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Antibacterial Activities of *Helichrysum plicatum* Subsp. *Plicatum* Extracts

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The antibacterial activities of ethyl acetate($CH_3COOC_2H_5$),methanol,(CH_3OH) chloroform($CHCl_3$) and acetone(CH_3COCH_3) extracts of *Helichrysum plicatum* subsp. *plicatum* were tested *in vitro* against 15 different bacterial species and strains, by using the disc diffusion method. The extracts of the leaves, stem and flowers showed various inhibitory effects (7-31 mm50 μl^{-1} inhibition zone) but All the plant parts showed no inhibitory effect against *Corynebacterium xerosis* UC 9165.Therefore, due to its antibacterial activities it could be used to as a raw material for therapy purpose.

Key words: Antibacterial activity, *Helichrysum plicatum* subsp. *plicatum*, plant extract.

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Introduction

The genus *Helichrysum* (*Asteraceae*) comprises 16 species which are naturalized in Europe, (Roussis *et al.*, 1998). Members of this genus have been used in folk medicine, mainly as anti-microbial, anti-inflammatory, digestive, choloretic agents and fragrance, (Chinou *et al.*, 1996). Several species have minor uses, as a tea , culinary springs are added to rice, vegetables, and savoury dishes to give a mild curry flavour (Bown, 1995).These species contains triterpenoids, steroids, flavonoids, hydroxy-isopentenyl-acetophenone and phloroglucinol, (Chinou *et al.*, 1997). *H. plicatum* subsp. *plicatum* is one of the richest species which has flavonoid contents in the *Helichrysum* species, (Cubukcu, 1986). The plant constitute 4.83 % flavonoids, Helichrysin A and B, apigenin, naringenin, isoastragalin and isosalopurposit, (Cubukcu, 1986).

The aim of this work is to determine the antibacterial activities of *Helichrysum plicatum* subsp. *plicatum* extracts.

Materials and Methods

Helichrysum plicatum subsp. *plicatum* was collected from Yavşan Mountain (1600 m) in Kahramanmaraş in August 2000. The plant identified at Biology Dept. University of K.S.U.(Voucher specimen has been deposited at the herbarium of the Lab. of Biology Dept.).The collected plants of *H. plicatum* subsp. *plicatum* were dried and broken into small pieces under sterile conditions, and 20 g of the plant was extracted with 150 ml of (Merck, Damstadt) $CH_3COOC_2H_5$, CH_3OH, $CHCl_3$ and CH_3COCH_3 solvent for 24 hr. by using a Soxhlet equipment, (Khan *et al.*, 1988).The antibacterial activities were determined by using disc diffusion method, (Collins *et al.*, 1989; Bradshaw, 1992).

Micro - organisms: *Bacillus brevis* FMC 3, *Bacillus megaterium* DSM 32, *Bacillus subtilis* IMG 22, *Bacillus subtilis var. niger* ATCC 10, *Corynebacterium xerosis* UC 9165, *Escherichia coli* DM, *Listeria monocytogenes* SCOTT A, *Micrococcus luteus* LA 2971, *Mycobacterium smegmatus* RUT, *Staphylococcus aureus* ATCC 25923, *Streptococcus thermophilus*, *Yersinia enterocolitica* O:3 P 41797.

All the extracts thus obtained and the standard antibiotics were injected into empty sterilized antibiotic discs having a diameter of 12 mm (Schleicher & Schüll No: 2668, Germany) in the amount of 50µl. The discs injected with solvents only were used as a control (Erdoğrul, 2000).

Results and Discussion

In vitro antibacterial activities of the extracts of different parts (leaves, stem and flowers) of *H. plicatum* subsp. *plicatum* showed in Table 1.The extracts were inhibited 12 out of 11 test bacteria (Table 1). Acetone extracts of flowers of *H. plicatum* subsp. *plicatum* inhibited 3 bacteria and its extracts of stem and leaves inhibited 8 out of 12 test bacteria. Methanol extracts of flowers inhibited 7 , while its extracts of stem and leaves inhibited 2 bacterias. In addition to these chloroform extracts of flowers, stem and leaves inhibited 11 bacteria. Ethyl acetate extracts of flowers inhibited 11 bacteria and finally ethyl acetate extracts of stem and leaves inhibited 9 bacteria out of 12. The ethyl acetate extracts of flowers, stem and leaves of *H. plicatum* subsp. *plicatum* have better antibacterial efficiency than the other extracts. All of the extracts of *H. plicatum* subsp. *plicatum* have shown no antibacterial efficiency to *Corynebacterium xerosis* .

Chinou *et al.*, (1996) reported the bacteriostatic activity of *H. amorginum* against *S. aureus, S. epidermis, P. aeruginosa, K.pneumoniae, E.cloaceae* and *E.coli* having MIC 0.75, 0.75, 1.25, 1.25, 1.25, 7.5mg ml^{-1} respectively and the bacteriostatic activity of *H. italicum* species was observed against *S. aureus, S. epidermis, P. aeruginosa , K. pneumoniae, E. cloaceae* MIC value is 3.25, 3.25, 3.75, 3.50, 3.50 mg ml^{-1} respectively and no bacteriostatic effect was detected against *E. coli.* The other study of Chinou *et al.* (1997), (MIC mg ml^{-1}) about the bacteriostatic activity of *H. stoechas* and *H. taenari* was reported and the bacteriostatic activity of *H. stoechas* was observed against *S. aureus* 1.250, *S. epidermis* 1.250, *P. aeruginosa* 7.500, *K. pneumoniae* 3.750, *E. cloaceae* 3.500 and *E. coli* 2.500, and the bacteriostatic activity of *H. taenari* was observed against *S. aureus* 1.250 , *S. epidermis* 1.250, no effect against *P. aeruginosa, K. pneumoniae, E. cloaceae* and *E. coli* .

It is not surprising that there are differences in the antibacterial effects of plant groups, due to phytochemical properties and differences among species. For the evaluation of plants which are naturally grown in Turkey, and are potential useful resources, additional studies will be beneficial from medicinal and economic stand points.

According to our results *H. plicatum* subsp. *plicatum* could be used as raw material for therapy because of its antibacterial activities.

Table 1. Antibacterial activities of the extracts of *Helichrysum plicatum* subsp. *plicatum*

	Inhibition Zone (mm)							
	Helichrysum plicatum subsp. plicatum extracts (50µl)							
Microorganisms	1	2	3	4	5	6	7	8
Bacillus brevis FMC 3	-	20	18	-	20	21	22	25
Bacillus megaterium DSM 32	-	16	18	-	21	21	22	21
Bacillus subtilis IMG 22	-	-	-	-	21	20	19	-
Bacillus subtilis var. niger ATCC 10	17	20	20	17	18	18	17	18
Corynebacterium xerosis UC 9165	-	-	-	-	-	-	-	-
Escherichia coli DM	-	17	19	-	25	26	29	31
Listeria monocytogenes SCOTT A	19	20	-	18	18	19	18	-
Micrococcus luteus LA 2971	-	15	14	-	20	22	20	24
Mycobacterium smegmatus RUT	13	-	-	-	20	23	23	27
Staphylococcus aureus ATCC 25923	-	-	-	-	23	24	23	30
Streptococcus thermophilus	-	16	17	-	23	27	24	30
Yersinia enterocolitica O:3 P 41797	-	20	20	-	13	19	24	25

1.Acetone extracts of flowers of *Helichrysum plicatum* subsp. *Plicatum*, 2. Acetone extracts of stem and leaves, 3. Methanol extracts of flowers, 4. Methanol extracts of stem and leaves, 5. Chloroform extracts of flowers, 6. Chloroform extracts of stem and leaves, 7. Ethyl acetate extracts of flowers, 8. Ethyl acetate extracts of stem and leaves

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