Antifungal and Antibacterial activity of Fig Fruit Latexes from two Ficus species Plants

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Abstract

This study evaluate the antimicrobial effect of the fig latex (*Ficus carica* and *Ficus elastica*) against some pathogenic bacteria, such as (*Escherichia coli stool patient, Salmonella spp, Staphylococcus aureus ,Pseudomonas aeruginosa ,Klebsiella spp., Escherichia coli UTI and Seratia spp, Aeromonas hydrophila, and Proteus mirabilis*) , and yeasts (*Candida tropicalis ,Candida albicans, Candida sojae , Candida kefyr ,Candida cruzi, , and Cryptococcus neoformans*) these samples obtained from the laboratory of fungi and bacteriology from Baghdad University / College of Science / Department of biotechnology. The results obtained showed that the *Ficus carica* latex has exhibited more antibacterial activity than *Ficus elastica.* While both *Salmonella spp* and *Escherichia coli* stool patient were being more sensitive than other pathogenic bacteria in this study, and also antifungal activity of *Ficus carica* latex was more inhibition effect than *Ficus elastica* m using agar well diffusion method for determination of inhibitory zone diameter, *also both Candida tropicalis* and *Candida albicans were* recorded the higher inhibition zone (30mm, 25mm) respectively than other yeasts (*Candida sojae, Candida kefyr ,Candida cruzi* ,and C*ryptococcus neoformans*). The study concluded that fig fruit latex have antimicrobial activity against some pathogenic bacteria especial Enteric bacteria and some yeast species *Candida*, *Cryptococcus*.

Keywords: Antifungal activity, antibacterial activity, latex, *Ficus carica,Ficus elastica.*

Introduction

Ficus, the fig genus constituted of the largest genera of medicinal plants over 800 species of woody plants, trees, shrubs, vines epiphytic and hemi epiphytic in the family Moraceae, various parts of the plant like bark, leaves, tender shoots, fruits, seeds and latex are medicinally important [1],[2]. The fig species of greatest commercial importance is *Ficus carica* L. (common fig), belongs to the family Moraceae which is one of the oldest fruits in the world [1].Other species of Ficus are *Ficus elastic* L. called rubber bush , rubber plant or India rubber bush[3], possesses antimicrobial activity (antibacterial and antifungi), and alsoanti-inflammatory activity of skin diseases [4].

Some active constituents found in *Ficus carica* latex include natural furocoumarins, phytosteroids, 18 fatty acids and certain amino acids, phytosterol, polyunsaturated fatty acids and phenolic acids [5,6].

F.carica latex exerted powerful anti-antibacterial properties against several species of bacteria ,and some fungi [7], also the latex of *F. elastica* has been analyzed for its phytochemicals as an intermediate energy source [8], but *F. elastic* latices did not have any antiviral activity [9].

This study was aimed to present an overview of latex extracts against some pathogenic bacteria and yeasts in this plant that are the causative agents of bacterial infections and important fungi.

Materials and Methods

This study was carried out in May / 2015 in the laboratories of Biotechnology Department–College of Science / Baghdad University.

Samples collection:

Plant material and extraction

Ficus carica and Ficus elastic fruits were collected in May / 2015 from the home garden in Baghdad were sterilized using membrane was confirmed sterilizer plant classification by Dr. Ali AL-Moussawi / Baghdad University/ College of Science / Department of Biology .

This fig fruit was cut open from its top, then slightly squeezed to collect a few drops of latex in a sterile tube then stored at (-30°C) until further use.

And then sterilized latexes through a sterile filter paper size of 0.45 µm and then used antibacterial and antifungal samples.

Microbial strains:

Microorganisms (Bacteria and yeasts) samples were obtained from culture collection in the laboratory of fungi and bacteriology from Baghdad University/ College of Science/Department of biotechnology, and then Diagnostic by VITEK® System.

VITEK device is used to diagnose types of bacterial isolates and yeasts after ascertained mediated biochemical initial tests, as well as determine the minimum inhibitory concentrations (MIC), and the impact of bacterial and fungal antigens, and the device is made from Cassette and card holder Reagent cards containing (64) hole each one represents a material foundation or the center to conduct the test, and nd plastic pipes as well as device Densi Chek and the unity of the introduction of information and taking them out as It is shown in the figure(1).

Determine the diagnosis Identification Level object level: comparing and taxonomic characteristics of the device is determined diagnosis object through his experiences map level, be given to the possibility of the object relative confidence level, for example, if the probability ratio of 96-99% is at the excellent level of confidence. (2014Biomerieux),

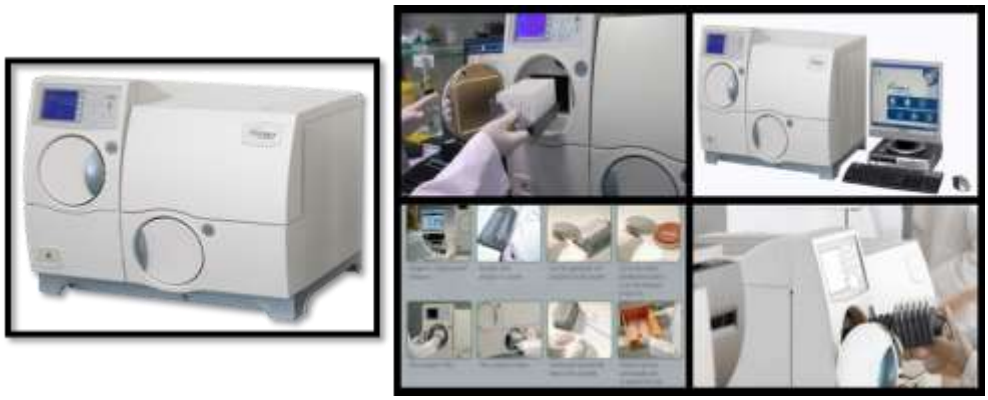

Figure (1) : (Biomerieux, 2014) VITEK® device

We used in this study two opportunists pathogenic yeasts (*Candida albicans, Candida tropicali, Candida cruzi, Candida kefyr, Candida sojae* and *Cryptococcus neoformans).* And The test pathogenic bacteria used in this study included, two gram positive bacteria *(Staphylococcus aureus, Streptococcus pyogenes)* and seven gram negative bacteria *(Klebsiella pneumonae, Klebsiella spp., Pseudomonas aeruginosa, Salmonella spp., Escherichia coli, Proteus mirabilis, Seratia spp.* , and *Aeromonas hydrophila)*

Antimicrobial assay

Well diffusion method

Mueller-Hinton agar (MH) and Sabouraud Dextrose agar (SDA) medium were respectively used for bacteria and fungi growth. Microbial cultures, freshly grown at 37°C/30°C were appropriately diluted with sterile normal saline solution to obtain the cell suspension at 105 CFU: ml. To evaluate Antimicrobial activity, an agar well diffusion method was used as described by [10]. The organisms were spread on MH and SD agar plates by cotton swab. Wells of 6 mm diameter were punched into the agar medium and filled with 100 µl of fig latex. The plates were incubated for 24 h at 37°C for bacteria and 72 h at 30°C for yeasts. Antimicrobial activity was evaluated by measuring the inhibition zone diameter against the test organisms.

Results and discussion

The results of antimicrobial activity (antibacterial and antifungal activity) of latex of fig fruit are indicated in table (1).

Table (1): It showed that the latex of *F. carica* and *F. elastica* fruit inhibition zone against the pathogenic bacteria and yeasts

Strain No.	Bacterial spp and yeast spp.	Inhibition zone (mm) of *F. carica*	Inhibition zone (mm) of *F. elastica*
1	*Pseudomonas aeruginosa*	10±0.00	10± 0.23
2	*Staphylococcus aurous 1*	14± 0.23	33± 0.40
3	*Staphylococcus aurous 2*	19± 0.10	25± 0.23
4	*Staphyococcus aurous 3*	15± 0.23	12± 0.22
5	*Pseudomonas aeroginosa*	29± 0.11	10± 0.11
6	*Aeromonas hydrophila*	7± 0.02	8± 0.11
7	*Proteus mirabilis*	6± 0.02	9± 0.00
8	*E. coli UTI pat.*	20± 0.01	12± 0.43
9	*E. coli standard*	20± 0.34	15± 0.45
10	*E. coli PBR 322*	15± 0.23	10± 0.34
11	*E. coli stool pat.*	28± 0.11	26± 0.45
12	*E. coli stool pat.*	30± 0.23	30± 0.14
13	*E. coli Amp (re) Tel (re)*	12± 0.22	19± 0.22
14	*Streptococcus pyrogenes*	20± 0.11	22± 0.00
15	*Salmonella spp.*	30± 0.77	20± 0.00
16	*Klebsila spp.*	22± 0.45	25± 0.76
17	*Klebsila pneumonia*	20± 0.76	12± 0.22
18	*Seratia spp.*	19± 0.43	22± 0.23
19	*Candida albicans*	25± 0.45	26± 0.12
20	*Candida tropicalis*	30±0.23	25± 0.67
21	*Candida cruzi*	14± 0.20	17± 0.00
22	*Candida kefyr*	19± 0.23	12± 0.22
23	*Candida abicans*	22± 0.34	17± 0.23
24	*Candida tropicalis*	19± 0.23	12± 0.12
25	*Candida sojae*	22± 0.12	19± 0.00
26	*Cryptococcus neoformans*	12± 0.34	10± 0.00

It showed that the latex of *F. carica* fruit exhibited strong activity against the gram negative bacteria *Escherichia coli* stool patient and *Salmonella spp*, (30 mm in diameter as inhibition zone), as compared with *F. elastic*a latexes was recorded against *Staphylococcus aureus* as higher inhibition zone diameter (30mm) while gram negative bacteria *Escherichia coli* stool patient was recordrd (30mm). ,the next bacteria were sensitive to the *F. carica* latex *Pseudomonas aeruginosa* (29 mm in diameter as inhibition zone), *Klebsiella spp., Escherichia coli* UTI and *Seratia spp* which recorded (22 mm, 20 mm, 19mm) respectively, but these bacteria, *Aeromonas hydrophila, and Proteus mirabilis* appeared to be less sensitive to the *F. carica* latex, the inhibition zone were (7 mm , 6 mm) respectively.

While it showed moderate activity against gram positive bacteria *Streptococcus pyogenes*it was recorded 20 mm *in diameter and Staphylococcus aureus (*19 mm in diameter as inhibition zone).

Staphylococcus aureus and *Escherichia coli* stool pat were the most sensitive to the latex of *F. elastic*, while the bacteria *Escherichia coli* stool pat, *Klebsiella spp, Streptococcus pyogenes*it and *Salmonella spp* were recorded (26mm, 25mm, 22mm, 20mm) respectively, but Klebsiella pneumonia , *Pseudomonas aeruginosa, Proteus mirabilis* and *Aeromonas* hydrophila were recorded inhibition zone diameter (12mm, 10 mm, 10 mm, 9 mm, 8mm) respectively.

These results revealed that a latex extract of fig had inhibition of the growth of all bacterial species used in this study. They indicated that the latex of fig fruit was high against gram positive bacteria as compared with gram negative bacteria [7]. Form the same table different inhibitory effects can be observed the latex of *F. carica* exhibit more inhibitory effect than Ficus elastic which may be to the difference in the amount of active inhibitory compounds excreted by each plant.

On the other hand, the antifungal activity of latex extract of fig showed a high inhibitory effect against all yeast strains. It was recorded inhibition zone diameter ranged from 30 mm to 12 mm with fig latex of *F. carica ,as compared with F. elastica latex* it was recorded inhibition zone diameter ranged from 25 mm to 10 mm. The highest inhibition zone diameter was recorded against *Candida tropicalis* (30mm), while it was recorded with *F. elastic* (25mm in diameter as inhibition zone), and *Candida albicans, Candida sojae , Candida kefyr* which recorded (25 mm, 22 mm,19 mm) respectivelywhilethe lowest inhibition zone diameter was recorded against *Candida cruzi, ,* and C*ryptococcus neoformans*(14mm , 12mm) with *F. carica* latex , as compared with *F. elastica latex* the yeasts *Candida albicans*as the highest value for *Candida albicans* (26 mm) , and *Cryptococcus neoformans* also the lowest value (10mm) . The results in table 1 showed that latex of *F. carica* was more active than of *F. elastica*for the yeasts. So compared with Rashid and Mahdi [11] showed that The latex fig (*Ficus carica*) showed higher activity against these bacteria *Staphylococcus aureus, Streptococcus pyogenes, Pseudomonas aeruginosa, Salmonella typhi* , were recorded (15 mm IZD) for each of them, but *Klebsiella pneumonae* and *Escherichia coli* seemed to be resistant which showed (11 mm, 10 mm IZD),and the fungi *Aspergillus nigar* (18 mm IZD) , *Candida albicans* (16 mm IZD), *Fusarium oxysporum* (17 mm IZD.

This study was indicated that fig latex extracts have antimicrobial activity against some pathogenic infections.

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الفعالية المضادة للفطريات والبكتريا لحليب التين لنوعين من نبات التين

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الملخص

تقدم هذه الدراسة تقدير تأثير المضادات المايكروبية لحليب التين (*Ficus carica* ، *Ficus elastica*) ضد بعض انواع البكتريا المرضية (*Escherichia coli stool pat , Salmonella spp, Staphylococcus aureus ,Pseudomonas aeruginosa ,Klebsiella spp.,*) (*Candida* والخمائر *Escherichia coli UTI* and *Seratia spp, Aeromonas hydrophila,* and *Proteus mirabilis) tropicalis ,Candida albicans,Candida sojae , Candida kefyr ,Candida cruzi, , and Cryptococcus neoformans)*. هذه العينات التي تم الحصول عليها من المختبر من الفطريات والجراثيم من جامعة بغداد / كلية العلوم / قسم التكنولوجيا الحيوية. وقد أظهرت النتائج المتحصل عليها ان *Ficus carica* ابدى فعالية عالية كمضاد بكتيري اكثر من *Ficus elastica* ، حيث ان كلا البكتريا *Salmonella spp* و *Escherichia coli* stool pat كانا اكثر حساسية من الانواع البكترية الاخرى في هذه الدراسة. وكذلك ابدى *Ficus carica فعالية عالية كمضاد للخمائر اكثر من Ficus elastica* باستخدام طريقة الحفر في الاكار لتحديد قطر المنطقة المثبطة ، اذ سجل الخمائر *Candida tropicalis* و *Candida albicans* أعلى تثبيط (25mm ، 30mm) على التوالي اعلى من الانواع الاخرى من الخمائر. ونستنتج من الدراسة ان حليب فاكهة التين لها فعالية مضادة للمايكروبات ضد بعض أنواع البكتيريا خصوصاً التي البكتريا المعوية وبعض أنواع الخميرة المبيضات *Candida* و *Cryptococcus* .

الكلمات المفتاحية: فعالية المضاد الفطري ، فعالية المضاد البكتيري ، حليب التين ، التين الشائع ، التين الزغبي.