

ANTIMICROBIAL ACTIVITY OF SOME PLANTS USED IN FOLK MEDICINE IN TURKEY

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Abstract

A preliminary antimicrobial activity screening of some medicinal plants collected from Idris Mountain in Ankara-Turkey, were evaluated. Methanol (80 %) extracts were prepared after exhausted with ethyl acetate from aerial parts of 15 plants used in Turkish folk medicine. In order to examine antimicrobial activity of the methanol extracts, the disc diffusion method was used against the tested microorganisms. The inhibition zone diameter was determined for each extract. All of the extracts were found to be active against yeast, and only Allium rotundum L. and Potentilla recta L. showed antibacterial activity.

Key Words: Antimicrobial activity; Folk medicine; Disc diffusion method; Turkey

Türkiye’de Kullanılan Halk İlacı Bazı Bitkilerin Antimikrobiyal Aktivitesi

Bu çalışmada Ankara’nın kuzeydoğusunda yer alan İdris Dağı’ndan toplanan bazı tıbbi bitkilerin antimikrobiyal aktiviteleri değerlendirilmiştir. Türkiye’de halk arasında kullanımı olan 15 bitkinin toprak üstü kısımları önce etil asetat ile tüketilmiş, sonra (% 80) metanollü ekstreleri hazırlanmıştır. Antimikrobiyal aktiviteyi değerlendirmek için disk difüzyon metodu kullanılmıştır. Her bir ekstre için inhibisyon zonları belirlenmiştir. Tüm ekstreler mayalara karşı aktivite gösterirken, yalnızca Allium rotundum L. ve Potentilla recta L antibakteriyel aktivite göstermiştir.

Anahtar Kelimeler: Antimikrobiyal aktivite; Halk tıbbı; Disk difüzyon metodu; Türkiye

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INTRODUCTION

During the last decade, the use of traditional medicine has expanded globally and is gaining popularity both in poor developing countries and countries which have conventional medicine in their national health care system (1). Plant species that used in folk medicine have been the centre of interest because of containing active compounds or their active extracts, therefore natural compounds from medicinal plants used as source of medicine in all cultures for that may give a new antimicrobial agent (1-4).

Discovery of antimicrobial drugs is important for the control of bacterial infections for some pathogens rapidly become resistant to many of established antibiotics. Studies about biological activities of plants that used in folk medicine have increased. Same as screening studies for biological activities have been recently increased on plants that have traditional usage in Turkey, where traditional medicine seems to be common like the other developing countries (5). Turkish Flora has one of the most extensive floras in continental Europe (6), with more than 9000 flowering plant species (7). The flora of İdris Mountain has very large vegetation with the endemism (8). Previously, there are lot of antimicrobial activity studies performed on some species regarding selected species from Idris Mountain.

The genus *Allium* comprises more than 141 species in Flora of Turkey (9). The genus is also well known in folk medicine. Various reports regarding the *Allium* species concern about antibacterial activities were released up to now, including their essential oils (10-18).

Flowers of *Anthemis cotula*, flowers and leaves of *Anthemis scariosa* (2, 19) and essential oil of *Anthemis xylopoda* exhibited antimicrobial activity (20). *Anthemis nobilis* essential oil showed anti-*Candida* activity (21).

Sanguinarine, a benzophenanthridine alkaloid derivative in *Fumaria* species, has been shown to possess antimicrobial activity (22).

Root, stem, leaf and fruit extracts of *Glaucium flavum* showed antibacterial activity (23). *Glaucium oxylobum* exhibited antifungal activity. The activity is attributed to some alkaloids, such as dicentrine, glaucine, protopine and -allocryptopine (24).

Inula viscosa has antimicrobial activity (25). Maoz and Neeman (26) showed that leavaes *Inula viscosa* inhibited *Candida albicans*.

Also, several antibacterial activity studies also were performed on *Phlomis* species (27, 28, 29).

The antifungal activity was investigated on *Sedum oxypetalum* (30) in a recent study.

Sideritis curvidens and *Sideritis lanata* essential oils showed antibacterial activity and their antibacterial activities were found to be more than tested reference antibiotics (31).

A large number of reports concerning the antibacterial evaluation of *Thymus* species can be found in the literature. These studies are focused on essential oil of this genus especially (32-41).

In the current study, we report the antimicrobial activities of extracts from 15 medicinal plants collected from İdris Mountain with very rich vegetation located in northeast of Ankara (8). These selected plants, *Allium rotundum* L., *Anthemis tinctoria* L., *Centhranthus longiflorus* Stev., *Digitalis lamarckii* Ivan, *Fumaria asepala* Boiss., *Glaucium grandiflorum* Boiss. & Huet ssp. *grandiflorum*, *Inula britannica* L., *Malabaila secacaul* Banks & Sol., *Phlomis armeniaca* Willd., *Potentilla recta* L., *Sedum acre* L., *Sideritis galatica* Bornm., *Thymus sipyleus* Boiss., *Zosima absinthifolia* (Vent.) Link., were evaluated for their in vitro antimicrobial activity. Some of them are reported for the first time for their antibacterial activity in this study.

The selected plants for this study, and their traditional usages in Turkey as shown (Table 1) (42).

Table 1: Selected plant species and their traditional usage

Plant name	Plant Family	AEF No	Traditional name	Traditional uses for genus
<i>Allium rotundum</i>	Liliaceae	23155	Körmen	antiseptic, antibacterial, diuretic, hypotensive, wound healer, laxative, cardioactive
<i>Anthemis tinctoria</i>	Asteraceae	23168	Boyacı papatyası, sarı papatya	stimulant, emmenagogue, anti-flatulence and natural dye
<i>Centranthus longiflorus</i>	Valerianaceae	23165	Kırmızı kantaron, kırmızı mahmuz çiçeği	sedative and hypnotic. <i>C. longiflorus</i> used as <i>C. ruber</i>
<i>Digitalis lamarekii</i>	Scrophulariaceae	23164	Doğu yüksükotu	No report
<i>Fumaria asepala</i>	Papaveraceae	23163	Şahtereotu	sedative, diuretic, hypotensive and weight reducing
<i>Glaucium grandiflorum</i> var. <i>grandiflorum</i>	Papaveraceae	23161	Boynuzlu gelincik	narcotic, expectorant, insecticide, bradycardiac
<i>Inula britannica</i>	Asteraceae	23166	Andızotu	diuretic, expectorant, choleric, wound healer, appetizing, antihelmintic and tonic
<i>Malabaila secacul</i>	Apiaceae	23154	----	No report
<i>Phlomis armeniaca</i>	Lamiaceae	23167	Ballık otu, şalba, çalba, şalvarotu	stimulant like sage
<i>Potentilla recta</i>	Rosaceae	23157	Beşparmakotu	constipation, antipyretic and tonic
<i>Sedum acre</i>	Crassulaceae	23159	Acıdamkoruğu, kayakorluğu	diuretic, laxative and wound healer (<i>S. acre</i> ; diuretic and laxative)
<i>Sideritis galatica</i>	Lamiaceae	23156	Dağçayı	appetizing, carminative
<i>Thymus sipyleus</i>	Lamiaceae	23160	Nemamulotu, sater	sedative, antiseptic, tonic, antihelmintic, for stomach and as a spice and essential oil used for antihelmintic, antiseptic and cholagogue
<i>Zosima absinthifolia</i>	Apiaceae	23162	----	No report

EXPERIMENTAL

Material

Allium rotundum L., *Anthemis tinctoria* L., *Centhranthus longiflorus* Stev., *Digitalis lamareckii* Ivan, *Fumaria asepala* Boiss., *Glaucium grandiflorum* Boiss. & Huet ssp. *grandiflorum*, *Inula britannica* L., *Malabaila secacaul* Banks & Sol., *Phlomis armeniaca* Willd., *Potentilla recta* L., *Sedum acre* L., *Sideritis galatica* Bornm., *Thymus sipyleus* Boiss., *Zosima absinthifolia* (Vent.) Link. were collected from different localities of the İdris Mountain placed in north east of Ankara, in July 2004. All of the species were identified by H. Duman from Gazi University. Voucher specimens were deposited at the Herbarium of the Faculty of Pharmacy of Ankara University (AEF). The plants which tested for their antimicrobial activity were shown in (Table 1).

In this study, *Staphylococcus aureus* ATCC 25923, *Bacillus subtilis* ATCC 6633, *Escherichia coli* ATCC 23556, *Candida albicans* ATCC 10231, *Candida krusei* ATCC 6258, *Candida glabrata* (isolate) were used as test microorganisms (Table 2). The strains were taken from The Refik Saydam Hygiene Center.

Extraction

Air-dried and powdered plant materials (10 g) were extracted with magnetic stirrer at room temperature initially ethyl acetate, then methanol (80%) for 24 h. The methanol extracts were filtered and evaporated in vacuum at not more than 40 C, and then they were used for antimicrobial activity studies.

Determination of Antimicrobial Activities

The disk-diffusion method was used as a screening test for antimicrobial activity (43). Twenty milliliters of the Mueller-Hinton Agar (Oxoid) for bacteria, Sabouraud Dextrose Agar (Oxoid) for yeast were poured into 9-cm sterile petri dishes. A suspension containing 10^8 cfu/ml bacteria, 10^6 cfu/ml yeast was spread on the plates of Mueller-Hinton Agar, Sabouraud Dextrose Agar respectively.

The residues obtained by the evaporation of the extracts dissolved in DMSO (dimethylsulfoxide) to obtain 10 mg/mL concentration separately in order to prepare the test solutions in concentration of 10 mg/mL each. Sterile paper disks in 6 mm diameter (Schleicher & Shüll No. 2668, Germany) were impregnated with these solutions with the capacity of 20 μ L. These impregnated disks were applied on solid agar medium in petri dishes by pressing slightly. After the incubation periods, inhibition zones were measured and compared with that of the references. These experiments were carried out in duplicate.

The plant extracts, bacteria, fungus and standard antibiotics disks used in this study were shown in (Table 2).

RESULTS AND DISCUSSION

This paper reports the first attempt to study antimicrobial activity of the plants that grow in Idris Mountain. The selected plants have also traditional usage for different purpose. Moreover, they have some biological activities that were reported in the scientific literature.

The inhibition zones of methanol extracts of species are given in (Table 2).

Table 2: Antimicrobial activities of tested plant extracts

Material	Diameter of Inhibition Zone (mm)					
	<i>S. aureus</i> ATCC 25923	<i>B. subtilis</i> ATCC 6633	<i>E. coli</i> ATCC 23556	<i>C. albicans</i> ATCC 10231	<i>C. krusei</i> ATCC 6258	<i>C. glabrata</i> (isolate)
<i>Allium rotundum</i> L.	-	12	-	15	10	15
<i>Anthemis tinctoria</i> L.,	-	-	-	11	12	-
<i>Centranthus longiflorus</i> Stev.	-	-	-	14	10	-
<i>Digitalis lamarckii</i> Ivan	-	-	-	-	10	-
<i>Fumaria asepala</i> Boiss.	-	-	-	10	10	-
<i>Glaucium grandiflorum</i> Boiss. & Huet var. <i>grandiflorum</i>	-	-	-	-	12	-
<i>Inula britannica</i> L.	-	-	-	-	14	9
<i>Malabaila secacul</i> Banks & Sol.,	-	-	-	-	12	-
<i>Phlomis armeniaca</i> Willd.	-	-	-	17	-	-
<i>Potentilla recta</i> L.	15	-	12	21	17	-
<i>Sedum acre</i> L.	-	-	-	13	12	-
<i>Sideritis galatica</i> Bornm.	-	-	-	9	15	-
<i>Thymus sipyleus</i> Boiss.	-	-	-	12	15	-
<i>Zosima absinthifolia</i> (Vent.) Link	-	-	-	10	10	-
Cephazoline (30 µg)	20	-	-	0	0	0
Gentamycin (30 µg)	-	-	21	0	0	0
Fluconazole (25 µg)	0	0	0	28	30	30

(-): No activity

0: Not tested

As shown in Table 2; all of the plant extracts all of the plant extracts showed moderate activity especially on fungus. However, the extract of the plants were found weakly active against bacteria strains. Only *Allium rotundum* showed moderate antibacterial activity on *B. subtilis*. Also, the extract of *Allium rotundum* showed antifungal activity on all of the tested yeast strains. *Anthemis tinctoria* exhibited antifungal activity on *C. albicans* and *C. krusei*. Antimicrobial activity of *Potentilla recta* were demonstrated against *S. aureus*, *E. coli*, *C. albicans* and *C. krusei*. *Fumaria asepala*, *Sedum acre*, *Sideritis galatica*, *Thymus sipyleus*, *Zosima absinthifolia*, *Centranthus longiflorus* exhibited antifungal effect on *C. albicans* and *C. krusei*, and *Glaucium grandiflorum* var *grandiflorum*, *Malabaila secacul* and *Digitalis lamarckii* extracts have antifungal activity only

against *C. krusei*. In previous studies, *Allium cepa* and *Allium sativum* have found to be active against *S. aureus* (18) and *Allium sativum* has shown activity against *C. albicans* (17). Similarly *Sedum oxypetalum* showed antifungal activity on *C. albicans* (30), and *Glaucium oxylobum* against some fungus strains (24).

Antimicrobial activity screening was performed on these selected plants from flora of Idris mountain in this study for evaluation of antimicrobial activity potential. The results of our study were supported by previous studies and exhibited similarities with the other studies.

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