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Antimicrobial Activity of *Ficus bengalensis* and *Ficus elastica* Fruit Latex against Selected Bacteria and Fungi

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Abstract

The present study investigates the use of agar well diffusion method and the inhibitory effect of *Ficus bengalensis* and *Ficus elastica* fruit latex on two gram-positive bacteria (*Staphylococcus aureus*, *Streptococcus pyogenes*), nine gram-negative bacteria(*E.coli* from UTI patient, *E.coli* from stool patient, *E.coli* PBR322, *E.coli* (ampicilline and tetracycline resistance), *Pseudomonas aeruginosa* , *Proteus mirabilis* , *Klebsilla pneumonia* , *Salmonella spp.* and *Seratia spp.*) and five Candida species(*Candida albicans*, *Candida tropicalis*, *Candida cruzii*, *Candida kefyr* and *Candida sojae*). The results showed that latex of *Ficus bengalensis* and *Ficus elastica* fruits have significant inhibitory effect against bacterial and fungal species used in the study. Different inhibitory effects can be observed that *Ficus bengalensis* latex showed more inhibitory effect than *Ficus elastic*. Candida species are more susceptible to fig latex than bacterial pathogens, whereas gram negative bacteria are less susceptible as compared with gram positive bacteria. In conclusion, present study showed that fig fruit latex have antimicrobial activity against various pathogenic bacteria and fungi.

Keywords: *Ficus bengalensis*; *Ficus elastic*; Fruit Latex; Antimicrobial Activity.

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1. Introduction

There is an urgent and continuous need to discover new antimicrobial compounds with diversity in chemical composition and mechanisms of action, due to the alarming increase in the incidence of new infectious diseases and its reemergence. In addition to the evolution of antibiotic resistance in current clinical use [1]. Therefore, for the treatment of infectious diseases, many alternative and complementary compounds are discovered for safe therapeutic purposes. Nowadays, plant products considered as best solution for effective control of microbial infections, because of their side effects on body tissues are low [2]. Ficus is the largest genus in the family Moraceae, with 800 species of woody plants, trees and shrubs, mainly found in tropical and subtropical regions throughout the world [3]. Many ficus species are commonly used as food and in folk medicine to cure different disease [4]. Various parts of the plant like fruits, leaves, bark, seeds and latex have long been used in traditional medicine as astringents, carminatives, stomachics, vermonicides, hypotensives, antihelmintics and anti-dysentery drugs [5]. Previous phytochemical studies on the ficus showed the presence of tannins, steroids, phenolic acids, alkaloids , saponins, flavonoids and triterpenes [6,7]. The most important species of ficus are *F. bengalensis, F. elastica, F. carica* and *F. racemosa* [5].

All ficus species have latex-like material within their vasculatures, providing protection and cure from physical attack [8]. It is an aqueous suspension of a complex mixture of molecules found in specialized secretory cells of plants, known as laticifers, which synthesize and store variety of secondary metabolites in significant amounts, namely, starches, sugars, oils, resins, terpenoids, alkaloids, tannins, flavonoids, phenols, sterols, saponins, glycosides, enzymes and proteins [9,10]. It has been used in several traditional folk medicine remedies, most of them used to treat skin viral infections [4,10]. Ficus latex has been reported to include anti-inflammatory, antioxidant activity [10], antiviral, antibacterial properties against several species of bacteria, hypoglycemic and anthelmintic effects [10, 11, 12]. It was observed that coumarins compose almost 91% of the active components found on latex [13]. Natural furocoumarins, phytosteroids,18 fatty acids, certain amino acids, phytosterols, polyunsaturated fatty acids and phenolic acids are the most active ingredients found in ficus species latex [10, 13, 14]. This study was aimed at providing the antimicrobial activity of *F. bengalensis* and *F. elastica* latex against some pathogenic bacteria and fungi.

2. Methods

2.1. Latex extraction

Fig fruits latex of *F. bengalensis* and *F. elastica* were collected from unripe fresh fruits. For getting maximum amount of latex, fig fruits were cut from its top, slightly squeezed to collect the latex that sterilized by Whatman No.2 filter paper in a sterile glass vessel . Stored the extracts at 4°C for while in use for various antimicrobial bioassays [15].

2.2. Microbial Strains

The test organisms used in this study included, 2 gram positive bacteria (*Staphylococcus aureus, Streptococcus pyogenes*), 9 gram negative bacteria(*E.coli* from UTI patient, *E.coli* from stool patient, *E.coli* PBR322, *E.coli*

(ampicilline and tetracycline resistance), *Pseudomonas aeruginosa* , *Proteus mirabilis* , *Klebsilla pneumonia, Salmonella spp.* and *Seratia spp.*) and 5 Candida species(*Candida albicans, Candida tropicalis, Candida cruzii, Candida kefyr* and *Candida sojae*). These strains were collected from laboratories of College of Science /Baghdad university.

2.3. Antimicrobial assay

Antimicrobial activity of crude fig fruits latex were tested using an agar well diffusion method [15]. For bacteria and candida species growth, Mueller-Hinton agar (MH) and Sabouraud Dextrose agar (SDA) medium were respectively used. Microbial cultures that freshly grown at 37°C / 30°C, were appropriately diluted in sterile distilled water to obtain cell suspension at ($1.5*10^8$cfu/ml). 100µl of suspensions were spread on(MH) and(SDA) plates, allow the inoculums to dry. Wells of 5 mm diameter were made into the agar medium and filled with 100 µl of fig latex. The latex was allowed to diffuse into the medium for 1 h at room temperature. Plates of test organisms were incubated at 37°C for 24 h for bacteria and at 30°C for 72 h for candida species. Antimicrobial activity was estimated by measuring the inhibition zone diameter against the test organisms [16].

3. Results and Discussion

The wide spread of drug resistance in human pathogens against commonly used antibiotics became one of the major problems in the world that required a search for alternative antimicrobial substance from other sources including plants and microbes [17]. The traditional medicinal methods, especially the use of medicinal plants, still play an essential role to support the basic health need in the developing countries. In this manner, plants still to be a rich source of therapeutic agents [1].

Latex was used directly without dilution because large amounts of it are lost during collection of the fruits. In addition, the dilution of remaining latex in the collected fruit may decrease the possibility of detecting antimicrobial substances present in it.

Eleven identified clinical bacterial isolates(2 Gram-positive and 9 Gram-negative bacteria) and five candida species were checked for their susceptibility pattern to crude fig fruits latex. Antibacterial and antifungal activity are indicated in table-1.

The results revealed that all bacterial species used in the study are susceptible to fig latex. It was examined by the presence of inhibition zone diameter. This antibacterial activity is mainly due to the presence of high level of various active components such as phenolic compounds, flavanoids, tannins, saponins and enzymes which play important role in plant defense and showed higher antimicrobial activity that can used as strong antimicrobial agents for chemotherapy of multidrug resistant human pathogens [5, 10, 11, 12,15]. It was indicated that the latex of fig fruit is less active against gram negative bacteria as compared with gram positive bacteria that may be attributed to the differences in cell wall structure [18].

On the other hand, the antifungal activity of latex extract of fig show high inhibitory on the yeast subjected in the study as represented in table -1. More often, this is due to the proteolytic enzymes and other proteins that fig

latex contain, which lyse the glucan, the main compound in the structure of candida cell wall [15, 19].

It was observed that candida species are more susceptible to crude fig latex than bacterial pathogens. Different inhibitory effects can be observed that the latex of *Ficus bengalensis* exhibited more inhibitory effect than *Ficus elastic* which may be due to the difference in the amount of active inhibitory compounds found in each plant, also may be related to the mechanism of action which represented that the *Ficus bengalensis* latex effects on microbial respiration and increase the permeability of cell membrane after lysis microbial cell wall, therefore latex act heavily upon human and veterinary pathogens[15, 19].

Table 1: Susceptibility of Microbial Strains to *F.bengalensis* and *F.elastica* Crude Latex

Strain number	**Bacterial Strains**	**Inhibition zone Diameter (mm) of**		
		F. bengalensis latex	**F. elastica latex**	**Chi-square– $\chi 2$ value**
1	Staphylococcus aureus	23	25	9.462 **
2	Streptococcus pyogenes	21	22	10.062 **
3	E.coli from UTI patient	19	12	10.812 **
4	E.coli from stool patient	18	16	10.538**
5	E.coli PBR322	15	10	10.944**
6	E.coli (ampicilline and tetracycline resistance)	20	19	10.819**
7	Pseudomonas aeruginosa	10	10	10.931**
8	Proteus mirabilis	13	9	11.035**
9	Klebsilla pneumonia	19	12	8.592**
10	Salmonella spp.	20	17	10.628**
11	Seratia spp.	17	12	10.819**
12	Candida albicans	25	26	9.140**
13	Candida tropicalis	30	25	7.351 **
14	Candida cruzii	18	17	7.150**
15	Candida kefyr	19	12	8.255**
16	Candida sojae	22	19	8.437 **

4. Conclusion

Fig fruits latex of *F.bengalensis* and *F.elastica* have antimicrobial activity against pathogenic bacteria and fungi. So, it can be used in the production of therapeutic materials (antimicrobial agents), thus reducing the incidence of resistance among pathogens that appear as a result of the misuse and overuse of antibiotics.

5. Recommendations

Many more studies are needed to isolate and characterize the bioactive components present in *F.bengalensis* and *F.elastica* latex, and confirm ingredients effect *in vivo.*

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