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Antibacterial Activity of Syrian Capparis spinosa. (Capparidaceae) Fruits and Roots

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Abstract
The ethanolic extract of *Capparis Spinosa*. Roots and Fruits were tested for their antibacterial activity against four species of bacteria, *Bacillus subtilis, Escherichia coli, Klebsiella* sp.and *Staphylococcus aureus* using disc diffusion technique. The extract concentrations of ethanolic roots and fruits extracts used were 0 (control), 125, 250, 500 and 1000 ppm in triplicates along with standard antibiotic, Ciprofloxacine (5 µg), Gentamycine (10 µg). Comparatively, ethanolic roots extracts showed higher activity than ethanolic fruits extracts. The results showed that In 1000 ppm ethanolic roots extract, a maximum of 3.2 cm ZI was observed against *Staphylococcus aureus* followed by 2.3 cm against *Escherichia coli*. The maximum ZI of 2.1 cm was recorded in 1000 ppm ethanolic extract of fruits against *Pseudomonas aeruginosa* followed by 1.5 cm against *Bacillus subtilis*.
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Introduction

Capparis Spinosa L. belonging to the family, Capparidaceae is a thorny much branched shrub traditionally used for the treatment of jaundice, inflammation and dysentery (Indian Medicinal Plants, 1999; Matthew, 1991). Various parts of *Capparis Spinosa* has been reported to possess anti-inflammatory and analgesic actitivies (Chaudhari *et al.,* 2004) and, hepatoprotective activity (Satyanarayana *et al.,* 2009); stem extracts of *Capparis Spinosa* are reported to possess antimicrobial and anti-inflammatory activity (Satyanarayana *et al.,* 2010). There are very scientific reports available with regard to the biological activities of *Capparis Spinosa*, the antibacterial activity of roots and fruits extracts is scanty. Hence, the present study has been aimed to study the antibacterial activity of ethanolic extracts of roots and fruits of *Syrian Capparis Spinosa* against four selective bacteria.

Materials and Methods

The roots and fruits of Syrian *Capparis Spinosa* L. (Fig. 1) belonging to the Family, *Capparidaceae* were collected in April and the identification was confirmed using standard local floras.

The roots and fruits of *Syrian Capparis Spinosa* collected were individually washed with tap water, blotted with filter paper and spread over news paper for air drying under shade. After complete dryness, the roots and fruits were powdered using a mixer grinder. A known quantity of the powder (100 g) of each plant was taken in a 250 ml conical flask and added with 100-200 ml of ethanol individually for roots and fruits. The solvent-powder mixtures were kept at room temperature for 48 hrs and rapidly stirred using glass rod every 8 hrs. After 48 hrs, the extract of each plant part was filtered to exclude the powder/particles. Then each filtrate was kept in beaker on a water bath at 45ºC until the solvent gets evaporated. A greasy final material (crude extract) obtained for the roots and fruits was transferred to screw cap tubes and stored under refrigerated condition till use.

By using digital electronic balance, 200 mg of each crude extract was carefully taken in a standard measuring flask and 5 ml of ethanol was added to dissolve the extract and 1-2 drops of emulsifier (Triton-X100) was added to completely dissolve the extract. Then it was made up to 200 ml by adding distilled water. This forms the stock solution of 1000 ppm (i.e., 1mg/ml), from which different concentrations of test solutions, 125, 250, 500 and 1000 ppm were prepared and used for antibacterial assay. Disc diffusion method of antibacterial assay was used to test the sensitivity of selected test organisms to the ethanolic extracts.

Each extract (100 µl) was applied to filter paper discs measuring 6 mm diameter and allowed to dry before being placed on the agar plate.

The test bacteria, *Bacillus subtilis, Escherichia coli, Klebsiella* sp., *Staphylococcus aureus* maintained in the Laboratory of Department of Microbiology, Damascus University. The Petri plates of 100 mm diameter with nutrient agar media were swabbed with broth culture of the test bacteria in separate plates by using sterile swab. Over this, prepared antimicrobial discs were placed under aseptic conditions. Three discs of each extract were placed in triangle. Ciprofloxacine (5 µg), Gentamycine (10 µg) were used as standard antibiotic. Also the discs without plant extract were also maintained as control. The plates were then incubated at 37ºC for 24 hrs and the zone of inhibition (ZI) was measured in diameter (cm) around the discs and recorded. The assays were performed with three replicates. From the results, activity index was calculated by comparing the ZI of fruit extracts with standard antibiotic as per the procedure adopted by Prakash and Karmegam (2016).

Results and Discussion

Capparis Spinosa is a genus distributed in many parts of the world with its many species showing varieties of medicinal properties. The medicinal uses of *Capparis Spinosa* are well known and the supporting scientific data available is very scanty. The present study reports the antibacterial activity of roots and fruits extracts against four different bacteria. The standard antibiotic, Ciprofloxacine (5 µg) showed a range of 2.8-3.7 cm zone against the test bacteria, Gentamycine (10 µg) showed a range of 3.6- 4.0 cm zone against the test bacteria. The antibacterial activity of root and fruit extracts of Syrian *Capparis Spinosa* measured in terms of zone of inhibition (ZI) showed variations among different concentrations of extracts and among different bacterial species tested (Tables 1 and 2). Only minimum activity was found in 125 ppm and 250 ppm concentrations of ethanolic fruit extracts against test bacteria. The fruit extract of 500 ppm showed antibacterial activity against all bacteria tested. which ranged from 0.8 to 1.6 cm ZI. In 1000 ppm fruit extract, a maximum of 2.1 cm ZI was observed against *Escherichia coli* followed by 1.5 against *Bacillus subtilis*. The least ZI of 1.4 cm was found in 1000 ppm fruit extract against *Staphylococcus aureus, and 1.3 against Klebsiella* (Table 1).

In comparison, the ethanolic root extracts showed higher ZI against tested bacteria than ethanolic fruit extracts of *Syrian Capparis Spinosa*. The maximum ZI of 3-3.2 cm was recorded in 1000 ppm ethanolic root extract against *Staphylococcus aureus* followed by 2.3 cm against *Escherichia coli* (Table 2).

Table 1: antibacterial effect of fruits of Capparis Spinosa

Bacteria tested	Zone of inhibition (cm)#						
	Std.1	Std.2	0 ppm$	125 ppm	250 ppm	500 ppm	1000 ppm
Bacillus subtilis	**3.5**	**-**	**-**	**-**	**AD**	**0.9**	**1.5**
Escherichia coli	**2.9**	**3.6-3.9**	**-**	**0.7**	**1.0**	**1.6**	**2.1**
***Klebsiella* sp**	**3.7**	**-**	**-**	**-**	**-**	**0.8**	**1.3**
Staphylococcus aureus	**2.8**	**0.4**	**-**	**-**	**AD**	**1.0**	**1.4**
# - Values are mean of three replicates; $ - Control (without extract); Std.1 – Standard antibiotic, Ciprofloxacine (5 µg); Std.2 – Standard antibiotic, Gentamycine (10 µg); AD – Around the disc.							

Table 2: antibacterial effect of roots of Capparis Spinosa

Bacteria tested	Zone of inhibition (cm)#						
	Std.1	Std.2	0 ppm$	125 ppm	250 ppm	500 ppm	1000 ppm
Bacillus subtilis	**3.5**	**-**	**-**	**-**	**-**	**0.4**	**1.1**
Escherichia coli	**2.9**	**3.6-3.9**	**-**	**-**	**0.4**	**1.3**	**2.3**
***Klebsiella* sp**	**3.7**	**-**	**-**	**-**	**-**	**0.1**	**0.4**
Staphylococcus aureus	**2.8**	**0.4**	**-**	**0.2**	**1.1**	**2.7**	**3.2**
# - Values are mean of three replicates; $ - Control (without extract); Std.1 – Standard antibiotic, Chloramphenicol (30 µg); Std.2 – Standard antibiotic, Gentamycine (10 µg); AD – Around the disc.							

Mahboubi and Mahboubi (2014) revealed the scientific support to the traditional uses of root and fruit extracts as antimicrobial agents by studying the methanol, ethanol and ethyl acetate extracts from fruit and root of *Capparis spinosa,* another important medicinal plant species of *Capparis,* which exhibited good activity against microorganisms, especially fungi.

In the present study, the roots and fruits were subjected to antimicrobial activity against selective bacteria in which the results revealed that the ethanolic root extracts had good antibacterial activity.

In conclusion, the ethanolic root and frutt extracts of *Syrian Capparis Spinosa*. showed concentration dependent antibacterial activity. The extracts showed maximum activity in the highest concentration of 1000 ppm used in the present study.

Ethanolic Root extracts of Syrian *Capparis Spinosa* showed higher activity than fruit extracts. The maximum ZI of 3.2 cm was recorded in 1000 ppm ethanolic roots extract against *Staphylococcus aureus* followed by 2.3 cm against *Escherichia coli*.

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