

# Determination of Antimicrobial Activity of *Thuja orientalis* Against Some Pathogenic Microorganisms

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## Abstract

The present study was conducted to investigate the antimicrobial activity of the hot water and the hot ethanolic extracts of *Thuja orientalis* against some pathogenic microorganisms (*Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Escherichia coli*, *Proteus mirabilis*, *Salmonella typhi*, *Klebsiella pneumoniae*, *Bacillus cereus*, *Bacillus subtilis*, *Acinobacter*, *Staphylococcus epidermidis* and *Candida albicans*). Results showed that both the water and alcoholic extracts of this plant exert marked inhibitory effect against all the bacterial isolates and yeast and at different ratio, and it was shown that ethanolic extract was more effective in microbial inhibition than the water extract. Maximum inhibition (16 mm) was recorded against *Staphylococcus aureus* and *Candida albicans* with the hot water extract, while maximum inhibition was seen against *Bacillus cereus* by the hot alcoholic extract.

**Key words:** *Thuja orientalis*, pathogenic bacterial, antimicrobial activity

## Introduction

Resistance towards prevailing antibiotics having become widespread among bacteria and fungi, new class of antimicrobial substances are urgently required. It is well known that plants, although lacking the typical immune response, have an in-built system for protection against biotic and abiotic stress conditions. Since plants have co-evolved with pathogens, they understandably have also developed the chemical protection against the pathogenic organisms. Therefore, it is reasonable to expect a variety of plant compounds with specific as well as general antimicrobial activity and antibiotic potential. In fact, there are several studies which reveal the presence of such compounds with antimicrobial properties in various plant parts. [1].

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*Thuja orientalis* L plants, Family Cupressaceae, the genus have five species, two one native to North America and three native to eastern Asia; they are commonly known as arborvitae. It has been widely cultivated as an ornamental timber tree for its source of wood, shade in different kind of soils, and it can be grown as dense hedge [2].

Thuja has a lot of names: *Biota orientalis*, *Thuja orientalis*, *Platycladus orientalis*, *Oriental arborvita*, all these are thuja's scientific names [3, 4]. Thuja is a useful herb remedy with a lots of health benefits, it can be used as diuretic, antibacterial, antifungal, sedative, antiasthmatic, antipyretic and parasiticide [5, 6].

The present research was carried out to evaluate the antimicrobial activity of the aqueous and alcoholic extracts of the dried fruit of *Thuja orientalis*, and measuring which extract that give higher activity.

### **Material and Methods**

All the media and chemicals were obtained from Sigma Chemical Co. (USA) and BDH (England).

**Plant materials and preparation of extracts:** the plant material used in this study consisted of the dried fruit of the thuja which was collected from the local markets. The dried-plant material was then ground into fine powder and extracted with hot water and hot ethanol.

**Hot water extraction:** the aqueous extraction was prepared by boiling 10gm of thuja fruit powder in 100ml sterile distilled water over low flame for 15minutes. The flask was then plugged and removed from heat and allowed to cool. After cooling the contents of the flask was filtered. Later it allows drying in the incubator at 37° for 7days until we get the dry powder and then serial concentrations (10, 5, 2.5, 1.25 and 0.65) mg/ml were prepared [2].

**Hot alcohol (ethanol) extraction:** it prepared by adding 10gm of thuja fruit powder into 100ml of ethanol (80%). Then it was left in water-bath for 18hour at 40°. The flask was then allowed to cool and it contents was filtered. Later it allows drying in the incubator at 37° for 72hours and then serial concentrations (10, 5, 2.5, 1.25 and 0.65) mg/ml were prepared[2].

**Bacterial strains and culture preparation:** 10 bacterial strains and one fungi were used in this study, which include (*Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Escherichia coli*, *Proteus mirrabilis*, *Salmonilla typhi*, *Klebsiella pneumoniae*, *Bacillus cereus*, *Bacillus subtilis*, *Acinobacter*, *Staphylococcus epidermidis* and *Candida albicans*) and they were provided from the culture collection of the laboratories of the Al-

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Yarmouk Teaching Hospital. Then bacterial isolated and fungi were collected by culturing on nutrient agar and stored until required [7].

**In vitro antimicrobial susceptibility assay:** well-diffusion assay was employed for the determination of the antibacterial activity of thuja. The antimicrobial inhibition activity was measured by seeding 0.1ml from bacterial suspensions at OD of 0.5nm and spread with sterile spreader. Later, wells of 0.5mm were made in the culture medium (nutrient agar) and to which the plant extracts with the all concentrations were added. Finally the plates were kept at 37°C for 18hour, and next day zone of inhibition was determined [7].

### Results and Discussion

The antimicrobial activity of the water and alcohol hot extracts of *Thuja orientalis* fruit with different concentrations, have been tested against different pathogenic microorganisms. Results show that both the water and alcohol extract have antimicrobial activity with different effects, but alcohol extract showed much higher activity than the water extract. Result in table (1) revealed the effect of hot water extract against these microorganisms and the higher antimicrobial activity was seen against *Staphylococcus aureus* and *Candida albicans* which is reached to (16 mm). Similar results were also indicated by [8, 9, 10] in which they reported the antibacterial activity of *Thuja orientalis* aqueous extract against some pathogenic bacteria and fungi.

**Table (1): Antimicrobial activity of the hot water extract of *Thuja orientalis***

Concentration Bacterial Strain	Crude10 mg	5mg	2.5mg	1.25mg	0.65mg
<i>Acinobacter</i>	15	10	8	6	5
<i>E. coli</i>	13	10	9	8	7
<i>P. aeruginosa</i>	13	11	9	6	3
<i>S. epidermis</i>	9	7	4	-	-
<i>S. aureus</i>	16	13	11	7	6
<i>B. cerus</i>	13	10	9	6	5
<i>B. subtilus</i>	15	10	9	7	6
<i>P. mirrabilis</i>	13	11	10	9	7
<i>S. typhi</i>	12	11	9	8	7
<i>K. pneumoniae</i>	9	8	7	6	4
<i>Candida</i>	16	14	12	10	9

Diameter of inhibition zone (mm)

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Further more, results in table (2) showed the antimicrobial activity of hot alcohol extraction with different concentration against some pathogenic bacteria and fungi. It was shown that the higher antimicrobial activity was seen against *Bacillus cereus* which is reached to (35 mm). However, the antimicrobial activity of alcohol extract of *Thuja orientalis* have been also reported by other authors including [2, 10, 11.].

From the result of the antimicrobial screening of the two extracts of Thuja used in this study, it was found that this plant has promising antimicrobial activity and this is due to the chemical composition of this plant which is found to be rich in glycosides, flavonoids and triterpenoids.

**Table (2): Antimicrobial activity of the hot alcohol extract of *Thuja orientalis***

Concentration Bacterial Strain	Crude10 mg	5mg	2.5mg	1.25mg	0.65mg
<i>Acinobacter</i>	25	21	17	13	10
<i>E. coli</i>	27	23	19	14	11
<i>P. aeruginosa</i>	23	19	15	12	9
<i>S. epidermis</i>	27	24	20	16	13
<i>S. aureus</i>	26	23	19	16	12
<i>B. cerus</i>	35	31	26	22	17
<i>B. subtilus</i>	27	22	19	15	11
<i>P. mirrablis</i>	24	21	16	14	10
<i>S. typhi</i>	26	23	19	17	15
<i>K. pneumoniae</i>	31	22	20	17	15
<i>Candida</i>	29	25	23	20	17

Diameter of inhibition zone (mm)

### Reference

1. Darokar, M.; Mathur, A. and Dwired, S. (1998). Detection of antibacterial activity in the floral petals of some higher plants. Curren. Scien., 75(3): 187-189.

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2. Sharad B.; Avinash, B. and Bohra, A. (2008). Antibacterial potential of three naked-seeded (Gymnosperm) plants. *Natur. Prod. Radia.*, 7(5): 420-425.
3. Guang, H.; In-Ja, R., Young, K.; Soo, C. and Ick, D. (2009). Free Radical Scavenging and Antielastase Activities of Flavonoids from the Fruits of *Thuja orientalis*. *Arch Pharm. Res.*, 32(2): 275-282.
4. Yan-hua L.; Zhi-yong L.; Zheng-tao W. and Dong-zhi W. (2006). Quality evaluation of *Platycladus orientalis* (L.) Franco through simultaneous determination of four bioactive flavonoids by high-performance liquid chromatography. *J. Pharmaceut. Biomed. Anal.*, 41(4):1186-1190
5. Kyung Ah Koo, Sang Hyun Sung, Young Choong Kim (2002). A new neuroprotective pinusolide derivative from the leaves of *Biota orientalis*. *Chem. Pharmacut. Bull.*, 50(6): 834-836.
6. Jain, R. K. and Garg, S.C. (1997). Antimicrobial activity of the essential oil of *Thuja orientalis* {L}. *Ancient Science of Life*, 16(3):186—188.
7. Rasadah, M. A. and Houghton, P. J. (1998). Antimicrobial activity of some species of bignoniaceae. *Review of Biodiversity and Environmental Conservation. Article III*
8. Oh, D. H. (2000) Antimicrobial activities of *Thuja orientalis* L. and *Acoru graminens* scoland on the harmful microorganisms. *J. Agr. Sci.*, 11: 47-55.
9. Chen, C. P. (1989). Screening of Taiwanese crud drug for antimicrobial activity against *Streptococcus mutans*. *Enthopharmacol.*, 27(3): 285-295.
10. Guleria, S. and Kumar, A (2006). Antifungal activity of some Himalayan medicinal plants using direct bioautography. *J. Cell Molec. Biolo.*, 5: 95-98.
11. Ezzat, S. M. (2001). *In vitro* inhibition of *Candida albicans* growth by plant extract and essential oils. *Wor. J. Micro. Biochem.*, 17(7): 757-759.

## تقدير الفعالية البايولوجية التثيضية لنبات العفص تجاه بعض الاحياء المجهرية المرضية

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### الخلاصة

تم اجراء الدراسة الحالية من اجل التحري عن الفعالية البايولوجية التثيضية للمستخلص المائي والكحولي الحار لنبات العفص تجاه بعض الاحياء المجهرية المرضية *Staphylococcus aureus, Pseudomonas aeruginosa, Escherichia coli, Proteus mirrabilis, Salmonella typhi, Klebsiella pneumoniae, Bacillus cereus, Bacillus subtilis, Acinobacter, Staphylococcus epidermidis* (and *Candida albicans*). اظهرت النتائج امتلاك كل من المستخلص المائي والكحولي لهذا النبات فعالية تثيضية تجاه جميع العزلات البكتيرية والخميرة وبنسب مختلفة، وقد لوحظ ان المستخلص الكحولي كان اكثر كفاءة من المستخلص المائي في التثييط المايكروبي. وقد سجل اعلى تثييط تجاه *Staphylococcus aureus and Candida albicans* عند استخدام المستخلص المائي الحار في حين سجل اعلى تثييط ضد *Bacillus cereus* عند استخدام المستخلص الكحولي الحار.