

Effect of Argan Oil-Hydrogen Peroxide Mixture on *Mycobacterium tuberculosis*- In Vitro

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Abstract

Objective: Tuberculosis (TB) is the threatful infectious disease that dwell about one third of worlds. Among Middle East, Iraq occupy the fifth order country endemic with TB.

Methodology: Six mixtures of Argan oil: 1.5% H₂O₂ were prepared at different ratio: 1=0.75:9.25, 2=1:9, 3=1.5:8.5, 4=2:8, 5=2.5:7.5, 6=3:7 and mixed with Lowenstein-Jensen (L-J) medium. Seventeen *Mycobacterium tuberculosis* isolates got from the consultants clinic of respiratory and thoracic diseases in Hilla city-Iraq. All isolates cultured on LJ medium containing the mixture of Argan oil: 1.5% H₂O₂ in different ratio and control tube (LJ without mixture) also used. The growth monitored per a day and recorded at different interval and the inhibition (no growth) were recorded.

Results: The effect of Argan oil: 1.5% H₂O₂ mixture on the *Mycobacterium tuberculosis* were investigated over three incubation intervals (14th -20th, 21st -28th and after 29th day). The results revealed the high Argan concentration mixture 2.5:7.5 and 3:7 give excellent inhibitory effect on *Mycobacterium tuberculosis* during full periods of incubation with inhibition percentage (64.71%-82.35%).

Conclusion: The current study aims to investigate the effects of argan oil on *Mycobacterium tuberculosis* and conclude the anti-mycobacterial activity of argan oil as a safe medication for prophylaxis and treatment of TB.

Keywords: Tuberculosis; Argan oil; MDR; XDR; Hydrogen peroxide

Introduction

One third of the world's population infected with *Mycobacterium tuberculosis*. It is the principal causative agent of the widespread disease, tuberculosis (TB), among human's beings. It comes second to HIV as a cause of fatality worldwide [1]. Globally, in 2011 World Health Organization (WHO) reported that the incidence rates of TB about 8.7 million case, of which 1.4 million not healed and died and also document that, annually 3 million person die due to TB [2,3]. Iraq occupy the fifth order among middle east countries infected with TB and about 3 thousands die due TB [3,4].

WHO and Ministry of Health of Iraq (MOH) record that the incidence rate of TB decreased after during the period from 2011-2014, the incidence rate is 45 case for 100,000 people (from 2005-2010 the is incidence rate 64 case for 100,000 people) [5,6]. Malnutrition person and those with low socio-economic status are targeted by TB and the main strategies to compact this devil can be achieved via good nutrition and high level of personal hygiene [7]. Tuberculosis still the major public health problem and emergence of multi-drug resistance TB (MDR-TB) and extensive drug resistance TB (XDR-TB) among *M. tuberculosis* (resistance to first and second line drugs respectively) push the scientist to investigate the effects of many oils and plant extract as alternative medications [8]. In 2013 approximately 5% of patients infected with TB develop MDR-TB and about 9% of that MDR-TB has XDR-TB [9].

Morocco Argan oil is rich herbal and medical oil with beneficial compounds. It contain fatty acids (like myristic, palmitic, palmitoleic, heptadecanoic, stearic, oleic, linolic, linolenic, arachidic and gadoleic acids), sterols (includes schottenol, spinasterol, avenasterol and campesterol), tocopherols (alpha, beta, gamma and delta tocopherols) and triterpene. It also contains carotenes, phenols and squalene [10]. The benefit of argan oil in cosmetics and physiological disorders treatments

were extensively studied while little information about antibacterial activity of argan oil gathered [11]. The antibacterial activity of argan oil was firstly studied against two perilous bacteria, Methicillin-resistant *Staphylococcus aureus* (MRSA) and *Pseudomonas aeruginosa* isolated from wounds infection [12,13]. The current study aims to investigate the effects of argan oil on *M. tuberculosis*.

Materials and Methods

Mixture preparation

Six mixtures of Argan oil: 1.5% H₂O₂ was prepared at different ratio as follow:

1=0.75:9.25, 2=1:9, 3=1.5:8.5, 4=2:8, 5=2.5:7.5, 6=3:7 and mixed with Lowenstein-Jensen (L-J) medium (Himedia/India).

Bacterial isolates

Seventeen *Mycobacterium tuberculosis* isolates got from the consultants clinic of respiratory and thoracic diseases in Hilla city-Iraq. All isolates cultured on LJ medium containing the mixture of Argan oil: 1.5% H₂O₂ in different ratio and control tube (LJ without mixture) also used. The growth monitored per a day and recorded at different interval and the inhibition (no growth) were recorded.

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Results

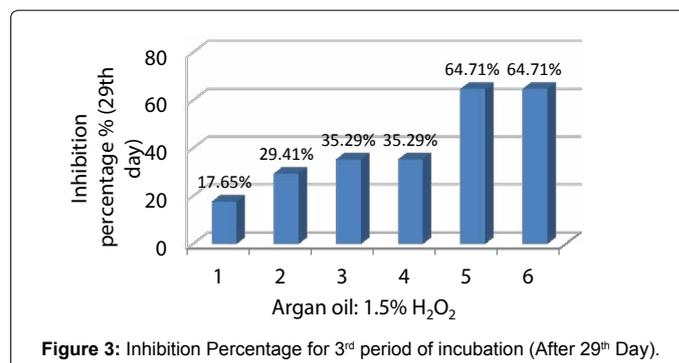
The results of growth were recorded among three incubation intervals (14th -20th, 21st -28th and after 29th day). the results revealed that there is no well noted differences of inhibition percentage among mixture 0.75:9.25 and 1:9 during all incubation period (58.82% for both mixture at first period, 47.06% and 41.18% for both mixture at second period, 17.65% and 29.41% for both mixture at third period as shown in Figure 1-3.

The results for rest mixtures over incubation periods give approximately same similarity of results with different percentage. The result of inhibition for mixture 1.5:8.5 was 70.58%, 58.82% and 35.29% respectively for 1st, 2nd And 3rd periods. The percentages of inhibition for mixture 2:8 were 64.70%, 58.82% and 35.29% for 1st, 2nd And 3rd incubation periods respectively. The high Argan concentration mixture 2.5:7.5 and 3:7 give same results of inhibition in which 82.35% for both mixtures for 1st (14th -20th day) period, 70.59% for both mixtures for 2nd (21th -28th day) period and 64.71% for both mixtures for 3rd (after 29th day) as shown in Figures 1-3.

The result revealed excellent effect of Argan oil as anti-Mycobacterial alternative medication for long period that provide safe, economic, easily to metabolize and patient-friendly medication. Our data in accordance with other results performed on Methicillin Resistance Staphylococcus aureus (MRSA) and Pseudomonas aeruginosa and confirm their effects on these microbes [12,13].

Discussion

The antibacterial activity attributed to phenol and tocopherol compounds in argan oil [14,15]. Also the activity can be accounted to another component of argan oil like squalene. Argan oil contains



high content of squalene (310 mg/100 g) when compare with other medical oils. Squalene has both anti-bacterial and anti-fungal activities [16]. The anti-bacterial and anti-fungal compounds are spinasterol (41%) and schottenol (47%). The current study concludes the anti-mycobacterial activity of argan oil as a safe medication for prophylaxis and treatment of TB.

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