Influence of watery and alcoholic extracts of Capparis Spinosa plant on bacterial activity

Marwa Hamd Daher and Jawad Kadhum Muraih*

Department of Chemistry,College of science , Al-muthanna University, Iraq

**Corresponding author email: jmuraih@mu.edu.iq*

Received 11-29-2021, Accepted 12-27-2021, published 05-31-2022.

DOI: 10.52113/2/09.01.2022/45-58

ABSTRACT: Alternative pharmacological treatments are the recent medical trend due to their low cost and light side effects. *Capparis spinosa* has a therapeutic history in many societies. Different parts of *C. spinosa* are also used as drugs to treat several diseases. The aim of this study was to assess the antibacterial activity of *C. spinosa* against *Staphylococcus aureus* and *Escherichia coli*. Extraction of the C. spinosa leaves and fruits was performed by using water and 95% ethanol. The biologically active substances were determined using the chemical reagents detection and the optical density spectrum methods, and the effect of these extracts on bacterial activity was studied. The results showed that there is no significant difference between the extraction products of ethanol and distilled water. Also, the results showed that both the leaf and fruit extracts have an effect on the bacterial activity. *C. spinosa* leaves and fruit extracts have antibacterial activity against Gram-positive and Gram-negative bacterial strains.

Keywords: C. spinosa, bacterial, Leaves, fruits.

1. INTRODUCTION

Natural products and their derivatives constitute more than half of all medications in clinical trials around the world [1]. The desire to employ natural products as medicine has sparked research into the methods for collecting plant components needed for pharmacological screening and medication development [2].

It is believed that natural products are safer, because they are more compatible with our biological systems [3]. Plants are the primary element in most traditional medicinal methods, and they have inspired some prominent pharmaceuticals [4]. The plants have long been used to treat a variety of diseases. There are around 45,000 plant species in India, with thousands claiming to have therapeutic benefits [5]. In some

countries, *Capparis spinosa L*. is known by the common name "capers." [6]. It is a xerophytic plant belonging to the *Capparidaceae* family that grows in a wide range of climatic conditions, from dry deserts to cooler alpine elevations [7]. *C. spinosa L.*, sometimes known as the caper bush, is a perennial winter deciduous species with enormous white to pinkish blooms and rounded fleshy leaves [8]. Capparis species have been found throughout Iraq, from the northern to southern plateaus [9]. Extracts from several portions of the *C. spinosa* plant have been discovered to exhibit biological action against a wide range of diseases [10]. Antihyperlipidemic [11], antibacterial, antifungal, anti-amoebic, anti-worm [12], antihypertensive, poultice [13], antileishmania, antihepatotoxic, and antiallergic properties have been demonstrated [14]. This study aimed to investigate the antibacterial behavior of the *Capparis Spinosa* extracts against *Staphylococcus aureus* and *Escherichia coli.*

2. MATERIALS AND METHODS

All the reagents and chemicals used in this study were purchased from good sources, and further purification was not needed. The pathogenic bacterial strains were identified in biology department, college of science, University of Thi-Qar, Iraq.

2.1. Plant Collection

C. spinosa L. was collected in October 2018 from Al Samawa city, Iraq. The fruits and leaves were cleaned, washed, and dried at room temperature for two weeks. The fruits and leaves were ground and kept in glass containers for further use.

2.2. Extraction Method

Extraction of the C. Spinosa leaves and fruits were performed by using two solvents: water and ethanol. The organic solvent extraction of 50 grams of the *C. Spinosa* fruit powder in 500 ml of 95% ethanol was performed by using Soxhlet processing for 10 hours. Then the extracts were filtered through Whatman filter paper No.1 and the solvent was evaporated using a rotary distillation apparatus. They were then kept at 4°C. The same procedure was followed for the extraction of 50 grams of *C. spinosa* leaves with water.

2.3. Antibacterial Activity Assessment

The well-diffusion method was used to estimate the inhibitory effect of the extracts. Practically, 38 gm of Muller Hinton Agar was dissolved in 1 L of distilled water, and the media was heated to reach the boiling point to complete the

dissolving process. The media was sterilized by autoclaving for 15 minutes, then it was poured into a sterilized Petri dish. *S.* aureus and *E. coli* were used. The bacteria were incubated overnight at 37 °C, 4 mm diameter wells were obtained by using a pure cork punch. 1 ml of each extract (100 mg/ml) was added to media agar wells and incubated overnight at 37 °C. The antibiotic Cefotaxime at concentration of 30 mM was used to compare its inhibition activity with the extracts [15].

2.4. Statistical Analysis

The statistical analysis used in this study was performed using Microsoft Excel 2010.

3. RESULTS AND DISCUSSION

The *in vitro* antibacterial activity of crude extracts (ethanol and water solvents) was determined by measuring the diameters of inhibition zones as shown in Table 1. The crude extract of *C. spinosa L.* leaves and fruits showed maximum activity against pathogens *E.coli* and minimum activity against *S. aureus* as shown in Table 1, this could be attributed to the cell envelope including cytoplasmic membrane and cell wall components' structural differences between Gram-positive and Gram-negative bacteria [16]. The broad antibacterial activity of the extract in this study can be attributed to the presence of various bioactive chemicals such as phenolic acids,

Table 1: The antibacterial activity of *Capparis Spinosa* extracts**.**

Name of Organisms	Zone of inhibition in mm							
	Leaves extract		**Fruits extract**		**Control**		D.W	buffer
	Ethanol	Water	Ethanol	Water	Con (+)	Con (-)		
E.coli	17	15	11	10	12	0	0	0
Staph.aureus	13	12	10	9	0	0	0	0

Control (+): Cefotaxime, Control (-): Not found any thing

Figure1: The activity of extract against *Escherichia coli(gram-negative bacteria)*: Fruit extract from ethanol (1); leave extract from water (2); leave extract from ethanol (3); Fruit extract from water (4); D.W (5); buffer solution (6); Control (+): Cefotaxime and Control (-): Not found any thing.

Figure2: The activity of extract against *Staphylococcus aureus (gram-positive bacteria)*: Fruit extract from ethanol (1); leave extract from water (2); leave extract from ethanol (3); Fruit extract from water (4); D.W (5); buffer solution (6); Control (+): Cefotaxime and Control (-): Not found any thing.

glycosides, and flavonoids [17]. Polyphenols have been reported to exhibit antibacterial activities [18]. The inhibition of microorganisms by polyphenolic compounds may occur due to iron deprivation or hydrogen bonding with vital proteins such as microbial enzymes [19]. Polyphenols are well documented to have antibacterial properties [19, 16]. Oxidized polyphenols also have an inhibitory effect on bacterial growth [16]. Polyphenols interact with microbial membrane proteins, enzymes, and lipids, thereby altering cell

permeability and permitting the loss of protons, ions, and macromolecules [20].

Phenolic acids are antimicrobials and are directly involved in the response to micro-organisms. Indeed, their concentration rises after plant infection [21], and the phenolic acid content of vegetables produced by organic or sustainable agriculture is higher than that of vegetables grown without stress, such as those grown in conventional or hydroponic conditions **[**22].

CONCLUSION

The aim of this study was to assess the antibacterial activity of *C. spinosa* against *S. aureus* and *E. coli*. Extraction of the *C. spinosa* leaves and fruits was performed by using water and 95% ethanol. The biologically active substances were determined using the chemical reagents detection and the optical density spectrum methods, and the effect of these extracts on bacterial activity was studied. The results showed that there is no significant difference between the extraction products of ethanol and distilled water. Also, the results showed that both the leaf and fruit extracts have an effect on the bacterial activity. *C. spinosa* leaves and fruit extracts have antibacterial activity against Gram-positive and Gram-negative bacterial strains.

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