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Chemical Composition of the Essential Oil of Quince (*Cydonia Oblonga* Miller) Leaves

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Abstract

The essential oils from the leaves of *Cydonia oblonga* Miller, collected at both flowering and fruiting periods, obtained by hydrodistillation were analyzed using Gas Chromatography (GC) and GC/MS. A total of 47 and 40 components were identified from quince's leaves in flowering and fruiting periods. The main constituents of quince leaves collected at different periods have been revealed as follows: *C. oblonga* (in the flowering period): benzaldehyde (12.8%), hexadecanoic acid (7.2%), linalool (5.7%), (E)-β-Ionone (5.1%); *C. oblonga* (in the fruiting period): germacrene D (8.6%), benzaldehyde (4.9%).

Keywords: *Cydonia oblonga* miller; Rosaceae; Quince leaves; Essential oil

Introduction

Quince (*Cydonia oblonga* Miller) is a species native to Southwest Europe and Minor Asia [1]. It belongs to the Rosaceae family. Quince fruit is too astringent to be consumed fresh. It is a seasonal fruit and is frequently processed at home into a jam or jelly during October and November in Turkey. *C. oblonga* is called as "Ayva" in Turkey and properly identifiable as *Cydonia oblonga* Miller (*Cydonia vulgaris* Pers.). In traditional medicine, its leaves are used as diuretic (for kidney stones), antidiarrhea, treatment of bronchitis and against cystitis [2,3]. Phenolic compounds [4], tetracyclic sesterterpenes [5], organic acids [6] and ionone glucosides [7] were isolated by previous phytochemical studies of quince leaves. Some reports have shown that *C. oblonga* leaves possess biological activities such as UVA protective effect [8], antioxidant and antiulcerative properties [9] and anticancer activity [10]. Previously, the volatile components of the quince fruit have ben reported [11-13]. Nevertheless, there is no published report on the phytochemical composition on the essential oils of the *C. oblonga* leaves. Therefore, we focused our study on the oil composition of the quince leaves in the fruiting and flowering periods by GC and GC-MS analysis.

Materials and Methods

Plant material

The quince leaves in the flowering and fruiting periods were collected from Izmir-Kemalpaşa in November 2009 and April 2010 and identified by B. Kıvçak from Ege University. The voucher specimens (No 1419, 1420) are deposited in the Herbarium of the Faculty of Pharmacy, Ege University, Izmir.

Essential oil distillation

The leaves were dried in the shade at room temperature and 100 g of each were subjected to seperate hydrodistillation for 3 h using a Clevenger-type apparatus to produce essential oils.

GC and GC/MS analysis of the essential oils

The GC-MS analysis was carried out with an Agilent 5975 GC-MSD system. Innowax FSC column (60 m × 0.25 mm, 0.25 µm film thickness) was used with helium as carrier gas (0.8 ml/min). GC oven temperature was kept at 60°C for 10 min and programmed to 220°C at a rate of 4°C/min, and kept constant at 220°C for 10 min and then programmed to 240°C at a rate of 1°C/min. Split ratio was adjusted at 40:1. The injector temperature was set at 250°C. Mass spectra were recorded at 70 eV. Mass range was from *m/z* 35 to 450.

Identification of components

Identification of the essential oil components were carried out by comparison of their relative retention times with those of authentic samples or by comparison of their relative retention index (RRI) to series of *n*-alkanes. Computer matching against commercial (Wiley GC/MS Library, Adams Library, MassFinder 3 Library) [14,15], and in-house "Başer Library of Essential Oil Constituents" built up by genuine compounds and components of known oils, as well as MS literature data [16,17], was used for the identification.

Results and Discussion

The analysis results of the essential oils of *C. oblonga* leaves collected in the flowering and fruiting periods obtained by water-distillation are shown in table 1. GC/MS analysis of the oils was carried out. 47 components representing 95.7% oil of quince leaves of the flowering period and 40 compounds representing 64.5% oil of quince leaves of the fruiting period were characterized.

According to our results, the common main constituents of the essential oil from leaves of *C. oblonga* in the flowering period were characterized by a high percentage of aromatic aldehyde [benzaldehyde (12.8%)], followed by fatty acid [hexadecanoic acid (7.2%)], oxygenated monoterpene [linalool (5.7%)], norisoprenoid [(E)-β-Ionone (5.1%)]. Sesquiterpene hydrocarbon [germacrene D (8.6%)] and aromatic aldehyde [benzaldehyde(4.9%)] were found to be the main components

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RRI	Compound	A %	B %
1093	**Hexanal**	0.4	0.2
1000	**Decane**	tr	-
1200	Dodecane	0.6	-
1203	Limonene	tr	-
1225	**(*Z*)-3-Hexenal**	**1.3**	**3.0**
1244	**Amyl furan (*2-Pentyl furan*)**	**0.5**	**-**
1290	Terpinolene	tr	-
1296	Octanal	2.9	0.7
1327	(*Z*)-3-Hexenyl acetate	-	1.4
1391	(*Z*)-3-Hexenol	-	3.8
1400	Nonanal	5.0	-
1400	Tetradecane	-	0.8
1500	Pentadecane	1.1	-
1506	Decanal	1.0	-
1541	Benzaldehyde	12.8	4.9
1548	(*E*)-2-Nonenal	0.8	-
1553	Linalool	5.7	1.3
1597	(*E,Z*)-Nonadienal	tr	-
1600	**Hexadecane**	2.5	-
1612	β-Caryophyllene	-	0.9
1617	Undecanal	**1.9**	**-**
1638	β-Cyclocitral	**1.3**	**-**
1681	**(*Z*)-3-Hexenyl tiglate**	**0.9**	**-**
1668	(*Z*)-β-Farnesene	-	4.8
1688	**Selina-4,11-diene (=*4,11-Eudesmadiene*)**	**-**	**0.4**
1700	**Heptadecane**	2.0	-
1706	α-Terpineol	2.2	2.3
1722	Dodecanal	1.8	-
1726	Germacrene	-	8.6
1742	β-Selinene	-	0.7
1758	(*E,E*)-α-Farnesene	4.6	0.7
1763	Naphthalene	1.5	-
1773	δ-Cadinene	-	0.4
1776	γ-Cadinene	-	0.1
1798	Methyl salicylate	-	0.1
1800	**Octadecane**	1.1	-
1830	Tridecanal	3.9	0.5
1838	(*E*)-β-Damascenone	1.9	-
1857	Geraniol	3.2	-
1868	(*E*)-Geranyl acetone	0.3	-
1873	α-Ionone	0.2	0.4
1933	Tetradecanal	1.0	-
1900	Nonadecane	0.2	-
1902	Benzyl isovalerate	-	0.2
1958	(*E*)-β-Ionone	5.1	0.5
1973	Dodecanol	0.2	-
2008	Caryophyllene oxide	-	1.9
2041	Pentadecanal	4.6	1.0
2050	(*E*)-Nerolidol	0.5	1.4
2084	Octanoic acid	tr	-
2095	Hexyl benzoate	-	0.4
2131	Hexahydrofarnesyl acetone	1.1	-
2148	(*Z*)-3-Hexen-1-yl benzoate	1.7	0.6
2170	(*E*)-2-Hexen-1-yl benzoate	-	0.6
2187	T-Cadinol	-	4.7
2192	Nonanoic acid	0.8	-
2255	α-Cadinol	-	1.5
2298	Decanoic acid	1.1	-
2300	Tricosane	0.3	2.3
2312	9-Geranyl-*p*-cymene		1.5
2384	Farnesyl acetone	0.1	-
2400	Undecanoic acid	0.1	-
2400	Tetracosane	0.1	-
2500	**Pentacosane**	1.0	-
2503	Dodecanoic acid	0.8	-
2324	Caryophylla-2(12),6(13)-dien-5α-ol (=*Caryophylladienol II*)	-	0.7
2400	Tetracosane	-	0.8
2500	**Pentacosane**	-	2.8
2551	**Geranyl linalool**	0.7	-
2617	Tridecanoic acid	tr	-
2622	Phytol	1.0	3.1
2655	Benzyl benzoate	-	0.7
2670	Tetradecanoic acid	2.2	-
2700	Heptacosane	3.6	1.9
2804	Benzyl salicylate	0.2	-
2900	Nonacosane	0.7	0.2
2931	Hexadecanoic acid	7.2	1.7
	Total	95.7	64.5

A: The essential oil of quince leaves collected in the flowering period.
B: The essential oil of quince leaves collected in the fruiting period.
RRI: Relative retention indices calculated agains n-alkanes. Percentage calculated from FID data; tr: trace (<0.1%).

Table 1: The volatile composition of *Cydonia oblonga* leaves.

in the essential oil from leaves of *C. oblonga* in the fruiting period. According to literature, only the essential oils of *C. oblonga* fruits have been studied, so far [11-13]. α-Farnesene was observed as the major constituents (31.36% and 74.48%) in previously studied on the essential oils from fruits of *C. oblonga* [11, 13]. This constituent was detected in lower concentrations (4.6% and 0.7%) in leaves of *C. oblonga* of flowering and fruiting period in this study.

To the best of our knowledge, this is the first investigation on the oil composition of quince leaves.

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