International Journal of Academic Health and Medical Research (IJAHMR)
ISSN: 2643-9824
Vol. 8 Issue 2 February - 2024, Pages: 49-52

Allium Sativum L Extract Antimicrobial Properties against Pathogenic Gram Positive and Gram Negative Bacteria

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Abstract: *The current study attempted to examine the antimicrobial ability of allium sativum L extract opposed to gram-positive and gram-negative pathogens. Allicin, the active component of garlic, belongs to the thiosulfates chemical family and is commonly used as an antibacterial, antifungal, antiviral, and food preservation agent. Garlic was extracted using an aqueous extraction technique, and the extract was placed in curved hales on Muller Hinton agar swabbed with clinical organisms before being incubated at 37°C for 24 hours. Garlic extract's antimicrobial efficacy was tested in vitro against ten clinically isolated bacterial species. Klebsiella pneumoiae, Enterococcus facalis, Eschrichia coli, Salmonella typhi, Salmonella paratyphi A, Staphylococcus aurues, and Staphylococcus epidermidis were sensitive to garlic, while Proteus vulgaris, Proteus mirabilis, and Pseudomonas aeruginosa were resistant to garlic aqueous extract. Allium Sativum L demonstrated broad-spectrum antibacterial activity against gram-positive and gram-negative pathogens, and it is advised for use as a booster or alternative therapy option for bacterial infections.*

Introduction

Antimicrobial resistance has skyrocketed in recent years, forcing the creation of new antibiotic classes to combat infectious diseases (1). In recent decades, the pharmaceutical industry has primarily focused on high-throughput biochemical screening technologies for the identification and development of new drugs. (2) Choosing novel options with great efficacy and little side effects is one of the treatment's possible and desirable solutions (3). Several plants have been utilized to cure a variety of illnesses and have shown antibacterial activity. Spices are often used for a range of infectious diseases due to their antibacterial properties. (4) Garlic, leeks, onions, and chives are perennial bulb-forming plants of the Liliaceae family (5). Garlic (Allium sativum L.) is a "aroma" vegetable that is commonly used as a food ingredient in many countries and cultures due to its distinct flavor and potential health benefits. It has been claimed that garlic's biochemical and physiological benefits stem from its polyphenols and organosulfur compounds (6). Garlic is a potential food pathogen inhibitor that avoids food contamination, increases shelf life, and reduces spoilage and food poisoning (7, 8). Garlic (Allium sativum L) is a widely grown vegetable crop and a well-known medicinal herb globally (3). Allicin, a sulfur-containing natural component with several biological properties, is responsible for the distinct odor and flavor of freshly cut or crushed garlic (2). Garlic contains sulfur compounds, flavonozides, vitamins (A, B1, B2, C), phytosterol, glycerides of palmitic, stearic, oleic, linoleic, myristic, allicin, and sterol (erubozide) derivatives. Onion and garlic tea has long been suggested in China for fever, headache, cholera, and dysentery, and garlic was used as an antiseptic during World Wars I and II to prevent gangrene. Garlic is still used in traditional medicine around the world to cure a wide range of ailments (9). A recent research was undertaken to assess the antibacterial impact of fresh onion and garlic juice compared to the antibiotics of choice, utilizing the diffusimetric agar method. Both plant materials examined had an antibacterial effect, and the bacterial species were identified as sensitive to their activity (10). Studies conducted on cohorts have demonstrated the anticancer activity of garlic in many types of stomach malignancies [11, 12]. The current study sought to assess the antibacterial activity of garlic extract against both gram-positive and gram-negative pathogens.

Material and method

Sample collection and preparation

Garlic cloves were carefully picked from the west Kordofan region, completely washed with pure tap water, and allowed to dry in the sun for 48 hours before being sliced and weighed.

Strains: Ten isolated organisms were collected from West Kordofan University's microbiology department and El-Nhood Hospital**.**

Garlic extraction by water method:

Garlic (90 g) were placed in a beaker containing 180 cc of neutral PH water at room temperature for 7 hours and utilized for examining.

Antibacterial activity testing using Agar well diffusion assay

The isolates' ten Gram positive and Gram negative bacterial strain suspensions were prepared according to McFarland standards, aseptically swabbed into Muller Hinton agar plates, crooked by sterilized blue tips (upper end), 150 micro litter (3 drops) added, and

Species	**Garlic**	
	Zone of inhibition	**Resistant**
Salmonella typhi	(24 mm)	
Salmonella paratyphi A	(21 mm)	
Eschrichia coli	(22 mm)	
Klebsiella pneumoiae	(19 mm)	
Pseudomonas aeruginosa		(5 mm)
Proteus vulgaris		(5 mm)
Proteus mirabilis		(5 mm)
Staphylococcus aurues	(20mm)	
Staphylococcus epidermis	(21mm)	
Enterococcus facalis	(25mm)	

incubated upright at 37°C for 24 hours. The diameter of the inhibitory zone was measured in millimeters, and the results were recorded.

Results

The present study found that the growth inhibition zone diameter was detected around the disc for both gram-positive and gram-negative bacteria. In general, as the concentration of garlic aqueous extract grew, so did the diameter of the growth inhibition zone. Garlic appeared to be effective against Klebsiella pneumoiae, Salmonella typhi, Escherichia coli, Staphylococcus aurues, Staphylococcus epidermidis, Enterococcus facalis, and Salmonella paratyphi (A), but Pseudomonas aeruginosa, Proteus vulgaris, and Proteus mirabilis were resistant.

Discussion

We believe garlic has wide antibacterial activity against both gram positive and gram negative bacteria, even though some gram negative bacteria (Proteus and Pseudomonas) are resistant to garlic. The findings of this study are consistent with Rotaru et al.'s conclusion that fresh juices of both onion and garlic have antibacterial effects with a broad range of action (13) and another study revealing that garlic has natural antimicrobial properties and acts against a variety of microorganisms such as bacteria, fungi, parasites, protozoa, and viruses (14). Furthermore, a study conducted in Iran found that garlic aqueous extract had antibacterial effects against S. aureus present in hamburger, encouraging the use of garlic as a natural additive to hamburger (15). Klebsiella pneumoiae were shown to be resistant to broad-spectrum antibiotics but responsive to garlic extract. Garlic was harmful to Escherichia coli, Salmonella typhi, and Salmonella paratyphi. Garlic-resistant strains include Proteus and Pseudomonas. In contrast to a study on gram-positive and gram-negative bacteria, which found no resistance to garlic extract, we discovered resistance in pseudomonas and proteus (5). Another study on 15 gram-positive and 2 gram-negative Bactria discovered that garlic has broad antibacterial properties (9). We also followed a 2007 trial that found garlic, cefazolin, and oxallcine to be beneficial against staphylococcus and pseudomonas aeruginosa (13). Banerjee and Sarkar discovered in 2003 that aqueous garlic has substantial bacteriostatic activity against both gram-positive and gram-negative bacteria (16). Ghulam's work demonstrated that essential garlic oil had a lower antibacterial activity than garlic extract (17).The current study's findings reveal that garlic has bactericidal activity against both gram positive and gram negative microorganisms.

Conclusion

Because long-term supplementation with garlic and onion is required to achieve their preventive advantages, it is important to examine the potential toxicity and undesirable effects, as well as the interaction with other chemical components. This study concluded that garlic extract shown antibacterial activity against gram-positive and gram-negative bacteria utilizing a water extraction technique. The study found that several gram-negative bacteria (Proteus vulgaris, Proteus mirabilis, and Pseudomonas aeruginosa) were resistant to garlic extract. Finally, garlic extract displayed broad-spectrum antibacterial activity against both gram-positive and gram-negative bacteria, indicating that it could be used as an alternative treatment or booster for bacterial illnesses. Garlic's antibacterial activity is regulated by the solvent and the method of extraction.

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