Antibacterial and Antifungal Activities of Centaureabruguierana (Asteraceae) from Iraq

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Abstract

The methanol and aqueous extracts of *Centaureabruguierana*. (Asteraceae) from Iraq were tested for their biological activity against two Gram positive , stwo Gram negative bacteria and four fungal species by using agar well diffusion method . The crude methanol extract (100mg/ml) and its dilutions and the crude aqueous extract(100mg/ml) showed biological activity against all bacteria and fungi studied. Compared with the aqueous extracts , methanol extracts, particularly the crude one, were more bioactive against bacteria and fungi studied . Among the studied microbes, *E.coli*, *Staphylococcus aureus*and *Microsporumcanis* were the most sensitive species to *C.bruguierana* extracts tested. Methanol extract at all concentrations and aqueous extract at high concentrations showed close or more antibacterial activity(except in case of *P.auruginosa*) than that of the bacterial control (tetracycline) . The crude methanol extract was more bioactive against all fungi studied than the fungal control (nystatin).This is the first report on the antibacterial and antifungal activities of *C. bruguierana* extracts from Iraq and its bordering countries.

Kew words :*Antibacterial, Antifungal , Asteraceae, Centaurea , Iraq.*

Introduction

Centaurea is the fourth largest genus in the Asteraceae family ,including 300 -700 species[1] [2] [3][4] with annual, biennial and perennial plants [5] that distributed all around the world especially in Mediterranean sea region and west Asia [1][4] .In Iraq, this genus was represented by more than 30 species [6]. Species of this genus have been used in folk medicine as diuretic , stomachic , tonic, astringent, antimalarial ,antirheumatic, antidandruff, hypoglycemic and antipyretic [2][7][8][9][10]. Many investigations have been indicated the presence of different classes of active compounds in this genus which in many cases are responsible for its biological activity[10][11]. C. *bruguierana* (DC.)Hand.-Mazz. was reported for the first time from Iraq [12]. Our previous study [13] showed a high flavonoid content in this species. However, there is no reports on the antimicrobial activity of C. *bruguierana* in the literature .Therefore, this study was conducted to evaluate the effects of the methanol and aqueous extracts of this species in four bacterial species (two Gram positive and two Gram negative) and four fungal species .

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Materials and Method

Plant materials and extraction method

C.bruguierana samples were collected from Tikrit province/ Salahadin Governorate (north central Iraq)in March 2018 . Plant samples were identified according [14] and confirmed by the Iraqi National Herbarium .Identified samples were kept in the Department of Biology, College of Education for Pure Sciences,TikritUniversity,Iraq . Aerial flowering parts of *C.bruguierana* were oven dried at 40^0C and then grinded with electrical mill. 40 g of the powdered samples were extracted with 160ml of 95%methanol or hot distilled water for 24 hours, then the liquid was filtered through gauze colth and filter paper Whatman No.1 and the filtrate was concentrated at 40^0C. The solid residue was stored in the fridge until subsequent use . For in vitro assay ,1gm of the solid

residue were dissolved in 10ml of the same solvents

(methanol or distilled water) and tested at concentrations 25,50,100mg/ml . These concentrations were evaluated in triplicate for bacteria or fungi tested. Before use, the crude extracts (100mg/ml) were filtered by using Millipore filter with Whatman filter paper No. 0.22 [15] [16].

Microorganisms and antimicrobial assay

Two Gram positive(*Staphylococcus aureus , Bacillus pumilus*) and two Gram negative(*Escherichia coli , Pseudomonas aeruginosa*) bacterial species , three fungal species(*Microsporumcanis , Trichophytonrubrum , Aspergillusterreus*) and one yeast (*Candida albicans*)were used in this study. All bacteria and molds were obtained from the Biology Department ,College of Science, Baghdad University and the yeast was supplied from the Department of Biology,College of Science,Tikrit University. Nutritive media used included nutrient agar and MacConkey agar for bacteria and Sabouraurd dextrose agar and potato dextrose agar for fungi(all media from Bekasi , Indonesia). Antibacterial and antifungal activities were studied by agar well diffusion method [16][17]. For the antibacterial and antifungal tests ,tetracycline and nystatin (100µg/ml for each) were used as positive control while methanol and sterilized distilled water were used as negative control.

Results and Discussion

The biological activities of the methanol and aqueous extracts of C.*bruguierana* against bacterial and fungal species tested in this study are presented in Table 1 ; Fig.s.1,2 . The results showed that all C. *bruguierana* extracts exhibited inhibitory activity against all bacterial species studied while these extracts showed some activity on fungi tested .Methanol extracts revealed strong activity against both bacterial and fungal species studied compared with the aqueous extracts. The activity of the studied extracts was directly proportional with their concentrations . As shown in Table 1 , *S.auraus ,E.coli* and *M.canis* were the most sensitive to the extracts tested especially at high concentrations. In case of bacteria(Table 1 and Fig.1) ,methanol extract of *C.bruguierana* at all concentrations showed inhibition zone diameters (16.1-25mm) very close or greater than the standard antibiotic tetracycline(16.4mm) . Methanol extract only at high concentration (100mg/ml) gave inhibition zones diameter(17-20mm) greater than the antifungal nystatin(15mm) . Aqueous extracts except few cases (*B.pumilus and P.aeruginosa*) showed inhibition zones close or greater (15.1-25.4 mm)than the control etracycline (Table 1 and Fig.2).Aqueous extracts at all concentrations showed lower inhibition zones diameter than the antifungal nystatin . Table 1 revealed that the mean inhibition zone diameters exhibited by the methanol extracts(19.1-23.6mm for bacteria and 14.2-16.7mm for fungi) were greater than those exhibited by the aqueous extracts (3.0-22.6mm). The high flavonoid contents previously reported in *C. bruguierana*[13] may be responsible for the antimicrobial activity of this species[10][11] . According to the literatures, this is the first report on the antimicrobial activity of the *C. bruguierana*. The present study was in agreement with the previous studies on the antimicrobial activity of the other *Centaurea*species ,particularly their methanol extracts[3][6][7][8][10] [18][19] .However, further studies are needed to evaluate the biological activity of methanol extracts of *C. bruguierana* against other pathogenic bacteria and fungi ,because their antimicrobial activities are more than that of the of the standard antibiotic tetracycline and antimycoticnystatin.

Conclusion

This is the first study on the antimicrobial activities of *C. bruguierana* extracts. This study showed a promising antimicrobial activities of *C. bruguierana* extracts ,particularly methanol extracts . Methanol extracts exhibited stronger antibacterial and antifungal activities than the standard antibiotic tetracycline and the antifungal nystatin. This plant species could be a source for antimicrobial drug against pathogenic microorganisms ,particularly multiresistant bacteria .

Table 1. Antibacterial and antifungal activities of the methanolextract from C.bruguierana

Microbes	methanol extract mg/ml			aqueous extract mg/ml			mean methanol extract	mean aqueousextract
	25	50	100	25	50	100		
S.aureus	20.9	24.9	25.0	20.0	22.0	23.3	23.6	21.8
B. pumilus	16.1	19.2	22.6	13.2	15.1	15.3	19.1	14.5
E.coli	020.	23.2	25.9	20.1	22.3	25.4	23.0	22.6
P.aeruginosa	18.3	19.2	20.9	9.0	9.0	11.2	19.5	9.7
C. albicans	10.3	10.5	019.	0.0	0.0	9.9	14.2	3.6
T. rubrum	14.0	17.0	19.0	0.0	0.0	9.0	16.7	3.0
M. canis	14.0	14.0	20.0	9.0	9.0	10.5	16.0	9.5
A. terreus	14.0	16.0	17.0	0.0	14.0	14.0	15.6	9.3
tetracycline	16.4							
nystatin	15							
Methanol	0.0							
water	0.0							

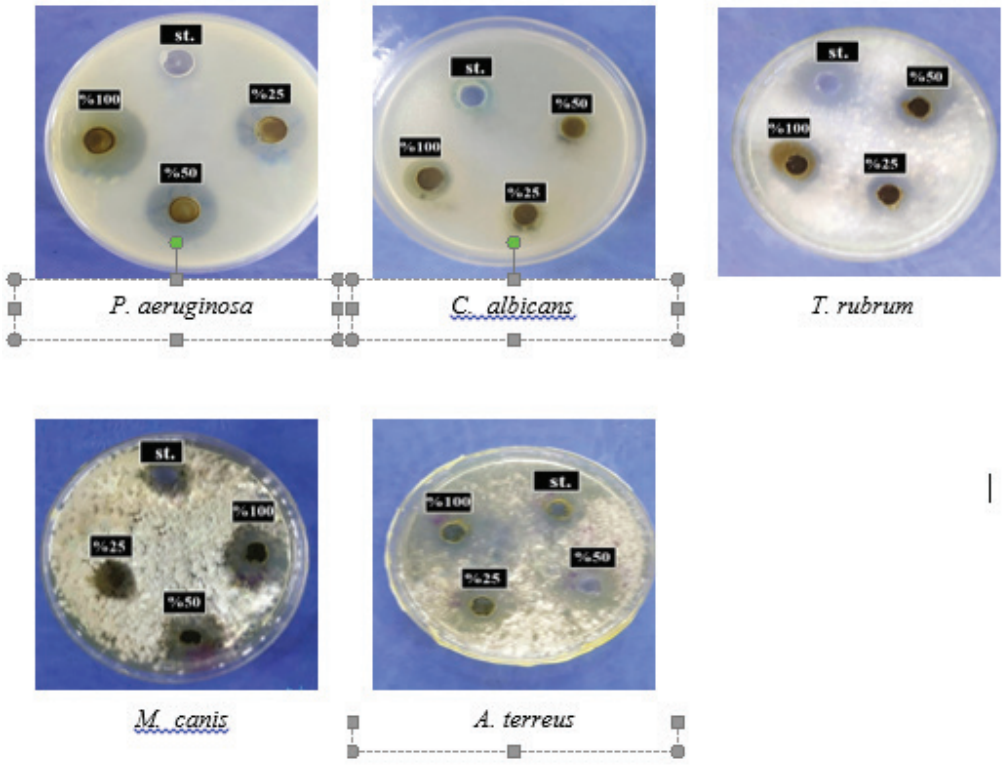

Fig.1. Antimicrobial activity of the methanol extracts of *C.bruguierana*.
St:standard

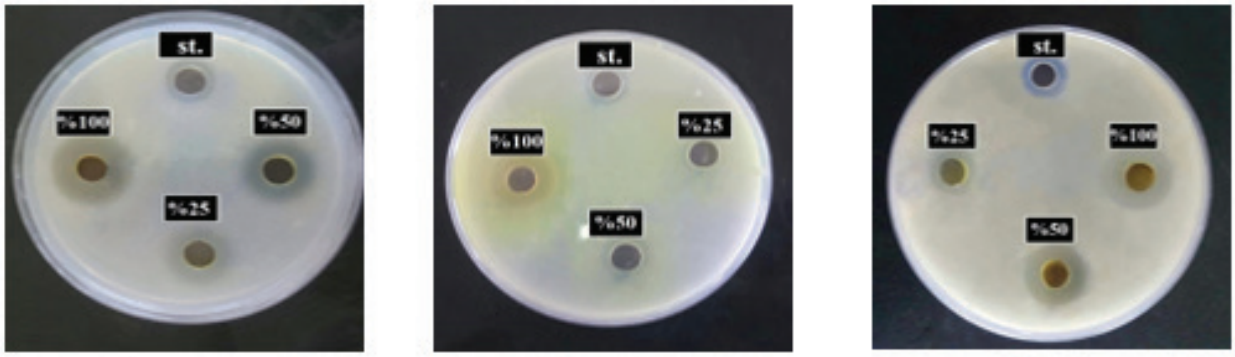

Fig.2.antimicrobial activity of the aqueous extracts of *C.bruguierana*.
St: **standard**

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