

Anti-microbial investigation of *Suaeda baccata* (chenopodiaceae)

Al-Mohammadi S. Suhad*
Al-Khateeb Ekbal
Al-Shamma Ali

Received 24/8/2004 ; accepted 13/2/2005

الخلاصة

ان هذه الدراسة تكشف عن الفاعليه المضادة للأحياء المجهرية لكل من قلويد التراكونيلين (Trigonelline) والمستخلص الكامل لنبات الطرطيع *Suaeda baccata* للعائلة (Chenopodiaceae). حيث تضمنت التجارب البحث عن الفعاليه ضد الاحياء المجهرية التاليه :-

Staphylococcus aureus وتمثل احد مجاميع البكتيريا الموجبة.

Escherichia coli وتمثل احد مجاميع البكتيريا السالبة.

Candida albicans وتمثل احد مجاميع الخميرة.

وأسفرت النتائج عن أن قلويد التراكونيلين و المستخلص النباتي لهما الفعالية المضادة لنمو بكتيريا *Staphylococcus aureus* في حين أظهرت كل من بكتيريا *Escherichia coli* . وخميرة *Candida albicans* مقاومة لكل منهما.

ABSTRACT

This study includes the detection of the anti microbial activity of both the plant extract of *Suaeda baccata* (Chenopodiaceae) and its constituent the trigonelline alkaloid, against several micro-organisms (*Staphylococcus aureus* to represent one member of Gram positive bacteria, *Escherichia coli* to represent one member of Gram negative bacteria and *Candida albicans* to represent one member of fungi) in that trigonelline alkaloid and the plant extract, showed an antibacterial activity against the growth of gram positive bacteria, *Staphylococcus aureus*, while gram negative bacteria, *Escherichia coli* and the yeast, *Candida albicans* were resistant to both.

INTRODUCTION:

Members of Chenopodiaceae family including *Suaeda baccata* mostly grow naturally in soils containing much salt (halophytes)⁽¹⁾. *Suaeda baccata* is a wild Iraqi plant, widely distributed all over the country, first studied in Iraq.

A number of studies have been reported, investigating the anti-microbial activities of some Suaeda species as *Suaeda fruticosa* which has potent antibacterial activity against Gram positive bacteria (*Staphylococcus*)⁽²⁾, *Suaeda villosa* has antifungal activity against *Candida albican* and *Fusarium Oxysporum*, where as *Suaeda vermiculata* has antibacterial activity in addition to its antifungal activity against the same fungi.⁽³⁾

On the other hand several references showed that triginelline alkloid has anti bacterial activity^(4,5,6); thus it was deemed desirable to find out the anti-microbial activity of *Suaeda baccata*.

*Department of Pharmacognosy, College of Pharmacy, Baghdad University, Baghdad – Iraq.

MATERIALS AND METHODS:

The plant material (aerial part) was collected during months of June, July, August, September and October 2001-2002. From the high ways of Baghdad city. The plant was identified by the Department of Pharmacognosy, College of Pharmacy/University of Baghdad; and authenticated by the National Herbarium of Iraq/ Botany Directorate at Abu-Ghraib/ Iraq.

Five hundred grams of the dried aerial plant part were first defatted by n-hexane over night, and then extracted by maceration with 2L 96% ethanol for 24 hours. The ethanolic filtrate then was evaporated to dryness under reduced pressure at a temperature not exceeding 40°C. The residue was then dissolved in sufficient quantity of water. This solution was the total plant extract used.

The minimum inhibitory concentration was determined by using the tube dilution method⁽⁷⁾ to find out the anti-microbial activity of the studied plant extract, since this method is an easy and an accurate method to be used for the first determination of the antimicrobial activity of a given compound. It was carried for the total plant extract and the isolated trigonelline, in which samples were tested for anti microbial activity at the level of 1000mcg/ml, since beyond this concentration the antimicrobial activity will be of no interest.

Preparation of samples for anti-microbial test:

The tested samples (total plant extract and isolated trigonelline) were prepared at different concentrations starting with 1000 mcg/ml, and ending with 100mcg/ml. concentrations.

The stock solution was prepared by dissolving 250mg of the plant extract in 2.5ml of distilled water, and 30mg of the isolated trigonelline in 0.3ml of distilled water to bring the concentration of both samples to 100,000mcg/ml.

Then the serial dilutions were prepared according to the equation

$$C_1 V_1 = C_2 V_2$$

A standardized microbial inoculum (10^6 cell/ml) was added to tubes containing serial dilutions of both samples and the growth of the microorganisms monitored as a change in turbidity.

The test was done in Ibn-Sina Center for Drug Research-Baghdad and the results were taken according to turbidity of the tubes.

RESULTS AND DISSCUSSION:

The antimicrobial activity was approved to the total plant extract and the isolated trigonelline, by using the MIC technique and was monitored as a change in turbidity, in that the clear test tube indicates that the tested compound has an antimicrobial activity at this concentration, while the turbid one indicates the absence of the antimicrobial activity to the tested compound.

Results obtained were as follows:

Microorganism	Plant extract (F3)	Isolated Trigonelline
Staphylococcus aureus ATCC 25923	900mcg/ml (clear solution)	600mcg/ml (clear solution)
Escherichia coli ATCC 25922	No antimicrobial activity (turbid solution)	No antimicrobial activity (turbid solution)
Candida albican	No antimicrobial activity (turbid solution)	No antimicrobial activity (turbid solution)

MECHNISIM OF ACTION:

It is clear that the cationic agents having antimicrobial activity fall within the group known as quaternary ammonium compounds which are variously described as Q.A.Cs. Its antimicrobial activity is related to its action on the cytoplasmic membrane of the micro-organism⁽⁸⁾.

The stability of all membranes in the micro-organism cell is maintained by a combination of non covalent interactions between the constituents involving ionic, hydrophobic and hydrogen bonding. The balance of these interactions can be disturbed by the intrusion of the membrane active agent (Q.A.Cs) which destroy the integrity of the membrane, there by causing leakage of cytoplasmic content or impairment of metabolic functions associated with the membrane.⁽⁹⁾

From our experiment, it is obvious that Suaeda baccata has antibacterial activity aganst Gm positive bacteria (Staphylococcus aureus)

This may be due to its alkaloidal constituent mostly the trigonelline, which is a Q.A.C and may probably act by the same mechanism of action as other Q.A.Cs.

REFERENCES :

- 1- Trease and Evans; "Pharmacognosy" University of Nottingham, Nottingham, UK, 15thEd. 2002, p.22.
 - 2- Pakistan Journal Of Biological Sciences: "Chemical Composition And Antibacterial Activity Of Suaeda fruticosa forsk. "From Cholistan, Pakistan. Vol. 3 No. 2, Feb.2000, 348-349.
 - 3- Mahasneh, Adel, M.; Abbas, Jameel A, EI-Oqlah, Ahmad A.; "Antimicrobial Activity of Extract of Herbal Plants Used In the Traditional Medicine of Bahrain. "(Dept. Biological Science University Jordan, Amman, Jordan.) Phytother. Res. 1996, 10(3), 251-253(Eng).
 - 4- PDR for herbal medicine, 1st ed., Medical Economic Company, Montvale, New Jersey, (1988), PP.:1188-89.
 - 5- The Wealth of India. Vol.10, publication and information directorate CSIR, New Delhi, (1996), pp: 298-306.
 - 6- Newall, C.A.; Anderson, L.A. and Phillipson, J.D. (Eds):"Herbal Medicine" A Guide for Health-Care Professionals. London, The pharmaceutical press, (1996), pp: 117-118.
 - 7- Ronald M. Atlas, Alfred E. Brown, Lawrence C. Parks:" Experimental Microbiology, Laboratory Manual" (1995), p 341.
 - 8- W.B. Hugo A.D. Russell, "Pharmaceutical Microbiology", 6th Edn. (1998), pp225
 - 9- Ibid-p178.
-