus	Origanum
Family:	Lamiaceae
Species:	Origanum vulgare

Medicinal uses:

- The antioxidant capacity of essential oils is weaker than water-soluble components. However, the antioxidant capacity of thyme may vary depending on different species and sources. According to a study, thyme has all the antioxidant capacity and phenolic content of five Lamiaceae plants such as thyme, sage, rosemary, mint, and basil.
- Carvacrol, a chemical component present in oregano oil, has been shown to have antibacterial properties through extensive research. Oregano oil has antimicrobial activity against many harmful microorganisms [(7)].

Jalapeno (Capsicum annuum)

It is obtained from the jalapeno pepper variety Capsicum annuum. Jalapeños are a type of pepper native to Mexico and frequently used in many cuisines around the world. Due to their properties such as color, heat, spiciness, smell, and taste, hot peppers, and peppers are used fresh or as food additives or spices in many national cuisines[(8)]. Hot peppers and peppers are rich in vitamins A, C, E and phenolic compounds. An important part of Mexico's social, economic, and cultural life is pepper cultivation. These are the two main groups of peppers. All peppers grown and sold in Mexico are called "jalapeño" peppers or peppers. Compared to 2020 data, the area planted with jalapeno fell 11.2% from 33,000 hectares in 2010. As connected devices focus more directly on consumer needs, new challenges arise. The Mediterranean diet is known for its frequent use of spices[(6)]. The average daily food intake of spices suchas paprika (paprika) in Europe is approximately 0.5 grams per person. Chili peppers are often used in dishes to enhance flavor and color. This fruit is rich in phytochemicals such as capsaicin, flavonoids, and phenols. The Mediterranean diet is known for its frequent use of spices. The average daily food intake of spices such as paprika (paprika) in Europe is approximately 0.5 grams per person[(9)]. Chili peppers are often used in dishes to enhance flavor and color. This fruit is rich in phytochemicals such as capsaicin, flavonoids, and phenols. Due to their strong antioxidant properties, these herbs are important in preventing dementia, cancer, and heart diseases. there is growing evidence that eating certain foods, diets, and regular beverages can reduce many indicators of oxidative damage in biological systems. This is because reactive oxygen species (ROS) play a role in many human diseases[(10)].

Kingdom:	Plantae
Division:	Magnoliophyta
Class:	Magnoliopsida
Subclass:	Asteridae
Family:	Solanaceae
Species:	Capsicum annuum

Medicinal uses:

- Jalapenos include capsaicin, which stimulates the synthesis of digestive enzymes and improves digestion. Consuming jalapenos in moderation can help ease digestive disorders such as indigestion, bloating, and gas.
- Capsaicin may improve blood circulation and lower cholesterol levels, perhaps benefiting cardiovascular health. However, more research is required to definitively validate this impact[(11)].

MATERIALS AND METHODS:

PLAN OF WORK:

- Literature survey of the selected project
- Procurement of glassware and chemicals
- Preparation of jalapeno and oregano seed extracts
- Preliminary qualitative analysis
- Antioxidant Assay

1. Phosphomolybdate assay
2. Hydrogen Peroxide scavenging activity

Extraction of material:

Take 50g of material, add 250 ml of a suitable solvent, then macerate for 7 or 21 days. Filter the sample and collect the solution, then proceed with the phytochemical screening.

Extraction of oregano seed:

Place 50 grams of oregano powder in a conical flask. 250ml of ethanol was added to the mixture. The contents were kept in a dark place for 21 days and a small amount of ethanol was added daily to prevent drying. After 21 days, the material was filtered and collected.

Extraction of jalapeno seed:

Place 50 grams of jalapeno powder in a conical flask. • Add 250ml of ethanol. The contents were kept in a dark place for 21 days and a small amount of ethanol was added daily to prevent drying. After 21 days, the material was filtered and collected.

PHYTOCHEMICAL ANALYSIS:

Phytochemical analysis for major phytoconstituents of the plant extracts was undertaken using standard qualitative methods [(11)]. The plant extracts were screened for the presence of biologically active compounds like carbohydrates, alkaloids, anthocyanins, coumarins, flavonoids, phenol, saponins, steroids, tannins, and terpenoids.

EVALUATION OF ANTIOXIDANT METHOD:

ESTIMATION OF PHOSPHO MOLYBDATE ASSAY:

First, we take. Put 1 mL of the plant extract into an Eppendorf tube. Fill the same tube with 1 ml of phosphomolybdate reagent. Shake the tube and ensure that the contents are properly mixed. Incubate the mixture in tubes covered with silver foil in a water bath at 95°C for 90 minutes. After incubation, allow the mixture to cool to room temperature. Determine the absorbance of the solution at 765 m.

Blank:

- It is recommended to employ the same solvent as used for extraction.
- 1 ml of the solvent and 1 ml phosphomolybdate reagent

Standard

- use any commercially available antioxidant like Ascorbic acid.
- use .1ml of the standard antioxidant, to which, add 1 ml of phosphomolybdate reagent.
- Higher absorbance values indicate, the higher total antioxidant potential of the specific plant extract.

2. HYDROGEN PEROXIDE RADICAL SCAVENGING:

Prepare a 40 mM hydrogen peroxide solution in 50 mM phosphate buffer with a pH of 7.4. Hydrogen peroxide concentration is measured using a spectrophotometer at 230 mm. Add extract (20-60 mg) to hydrogen peroxide and measure absorbance at 230 mm after 10 minutes against a blank solution of phosphate buffer without hydrogen peroxide. The calculation for hydrogen peroxide scavenging is as follows: % Scavenged (H202) = (A0 -

A1 / A0) * 100 A0 represents the absorbance of the control, while Al represents the absorbance of the test sample. Positive control: ascorbic acid, rutin, BHA, &-tocopherol, quercetin.

RESULT AND DISCUSSIONS:

Phytochemicals analysis of extracts:

The phytochemical screening of oregano and jalapeño seeds revealed the existence of several beneficial substances. Oregano and jalapeno seeds include a wide variety of phytochemicals, including carbohydrates, flavonoids, tannins, phenolic compounds, glycosides, and proteins.

The presence of carbohydrates in both indicates the existence of sugars and polysaccharides, which may contribute to the extracts' potential medicinal qualities. Carbohydrates are recognized to have antioxidant, anti-inflammatory, and immunomodulatory properties.

The presence of flavonoids, tannins, and phenolic substances in both is notable. These phytochemicals are widely recognized for their antioxidant and anti-inflammatory effects. Flavonoids, in particular, have been thoroughly researched for their potential. Health benefits include the ability to scavenge free radicals and control inflammatory pathways.

Table: Phytochemical screening of Oregano seeds and jalapeno seeds

Phyto-constituent	Oregano seeds	Jalapeno seeds
Carbohydrates	+	+
Protein	-	-
Amino acids	-	-
Glycosides	+	+
Flavonoids	+	+
Tannins and phenolic compound	+	+
Alkaloids	+	+

Phosphomolybdate assay:

The phesphomolybeenum reagent assay is a standard method for determining the antioxidant activity of plant extracts or compounds. In this work, the experiment was done to investigate the antioxidant capacity of oregano and jalapeño seeds, using ascorbic acid as the reference antioxidant. The results demonstrated that the oregano seeds had a substantial antioxidant activity, with a percentage antioxidant activity of 71.94%. This shows that jalapeno seeds have excellent antioxidant qualities, as they can scavenge free radicals and minimize oxidative stress. The high antioxidant activity of oregano seeds shows that they contain compounds capable of effectively neutralizing free radicals and protecting against oxidative damage 71.94%

Jalapenos showed antioxidant activity similar to oregano seeds. Jalapeño seeds exhibit 66.25% antioxidant activity. This shows that jalapeno seeds contain chemicals capable of effectively neutralizing free radicals and protecting against oxidative damage.

(%) Percentage Antioxidant activity

$$\frac{\text{Absorbance(control)-Absorbance(sample)}}{\text{Absorbance(control)}} \times 100$$

Table: Percentage of antioxidant activity of oregano seeds and jalapeno seeds

Sample	Absorbance	Percentage of Antioxidant activity (%)
Ascorbic acid	3.607	-

Oregano seeds	1.012	71.94%
Jalapeno seeds	1,012	71.94%

Hydrogen Peroxide scavenging assay:

The hydrogen peroxide scavenging activity assay evaluates a substance's capacity to neutralize hydrogen peroxide, a reactive oxygen species that can cause cellular damage. In this case, the hydrogen peroxide scavenging activity of jalapeno and oregano seeds was tested, with ascorbic acid serving as a benchmark for comparison. Let us discuss the findings:

The results show that both Darjeeling tea and filter coffee have high hydrogen peroxide scavenging capability. Jalapeno seeds inhibited hydrogen peroxide by 66.25%, while oregano seeds inhibited it slightly more at 66.25%.

Hydrogen peroxide scavenging activity is a measure of a substance's antioxidant capability. A higher percentage of inhibition suggests a better ability to neutralize hydrogen peroxide and protect against oxidative damage. The findings indicate that both jalapeno and oregano seeds have excellent antioxidant qualities, as they may significantly limit hydrogen peroxide.

While both jalapeno and oregano seeds had strong hydrogen peroxide scavenging activity, the % inhibition was significantly higher. The antioxidants in oregano and jalapeño seeds contribute to their increased scavenging activity.

(%) Percentage Antioxidant activity

$$\frac{\text{Absorbance(control)-Absorbance(sample)}}{\text{Absorbance(control)}} \times 100$$

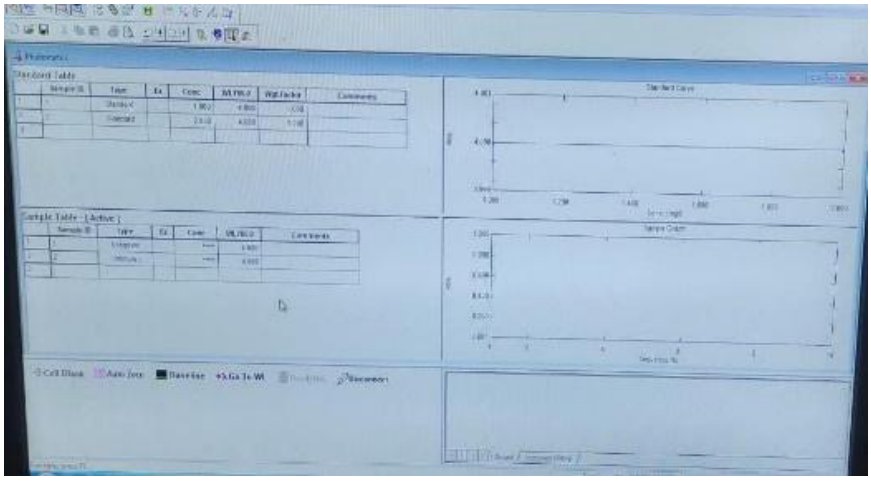
Table: Hydrogen peroxide scavenging activity of oregano seeds and jalapeno seeds

Sample	**Absorbance**	**Percentage antioxidant activity (%)**
Ascorbic acid	1.387	-
Oregano seed	0.468	66.25%
Jalapeno seed	0.468	66.25%

CHARACTERIZATION OF OREGANO SEEDS AND JALAPENO SEEDS:

UV-visible spectroscopy:

UV-VIS spectroscopy is a technique for characterizing size, shape, concentration, aggregation state, and refractive index. The intensity of reflected light is measured with a reference material and compared to the sample resolution. Using a Shimadzu U.V. probe 1800 in the scanning series of 200 to 800 nm with a resolution of 1 nm, the spectra of the sample or medication were investigated to observe the complete bioreduction of oregano seeds and jalapeño seeds.



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