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Chemical Composition of the Essential Oil of *Cyperus Conglomeratus* Rottb. from Iran

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Abstract: The compositions of the essential oil from *cyperus conglomeratus* were obtained by hydrodistillation and analyzed by GC/MS (Gas chromatography/mass spectrometry). Twenty seven compounds were identified. Of which the cyperene (27.2%) was the major component. This is the first time that an oil of *C. conglomeratus* has been found with cyperene as the major constituent. Also, the oil of *C. conglomeratus* consisted mainly of sesquiterpene hydrocarbons, oxygenated sesquiterpenes and a small percentage of monoterpenes.

Keywords: *Cyperus conglomeratus* Rottb., Essential oil composition, Cyperene, Cyperol

Introduction

Cyperaceae are the third largest monocotyledonous family[1] and constitute a specialized group of plants, particularly in relation to their generative structure[2]. The majority of the species of *Cyperaceae* are anemophilous and their flowers generally have no scent because of their tiny, inconspicuous flowers and hidden or reduced perianth[3].

Cyperus is a large genus of about 600 species of *Cyperaceae* (sedge family), that distributed throughout all continents in both tropical and temperate regions[4]. This genus is characterized by the presence of quinines[5], flavonoids[6] and sesquiterpenes[7]. One of the most famous species of the genus is *Cyperus rotundus*, as a medical plant, appearing among Indian, Chinese and Japanese traditional drugs that are used against spasms, stomach and bowel disorders and menstrual irregularities[8,9]. *C. rotundus* has been widely investigated by several authors and the most important essential oils isolated from *C. rotundus* are *α*-pinene, *β*-pinene, *α*-copaene, cyperene, cyperotundone, *α*-cyperone and caryophyllene oxide[10-13].

One of the species of *Cyperus* that is distributed in the southern coast, eastern south and central part of Iran is *Cyperus conglomeratus* Rottb.[14] This species is able to support extreme climatically conditions, since southern coast, eastern south and central part of Iran have dry and very hot air about eight month of year[15]. It has been reported that this species

used in traditional medicine as pectoral, emollient, diuretic, stimulant, analgesic and anthelmintic treatment[16]. The aim of this paper was to determine the composition of the essential oil from *C. conglomeratus*. A literature survey revealed that the oil of *C. conglomeratus* from Iran has not been previously studied. So we decided to examine this oil.

Experimental

The aerial parts of the *C. conglomeratus* species were collected at the Khark Island, Province of Hormozgan, Iran, in March 2007 at the flowering stage. Voucher specimens have been deposited at the herbarium of Research Institute of Forests and Rangelands (TARI).

Hydrodistillation

The aerial parts of the plant after grinding had been submitted to hydrodistillation with a Clevenger type apparatus according to the standard procedure described in the European pharmacopoeia[17]. The essential oil had been co-distilled with water for 3 h, collected, dried under anhydrous sodium sulfate and stored at 4 ºC until used. The yield of the oil was 1.5% and 1.2% (v/w), based on dry plant weight.

Gas chromatography-mass spectrometry

The essential oils were analyzed by gas chromatography coupled to mass spectrometry (GC–MS) (Hewlett- Packard computerized system comprising a 6890 gas chromatograph coupled to a 5973 mass spectrometer) using a capillary column, Hp-5Ms (5% phenylmethyl siloxane) (30 m × 0.25 mm, film thickness 0.25 μm). Oven temperature was programmed 60 ºC for 20 min and then increased to 220 ºC at a rate of 4 ºC/min, finally holding at 220 ºC for 20 min. Helium was used as carrier gas at a flow rate of 1 mL/min. The ionization energy was 70 eV with a scan time of 1 s and mass range of 40-300 amu. Retention indices for all the compounds were determined according to the Kovats method using *n*-alkanes as standards. The identification of the oil components was accomplished by comparison of their GC retention indices as well as their mass spectra with corresponding data of authentic compounds or of components of reference oils[18,19]. Relative percentage was calculated from TIC by the computer.

Results and Discussion

The compositions of the oils of *C. conglomeratus* are listed in Table 1, in which the percentage and retention indices of components are given. More than twenty five compounds were identified in the oil, such as 5 monoterpenes, 11 sesquiterpene hydrocarbons and 11 oxygenated sesquiterpenes which represented 94.8% of the total composition of the oil. sesquiterpene hydrocarbons represented 56.8% of the oil and oxygenated sesquiterpenes represented 33.3% of one. Cyperene (27.2%) was the main constituent. Moreover, the oil had significant amount of cyperol (8.7%), cyperotundone (8.1%), isorotundene (7.5%), *α*-cubebene (5.3%), *α*-cyperone (5.1%), mustakone (4.1%).The monoterpene fraction of the oil was relatively small, representing (4.7%) of the total oil.

There have been few publications on the chemical composition of *C. conglomeratus* grown in different parts of the world[20-24]. For example, Abdel-Razik *et al*. have isolated two new prenylflavans[20]. Also, in the other investigation, some flavonoids were identified as main constituents[23,24]. Nevertheless, our sample from Iran is different by a noticeable content of cyperene (27.2%).

Table 1. Percentage compound of the oil of *C. conglomeratus*

Composition	KI[a]	%
α-Pinene	937	2.8
α-Sabinene	970	0.2
β-Pinene	974	1.5
Sabinene hydrate trans	1060	0.1
Camphor	1126	-
Borneol	1155	-
Cyprotene	1345	-
Cypera-2,4-diene	1351	0.7
α-Cubebene	1360	5.3
β-Cubebene	1387	-
α-Copaene	1387	0.2
Cyperene	1390	27.2
β-Damascone	1394	0.1
β-Caryophyllene	1418	0.2
Caryophyllane-2-6-*β*-oxide	1425	-
α-Humulene	1454	-
Rotundene	1460	-
β-Selinene	1485	3.1
α-Selinene	1492	-
α-Calamenene	1498	-
α-Muurolene	1499	0.3
T-Calamenene	1512	3.3
β-Calamenene	1514	-
δ-Cadinene	1517	0.9
α-Calacorene	1542	-
Isorotundene	1560	7.5
Caryophyllene oxide	1576	0.3
Isocyperol	1593	4.1
Cyperol	1600	8.7
T-Cadinol	1616	2.1
Cubenol-1-epi	1619	-
α-Muurolol	1630	3.2
T-Muurolol	1632	0.5
Cubenol	1636	0.1
α-Cadinol	1640	4.2
Caryophyllene epoxide	1660	0.3
Mustakone	1670	4.7
Cyperotundone	1680	8.1
α-Cyperone	1706	5.1
Total	--	94.8

KI: Kovats Index

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