Compression Effectiveness of Plant Extract by Using Magnetic Water and Ethanol on Some Pathogenic Bacteria

Amer A. Hammadi
Department of Clinical Laboratories, College of Applied medical sciences, University of Kerbala, Karbala, Iraq.
E-mail: amer.a@uokerbala.edu.iq

Abstract
Objectives: The current research compares the antibacterial efficacy of plant products on pathogenic bacteria Escherichia coli (E. coli) and Staphylococcus aureus (Staph. aureus) using powder of Allium sativum (A. sativum) extracted using two different procedures ethanolic and magnetic water methods .Methods: In order to obtain a cured extract of A. sativum, two solvents—ethanol and magnetic water—were used. The extract's minimum inhibitory concentration (MIC) was then determined by testing its efficacy against two types of bacteria E. coli and Staph. aureus to find the most effective method and concentration of solvent optimization.Results: When compared between these two methods and with the antibiotic, the extract showed activity in vitro against two species of pathogenic bacteria (E. coli and Staph. aureus). This appeared in inhibited zone diameter for these bacteria pathogenic bacteria (8,6, 1.5)mm with ethanolic extract and (13, 6.8, 2.4, 1.3)mm with magnetic water methods on E. coli. Effectiveness of ethanolic extract on Staph. aureus (18, 10, 4, 2)mm and magnetic water on (25, 18, 8.2, 3.8, 1.5)mm. All isolates were susceptible to ethanolic extracts, a magnetic water extract of A. sativum, and the effectiveness of G+ve bacteria over G-ve bacteria. Conclusion: The current report will aid in the discovery of novel goods and medications. The findings of this study demonstrate that chemicals with antibacterial and antioxidant effects against various bacteria are present in A. sativum extracts prepared using two different techniques.

1. Introduction

Medical plants are gifts from nature that protect against numerous infections and diseases. Because of their value in treating common illnesses like fever and the common cold, medical plants have recently attracted a lot of attention (1). Crude herbal extracts of aromatic plants have been used for a variety of uses, including food, medicine, and perfumery, since antiquity (2) (3).

The scientific name for garlic is A. sativum and it is a member of the Alliaceae family. A lot of food and medication uses garlic (4). An all-encompassing remedy for wound infections, cough and lung TB, diabetes is A. sativum, hypertension, the common cold, , mental illness, renal diseases, liver diseases, asthma, and malaria sexually transmitted diseases. (5). A significant member of the Rutaceae family of medicinal plants is citrus fruit. It is mostly employed for its alkaloids, which have anticancer effects and the potential to be antibacterial in crude extracts of several lemon components (leaves, stem, root, juice, peel, and flower). Due to the presence of alkaloids, citrus fruits exhibit a high influence of biological action including antifungal, antiviral properties, anticancer, antidiabetic and antibacterial (6). Essential Oils (EOs) are products made from plant-based raw materials, such as leaves, buds, fruits, flowers, herbs, twigs, barks, woods, roots, and seeds. EOs are complex mixtures that may contain volatile terpenic compounds, [(C5H8)n] monoterpenes, sesquiterpenes, and diterpenes, as well as antimicrobial molecules that fight oral bacteria, like the glycoside phlorin. These are plant secondary metabolites and accountable for several plants' distinctive odors, including citrus (7).

Numerous bacteria, including antibiotic-resistant strains, and fungi were resistant to the antibacterial effects of essential oils. They can harm filamentous fungus, yeasts, and both gram positive and gram negative bacteria (8). Water has a magnetic charge because it is paramagnetic. Few or all of the individual materials include molecules, ions and atoms have a perpetual magnetic dipole moment, para-magnetism is most common. Due to its dipole moment, water is paramagnetically susceptible (9,10).

When a magnet is placed in water, it turns the water's qualities into something highly fertile and active, resulting in a high oxygen ratio, a rapid rate of dissolved salts, and a rapid rate of amino acids in the water. This is what is meant by the term "magnetic water." Dead water is what is left over after disinfection, hence magnetic water transfers water from the dead to the living (11,12). When water was exposed to a magnetic field, the pH, total dissolving solids, total rigidity, conduction, salinity, oxygen dissolving, evaporated temperature, minerals, organic substance and overall bacterial Numerate all changed significantly (13).

Red blood cell count and hemoglobin concentration significantly increased in animals given magnetic water. (12) found that holstein bulls treated with magnetic water had significantly higher levels of hemoglobin, packed cell volume, and red blood cells at ages 17 to 18 and 29 to 32 months compared to

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controls (15). The number of RBCs has been linked to an increase in the strength of the water processor's magnetic field, caused of magnetic area to work with the iron blood to attract it and connection with more blood in region, increasing the of RBCs numbering, concentration hemoglobin and carrying more oxygen to the cells (16) (14).

Following animal sacrifice, the histological changes in the heart, lungs, and spleen were examined. Rats exposed to magnetic water at intensities of 250, 750, 1000, and 1500 gause did not exhibit any obvious pathological lesions in their hearts, according to histopathology (17). The body's capacity to produce general and sexual hormones, via the blood nutrients moving and mend semen qualities and range of fertility can all be increased by magnetic water (18). It was noted that the mass motility, sperm concentration and sperm total live of rabbit bucks who drank magnetized water increased significantly (19). An efficient method to increase the content of bone mineral, mineral density of bone and resistance of bone in Wistar ranges was to drink water that had been exposed to a magnetic field for 45 days (20).

2. Material and Methods

Plant Substance

Two types of plant A. sativum with C. limon collected of local market in Karbala city A. stivum plant as a powder and C. limon plant as juce .

Plant extract

A-Ethanolic extract

Allium sativum 100 grams and 400 milliliters of ethanol 1/5 were combined well, left overnight in a shaker incubator at 40 degrees, and then the mixture was filtered on filter paper and placed in an oven at 45 degrees to dry and collect the extract powder (21).

B-Magnatic water

Mix well 100 g of Allium sativum with 400 ml of Magnatic water, overnight in a shaker incubator at 40 degrees, filter the mixture onto filter paper, and then place the mixture in a 45-degree oven to dry and collect the extract powder.

Bacterial isolation

E. coli and Staph. aureus, two bacterial pathogenic genera, were isolated from an infected patient at (AL-Hussainy hospital). Bacteriological and biochemical tests are used for all bacterial identification.

Mueller-Hinton agar

Weighted 40 g from media and solved in 1000 mL of Distal water based on method of company (Himedia company).

Prepare plant extract

To gather information, combine A. sativum powder and Citrus l. juice for 24 hours in a shaker apparatus while dissolving 5, 10, 15, 20, and 25 mg of A. sativum in 3 mL of Citrus L. juice (21).

Prepare antibiotic

Take 1g from tetracycline antibiotic and dissolve in 10 mL of distal water.

Well method procedure

Pour 4 mm of Muller Hinton Agar medium into the plates. By using a cotton swab, apply a broth culture of an isolated bacterium to ager plates. Create a well in the plate (or more wells if using multiple concentrations of an antibiotic) using a sterile crock borer with a suitable diameter of 10 mm while maintaining aseptic conditions after the plate has dried at 37°C for 30 min. Place a tried-and-true antibiotic in the well. Plates should be incubated for 18–24 hours at 37 °C. Measure the well's surrounding inhibitory zone (21).

3. Result and discussion

The current study compared the effectiveness of plant products such as C. limon juice and A. sativum powder on various pathogenic bacteria using the ethanolic method and the magnetic water method. The findings revealed that plant products had no harmful side effects but had a greater impact on Gram positive bacteria like S. aureus than Gram negative bacteria like E. coli.

The results showed in table (1) effectiveness of Allium sativum powder extract by ethanolic methods and Citrus limon juice mixed plant product against E. coli bacteria through diameter of inhibition zone in concentration (25 mg/3 mL, 20 mg/3 mL, 15 mg/3 mL) of mixed plant extract with juice comparison with inhibition zone of antibiotic, there is limited effect on Gram's negative bacteria.

Table (1) Inhibition zone (mm) of Allium sativum powder extract by ethanolic methods and Citrus limon juice mixed plant product against E. coli bacteria

No	Concentration of extract (mg/mL)	Inhibition zone diameter			Mean of concentration
		1	2	3	
1	Ceftriaxone 100 µg/mL	25	26	24	25
2	25 mg/3 mL	10	6	8	8
3	20 mg/3 mL	4.5	4.5	6	5
4	15 mg/3 mL	3	3	1.5	2.5
5	10 mg/3 mL	0	0	0	0
6	5 mg/3 mL	0	**0**	0	0
	Mean of extract solvent	6.6	6.5	6.5	6.7

Results showed in table (2) effectiveness of Allium sativum powder extract by magnetic water methods and Citrus limon juice mixed plant product against E. coli bacteria through diameter of inhibition zone in concentration (25 mg/3 mL, 20 mg/3 mL, 15 mg/3 mL, 10 mg/3 mL) of mixed plant extract with juice comparison with inhibition zone of antibiotic, there is effect on Gram's negative bacteria reach to the half

of antibiotic effectiveness on the same bacteria. In addition that plant extract without or limited side effect.

Table (2) Inhibition zone (mm) of Allium sativum powder extract by Magnetic methods and Citrus limon juice mixed plant product against E. coli bacteria					
No	Concentration of extract (mg/mL)	Inhibition zone diameter			Mean of concentration
		1	2	3	
1	Ceftriaxone 100 µg/mL	25	26	24	25
2	Extract 25 mg/3 mL	10	16	13	13
3	Extract 20 mg/3 mL	9.4	5	6.8	7.1
4	Extract 15 mg/3 mL	3.2	3.4	2.4	3
5	Extract 10 mg/3 mL	0.9	0.7	1.3	1
6	Extract 5 mg/3 mL	0	0	0	0
	Mean of extract solvent	7.9	8.5	7.9	8.1

Results showed in table (3) Inhibition zone (mm) of Allium sativum powder extract by ethanolic methods and Citrus limon juice mixed plant product against Staph. aureus bacteria through diameter of inhibition zone in concentration (25 mg/3 mL, 20 mg/3 mL, 15 mg/3 mL, 10 mg/3 mL) of mixed plant extract with juice comparison with inhibition zone of antibiotic, there is effect on Gram's positive bacteria few less of antibiotic effectiveness on the same bacteria.

Table (3) Inhibition zone (mm) of Allium sativum powder extract by ethanolic methods and Citrus limon juice mixed plant product against Staph. aureus bacteria					
No	Concentration of extract (mg/mL)	Plant extract			Mean of concentration
		1	2	3	
1	Ceftriaxone 100 µg/mL	30.4	32	27.6	30
2	Extract 25 mg/3 mL	16.9	19	18.1	18
3	Extract 20 mg/3 mL	10	7	13	10
4	Extract 15 mg/3 mL	6	3.5	2.5	4
5	Extract 10 mg/3 mL	1.8	1.7	2.5	2
6	Extract 5 mg/3 mL	0	0	0	0
	Mean of extract solvent	10.85	10.53	10.61	10.66

Results showed in table (4) Inhibition zone (mm) of Allium sativum powder extract by magnetic water methods and Citrus limon juice mixed plant product against Staph. aureus bacteria through diameter of inhibition zone in concentration (25 mg/3 ml, 20 mg/3 ml, 15 mg/3 ml, 10 mg/3 ml, 5mg/3 ml) of mixed plant extract with juice comparison with inhibition zone of antibiotic, there is effect on Gram's positive bacteria reach equal to the antibiotic effectiveness on the same bacteria. In addition that plant extract without or limited side effect.

Table (4) Inhibition zone (mm) of Allium sativum powder extract by magnatic water methods and Citrus limon juice mixed plant product against Staph. aureus bacteria					
No	Concentration of extract (mg/mL)	Plant extract			Mean of concentration
		1	2	3	
1	Ceftriaxone 100 µg/mL	30.4	32	27.6	30
2	Extract 25 mg/3 mL	28	24	23	25
3	Extract 20 mg/3 mL	18.3	17.2	18.5	18
4	Extract 15 mg/3 mL	6	10.2	8.4	8.2
5	Extract 10 mg/3 mL	4.8	3.8	2.8	3.8
6	Extract 5 mg/3 mL	1.5	1.5	1.5	1.5
	Mean of extract solvent	10.85	10.53	10.61	10.66

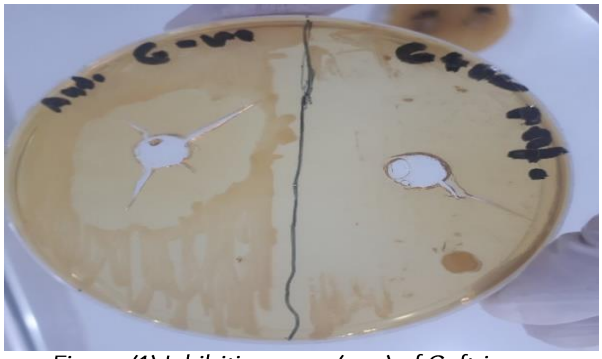
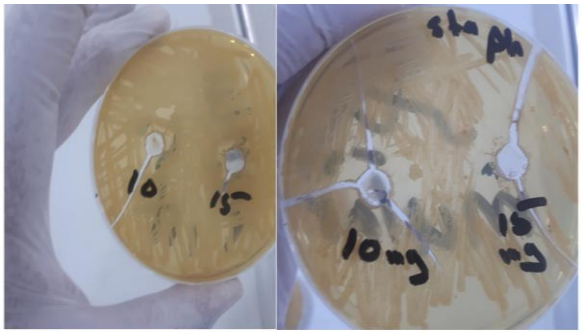
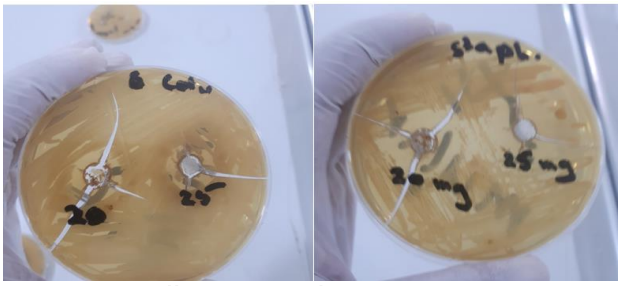


Figure (1) Inhibition zone (mm) of Ceftriaxone antibiotic, On the left effectiveness on Gram's negative and on right effectiveness on Gram's positive.



Figure(2) effectiveness of ethanloic extract of A. sativum on E. coli

Figure(3) effectiveness of ethanloic extract of A. sativum on Staph. aureus



Figure(4) effectiveness of magnetic water extract
Figure(5) effectiveness of magnetic water extract

of A. sativum on E. coli of A. sativum on Staph. aureusCell membrane make up lipid bilayer and embedded protein on the bacterial surface of each have a hydrophobic non-polar tail and a hydrophilic polar head. The cell membrane structure is made up of a free-floating phospholipid bilayer, whose hydrophilic polar head is facing outward and its hydrophobic non-polar head is facing inside. The inserted proteins are of a given amount of dipole moment and provide a variety of functions, including those of ion channels, receptors, etc (22). The bacterial cells' cell membranes are mostly affected by the magnetic pulse. The membrane free floating phospholipid bilayer have embedded proteins. The embedded proteins have a variety of activities, including those of ion channels, receptors, and others. The amount of the membrane protein's dipole moment is connected with both its amino acid composition and its interaction with the magnetic field (23).

According to Wevangti Vangra (24), when water is magnetically charged, it electrically acquires a higher ionic charge than the minerals, which results in a naturally magnetic attraction between the two. A real reduction in the size of the water molecule results in softening and enhanced flavor. Greater solubility and magnetic attraction can be found in the tiny magnetized water molecule. the enduring water molecules are impacted by field by:

• The molecules get bigger, increased water permeability and solubility (ability to dispense and other substances penetrated). The body's ability to absorb both water and nutrients is improved by increased permeability, which also aids in the degradation of nutritious components. Additionally, a water molecule's capacity to absorb poisons increases as its size does (24).

• being a little acidic When exposed to electro-magnetic trembling, separate hydrogen ions H+ and hydroxyl ions OH – of some water molecules. With certain minerals such as calcium some hydroxyl ions will react, to result bicarbonate of calcium with alkaline characteristic. The pH range of magnetized water is between 7.6 and 8.5 (25).

• Surface tension reduce—due to microcluster, it drops from 75 to 45 or even 38 dynes. It also lessens the viscidity of blood (24) .

• In comparison to ordinary water, magnetized water has fewer molecules per cluster. It has six molecules compared to the 14–30 of ordinary water. As a result, the microcluster makes it simpler to pass through cell membrane. Because it is simpler to move out toxins and waste material from cells and to carry nutrients and oxygen into cells, metabolism is increased (25) .

• Antioxidant: When certain hydroxyl ions (OH-) interact, they produce the ions water and oxygen (O). Since this oxygen ion is negatively charged, it can block the free radical cycle. Any molecule with one unpaired electron in its outer shell is referred to as a free radical. This free radical will rob the body of an electron and cause other molecules to lose their electrons as a result. The body will lose an electron to that molecule, creating another free radical. The "free radical cycle" refers to this (25).

• Have a lot of oxygen: When oxygen ions unite to form oxygen, the oxygen dissolves right away in the water. The closed bottle contain magnetized water will have tiny bubbles that adhere to the bottle walls. "Water that has an alkalinity properties always has oxygen inside" goes the saying. This fuels the cells, blocks the growth of anaerobic bacteria, and hinders their development (25).

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