

ANTIMICROBIAL ACTIVITY OF THE JATROPHA SPINOSA EXTRACTS ON THE SELECTED PATHOGENIC MICROORGANISMS

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ABSTRACT

This study was conducted to assess the antimicrobial activity of the stem juice (sap) and the extracts of the *Jatropha spinosa*, that belongs to the Euphorbiaceae family. The stem juice and the methanolic stem extract were tested against three bacterial species and one fungi. They are as follows: the *Staphylococcus aureus*, *Escherichia coli*, *Pseudomonas aeruginosa* and *Candida albicans* was also used via agar diffusion and minimum inhibitory concentration of (MIC) as a determination method. The fresh stem juice and the methanolic stem extract displayed a potential antibacterial activity against all the bacterial species, but the stem juice was more effective than the methanolic stem extract. The plant extracts not showed any efficiency on *C. albicans*. MIC values for all the existing extracts at a

concentration of 25 μ l and 5 mg/l.

KEYWORDS: *Jatropha spinosa*, Pathogenic microorganisms, Juice, Extract, Antimicrobial activity, MIC.

INTRODUCTION

The *Jatropha* tree belongs to the Euphorbiaceae family. This family comprises about 300 to 5000 species distributed mainly in America and (tropical Africa).^[1] The genus *Jatropha* contains approximately 170 known species. The genus name *Jatropha* derived from the Greek *jatros* (doctor), *trophé* (food), which implies medicinal uses.^[2]

The *Jatropha* trees are used in the traditional medicine to cure various ailments in Africa, Asia and Latin America.^[3,4,5] The plant have been used in traditional medicine in many part of Yemen to treat the respiratory tract infection (RTI) and also as an Antiseptic of wounds as well as a hemostatic to stop bleeding and many other uses.^[6] The *Jatropha* possess an antimicrobial activity and contain flavonoids, terpenoids, tannins, and others.^[7,8,9,10,11,12,]

The *Jatropha spinosa* belongs to genus *Jatropha*, it is an small shrub of about 1–2 miter tall, it has spines, watery latex, woody, branches stem. The leaves are glabrous and has long petioles, indented, stipules modified into spines structure like. The antimicrobial effect of this plant has not been studied. In this study, we was screening the antimicrobial activity of *Jatropha spinosa* against some clinical isolates pathogens.

Figure (1) shows aerial parts of *Jatropha spinosa*.



Figure (1). Aerial parts of *Jatropha spinosa*

MATERIALS AND METHODS

The plant materials

The Plant materials were collected from Al-Hood mountain at Al-ddali governorate, Yemen, especially in the dryness seasons and identified by the professor Dr. Al-Gifri.A, at the Biology Department, Faculty of Education/Aden, University of Aden.

The plant sap (juice) collection was gathered by the stem injury using a sterile surgical blade and which collected into micro tube of about (1.5 ml) at the dryness seasons and stored in a refrigerator till further use.

The fresh stem was dried approximately for 15 days in order to get a constant weight and then pulverized in an electric blender and stored in a tight container for further use and getting the methanolic extraction.

EXTRACTION

Exactly 80g of the pulverized plant material was extracted by soaking in 800ml of methanol for 48 hours at the room temperature. The methanolic extracts were filtered through whatman's filter paper NO.1. and the filtrated methanolic extracts were concentrated to dryness.^[10] in an oven at 50°C to remove the methanol solvent and dissolved in Dimethyl Sulfoxide (DMSO) to give a concentration of 100mg/ml and these were kept in refrigerator till further use.

ISOLATION OF MICROORGANISMS

The microbial specimens isolated from patients suffering from different clinical conditions like (wound infection, urinary and tract infection) and included the following organisms: *Staphylococcus aureus*, *Escherichia coli*, *Pseudomonas aeruginosa* and *candida albicans*. The processes of Bacterial culturing and the identification of bacterial and fungal specimens were done at the bacteriological laboratory of Ibn khaldoon Hospital, Lahj Governorate, Yemen.

ANTIMICROBIAL ACTIVITY ASSAY

The Antibacterial and the antifungal activity of the fresh stem juice and the methanolic stem extract of the *Jatropha spinosa* were individually tested against studied microorganisms. The extract were assessed using well Agar diffusion test.^[13] Mullar Hinton agar and PD agar (Himedia, india) was used with different diluted extract concentrations (50 µl, 100 µl and 150 µl). The DMSO solvent was served as a negative control and the Amikacin (30 µg) (Himedia, india) for bacteria and nystatin for fungi as a positive control. The Antimicrobial activity was measured using well diffusion method according to the National Committee for Clinical Laboratory Standard.^[14] All tests were performed in triplicate.

MINIMUM INHIBITORY CONCENTRATION (MIC)

The minimum inhibitory concentration (MIC) was determined by the micro-dilution method using serially diluted (2-fold) of the plant extracts according to the.^[14] A final concentration from 10 to 0.625 mg/ml was used for plant extract. The bacteria inoculation was adjusted to contain approximately 10^5 CFU/ml. The test plates were incubated at 37 °C for 18 h.

RESULT AND DISCUSSION

Antibacterial activity

The results of antibacterial activity of the *Jatropha spinosa* showed that the juice extracts are effective against all of the tested bacteria. Table (1) shows diameter zones of inhibition of

bacterial growth at different concentration of the fresh stem juice and the methanolic extract of the stem.

The highest activity were demonstrated by the *J. spinosa* stem juice against *E. coli* and *P. aeruginosa* respectively, the respective diameter zones of inhibition were 17.3 ± 0.57 , 20 ± 0.74 , 22.6 ± 0.65 and 13.3 ± 0.6 , 18.3 ± 1.52 , 22 ± 0.8 mm respectively. While the lowest activity demonstrated against *S. aureus*, where the diameter zones of inhibition were 8.5 ± 0.44 , 10.6 ± 1 and 13 ± 0.89 mm.

The methanolic extracts of the *J. spinosa* stem were found less effective on the tested pathogenic in comparison with the Juice extract. The diameter zones of the inhibition were 6.3 ± 0.57 , 9 ± 1 , 10.6 ± 0.57 mm at *S. aureus*, 10.83 ± 0.28 , 12.33 ± 0.57 , 13 ± 1 at *P. aeruginosa* and 11.3 ± 0.57 , 13.5 ± 0.5 , 16.1 ± 1.04 at *E. coli*.

In this study, the fresh stem juice exhibited higher antibacterial activity against *E. coli* and *P. aeruginosa* compared to the Amikacin antibiotic.

Antifungal activity

The methanolic stem extracts and the fresh stem juice of the *Jatropha spinosa* were not effective on *C. albicans* at any concentration Table (2).

In our study the MIC is expressed as the lowest concentration of the extract gave inhibition against the bacteria. MIC values for fresh stem juice against the bacteria *E. coli* and *P. aerogenes* were at a 25 μ l and 50 μ l concentration respectively, while the MIC values of methanolic extract against *E. coli* at 5 mg / ml and *P. aerogenes* at 10 mg/l Table (3).

In the present investigation the antimicrobial activity of the *Jatropha spinosa* fresh stem juice (sap) and the stem methanolic extract against three human pathogenic bacteria *E. coli*, *S. aureus*, *P. aeruginosa* and one yeast *C. albicans* has been demonstrated for the first time. The results showed that the extract of *Jatropha spinosa* stem juice was effective than the stem methanolic extract.

Whereas no reports about *Jatropha spinosa* were found, the extracts of other species of *Jatropha* namely, *Jatropha elliptica*, *Jatropha gossypifolia*, *Jatropha variegata*, *Jatropha uncostata*, *Jatropha* and other *Jatropha* species exhibited antibacterial effect against the gram positive and the gram negative bacteria.^[15,16,17,7,8,19,20,21]

Table 1. Antibacterial activity of *Jatropha spinosa* stem juice and extracts against some pathogenic bacteria.

Zone of inhibition (mm) (Mean \pm SD)							
Microorganisms	Fresh juice			Stem extract (methanolic)			Amikacin (30 mcg)
	50 μ l	100 μ l	150 μ l	50 μ l	100 μ l	150 μ l	
Staphylococcus aureus	8.5 \pm 0.44	10.6 \pm 1	13 \pm 0.89	6.3 \pm 0.57	9 \pm 1	10.6 \pm 0.57	17
E. coli	17.3 \pm 0.57	20 \pm 0.74	22.6 \pm 0.65	11.3 \pm 0.57	13.5 \pm 0.5	16.1 \pm 1.04	14
P. aerogenes	13.3 \pm 0.6	18.3 \pm 1.52	22 \pm 0.8	10.83 \pm 0.28	12.33 \pm 0.57	13 \pm 1	16

Table 2. Antifungal activity of *Jatropha spinosa* stem juice and extracts against *candida albicans*.

Zone of inhibition (mm) (Mean \pm SD)							
Microorganisms	Fresh juice			Stem extract (methanolic)			Nystatin (100 units)
	50 μ l	100 μ l	150 μ l	50 μ l	100 μ l	150 μ l	
<i>Candida albicans</i>	6.2 \pm 0.4	6 \pm 0.24	6.8 \pm 0.2	6 \pm 0.0	6 \pm 0.0	6.5 \pm 0.8	12

Table (3). The Minimum inhibitory concentration (MIC) of *Jatropha spinosa* stem juice (μ l) and methanolic stem extracts (mg/l) against pathogenic microorganisms.

Minimum inhibitory concentration (MIC) in mg/l and μ l		
Microorganisms	Fresh stem juice	Methanolic extract
<i>S. aureus</i>	nd	nd
<i>E. coli</i>	25 μ l	5 mg/l
<i>P. aeruginosa</i>	50 μ l	10 mg/l
<i>C. albicans</i>	nd	nd

nd: no detection

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