

ANTIMICROBIAL ACTIVITY OF SOME PLANTS USED IN FOLK MEDICINE

GELENEKSEL TEDAVİDE KULLANILAN BAZI BİTKİLERİN ANTİMİKROBİYAL AKTİVİTESİ

Gülçin SALTAN ÇİTOĞLU^{1*} Nurten ALTANLAR²

¹Ankara University, Faculty of Pharmacy, Department of Pharmacognosy,
06100 Tandogan, Ankara-TURKEY

²Ankara University, Faculty of Pharmacy, Department of Microbiology,
06100 Tandogan, Ankara-TURKEY

ABSTRACT

In this study, the antimicrobial activities of the ethanollic extracts of Plantago major (Plantaginaceae), Ononis spinosa (Leguminosae), Lythrum salicaria (Lythraceae) and Juglans regia (Juglandaceae), all used in the folk-medicine, were tested against gram-negative (Escherichia coli, Pseudomonas aeruginosa) and gram positive (Staphylococcus aureus, Bacillus subtilis) bacteria as well as yeast-like fungi (Candida albicans, Candida galabrata, Candida krusei) by the agar diffusion method. All plants showed higher antibacterial activity against E. coli and S. aureus. The highest activity against yeast-like fungi were obtained by the extracts of Ononis spinosa and Lythrum salicaria.

Key Words: Antibacterial activity, Antifungal activity, Plantago major, Ononis spinosa, Lythrum salicaria, Juglans regia

ÖZET

Bu çalışmada halk arasında kullanımı olan Plantago majör (Plantaginaceae), Ononis spinosa (Leguminosae), Lythrum salicaria (Lythraceae), Juglans regia (Juglandaceae) 'nin etanollü ekstralarının antimikrobiyal aktivitesi bazı gram-negatif (Escherichia coli, Pseudomonas aeruginosa) ve gram-pozitif (Staphylococcus aureus, Bacillus subtilis) bakteriler ile maya benzeri mantarlara (Candida albicans, Candida galabrata, Candida krusei) karşı agar difüzyon metodu kullanılarak ölçülmüştür. Bütün türler E. coli'ye ve S. aureus'a karşı yüksek aktivite göstermiştir. Maya benzeri mantarlara karşı en yüksek aktiviteyi Ononis spinosa ve Lythrum salicaria ekstraları göstermiştir.

Anahtar Kelimeler: Antibakteriyel aktivite, Antifungal aktivite, Plantago major, Ononis spinosa, Lythrum salicaria, Juglans regia

* Correspondence author

INTRODUCTION

Herbal medicine has been improved in developing countries as an alternative solution to health problems and costs of pharmaceutical products. The development of drug resistance in human pathogens against commonly used antibiotics has necessitated a search for new antimicrobial substances from other sources, including plants. Plants used for traditional medicine contain a wide range of substances that are used to treat chronic as well as infectious diseases.

In this study, the antibacterial and antifungal potential of four plant extracts used in the treatment of skin disorders as antiseptic has been evaluated.

Plantago major L. (Plantaginaceae) is used externally, in the treatment of wounds and boils. It is used internally to suppress coughs associated bronchitis and upper respiratory inflammation, to reduce skin inflammation and as a laxative (1-3). The Commission E approved the internal use of *P. major* for catarrhs of the respiratory tract and inflammatory alterations of the oral and pharyngeal mucosa. Its external application is approved for inflammatory reactions of the skin (4).

Ononis spinosa L. (Leguminosae) is used for inflammatory diseases of the lower urinary tract and also for the treatment of kidney stones. Externally, it is used for the healing of wounds, eczema and the other skin disorders (1,5-7).

Lythrum salicaria L. (Lythraceae) is used internally for diarrhea, chronic intestinal catarrh, hemorrhoids and eczema. Externally it is used in the treatment of varicose veins, bleeding of the gums, hemorrhoids and eczema. The whole flowering plant and the flowering branch tips of this plant is used in the folk medicine (1,6,8).

Juglans regia L. (Juglandaceae) is used medicinally for centuries. The plant is used as a topical remedy for dermal inflammation and excessive perspiration of the hands and feet. It is also a common home remedy for the treatment of chronic eczema, scrofula and inflammation of the lids. The Commission E approved the use of *J.regia* leaves for mild and superficial inflammations of the skin. The leaves of this plant is used topically to treat scalp itching, peeling and dandruff sunburn and superficial burns as well as an adjunctive emollient and itch-relieving treatment in skin disorders (1,4,6,9-11).

In this report, we present data on the antimicrobial activity of the aqueous ethanolic extracts from four plants traditionally used for skin disorders in Turkey. The efficacies of the ethanolic extracts against four bacteria and three fungi strains have been investigated.

MATERIAL AND METHODS

Materials

Plant samples were collected from the vicinities of Kızılcahamam-Ankara. Taxonomic identities of the plants were confirmed by Prof. Dr. Hayri Duman. Designation of the individuals and their origin are given in Table 1.

Table 1. The names and origins of the plants used in this study

<i>Plantago majör</i>	B4 : Ankara:Kızılcahamam, 1000m, 22.7.2002, AEF 22910
<i>Ononis spinosa</i>	B4 : Ankara:Kızılcahamam, 1000m, 22.7.2002, AEF 22911
<i>Lythrum salicaria</i>	B4 : Ankara:Kızılcahamam, 1000m, 22.7.2002, AEF 22912
<i>Juglans regia</i>	B4 : Ankara:Kızılcahamam, 1500m, 22.7.2002, AEF 22944

Extraction of plant materials

The dried and chopped aerial parts of *Plantago major*, *Ononis spinosa* and *Lythrum salicaria* as well as the leaves of *Juglans regia* (20 g of each) were extracted with ethanol (75 % aqueous, 150 ml of each) for 24 hours by using a Soxhlet apparatus, respectively (12).

Antimicrobial activity

All the extracts were impregnated on empty sterilized discs having a diameter of 6 mm (Schleicher & Shüll No. 2668, Germany) in the amount of 20 µl. Discs were impregnated with pure ethanol as negative control. Standard antibiotic discs of ampicillin, cephalosporin and fluconazole were used for positive control. Discs were provided from Bioanalyse (Turkey). *Escherichia coli* ATCC 23556, *Pseudomonas aeruginosa* ATCC 10145, *Bacillus subtilis* ATCC 6633, *Staphylococcus aureus* ATCC 25923, *Candida albicans* ATCC 10231, *Candida galabrata* (isolate) and *Candida krusei* ATCC 6258 were used as test microorganism. The strains obtained from the Refik Saydam Hygiene Center.

The disc-diffusion method (13) was used as a screening test for antimicrobial activity, using Mueller-Hinton Agar (Oxoid) for bacteria and Sabouraud Dextrose Agar (Oxoid) for yeast-like fungi.

All extracts were dissolved in 75% aqueous ethanol to obtain 133 mg/ml extract concentration. These solutions were impregnated on sterile paper discs of 6 mm diameter (15 for per disc). Discs were applied on the solid agar medium by pressing slightly. The treated Petri dishes were placed at room temperature for 10 minutes and then incubated at 35 ± 0.1 °C for 24-48 hours. At the end of the incubation period, inhibition zones of the extracts formed on the medium were measured with a transparent ruler in millimeters and compared with those of reference antibiotics. These experiments were carried out in duplicate.

RESULTS AND DISCUSSION

The *in vitro* antimicrobial activities of the aqueous methanolic extracts of the title plants are shown in Table 2. The inhibition zones formed by the standard antibiotic discs (positive control) and the discs injected with only ethanol (negative control) are also given in Table 2.

Table 2. The inhibition zones diameters of free and aqueous ethanolic extracts of the plants (mm)

Diameters of the inhibition zones (mm)							
	<i>E. coli</i>	<i>P. aeruginosa</i>	<i>B. subtilis</i>	<i>S. aureus</i>	<i>C. albicans</i>	<i>C. galabrata</i>	<i>C. krusei</i>
<i>Plantago major</i>	11	10	-	13	7	12	12
<i>Ononis spinosa</i>	11	11	1	11	16	7	16
<i>Lythrum salicaria</i>	11	13	9	9	12	16	16
<i>Juglans regia</i>	10	10	-	12	11	8	8
<i>Ampicillin (25 fg)</i>	12	N.T	13	15	N.T	N.T	N.T
<i>Fluconazole(25 ng)</i>	N.T	N.T	N.T	N.T	18	20	20
<i>Control(Ethanol)</i>	-	-	-	-	-	-	-

N.T.: not tested

(-): no inhibition zone

When compared with the standard antibiotics, all plant extracts were found to have good activities against *E. coli* and *S. aureus*. However, *P. major* and *J. regia* did not show any activity against *B. subtilis*.

Ononis spinosa showed a good activity against *C. albicans* and *C. krusei*. Previously it was reported that the aqueous ethanolic extract of *O. spinosa* showed the similar results against *C. albicans* (7). *Lythrum salicaria* exhibited a good pattern of inhibition against *C. galabrata* and *C. krusei*. In a previous study *L. salicaria* was reported to show fungusidic activity against *C. albicans* (8).

In conclusion, the present study shows that the extracts examined have variable antimicrobial activities.

REFERENCES

1. **Baytop, T.**, Türkiye'de Bitkilerle Tedavi (Therapy with Medicinal Plants in Turkey), Nobel Tıp Basımevi, İstanbul, Turkey (1999).
2. **Gomez-Flores, R., Calderon, C.L., Scheibel, L.W., Tamez-Guerra, P., Rodriguez-Padilla, C., Tamez-Guerra, R., Weber, R.J.** "Immunoenhancing properties of *Plantago majör* leaf extract" *Phytother. Res.*, 14, 617-622 (2000).
3. **Holetz, F.B., Pessini, G.Z., Saunces, N.R., Cortez, D.A., Nakamura, C.V., Filh, B.P.** "Screening of some plants used in Brazilian folk medicine for the treatment of infectious diseases" *Mem. Inst. Oswaldo Cruz.*, 97, 1027-1031 (2002).
4. **Blumenthal, M.**, Herbal Medicine (Expanded Commission E Monographs), Integrative Medicine Communications, Newton (2000).
5. **Weiss, R.F.**, Herbal Medicine, Beaconsfield Publisher LTD., Beaconsfield (1992).
6. **Gruenwald, J., Brendler, T., Jaenjke, C.** PDR for Herbal Medicines, Medicinal Economic Company, New York (2001).
7. **Mahasneh, A.M., El-Oqlah, A.** "Antimicrobial activity of extracts of herbal plants used in the traditional medicine of Jordan" /. *Ethnopharm.* 64, 271-276 (1999).
8. **Rauha, J.P., Remes, S., Heinonen, M., Hopia, A., Kahkonen, M., Kujala, T., Pihlaja, K., Vuorella, H., Vuorella, P.** "Antimicrobial effects of finnish plant extracts containing flavonoids and other phenolic compounds" *Int. J. Microbiol.*, 56, 3-12 (2000).
9. **Robbers, J.E., Tyler, V.E.**, Tyler's Herbs of Choise: The Therapeutic Use of Phytomedicinals, The Havorth Herbal Press, New York (1999).
10. **Alkhawajah, A.M.** "Studies on the antimicrobial activity of *Juglans regia*" *Ani. J. Chin. Med.*, 25, 175-180 (1997).
11. **Ali-Shtayeh, M.S., Abu Ghdeib, S.L.** " Antifungal activity of plant extracts against dermatophytes" *Mycoses*, 42, 665-772 (1999).
12. **Khan, N.H., nur-E Kamal, M.S.A., Rahman, M.** "Antibacterial activity of *Euphorbia thymifolia* Linn" *Indian J Med. Res.*, 87, 395-397 (1988).
13. **National Committee for Clinical Laboratory Standards (NCCLS)**, Performance Standards for Antimicrobial Disc Susceptibility Tests, Approved Standard M2-A6, Villanova,PA(1998).

Received: 28.04.2003**Accepted: 02.07.2003**