Investigating the chemical composition of different parts extracts of bipod nettle *Urtica dioica* L. in Tonekabon region

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Abstract

Bipod nettle *Utrica dioica* L has therapeutic properties in treatment of human chronic diseases such as anemia, joints pain and skin diseases. In this research the major components of extracts in different parts of plant (root, stem and leaf) were identified by gas chromatography (GC) apparatus. Twenty compounds were identified, the most important of which were Neophytadiene (25.21%), Phtaleic acid (8.15%), Dibutyl phtaleate (7.37%), Bis (2-ethyl hexyl) maleate (6.32%) and 1,2-benzenocli carboxylic acid (7.62%). The study revealed that the amount of these compounds in leaf was greater than in other parts of plant. Thus to extract the antibacterial compounds in *Urtica dioica* L., it is recommended to use leafs.

Keywords: extract; chemical analysis;nettle *Urtica dioica* L.

Abbreviations:
GC: gas chromatography

Habibi Lahigi, S., K. Amini, P. Moradi and **K. Asaadi. 2001.** 'Investigating the chemical composition of different parts extracts of bipod nettle *Urtica dioica* L. in Tonekabon region'. *Iranian Journal of Plant Physiology* 2 (1), 339 – 342**.**

Introduction

Medicinal plants are important from botanical perspective due to having nutritional and medicinal active compounds. The family of nettle, belonging to medicinal plants, is composed of 600 species distributed among 45 genuses. Urtica is an important genus that with 30 species and *Utrica dioica* L as a bipod nettle is categorized in this group. The name 'Urtica' is obtained from Greek word 'Uro' which means burning (piquant fuzz) and 'Dioica' meaning bipod. The piquant fuzz is among the main characteristics for identifying this plant as it covers all parts of the plant. The bipod nettle is native plant of mild regions of Europe and Asia. It is a grassy plant with height 0.5-1m and often grows wildly in humid and shady places. Bipod nettle *Urtica dioica* L. has medicinal properties and its extract have been used for hundreds of years in world traditional medicine for treating diseases such as eczema, digestion and sexual disorders, joints pain and anemia (Cowan, 1999). Studies show that nettle plant extracts have antibacterial effects and this effect on the positive and negative gram bacteria is several

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Received: October 2011
Accepted: November 2011

times more than chemical antibacterial materials (Lichius and Math, 1997; Obertreos et al., 1996). Also it is reported that nettle extract in synthetic condition can halt the viral propagation for viruses such as those causing aids and hepatitis (Akubugw, 2007; Agbafor and Unicini Manganelli et al., 2005; Chrubasik et al., 2007).

As nettle plant extract has antivirus, anti fungi and anti bacterial properties, this study aims at identifying different compounds in nettle extract and compare the contents of these compounds in roots, stems and leaves.

Materials and Method

Plant gathering and extracting

The different organs of nettle plant including root, stem and leaf were gathered from Dohezar region located in Tonekabon, north of Iran and then verified by Botanical Department of of Islamic Azad University, Saveh Branch. The drying process for different parts of plant has a great importance. Different parts of plant were expanded in shady place separately. After drying and segmenting the plants into small pieces, each organ was separately extracted by Celvanger apparatus with water for 6 hours and after separating the extracts from water by $NaSO_4$, dehydration was done and the resulted extracts were kept in dark and closed bottles. 3.4 g extract was obtained per each 100 g dried weight of plant.

Identifying the extract components

The most important components of extract were separated by GC method and their percentages were determined through normalizing method. The extract analysis was done by gas chromatography apparatus (Varian C-P-3800) based on the following conditions. The used column was SP Sil 8CB with 60mm length and with 0.32mm diameter. The thickness of static phase layer was 0.25 micrometer and the conveying gas was nitrogen and the pressure of head in column was 7 psi. The thermal scheduling ranged from 50 to 230°C and by 3°C increment per minute, and temperature of injection case was 117°C determined in transfer line 250°C. Then 1 µl of nettle extract (from root, stem, leaf) was separately injected three times and the relative percentage of major components of extract were determined using standard materials and comparing the retardation time.

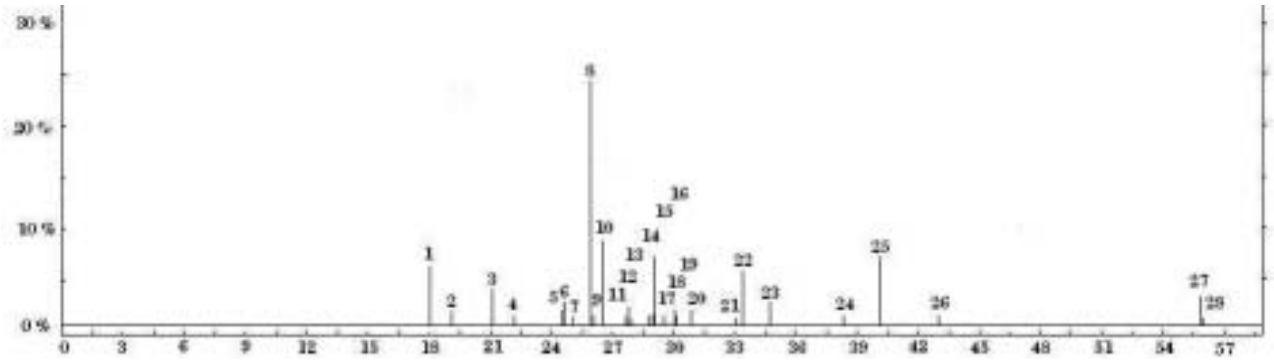

Fig. I. Leaf chemical composition of *Urtica dioica* L

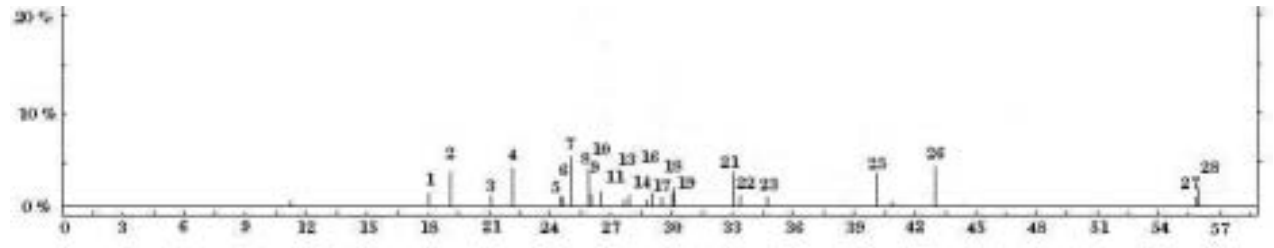

Fig. III. Root chemical composition of *Urtica dioica* L

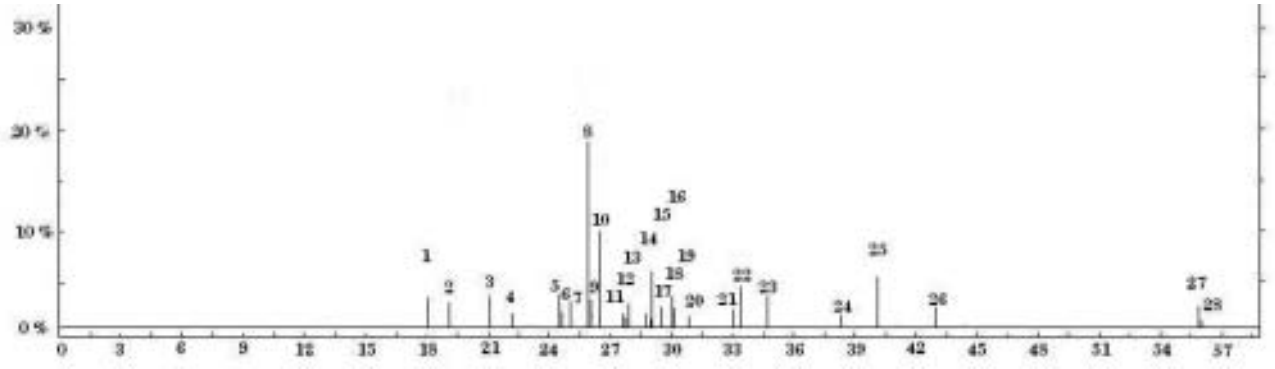

Fig. II. Stem chemical composition of *Urtica dioica* L

Results

In this research, chemical compositions in different organs of nettle plant *Urtica dioica* L were extracted by water and distillation method. The extracted compounds included 2,4,10-trimethyl, 14-ethylen-14-pentadecen (Neophytadiene) (25.21%), butyl tetradecyl ester (Phetalic acid) (8.15%), dibutyl ester (dibutyl phtalat) (7.37%), bis(2-ethyl hexyl) maleat (6.32%) and 1,2-benzen edi carboxylic acid (7.62%). Overall, concentration of these compounds in leaf was greater than in root and stem (Figs.I, II & III). The compounds and their relevant quantity in various plant organs are shown in Table 1.

Discussion

Results suggested that concentration of the chemical compounds in leaves were higher in comparison with stem and root extracts. Analysis of the chemical compounds of the plant showed that bipod nettle *Urtica dioica* L. extracts contained Neophytadiene. Neophytadiene is reported to be an antibacterial compound (Palicee et al, 2002) suitable for treatment of headache, rheumatism and some skin diseases (Suresh et al., 2010). Aromatic compounds including carboxylic acids and esters were also reported in this plant (Ray et al, 2010). Finally, fat acids including phtalic acid, dibutyl ester, Bis (2-ethyl hexyl) maleat and 1,2-benzenedi carboxylic acid were observed in this plant. These compounds are reported to have anti putrefying (Li et al, 2004) and antimicrobial effects (Moolupe et al, 2010). The study showed that these highly valuable medicinal compounds are more concentrated in leaves comparing to other organs.

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Table 1
GC Aanalytical report for Root, Steam and Leaf of essential oil of *Urtica dioica* L.

Number	Name of the compound	Molecular formula	RT	Peak Leaf%	Peak Steam%	Peak Root%
1	2,4-di-t-butylphenol	$C_{14}H_{22}O$	18.15	5.28	3.12	0.93
2	Unknown	——	19.33	2.16	2.64	3.81
3	Phosphoric acid tributylester	$C_{12}H_{27}O_4P$	21.31	4.12	2. 81	0.68
4	8-methylheptadecane	$C_{18}H_{38}$	24.43	1.20	1.85	4.21
5	1-Heptadecene	$C_{17}H_{34}$	24.68	2.15	4.10	0.85
6	Eicosane	$C_{20}H_{42}$	24.84	2.83	2.03	0.72
7	Unknown	—	25.11	1.04	2.81	5.38
8	Neophytadiene	$C_{20}H_{38}$	25.94	25.21	18.56	4.70
9	3,7,11,15-tetramethyl-2-hexadecyl ester	$C_{20}H_{40}$	26.12	1.63	3.45	1.66
10	Phtaleic acid	$C_{26}H_{42}O_4$	26.66	8.15	9.11	2.36
11	2,6,10,15-tetramethylheptadecane	$C_{21}H_{44}$	27.79	1.17	1.59	0.48
12	Olean-18-ene	$C_{30}H_{50}$	27.91	2.25	1.61	-
13	Unknown	—	28.84	0.86	2.70	1.20
14	3,5-di-tert-butyl-ortho-benzoquinone	$C_{14}H_{20}O_2$	28.85	1.28	1.79	0.52
15	2,6,10,14-tetramethylpentadecane	$C_{19}H_{40}$	29.10	1.45	1.13	-
16	Dibutylphtaleate	$C_{16}H_{22}O_4$	29.26	7.37	5.22	2.15
17	Unknown	—	29.70	1.86	2.59	0.72
18	Heneicosane	$C_{21}H_{44}$	30.37	2.26	4.06	1.30
19	Unknown	—	30.49	1.36	2.59	2.26
20	Hexacosane	$C_{28}H_{54}$	32.66	2.04	1.33	-
21	Unknown	—	33.03	0.92	2.06	4.15
22	Bis(2-ethyl hexyl)maleate	$C_{20}H_{36}O_4$	33.54	6.32	4.19	1.59
23	Nonacosane	$C_{29}H_{60}$	34.77	2.72	3.81	0.82
24	Pentacosane	$C_{25}H_{52}$	38.46	1.51	1.77	-
25	1,2,-benzenedicarboxylic acid	$C_{24}H_{38}O_4$	40.61	7.69	5.09	3.11
26	Unknown	—	43.55	1.40	2.68	4.42
27	2-tert-Butyl-4,6-bis(3,5-di-tert-butyl-4-hydroxybenzyl) phenol	$C_{40}H_{58}O_3$	55.96	3.42	2.12	1.15
28	Unknown	—	56.27	0.51	0.48	1.88

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