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Evaluation of Antibacterial Activity of *Jasminum Officinale*

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Abstract: *Jasminum officinale used as a urinary anti-infective in folk medicine. To validate this use, the in vitro anti-bacterial activity of ethanolic extracts of different parts(flowers, stems plus leaves and roots) of J.officinale growing in local gardens was evaluated against four reference bacteria by broth dilution assay and agar diffusion assay. The MIC value of the ethanolic extracts of flowers and stems plus leaves against all bacteria was 2 mg/mL and the MIC value of roots against S. aureus, E.faecalis and E. coli was 4 mg/mL and the MIC value of roots against P. aeruginosa was 2 mg/mL. In agar diffusion assay, the ethanolic extracts of all parts of the plant showed considerable activity against all bacteria.*

Keywords: *Jasminum officinale* **,** *Antibacterial activity*.

I. Introduction

The traditional medicinal methods, especially the use of medicinal plants, still play a vital role to cover the basic health needs in the developing countries and moreover the use of herbal remedies has risen in the developed countries in the last decades. In this connection, plants continue to be a rich source of therapeutic agents. In the recent years, the antimicrobial and antioxidant actions have received much attention. This is so because of the increasing interest in human health and have been studied in vitro and in vivo by many researchers. The antioxidant may be useful in retarding oxidative deterioration of food materials especially those with high lipid content. The natural antimicrobial agents protect living organisms from damages resulting in the prevention of various diseases [1].

The active principles of many drugs are found in plants or are produced as secondary metabolites. The remarkable contribution of plants to the drug industry was possible, because of the large number of physiochemical and biological studies all over the world. Herbal remedies used in folk medicine provide an interesting and still largely unexplored source for the creation and development of potentially new drugs for chemotherapy which might help overcome the growing problem of resistance and also the toxicity of the currently available commercial antibiotics. Therefore, it is of great interest to carry out a screening of these plants in order to validate their use in folk medicine and to reveal the active principle by isolation and characterization of their constituents , *Jasminum officinalle* Linn .Oleaceae family English : jasmin , Arabic : (yasmin) is small shrub , native and cultivated in the warm part of Asia . The chemical constituents are Jasmine (alkaloid) , saliciylic acid , resin , indol and alcohol [2]. The traditional use of this plant suggests analgesic, antidepressant, anti-inflammatory, antiseptic, aphrodisiac, sedative, expectorant and tonic (uterine) effects. Essential oil of *J. sambac* is used as fragrance for skin care products. Jasmine oil and absolute reduce skin inflammation, tones the skin and lifts up your mood [3] . The leaves of *Jasminum officinale* had allelopathic activity . The main active compound was isolated and determined by spectral data as a secoiridoid glucoside named oleuropein [4] .The pharmacological uses of the flowers of this plant was shown to be as tonic , astringent , anesthetic , and sedatives [2]. Also it has been shown that the plant posses a central nervous system depressant activity [5,6] .

The aroma of jasmine is described as calming and soothing without being soporific, and is indicated for depression and stress - as well as some respiratory conditions. It is indicated for sensitive skin conditions too. But mostly jasmine has a reputation as an aphrodisiac and used for all kinds of sexual problems [7] .

Indians often uses *Jasminum* to treat skin problems , the leaf juices can be applied to clear up corns and treat mouth ulcerations , the anti-secretary and anti-oxidant components of *Jasminum* may also treat peptic ulcer , furthermore , the ethanolic extract of *Jasminum* produce an antibiotic effect upon typhoid fever and staph infections , they stressed that jasmine oil may serve as a main stream antibiotic treatment , the leaf juice is applied to corns and ear discharges , the leaves and the barks contain salicylic acid and are used as analgesic , febrifuge .. etc. the root is used in the treatment of ringworm , while the flowers are aphrodisiac , antiseptic , antispasmodic, and tonic [7,8] . One of the uses of *J. officinale* in urinary infections and diuretic the leaves of stem , bark , and root of Jasminum has demonstrated detectable antibacterial activity against reference bacteria [9].

II. Materials And Methods

Chemicals : Ethanol (99.5%) (Merck); Ampicillin sodium (Merck); Gentamicin hydrochloride (Merck).

Preparation of Extract :- The whole plant *Jasminum officinale* were collected from private gardens in Baghdad , and authenticated by Iraqi National Herbarium in Baghdad . Ethanolic extract of different parts of the plant were prepared according to the standard methods fully described elsewhere [5] . Briefly , the shade dried flowers , stems and leaves ,and roots were ground into powder form and 55 gram of this powder extracted with ethanol 80% (5 x 600) , The combined extracts were filtered and the filtrate evaporated to dryness under vacuum at 40 c yielding 15.1 gram of coarse brownish crystals [10] , The residue was then re-dissolved in distilled water to give the required concentrations .

Media : The media used in broth dilution assays were brain-heart infusion broth (BHI broth) (Merck) and Mueller-Hinton broth (MH broth) (Merck) and the medium used in agar diffusion assay was Mueller- Hinton agar (MH agar) (Merck).

Test bacteria: *Staphylococcus aureus* ATCC 29213, *Enterococcus faecalis* ATCC 29212, *Escherichia coli* ATCC 25922, *Pseudomonas aeruginosa* ATCC 27853.

Antibacterial activity tests : Broth dilution assay .Broth dilution assay was carried out according to Murray et al [11] and Mackeen et al [12] A loop full of the bacterial culture from the slant was inoculated in the nutrient broth (BHI broth as well as MH broth) and incubated at 37±1ºC for 24 hours. The fresh broth (20 mL) was seeded with 0.25 mL of the 24-hour broth cultures and a two-fold serial dilution method was followed as below. The dried plant extracts were dissolved in 85% ethanol to obtain an 80 mg/mL solution and sterilized by filtration through a 0.45 µm membrane filter. A 0.2 mL solution of the material was added to 1.8 mL of the seeded broth and this formed the first dilution. 1 mL of this dilution was diluted further with 1 mL of the seeded broth to produce the second dilution, and the process was repeated until six dilutions were obtained. A set of tubes containing only seeded broth was kept as control and 85% ethanol controls were also maintained. After incubation for 24 h at 37±1ºC the last tube with no visible growth of the bacteria was taken to represent the minimum inhibitory concentration (MIC) of the test sample which is expressed in mg/mL. Moreover, the broth dilution assay was carried out with ampicillin and gentamicin in BHI broth as well as MH broth in the same way as the extracts and the MIC values of ampicillin and gentamicin were determined. 5% ethanol in a Soxhlet apparatus and the extracts [13]

Agar diffusion assay: The dried plant extracts were dissolved in 85% ethanol to a final concentration of 40 mg/mL and sterilized by filtration through a 0.45 µm membrane filter. Agar disc diffusion assay was then carried out according to Murray et al [6] using an inoculums containing 106 bacterial cells on MH agar plates (1 mL inoculums/plate). The discs (diameter, 6 mm) were each impregnated with 50 µl of extract (2 mg/disc) at a concentration of 40 mg/mL and placed on the inoculated agar and incubated at 37ºC for 24 h. Each test was carried out in triplicate with controls. Moreover, filter paper discs containing the antibiotics ampicillin and gentamicin were used as positive controls [14]

III. Results

The MIC values of all extracts in BHI broth were identical to the MIC values of extracts in MH broth. The MIC value of the ethanolic extracts of flowers and stems plus leaves against all bacteria was 2 mg/mL and the MIC value of roots against *S. aureus, E. faecalis and E. coli* was 4 mg/mL and the MIC value of roots against *P. aeruginosawas* 2 mg/mL (Table 1 and Table 2). The MIC values of ampicillin and gentamicin in BHI broth were identical to the MIC values of ampicillin and gentamicin in MH broth. The MIC value of ampicillin against *S. aureuswas0*.25 µg/mL and the MIC value of ampicillin against *E. faecalis and E. coli* was 8 µg/mL. The MIC value of gentamicin against S. aureusandE. coli were 0.5 µg/mL and 1 µg/mL respectively, while the MIC value of gentamicin against both *E. faecalis and P. aeruginosa*was 10 µg/mL (Table 3 and Table 4).\In agar diffusion assay, the ethanolic extracts of all parts of the plant showed considerable activity against all bacteria (Table 5). Further, in agar diffusion assays, S. *aureus, E. faecalis and E. coli* were sensitive to both ampicillin and gentamicin and *P. aeruginosa* was sensitive to gentamicin (Table 6).

IV. Discussion

The MIC values of the extracts as well as ampicillin and gentamicin do not depend on the type of the media used and also the antibacterial activity of roots is lower than flowers and stems plus leaves. The MIC values of the extracts are in the mg/mL range, while the MIC values of ampicillin and gentamicin are in the µg/mL range. Furthermore, the potencies of the discs of extracts are 2 mg/mL, but the potencies of the discs of

ampicillin and gentamicin are 10 µg/mL. Thus, the extracts of all parts of the plant have activity against all reference bacteria, but their antibacterial activities are much lower than ampicillin and gentamicin.

A number of compounds derived from plants often show considerable activity against Gram +ve bacteria but not against Gram –ve species. Gram negative bacteria have an effective permeability barrier, comprised of the outer membrane, which restricts the penetration of amphipathic compounds and multidrug resistance pumps that extrude toxins across this barrier. It is possible that the apparent ineffectiveness of plant antimicrobials is largely due to the permeability barrier [15,16] .

The activity of the plant against both gram-positive and gram-negative bacteria may be indicative of the presence of broad spectrum antibiotic compounds or simply general metabolic toxins in the plant. Since *Jasminum offiinale* demonstrates activity against the most prevalent gram-negative bacteria in urinary infections namely *E. coli*, the use of the plant as a urinary anti-infective is validated. Furthermore, it may help to discover new chemical classes of antibiotics that could serve as selective agents for the maintenance of animal or human health and provide biochemical tools for the study of infectious diseases.

V. Conclussion

Based on the results of the present study it can be concluded that the ethanolic extract of *Jasminum* found to be potent and efficacious towards the anti-bacterial activity, when compared with standard antibiotics in different growth medias . More detailed physiochemical studies are, however, necessary to identify the active principle(s) and exact mechanism(s) of action.

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Table-1 :- The MIC values in mg/ml of *J . officinale* extracts in brain-heart infusion broth.

Ethanolic extract	*S.aureus*	*E. faecalis*	*E. coli*	*P.aeruginosa*
Flowers	2	2	2	2
Stems and leaves	2	2	2	2
Roots	4	4	4	2

Table-2:- The MIC values in mg/ml of *J.officinale* in Mueller – Hinton broth .

Ethanolic extract	*S.aureus*	*E. faecalis*	*E. coli*	*P.aeruginosa*
Flowers	2	2	2	2
Stems and leaves	2	2	2	2
Roots	4	4	4	2

Table-3:- The MIC values inμg/mL of ampicillin and gentamicin in brain-heart broth .

Antibiotics	*S.aureus*	*E. faecalis*	*E. coli*	*P.aeruginosa*
Ampicillin	0.25	8	8	-
Gentamicin	0.5	10	1	10

Table-4 :- The MIC values in μg/mL of ampicillin and gentamicin in Mueller – Hinton broth .

Antibiotics	*S.aureus*	*E. faecalis*	*E. coli*	*P.aeruginosa*
Ampicillin	0.25	8	8	-
Gentamicin	0.5	10	1	10

Table-5 :- Antibacterial activity of *J . officinale* extracts against bacteria in Mueller-Hinton agar disc diffusion assay (disc diameter, 6mm; disc potency, 2mg/disc).

Ethanolic extract	Inhibition Zone diameter *(mm)* *S.aureus*	*E. faecalis*	*E. coli*	*P.aeruginosa*
Flowers	27.8	14.6	25.7	26.3
Stems and leaves	28.2	15.7	22.3	23.8
Roots	26.8	14.3	20.9	21.3

Table-6 :- Antibacterial activity of ampicillin and gentamicin against bacteria in Mueller-Hinton agar disc diffusion assay (disc diameter, 6mm; disc potency, 2mg/disc).

Ethanolic extract	Inhibition Zone diameter (mm) *S.aureus*	*E. faecalis*	*E. coli*	*P.aeruginosa*
Ampicillin	29	31	21	-
Gentamicin	19	15	18	17