Chemical Constituents of Essential Oil and Cytotoxic Activity of Ducrosia asadi Alva. from Iran

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Abstract— *Hydro distillated oil of the aerial parts of Ducrosia assadi Alva. (Umbelliferae) , has been analyzed by GC/MS with two different capillary columns , HP-5MS and HP-Wax .Thirty-four compounds were identified, 94.3% of the total oils. The concentration of citronellol, chrysanthenyl acetate, decanoic acid, decanol and linalool was high in analysis of the oil with both columns . Cytotoxic activity studied on two human cancer cell lines (LS180 and MCF-7) represented moderate cytotoxic activity.*

Keywords— Ducrosia assadi, Umbelliferae, essential oil, citronellol, Chrysanthenyl acetate.

I. INTRODUCTION

The genus Ducrosia is distributed through Egypt to India. Ducrosia assadi Alva., Ducrosia anethifolia Boiss. and Ducrosia flabellifolia Boiss. grow in center parts of Iran and added to different types of food as flavoring species [1-3] .Biological activities such as antimicrobial, antibacterial effects have been reported. Phytochemical studies on essential oil of Ducrosia essential oil showed that aliphaticaldehydes and monoterpene hydrocarbons are the main constituents of these oils [5-8].We evaluated the chemical composition and cytotoxic activity [9-10] of essential oil obtained from the aerial parts of Ducrosia assadi alva.

II. MATERIAL AND METHOD

Plant material (Ducrosia assadi Alva) was collected during the flowering period from Hezar mountain, 1900 m elev. , province of Kerman , Iran ,in July 2014 . A voucher specimen has been deposited in the Herbarium of the department of Botany Faculty of Science Shaheed Beheshty University, Eveen, and Tehran, Iran. The air dried aerial parts of the plant were subjected to hydro distillation for 3 hours in a Clevenger type apparatus to give oil in 0.8% yield. The oils were dried over anhydrous sodium sulfate and stored in sealed vials at the temperature of 4°-6°C in dark for further analysis. The oil was analyzed by GC/MS using a Hewlett-Packard 5973 mass selective connected with a HP6890 Hewlett-Packard gas chromatograph. The separation by two different capillary columns, HP-5MS (5% phenyl methyl siloxane) (30 m x 0.25 mm, film thickness 0.25 μm) and HP-Wax (poly ethylene glycol) (60 m x 0.25 mm, film thickness 0.25 μm). The column temperature was kept at 60^{o}C for 20 min and programmed to 220 ^{o}C at a rate 5 ^{o}C/min, and then kept constant at 220 ^{o}C for 20 min . The flow rate of Helium as carrier gas was (1 ml / min). MS were taken at 70 eV. The identification of the volatile compounds was made by comparing their mass spectra with those given in the literature and those authentic samples. The compounds were identified by comparison of retention indices with those reported in the literature and also by comparison of their mass spectra with the published mass spectra.

Cytotoxicity assay: LS180 (human colon adenocarcinoma) and MCF-7 (human breastadenocarcinoma) cell lines were obtained from the Pasteur Institute, Tehran, Iran. Cell.LS180 and MCF-7 cells were plated at a density of 5 × 104 cells/mL (100μL per well). Control wells contained no essential oil and blank wells contained only growth medium. After incubation at 37°C, three different dilutions of the essential oils were added induplicate. At the end of incubation, the medium was removed and MTT was added to each well and to measure cell metabolic activity. The plates were incubated for 4 h at37°C.

The optical density was measured at 570 nm. The percentage of inhibition compared to control wells was calculated and IC50 values were calculated.

III. CONCLUSION

The yield of the yellow color oil from Ducrosia Asadi was 0.8% (w/w). Chemical composition of the essential oils from Ducrosia asadi are reported in table 1 in order of elution from two different capillary columns, HP-5MS (5% phenyl methyl siloxane) and, HP-Wax (poly ethylene glycol) column.

In GC/MS separation with HP-5MS column more than 90 % (29 components) of the oil, which is particularly rich in monoterpenes, was identificated: 54 % were monoterpenes and 4.74 % was sesquiterpenes. Among the monoterpenes fraction, oxygenated compounds were present in high percentage (47.5 %). Citronellol (38.2 %), Chrysanthenyl acetate (11.01%), decanoic acid (5.36 %), decanol (5.87%) and linalool (4.49 %) were found (table 1) to both major constituents. Similarly with HP-Wax column more than 75 % (28 compounds) of the oil, which is rich regard to monoterpenes, was identified: 41.6 % were monoterpenes and 3.4% ware sesquiterpenes. Among the monoterpenes fraction, oxygenated compounds were in high percentage (35.4 %). The major constituents of the volatile oil were citronellol (23.9 %), Chrysanthenyl acetate (4.34 %), decanoic acid (5.94 %), decanol (6.11 %) and linalool (2.35 %). Several aliphatic aldehydes such as n-decanal and dodecanal have been found in considerable amount in the essential oils.

The cytotoxic activities (table 2) of the essential oil from Ducrosia asadi alva on two different cancer cell lines were reported in table 2. The present study is the first report on the cytotoxic effect of this essential oil. The cytotoxic activity of Ducrosia asadi showed a lower activity on the LS180 in comparison with MCF-7. The cytotoxic activity of this oil may be attributed to the presence of monoterpenoid hydrocarbons.

TABLE 1
COMPARATIVE CHEMICAL COMPOSITION (%) OF THE OIL OF *DUCROSIA ASSADI* ALVA. WITH TWO DIFFERENT GC/MS COLUMNS

NO.	COMPOUNDS	NON-POLAR (%)	POLAR (%)	KI
1	Nonane	0.58	0.36	899
2	α–Pinene	2.25	2.75	939
3	Sabinene	0.83	0.69	976
4	Myrcene	0.78	0.81	991
5	p-Cymene	0.26	0.48	1026
6	Limonene	1.82	1.70	1031
7	cis-Linalool oxide	0.54	-	1074
8	Terpinolene	0.27	-	1088
9	Linalool	4.49	2.35	1098
10	p-Menthon	0.12	-	1098
11	Verbenol	-	0.22	1134
12	Di hydro Carveol	-	1.75	1182
13	Nonanol	1.77	3.01	1182
14	p-Cymene-8-ol	-	0.52	1183
15	Citronellol	38.2	23.98	1210
16	trans -Carvacrol	0.13	0.48	1217
17	Pulegone	0.21	-	1237

18	Ascaroide	2.63	2.61	1251
19	cis-Chrysanthenyl acetate	11.01	4.34	1262
20	Menthol	-	0.19	1163
21	Decanol	5.87	6.11	1266
22	Thymol	-	0.42	1273
23	trans-Pinocarvyl acetate	1.20	-	1297
24	α-Terpinyl acetate	0.67	1.18	1350
25	Piperitone oxide	1.47	-	1363
26	Tetradecane	5.76	6.78	1399
27	Decanoic acid	5.36	5.94	1412
28	δ-Cadinene	0.12	-	1524
29	Liguloxide	0.19	-	1531
30	Caryophyllene oxide	2.16	1.36	1578
31	Dodecanoic acid	1.23	4.03	1580
32	γ-Eudesmol	0.43	0.77	1630
32	α-Eudesmol	-	0.17	1630
33	β-Eudesmol	1.84	1.07	1649
34	Methyl Linoleate	2.10	0.46	2092
	Sum	94.29	75.5	

TABLE 2
CYTOTOXIC ACTIVITY OF ESSENTIAL OILS FROM *DUCROSIA* ASADI

Essential oil	IC_{50} (µg/mL)	
	LS180	MCF-7
D.asadi	187 ± 38	320 ± 88
Cisplatin	3.5 ± 0.8	5.0 ± 1.5

REFERENCES

[1] K.H. Rechinger , Docrosia , in : Flora Iranica ,Umbelliferae .No.162 ,Edits .,K.H.Rechinger & I.C. Hedge , p. 468 , Akademische Druck and Verlagsanstalt ,Graz ,Austria (1987)

[2] V. Mozaffarian, A dictionary of Iranian plant names. Farhang Moaser, Tehran,Iran, p. 192 (2003).

[3] V. Mozaffaria, Flora of Iran. Research Institute of Forest and Rangelands, Tehran,Iran, pp. 463-467 (2007).

[4] R.P.Adams , Identification of Essential oil component by GasChromatography/mass spectroscopy ,Allured pub. Crop. , Carol Stream , IL. USA (1995)

[5] M. Mahboubi and M. M. Feizabadi, Antimicrobial activity of Ducrosiaanethifolia essential oil and main component, Decanal against Methicillin-Resistantand Methicillin-Susceptible Staphylococcus aureus. J. Essent. Oil Bearing, 12, 574-579 (2009).

[6] M. Stavri, K. T. Mathew, F. Bucar and G. S. Pangelin, An antimycobacterialcoumarin from Ducrosia anethifolia. Planta. Med., 69, 956-959 (2003).

[7] A. Rustaiyan, H. Mazloomifar, S. Masoudi and Z. Aghjani, Volatile oils ofDucrosia assadi Alava. And Prangos acaulis (DC.) bornm. from Iran. J. Essent. OilRes., 18, 682-684 (2006).

[8] A. Mostafavi, T. Shamspur, D. Afazali and S. M. Mirtadzadini, Chemicalcomposition of the essential oil of Ducrosia assadii Alava. from Kerman province inIran. J. Essent. Oil Res., 22, 300-302 (2010).

[9] O. Firuzi, M. Assadollahi, M. Gholami, K. Javidnia, Composition and biologicalactivities of essential oils from four Heracleum species. Food Chem., 122, 117-122(2010).

[10] M.Y. Dar, W.A. Shah, M.A. Rather, Y. Qurishi, A. Hamid and M.A. Qurishi,Chemical composition, in vitro cytotoxic and antioxidant activities of the essential oiland major constituents of Cymbopogon jawarancusa (Kashmir). Food Chem., 129,1606-1611 (2011).