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

Nehad M. Gumgumjee[1*]

[1]University of Jeddah, College of Sciences, Department of Biology, Jeddah, Saudi Arabia.

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 investgation. Results showed that, tar oilhas antifungal effects against studied strains. Inhibition growth rate was from 16.33 to 46.00 mm. and also has positive activities against investagated 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,

**Corresponding author: E-mail: nmgomgomjee@uj.edu.sa;*

scent for saunas, anti-dandruff and drags for many dieseses [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 taroil(*Olea europaea* subsp.Cuspidata) extracted by destruction distillation, from Albahah district was obtained during May, 2019 from cool summit (2242 M.A.S.L.) at Albahah 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 amphoteracin 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 measur 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 DISCCUSIONS

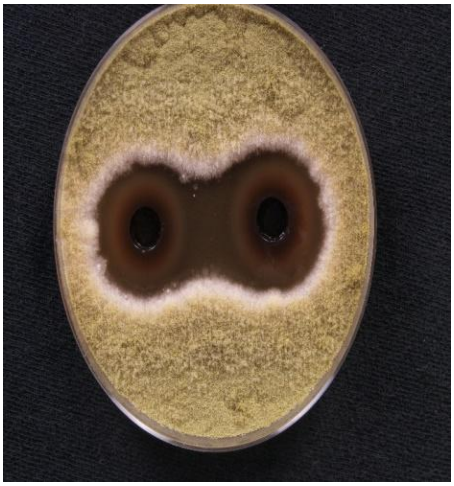
Table 1 and Figs. 1-4 present the results of the antimicrobial influence of wood tar oil, on four strains of fungi. (*A. flavus, A. fumigatus, A. niger* and *Candida albicans* using the agar well diffusion were investgated. Wood tar oil had higher activity against tested strains of fungi compared with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

1- *A. niger* treated with wood tar oil

2- *A. fumigatus* treated with wood tar oil



3- *A. flavus* treated with wood tar oil

4- *C. albicans* treated with wood tar oil

Figs. 1-4. Antifungal activity of wood tar oil (*Olea europaea* subsp. *Cuspidata*)

Table 1. Antifungal activity of wood tar oil compared to antibiotics against different pathogenic strains of fungi

Mean diameter of inhibition ±Standard error mean (SEM)			
Fungal strains	**Wood tar oil**	**Amphoteracin 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±00.33	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

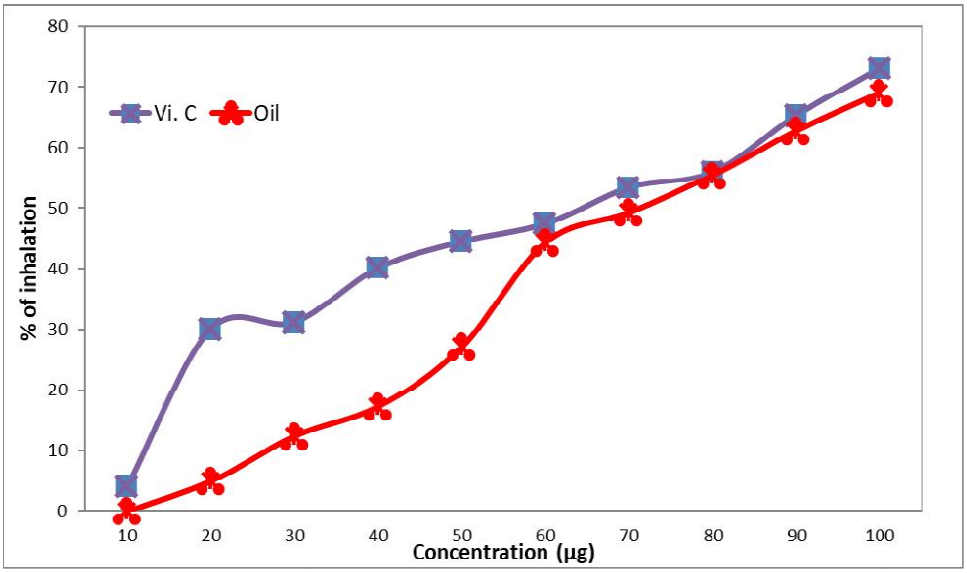


Fig. 5. Antioxidant activity of tar oil and ascorbic acid (Vitamin C)

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 evaluatation 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.

REFFERENCES

1. Turkustani AM, Gumgumjee NM, Hajar AS. Olea europaea subsp. cuspidate wood tar oil composition as an anticorrosive for metals in aqueous media, U.S. Patent 9783896B2; 2017.
2. Veijola V, Mustakallio E. The bacteriostatic effect of the wood tar, Ann Med Exp. Biol. Fenn. 1963;41:407414.
3. Kizil G, Yavuz M, Aytekin C. Antimicrobial activity of the resins obtained from the roots and stems of *Cedrus libani* and *Abies cilicica*. Prikl Biokhim Mikrobiol. 2002; 38:166-168.
4. Holder IA, Boyce ST. Agar well diffusion assay testing of bacterial susceptibility to various antimicrobials in concentrations non-toxic for human cells in culture. Burns. 1994;20: 426-429.
5. Agwa A, Aly M, Bonaly R. Isolation and characterization of two *Streptomyces* species produced non polyenic antifungal agents. Journal Union Arab Biologi. 2000; 7:62-82.
6. Benzie IFF, Strain JJ. The ferric reducing ability of plasma (FRAP) as a measure of "antioxidant power": the FRAP assay. Anal. Biochem. 1996;239:70–76.
7. Benlarbi L, Makhloufi A. Tarfaya B. Belahcene M. Moussaoui A, et al. Biological activities of *Olea europea* sylvestris Tar, growing wild in South west of Algeria. Int. J. Curr. Microbiol. App. Sci. 2014;3(8):771-777.
8. Tanya M Barnes, Kerryn A. Topical pine tar: History, properties and use as a treatment for common skin conditions. Australasian Journal of Dermatology. 2017;58:80–85.
9. Upadhyay RK. Evaluation of antibacterial and antifungal activities of olive (*Olea europaea*) essential oil. International Journal of Green Pharmacy. 2014;8(3): 180-186.
10. Pereira JA, Pereira APG, Ferreira ICFR, Valentão P, Andrade PB, et al. Table olives from Portugal: Phenolic compounds, antioxidant potential and antimicrobial activity. J. Agric. Food Chem. 2006;54: 8425-8431.
11. Tanya M. Barnes, Kerryn A. Topical pine tar: History, properties and use as a treatment for common skin conditions. Australas J Dermatol. 2017;58(2):80–85.
12. Nidhi Goel, Hina Rohilla, Gajender Singh, Parul Punia. Antifungal activity of cinnamon oil and olive oil against *Candida* Spp. Isolated from Blood Stream Infections. J. Clin. Diagn Res. 2016;10(8).
13. Merk HF, Mukhtar H, Kaufmann I, Das M, Bickers DR. Human hair follicle benzo [a] pyrene and benzo [a]pyrene 7,8-diol metabolism: Effect of exposure to coal tar-containing shampoo. J Invest Dermatology. 1987;88:71-76.
14. Schmid MH, Korting HC. Coal tar, pine tar and sulfonated shale oil preparations: comparative activity, efficacy and safety. Dermatology. 1996;193:1-5.
15. Faure P, Antognarelli C. Treatment of psoriasis with pine-tar, past and present. Rev Hist Pharm (Paris). 1996;44(312): 352-5.

16. Stone OJ, Anthony JA. The effect of tar on wound healing. Archives of Environmental Health. 1970;20(5):602-603.
17. Molyneux P. The use of the stable free radical diphenylpicrylhydrazyl (DPPH) for estimating antioxidant activity. Songklanakarin J Sci Technol. 2004;26(2): 211–219
18. Patricia Goldschmidt Lins, Silvana Marina Piccoli Pugine, Antonio Márcio Scatolini, Mariza Pires de Melo. *In vitro* antioxidant activity of olive leaf extract (*Olea europaea* L.) and its protective effect on oxidative damage in human erythrocytes. Heliyon. 2018;4(9): 00805.
19. Goulas V, Papoti VT, Exarchou V, Tsimidou MZ, Gerothanassis IP. Contribution of flavonoids to the overall radical scavenging activity of olive (*Olea europaea* L.) leaf polar extracts. J. Agric. Food Chem. 2010;58:3303–3308.
20. Xie P, Huang L, Zhang C, Zhang Y. Phenolic compositions, and antioxidant performance of olive leaf and fruit (*Olea europaea* L.) extracts and their structure–activity relationships. J. Funct. Foods. 2015;16:460–471.
21. Rahmanian N, Jafari SM, Wani TA. Bioactive profile, dehydration, extraction and application of the bioactive components of olive leaves. Trends Food Sci. Technol. 2015;42:150–172.
22. Lee OH, Lee BY. Antioxidant and antimicrobial activities of individual and combined phenolics in *Olea europaea* leaf extract. Bioresour. Technol. 2010;101: 3751–3754.

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