Asian Journal of Chemistry Vol. 19, No. 6 (2007), 4862-4866

Antibacterial Activity of Some Species of Umbelliferae

H. TURAN AKKOYUN and NURSEL DOSTBIL*
Department of Biology, Faculty of Science, Yuzuncu Yil University, Van, Turkey
Fax: (90)(432)2251114; Tel: (90)(432)2251706
E-mail: ndostbil@yyu.edu.tr

In this work, the antimicrobial activities of some species of Umbelliferae (*Anethum graveolens* L., *Petroselinum crispum*, *Coriandrum sativum* L.) have been studied. For this purpose herb extracts which were prepared in diethyl-ether were tested to bacteria strains, *P. aeruginosa* ATCC 25853, *E. coli* ATCC 11239, *K. pneumoniae* FML 5, *M. luteus* ATCC 9345, *E. faecalis* ATCC 29212, *B. megaterium* DSM 32 and *S. aureus* ATCC 25923 with disk diffusion method as *in vitro*. It is determined that herbs which were investigated show different levels of inhibitory activity to test strains, dill affects all of the bacteria, parsley and coriander have minimum antimicrobial activity.

Key Words: Dill, Parsley, Coriander, Antimicrobial activity.

INTRODUCTION

According to a search that world health organization carried out by base on some studies which are done on the medical plants of 91 countries, it is pointed out that the total amount of the medical plants which are used with the purpose of treatment are about 20,000[1].

The success story of chemotherapy lies in the continuous search for new drugs to counter the challenge posed by resistant strains of microrganisms. The investigation of certain indigenous plants for their antimicrobial properties may yield useful results. A large number of plants indeed were used to combat different diseases and known to possess antimicrobial activity[2].

Spices have been defined as plant substances from indigenous or exotic origin, aromatic or with strong taste, used to enhance the taste of foods[3]. In addition to this studies have been reported on antimicrobial effects of different herbs and their extracts used as spices or aromatic herbs including garlic, rosemary, onion, nutmeg, curry, mustard, black pepper, cinnamoni, thyme, oregano sage, Jamaican pepper, aniseed, dill, basal, paprika, cassia, turmeric, cardamom, cayenne pepper, clover, chives, coriander, ginger, savory and marjoram[4-18].

The antimicrobial activities of different plants and their extracts used as species or aromatic herbs including dill, parsley and coriander have been investigated[19-22].

This study was carried out to determine whether dill, parsley and coriander seeds have inhibitory activity on some pathogenics and saprophytics microorganisms.

EXPERIMENTAL

The dill seed (*Anethum graveolens* L.), parsley seed (*Petroselinum crispum*) and coriander seed (*Coriandrum sativum* L.) obtained from whole seller and retail organic food stores. All samples collected were dried in shade and then powdered.

Standard strains of microorganisms used in the present study (*Pseudomonas aeruginosa* ATCC 25853, *Escherichia coli* ATCC 11239, *Klebsiella pneumoniae* FML 5, *Micrococcus luteus* ATCC 9345, *Enterococcus faecalis* ATCC 29212, *Bacillus megaterium* DSM 32 and *Staphylococcus aureus* ATCC 25923) were obtained from culture collection of Department of Microbiology, Yuzuncu Yil University, Van, Turkey.

Trypticase soy broth (TSB, DIFCO 0369-01-4) was used for activation of cultures of microorganisms. Antibacterial activity assays were carried out using Mueller-Hinton Agar (MHA, OXOID CM337).

Preparation of model extracts: The method suggested by Monsefi *et al.*[22] was applied to prepare model extracts. The dill, parsley and coriander seed powder were extracted with diethyl-ether for 3 d and subsequently, the mixture was filtered and concentrated under reduced pressure (by a evaporator-Bibby-Rotary evaporator RE 100) at 50ºC. Different colour extracts were preserved in a refrigerator (4ºC) until the end of the analysis.

Test of antimicrobial activity: In the present study, disc diffusion technique as described by Hanafy and Hatem[23] was applied. The diethyl-ether extracts of dill, parsley and coriander seeds were transferred into sterile bottles containing filter paper (Whatmann No:1; 6 mm diameter) Bottles were then placed in a water bath (50°C) with occasional shaking to allow an even distribution of the extract between discs until complete evaporation of ether had been achieved. Disc diffusion techniques were used for this study as described by Hanafy and Hatem[23]. To activate bacterial culture, Trypticase Soy Broth (TSB, DIFCO 0369-01-4) were used while Mueller-Hinton Agar (MHA,OXOID CM337) was used in antibacterial activity. The strains taken from stock culture were diluted with TSB and incubated at 35 ± 0.1ºC for 24 h. At the end of incubation, bacterial suspansion, *ca.* contain 10^8-10^9 cfu/mL levels of organisms, mixed with a sterile loop and then, 0.1 mL were inoculated on MHA petri plates. The inoculum was spreaded on surface of plates completely and the inoculated

petri plates were dried in room temperature. Then, paper disks penetrated of plant extract were placed on petri plates inoculated previously and were incubated at 35 ± 0.1ºC for 48 h. Diameter of inhibition zone around dicks were measured and expressed as mm. Antibacterial activity studies were carried out duplicate for each test strains and average measurement were calculated.

RESULTS AND DISCUSSION

The beneficial health effects of extracts from many types of plants that are used as seasoning agents in foods and beverages have been claimed for centuries.

In this study the purpose is to examine the inhibitory effects of the dill, parsley and coriander seeds some pathogens causing food poisioning and different illneses in humans and some microorganisms causing spoilage in foods were used as test strains.

For this purpose, the diethyl ether extracts of the dill, parsley and coriander seeds were tested on *P. aeruginosa*, *E. coli*, *K. pneumoniae*, *E. faecalis*, *M. luteus*, *B. megaterium* and *S. aureus* with disc diffusion method *in vitro*. Results of antimicrobial activity assays are given in Table-1.

TABLE-1
ANTIMICROBIAL ACTIVITY RESULTS OF SOME SPECIES OF UMBELLIFERAE S

Bacterium strains	Inhibition zone (mm)		
	Dill seed	Parsley seed	Coriander seed
P. aeruginosa ATCC 25853	13	37	24
E. coli ATCC 11239	12	–	–
K. pneumoniae FML 5	17	15	10
E. faecalis ATCC 29212	14	–	6
M. luteus ATCC 9345	17	38	–
S. aureus ATCC 25923	13	10	21
B. megaterium DSM 32	22	–	–

(-) No inhibition.

The results of the antimicrobial activity assays indicated that dill seed had inhibitory activity on *P. aeruginosa*, *E. coli*, *K. pneumoniae*, *M. luteus*, *E. faecalis*, *B. megaterium* and *S. aureus*; however, in case of parsley and coriander no inhibitory activity was observed against *E. coli* and *B. megaterium*. Data presented in Table-1 shows that the *S. aureus* which is an important pathogen in food-poisoning has been identified as the most

sensitive strain against coriander. Examining findings, at the parsley the widest inhibition zone was formed around *M. luteus* (38 mm) and *P. aeruginosa* (37 mm) followed by *K. pneumoniae* (15 mm). The least inhibitory effects were observed for *S. aureus* (10 mm). In addition at the coriander the widest inhibition zone was formed around *P. aeruginosa* (37 mm) and *S. aureus* (21 mm) followed by *K. pneumoniae* (10 mm). The least inhibitory effects were observed for *E. faecalis* (6 mm).

The present study was designed to obtain antimicrobial effect of 3 dill, parsley and coriander plants on pathogenic microorganisms.

Antimicrobial characteristics of an herb is a factor of various chemical compunds including volatile oils, alcoloids, tanins, lipids and flavonozites that are presented in their tissue[24]. The inhibitory effect of dill seed detected in the present study may be due to the presence of tanins, rezin, fixed and volatile oils. The inhibitory effect of coriander seed detected in the present study may be due to the presence of flavonozites, glokosids, fixed and volatile oils. However the inhibitory effect of coriander seed detected in the present study may be due to the presence of sugar, tanins, rezin and volatile oils. The inhibitory effect of parsley seed detected in the present study may be due to the presence of volatile and fixed oils, flavonozites, glycosides.

Some investigators noted that sensitivity of microorganisms to chemotherapeutics differs according to type of strain. In this study, the difference between inhibition zone diameters on test strains, which were used in this study shows that, dill, parsley, coriander seeds affects microorganisms on different levels. This finding is similar to the findings of other investigators[25].

In this study, the most inhibitory effect is parsley herb. Findings of this study are similar to those reported by El Astal *et al.*[2]. Essential oils of coriander, mustard and pepper have been described as efficient on pathogens by other authors[9,26,27] however our extracts had effect against the some tested bacteria.

Tegos *et al.*[28] stated in their study that antimicrobial agents, hich were originated from herbs, had an inhibits activity on *S. aureus* and *B. megaterium*, which were mostly gram positive pathogens. Findings of this study show parallellism to findings of dill extre but not effect on *B. megaterium* while parsley and coriander extracts were just effect on *S. aureus*.

Results indicated that extracts of the dill, parsley and coriander seeds prepared using diethyl ether, has a strong inhibitory activity on some pathogen microorganisms. According to present studies, using dill, parsley and coriander seeds as antimicrobial additives in food may be useful.

REFERENCES

1. Ö. Ertürk and Z. Demirbag, Scorzonare mollis Bieb (Compositae) Bitkisinin Antimikrobiyal Aktivitesi. Cilt:12, Sayi:47, Sayfa:27-31 (2003).
2. Z.Y. El Astal, A. Ashour and A. Kerrit, *Pak. J. Med. Sci.*, **21**, 187 (2005).
3. P.M.L. Germano and M.I.S. Germano, *Higien Alimentar.*, **12**, 23 (1998).
4. L.L. Zaika and J.C. Kissenger, *J. Food Sci.*, **46**, 1205 (1981).
5. S.E. Aktug and M. Karapinar, *Int. J. Food. Microbiol.*, **3**, 349 (1986).
6. T. El-Khateib and H.A. El-Rahman, *J. Food. Prot.*, **50**, 310 (1987).
7. S.G. Deans and K.P. Svodoba, *J. Hort. Sci.*, **64**, 205 (1989).
8. R.S. Farag, Z.Y. Daw, F.M. Hewedy and G.S.A. El-Baroty, *J. Food Prot.*, **52**, 665 (1989).
9. P. Aureli, A. Constantini and S. Zolea, *J. Food Prot.*, **55**, 344 (1992).
10. M. Karapinar, *Int. J. Food. Microbiol.*, **10**, 193 (1990).
11. W.T.E. Ting and K.E. Deibel, *J. Food. Safety*, **12**, 129 (1992).
12. Y.A. Hefnawy, S.I. Mousta and E.H. Marth, *J. Food Prot.*, **56**, 876 (1993).
13. V.A. Pandit and L.A. Shelef, *Food Microbiol.*, **11**, 57 (1994).
14. D.L. Holt and N.G. Almonte, *J. Food Prot.*, **58**, 322 (1995).
15. A. Sivropoulou, E. Papanikolaou, C. Nikolaou, C. Kokkini, T. Lanaras and M. Arsenakis, *J. Agric. Food Chem.*, **44**, 1202 (1996).
16. Y.Y. Hao, R.E. Brackett and M.P. Doyle, *J. Food Prot.*, **61**, 307 (1998).
17. A.H. Çon, A. Ayar, H.Y. Gökalp, Bazi Baharat Uçucu Yaglarinin Çesitli Bakterilere Karsi Antimikrobiyal Aktivitesi. Gida Dergisi Sayi:3 Sayfa: 171-175 (1998).
18. D.S. Arora and J. Kaur, *Int. J. Antimicrob. Agents*, **12**, 257 (1999).
19. S.I.I. Abdel-Hafez and A.H.M. El-Said, *Int. Biodeter. Biodegrad.*, **39**, 67 (1997).
20. J.H. Al-Jedah, M.Z. Ali and R.K. Robinson, *Int. J. Food Microbiol.*, **57**, 129 (2000).
21. M. Elgayyar, F.A. Draughom, D.A. Golden and J.R. Mount, *J. Food Prot.*, **64**, 1019 (2001).
22. M. Monsefi, M. Ghasemi and A. Bahaoddini, *Daru*, **14**, 131 (2006).
23. M.S. Hanafy and M.E. Hatem, *J. Ethanopharmacol.*, **34**, 275 (1991).
24. T. Baytop, Türkiye'de Bitkiler ile Tedavi. I. Ü. Eczacilik Fak. I. Ü. Yayinlari. No:3255-Eczacilik Fak. No: 40, Istanbul (1984).
25. T.E. Çetin and N. Gürler, Bakterilerin Antibiyotiklere Duyarlilik Deneylerinin Yapilmasi, Kükem Dergisi, 12, 2 (1989).
26. C.N. Huntanen, *J. Food Prot.*, **43**, 195 (1980).
27. M. Kivanç and A. Akgül, *Flavour Fragr. J.*, **3**, 95 (1988).
28. G. Tegos, F.R. Stermitz, O. Lomovskaya and K. Lewis, *Antimicrob. Agents Chemo.*, **46**, 3133 (2002).

(*Received*: 22 November 2006; *Accepted*: 30 April 2007) AJC-5634