Evaluation of Antifungal and Antioxidant Effects of Qutran (Wood Tar) from Olea europaea Subsp. Cuspidate

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Author’s contribution

The sole author designed, analysed, interpreted and prepared the manuscript.

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ABSTRACT

Qutran oil (Olea europaea) extracted as medicinal plants extracted has a great activity against four fungistrains. Aspergillus (flavus, fumigatus, niger) and Candida albicans throughout using agar well diffusion in our investigation. Results showed that, tar oil has antifungal effects against studied strains. Inhibition growth rate was from 16.33 to 46.00 mm. and also has positive activities against investigated organisms more than traditional antibiotics either amphoteracin B or Nystatin. A. fumigatus was mainly susceptible fungi followed by A. niger while A. flavus has the most resistant fungi with inhibition zone (16.33 mm). Wood tar oil, Olea europaea, given a high DPPH radical scavenging activity 79.10% compared to ascorbic acid.

Keywords: Antimicrobial activities; wood tar; antioxidant activity; Olea europaea.

1. INTRODUCTION

Olive tree (Olea europaea) is aperennial plants which were cultivated for many purposes such as oil, wood, leaf. Additionally, it has drought-resistant, disease and fire-resistant properties. Its root has robust and capable of regenerating of tree [1]. Tar oil could be used as flavoring, spice,
scent for saunas, anti-dandruff and drags for many diseases [2,3].

Cuspidata produced by the wood destructive distillation as antifungal infections cause high mortality rates among human populations and aquaculture organisms. Due to this, the side effects of these drugs, searching about new natural plant alternatives with desirable side effects become urgent for solving the traditional problems of using anti-biotic against many pathogens. Extracts of some plant species have rich component of such aromas materials and could be used as antimicrobial agents. There were many studies on plant extracts antimicrobial effects. Our invention given a new approach for tar oil could using as antifungal and antioxidant agents against many pathogenic.

2. METHODS

2.1 Samples

Wood tar oil (Olea europaea subsp. Cuspidata) extracted by destruction distillation, from Al bahah district was obtained during May, 2019 from cool summit (2242 M.A.S.L.) at Al bahah district, southwestern Saudi Arabia (19°59′14.12″N, 41°27′53.01″E). Which was fervid at Sciences Herbarium Faculty (N. 1597), King Abdul Aziz University. Qutran solution prepared in dimethyl sulfoxide (200 mg/ml) then stored in darkness and used in the antifungal and antioxidant experiment.

2.2 Extract Preparation

Extracted Wood tar oil (Olea europaea sub sp) by Destruction Distillation.

2.3 Fungal Strains

For the antifungal assay, four fungi (A. flavus (ATCC200026); A. fumigatus (ATCC204305); A. niger (ATCC1015) and Candida albicans (ATCC10231) from King Fahed Hospital. Organisms subcultured Saboroud dextrose agar slopes (UK)/4°C. Petri plates prepared with sterile agar for cultivating fungi.

2.4 Antifungal Assay

Well-cut diffusion according to [4]. DMSO as negative control. Nystatin and amphotericin B as positive control. Cutting wells from plate using 0.5 cm cork borer. The wood tar oil extract introduced into each well, and plates kept at 4°C /2 h. Plates incubating 2-4 days /27°C. Diameter growth inhibition holes from extract measured in millimeters/triplic at for each treatment [5].

2.5 Free Radical Scavenging Activity

Measuring plants by 1, 1-diphenyl-2-picryl hydrazyl. 0.1 mM (DPPH) in ethanol. This solution (1 ml) added to 3 ml. of extracts in ethanol at (5, 10, 15, 20, 25, 30 µg/ml). All extracts with various concentrations prepared by dilution method. Mixtures were shaken vigorously and allowed / 30 min. then, absorbance measure at 517 nm. (spectrophotometer /UV-VIS).15. IC 50 of sample required to inhibit 50% of DPPH free radical and calculating by Log dose inhibition curve. DPPH scavenging % or inhibition% = A0 - A 1 / A0 × 100. Where A0 (Control reaction absorbance)and A1 (Absorbance test or standard sample) [6].

2.6 Statistical Analysis

Data were analyzed by SPSS to authenticate significant differences between pathogenic microorganisms and extract.

3. RESULTS AND DISCUSSIONS

Table 1 and Figs. 1-4 present the results of the antimicrobial influence of wood tar oil, on four strains of fungi. (A. flavus, A. fumigatus, A. niger and Candida albicans using the agar well diffusion were investigated. Wood tar oil had higher activity against tested strains of fungi compared with amphotericin B and nystatin.

Depending on our results, The most susceptible fungi A. fumigatus, followed by A. niger of the wood tar oil extract. The mean diameter of inhibiting zones of the extract against these fungal strains were 46.00 mm and 34.00 mm, respectively (Table 1). While the most resistant fungi were A. flavus with 27.33 mm. While, wood tar oil has more effect comparing to effects of amphotericin B and nystatin against all fungal strains tested. These studies confirm the results of [7] who's reported that tar had antifungal activities against studied fungi: Aspergillus niger, A. flavus, Penicillium purpurogenum, Fusarium oxysporum f. sp. Albedinis. However, the microorganisms studied did not show the same sensitivity against the tar. Inhibition growth from 0.006 to 0.1 mg/ml and bigest inhibition against
*Fusarium oxysporum* sp. Albedinis was 0.006 mg/ml. Additionally, pine tar had antipruritic, anti-inflammatory, antibacterial and antifungal. [8]. The methanol extracts of olive (*Olea europaea*) were antifungal against *A. niger*, *F. oxysporum* and *A. alternata*. The inhibition zone was ranged from 9.1 mm to 10.4 mm with MIC was 312.5 mg/ml for *A. niger* and *F. oxysporum*, and 156.2 mg/ml for *A. alternata* [9] has reported the inhibitory effect of olive oil on *A. niger*. Some workers have been reported that the phenolic substances in olive products work as antimicrobial as hydroxytyrosol and oleuropein [10,11,12] found that, sensitivity of *C. albicans* in olive oil was about (54 %), *C. tropicalis* (49%), *C. krusei* (56%) and *C. parapsilosis* (57%) which isolated from Blood Stream Infections.

Successful treated of some Skin disease such as psoriasis by pine tar [13,14,15] and wound healing [16]. In addition Benlarbi et al. [7] reported that Tar from *Olea europea* sylvestris had a good biological activity. The strong antifungal activity of *O. europea sylvestris* against array of filamentous fungi strains (*A. flavus*, *A. niger*, *P. purpurogenum* and three strains of *fusarium* is indicating for broad spectrum antifungal potential of tar which could be use tar as a promising natural as antimicrobial agent. Preparations have certainly good potential to using as medicament antifungal therapy for *Candida* strains.

![Antifungal activity of wood tar oil](image-url)
Table 1. Antifungal activity of wood tar oil compared to antibiotics against different pathogenic strains of fungi

| Fungal strains   | Wood tar oil | Amphotericin B | Nystatin |
|------------------|--------------|----------------|----------|
| A. flavus        | 27.33±0.33   | 25.00±0.00     | 26.00±0.00 |
| A. fumigatus     | 46.00±0.00   | 26.00±0.00     | 28.00±0.00 |
| A. niger         | 34.00±0.33   | 25.00±0.00     | 30.00±0.00 |
| C. albicans      | 31.33±0.33   | 28.00±0.00     | 29.00±0.00 |

Table 2. DPPH radical scavenging activity of ascorbic acid, and wood tar oil

| Concentration | Wood tar oil | Ascorbic acid (Vitamin C) |
|---------------|--------------|---------------------------|
| 10            | 0.000000     | 4.153846                  |
| 20            | 3.076923     | 30.07692                  |
| 30            | 7.692308     | 31.15385                  |
| 40            | 10.76923     | 40.23077                  |
| 50            | 16.92308     | 44.53846                  |
| 60            | 27.69231     | 47.46154                  |
| 70            | 30.76923     | 53.38462                  |
| 80            | 34.61538     | 56                         |
| 90            | 39.23077     | 65.38462                  |
| 100           | 43.07692     | 73.07692                  |

Fig. 5. Antioxidant activity of tar oil and ascorbic acid (Vitamin C)

3.1 Antioxidant Activity Assay

Antioxidants effects on DPPH radical scavenging thought-out its hydro gendonating ability. Mixing DPPH with substrate acting as hydrogen atom donor, a stable non-radical form of DPPH is obtaining changing color from violet to yellow [17]. In the present study Table 2 and Fig. 5 showed DPPH radical scavenging activity of ascorbic acid, and wood tar oil had highest DPPH radical activity for different concentration (10, 20, 30, 40, 50, 60, 70, 80, 90, 100 µg/ml) compared with ascorbic acid. Oxidative effect of wood tar oil extract and standard vitamin C with increase in dose. Similar to our results, [18] found that the Extract of olive leaf and ascorbic acid give the same effects on NO• scavenging assay which give us good indicatation that, olive leaves could using as antioxidant involving O2− and NO• and less HOCl-scavenging activity, and
also preventing oxidative stress. Olive leaf extract compared to ascorbic acid, has good antioxidant effects and presence of such phenolic substances [19,20,21]. Phenolic substances had synergistic effects on antioxidant capacity when are together, as in OLE comparing with its individual effects [20,22]. Similar to our results [7] reported that the antioxidant evaluation capacity of tar oil by hydrogen peroxide scavenging give potent antioxidant (EC50=EC50= 1.45±0.16 mg ml-1 ) comparing to ascorbic (EC50=2.19±0.12 mg ml-1). Tar from Olea europea sylvestris had a good biological activity.

4. CONCLUSION

The strong antifungal activity of O. europea subsp. Cuspidata against array of filamentous fungi strains is an indication of the broad spectrum antifungal potential of the tar. This studies could make the tar as promise natural products for antimicrobial and antioxidant agent.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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