Anti-inflammatory Activity and Chemical Compositions of *Prangos platychlaena* Essential Oil and Fractions

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Introduction

In the pharmaceutical and agrochemical industries, Apiaceae family members are important sources. Apiaceae is represented by 511 taxa in Turkey, with about 485 species. There are 181 endemic taxa among them. *Prangos platychlaena* Boiss. ex Tchihat (Apiaceae) is a Turkish endemic perennial herbaceous plant known locally as çağşır, çakşır, kirkor, and korkor (Başer and Kırımer, 2014; Tabanca et al., 2018). In the present work, the essential oil (EO) of *P. platychlaena* fruit was obtained by hydrodistillation using a Clevenger type apparatus for 3h. Obtained essential oil was separated into fractions with different polarities using column chromatography. Essential oil and the fractions were analysed both by GC-FID and GC-MS, simultaneously.

Metarial and Methods

The fruit of *P. platychlaena* was collected in 2018 from Turkey. The plant material was diagnosed by Dr. Hayri Duman and are kept at the Herbarium of the Faculty of Pharmacy of Ankara University in Ankara, Turkey.The EO was obtained by hydrodistillation using a Clevenger type apparatus for 3h. The yield of P. platychlaena fruit was 3.94%.

Obtained essential oil (500 mg) was separated into fractions with different polarities (*n*-hexane and methanol) using column chromatography. The amounts of *n*-hexane and methanol fractions are 98 mg and 400 mg, respectively (Figure 1).

GC-FID and GC-MS Analysis

The essential oil and the fractions were analyzed by GC-FID and GC-MS, simultaneously *(Demirci et al., 2013)*. The results are given **Table 1.**

5-Lipoxygenase (LOX) enzyme activity inhibition

Lipoxygenase (1.13.11.12, 7.9 Units/mg) enzyme activity inhibition levels were determined in a 96-well quartz plate, spectrophotometrically (Demirci et al., 2018). The experiments were carried out in 4 replicates, and the results are given in **Figure 1** as percent inhibition (%). Nordihydroguaiatic acid (NDGA) was used as a positive control.

Results and Discussion

Nona-3,5-diyne-2-yl acetate (46%) and 3,5-nonadiyne (13.5%) were found as the main constituent of the EO of *P. platychlaena*. The *n*-hexane fraction was characterized as 3,5-nonadiyne (45.6%) and germacrene B (16.4%), while main components of the methanol fraction were nona-3,5-diyne-2-yl acetate (59.6%) and 3,5-nonadiyne-2-ol (25.9%).

P. platychlaena EO, a fruit gathered in the southern-eastern portion of Turkey (Hakkari), has been studied previously. Although the authors did not specify the subspecies of *P. platychlaena*, major compounds including α-pinene (69.8%), β-phellandrene (10.6%), δ-3-carene (3.4%), and p-cymene (3.4%) were identified (Bulut et al., 2014). The present EOs appear to have more complex and varied compositions than the oil described by Uzel et al (Uzel et al., 2006). The essential oils of *P. platychlaena* collected Malatya and Sivas were characterized by a series of acetylenic derivatives like 3,5-nonadiyne (24.5% and 5.8% in Malatya and Sivas of *P. platychlaena*, respectively), (Z)-3,5-nonadiyne-7-ene (0.2% in Malatya), and (E)-3,5-nonadiyne-7-ene (0.5% in Malatya) (Tabanca et al., 2018).

Also, *in vitro* anti-inflammatory activity was evaluated by 5-lipoxygenase (5-LOX) inhibitory effect of the essential oil and the fractions, spectrophotometrically. Anti-inflammatory activity of the essential oil, *n*-hexane fraction and methanol fraction were determined as 70.98±1.7%, 67.10±2.5% and 50.11±4.8 in 100 µg/mL, respectively. To the best of our knowledge, this is the first report on the enzyme inhibitory activity of EO of *P. platychlaena* fruit.

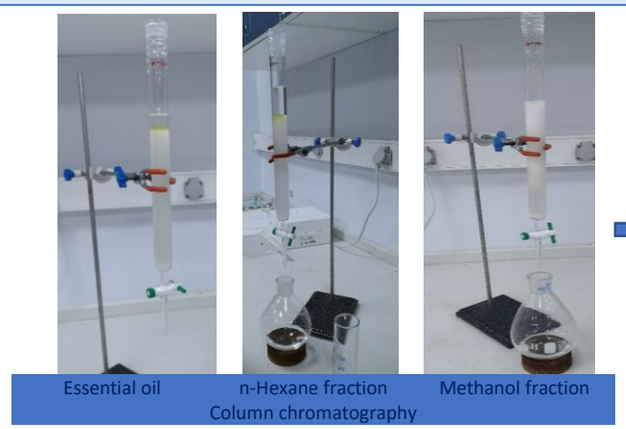

Figure 1. Enzyme inhibition activities

Table 1. The Composition of the essential oil of *P. platychlaena* and fractions

RRI	Compound	EO %	n-Hexane fraction %	Methanol Fraction %
1032	α-Pinene	3.5	0.3	-
1035	α-Thujene	0.1	-	-
1048	2-Methyl-3-buten-2-ol	0.2	-	-
1076	Camphene	0.2	-	-
1093	Hexanal	tr	-	-
1118	β-Pinene	0.3	-	-
1132	Sabinene	0.2	-	-
1174	Myrcene	0.3	-	-
1176	α-Phellandrene	1.4	0.5	-
1203	Limonene	0.8	0.7	-
1218	β-Phellandrene	6.2	5.8	-
1244	2-Pentyl furane	tr	-	-
1255	γ-Terpinene	0.1	-	-
1266	(E)-β-Ocimene	0.3	0.2	-
1280	p-Cymene	4.5	5.9	-
1290	Terpinolene	1.0	1.5	-
1327	3-Methyl-2-butenol	0.1	-	-
1415	3,5-Nonadiyne	13.5	45.6	-
1452	α,p-Dimethyl stryrene	tr	-	-
1495	Bicycloelemene	tr	-	-
1473	(Z)-3,5-Nonadiyne-7-ene	0.5	1.6	-
1539	(E)-3,5-Nonadiyne-7-ene	0.3	1.4	-
1582	cis-Chrysanthenyl acetate	tr	0.1	-
1590	Bornyl acetate	0.2	-	-
1600	β-Elemene	0.1	0.7	-
1612	β-Caryophyllene	tr	-	-
1638	cis-p-Mentha-2-en-1-ol	tr	-	-
1650	γ-Elemen	0.1	0.4	-
1668	(Z)-β-Farnesene	tr	-	-
1687	α-Humulene	0.2	1.7	-
1688	Selina-4,11-diene	tr	0.7	-
1690	Crypton	0.1	-	-
1726	Germacrene D	0.4	2.8	-
1740	Valencene	0.1	1.4	-
1755	Bicyclogermacrene	0.5	2.4	-
1758	cis-Piperitol	tr	-	-
1773	δ-Cadinene	0.1	0.9	-
1776	γ- Cadinene	tr	0.2	-
1785	7-epi-α-Selinene	0.1	1.0	-
1802	Cumin aldehyde	tr	-	-
1854	Germacrene B	1.7	16.4	-
1864	p-Cymen-8-ol	tr	-	1.7
1878	2,5-Dimethoxy-p-cymene	tr	-	-
1903	Nona-3,5-diyne-2-yl acetate (Isomer)	3.8	-	-
1915	Nona-3,5-diyne-2-yl acetate	46.0	-	59.6
2144	Spathulanol	0.1	-	-
2178	T-Cadinol	0.1	-	-
2202	Germacren D-4-ol	0.1	-	-
2191	3,5-Nonadiyne-2-ol	3.1	-	25.9
2209	T-Muurolol	0.1	-	-
2255	α-Cadinol	0.2	-	-
2931	Hexadecanoic acid	0.2	-	-
	Total	90.8	92.2	87.2

RRI: Relative retention indices calculated against *n*-alkanes; % calculated from FID data

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