

Original article

A comparative study of antibacterial activity of Fig and Olive Leaves Extracts

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Abstract

This comparative study was conducted to evaluate abroad spectrum antibacterial activity of ethanolic extracts of *Olea europaea* leaves (Olive tree) and *Ficus carica* (Fig tree). This study was carried out by using the agar disc diffusion method at concentration of 200mg/ml against bacterial strains of *Enterococcus faecalis* (Gram-positive bacteria) and *Escherichia coli* (Gram-negative bacteria). The results showed that olive leaves extract was the most active extract inhibiting bacterial growth of *E. faecalis*. However, both olive leaves extract and fig leaves extract did not show antibacterial effects against *E. faecalis* and *E. coli*. It's considered that some other works should be conducted about using olive and fig leaves extract against other bacterial species, especially multidrug-resistance strains.

Keywords: Antibacterial activity, *Ficus carica*, *Olea europaea*, *Enterococcus faecalis*, *Escherichia coli*.

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Introduction

The world has used medicinal plants for many reasons such as small expenses and the fewest side effects compared to chemical and pharmaceutical products [1]. The *Ficus carica* is one of the oldest herbal trees that was used as a herbal medicine [2]. *Olea europaea* is cultivated from ancient time in the Mediterranean regions [3]. The phenolic compound (Oleuropein)

represents the highest amount of olive leaves (up to 60-90mg/g dry leaves) and so reflect the antibacterial activity of different leaves extracts [4].

Many studies reported the antibacterial efficiency of olive leaves extract or its phenolic compounds against several bacterial species [5,6]. The results of

antibacterial activity of different extracts suggested that the antibacterial activity of olive leaves extract against Gram-positive bacteria is essentially due to the phenolic compounds as ligestroside, oleuropein, tyrosol, hydroxytyrosol, etc. [5,7]. However, the antimicrobial activity of fig leaves extract against Gram-negative bacteria is partly due to the presence of phenolic compounds, such as caftaric acid, quercetin, p.hydroxybenzoic acid, caffeic acid, gallic acid, etc. [8,9,10].

It has also been found that the antibacterial effect of olive leaves extract was higher than that of the stem extracts, and that the petroleum ether extract of the olive leaves and stems reported no activity against SA

and MRSA, while ethanolic extract of olive leaves caused high inhibition zone against both of them [11]. aqueous extracts had a better activity against gram-positive bacteria including (SA) and (MRSA) than ethanolic extracts [12]. Further research is needed to investigate the broad spectrum activity of olive and Fig leaves extracts with applying all different methods of leaf extraction.

The aim of the present study was to determine the antibacterial activity of locally collected *Olea europaea* and *Ficus carica* leaves ethanolic extracts and compare their antibacterial activity against a Gram-positive bacteria *E. Faecalis* and a Gram-negative bacteria *E. coli*.

Materials and Methods

Medicinal Plants Materials and Preparation

The leaves of two medicinal plants, namely *Olea europaea* and *Ficus carica* were collected from Al-assaba area which is about 120 kilometres southwest of the capital city Tripoli - Libya. The medicinal plants used in this study were identified and confirmed by Botany Department,

Faculty of Science, Aljabal Algharbi University.

The leaves of the medicinal plants were collected in early morning, then cleaned with tap water to remove dusts, and dried at shadow for 15 days till they became crisp. After drying, the leaves were powdered finely using a blender.

Plant ethanolic extraction

Extraction procedure were carried out at the microbiology laboratory at Al-Assaba General Hospital. Briefly, 50 grams of each finely powdered plant were separately dissolved in a flask containing 500ml ethanol 96% for 48 hrs using hot plate magnetic stirrer. The samples were filtered using filter paper Whatman No.1. The filtrates were collected and evaporated to dryness using hot air oven at 40°C and the residue was kept in the refrigerator at 4 °C until use as previously described [13].

Bacterial isolate

Bacterial strains of *E. faecalis* (Gram-positive bacteria) and *E. coli* (Gram-negative bacteria) were isolated from out-patient in Microbiology Department of Al-Assaba General Hospital. The aforementioned bacterial isolates were subjected to gram staining, growth on selective media and some biochemical tests,

using Bergy's manual of determinative bacteriology charts to verify the bacterial isolates [14]. The pure culture bacteria were streaked on nutrient agar plates and incubated at 37 °c for approximately 24 hrs to obtain isolated, actively growing colonies.

Antibacterial Activity Assay

Antimicrobial activity of both leaves extracts were researched by disc diffusion method on Mueller-Hilton agar (Oxoid CM337) [15]. Both leaves extracts were dissolved in 2:4 Dimethyl Sulfoxide (DMSO) and water respectively. All assays were carried out under aseptic conditions. Suspension of the tested microorganisms (1×10^8 CFU/ μ L) was spread on the solid media plates [16]. Then 6-mm diameter of whatman filter paper discs were sterilized

at 121°C, 15 pound per inch for 15 min in an autoclave. The discs were impregnated with previous extracts for 4 hrs at room temperature and allowed to dry. The impregnated discs were placed on the inoculated agar and they were incubated at 37°C for 24 hrs. The antimicrobial activities were evaluated by measuring the zones of inhibition against the test organisms. Each experiment was repeated three times.

Results

There was a clear variation between *Ficuscarica* and *Oleaeuropaea* ethanolic leaves extracts at concentration 200mg/ml on the growth of *E. faecalis*. *Oleaeuropaea* leaves extract was the more effective for the inhibition of *E. faecalis* than the *Ficuscarica* leaves extract with zone of inhibition was 11

mm. In contrast *Ficuscarica* leaves extract did not inhibit *E. faecalis* growth as shown in Figure-1-A. There were no inhibition effect of both *Ficuscarica* and *Oleaeuropaea* ethanolic leaves extracts at concentration 200mg/ml on the *E. coli* growth (Figure1-B).

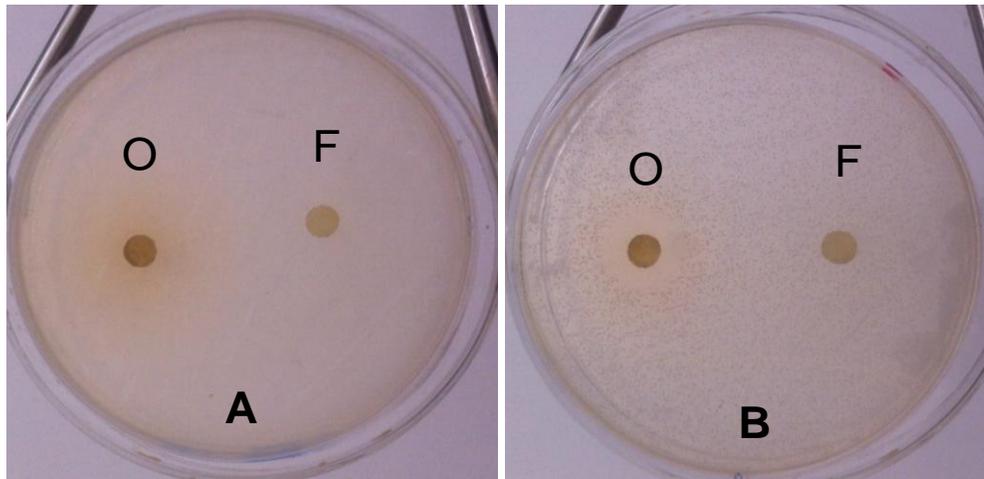


Figure 1: Antimicrobial activity of both olive and fig leaves extracts were tested by disc diffusion method on Mueller-Hilton agar. (A) E. coli growth and (B) E. faecalis growth; Zone of inhibition effect of olive (O) and fig leaves extracts (F).

Discussion

Plant antibiotics receive more attention, since they are generally considered very safe and have many positive effects on human health [17]. Recent scientific researches indicated the potential use of natural antimicrobials with a broad spectrum of antimicrobial effect [18,19]. This experiment involved a Gram-positive bacterial strain (*E. faecalis*) and a Gram-negative bacterial strain (*E. coli*), using the disc diffusion agar method. Antimicrobial activity evaluation of extracts with 200mg/ml concentrations. In this study, ethanolic extract was used as it was more active and safe, when compared with other

organic solvents used in other literature review [20].

Olive leaves extract was the most active extract inhibiting bacterial growth of Gram positive bacteria (*E. faecalis*). The results from this study are in agreement with the our recent finding reported by Ali et al. [20]. On the other hand, olive leaves extract and fig leaves extract did not show activity against Gram-negative bacterial strain *E. coli*. The bactericidal effect on Gram-positive bacteria was more than Gram-negative bacteria may be due to more lipid membrane structure in *E. coli* than *E. faecalis*.

The limitation of present study was the use of only one species of gram-positive bacteria *E. Faecalis* and one species of Gram negative bacteria *E. coli*. In addition of using only one an organic solvent for extraction procedure. Furthermore, we used a disc diffusion agar method instead of a well diffusion agar method which showed higher antibacterial activity in the our previous study [20]; therefore these two methods should be evaluated. Our finding

highlight that olive and fig extraction did not exhibit abroad spectrum antibacterial. In contrast, these results were not consistent with those reported by Mohamed et al. who found that olive and fig leaves extracts have antimicrobial activity against Gram-negative and Gram-positive bacteria [21]. The broad spectrum antibacterial finding could be due to that the authors used aqueous extract and the well diffusion agar method.

Conclusion

According to this study, the olive leaf extract presented the highest antibacterial activity against *E. faecalis*. However, both extracts did not show any inhibition against *E. coli*. Its considered that some further works should be conducted to assist a wide

spectrum activity against both Gram positive and Gram negative bacteria. By using higher concentrations of the extracts, different types of extraction procedure and wide kinds of pathogenic Gram negative and positive bacteria.

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Disclaimer

The article has not been previously presented or published, and is not part of a thesis project.

Conflict of Interest

There are no financial, personal, or professional conflicts of interest to declare.

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