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Chemical composition of the essential oil of *Eriobotrya japonica* (Thunb.) Lindl. flowers in the western Mediterranean area

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SUMMARY – The volatile oil fraction obtained from fresh flowers of *Eriobotrya japonica* (Thunb.) Lindl. (*Rosaceae*) was subject to GC/MS analysis. Thirty different compounds representing more than 95% of the essential oil were identified on account of their mass spectra and Retention Index (RI) values. An evaluation of yield in essential oil from fresh flowers was also carried out.

Key words: Essential oil, *Eriobotrya japonica* (Thunb.) Lindl., GC/MS, terpenes.

RESUME – *"Composition chimique de l'huile essentielle de fleurs de* Eriobotrya japonica *(Thunb.) Lindl. en Méditerranée occidentale". L'huile essentielle obtenue de fleurs fraîches de* Eriobotrya japonica *(Thunb.) Lindl. (Rosaceae) a été étudiée par CG/SM. 30 composants représentant 95% de la composition totale ont été identifiés par comparaison avec les spectres de masse et les indices de rétention. Le contenu en huile essentielle des fleurs fraîches a été établi.*

Mots-clés : *Huile essentielle,* Eriobotrya japonica *(Thunb.) Lindl., CG/SM, terpènes.*

Introduction

Odour of certain floral organs is one of the main attractive factors in pollination of Angiosperms. The volatile secondary metabolites, specially terpenoids, together with flower colours, constitutes the basic way of pollen transport. Pollinator insects are sensitive to very low concentrations of these products (Harborne, 1992), sometimes not perceptible for man's senses. The reproductive biology of cultivated *Eriobotrya japonica* (Thunb.) Lindl. in western Mediterranean is related to the Thermomediterranean climate (Rivas Martínez, 1983). During flowering, some Mediterranean bushes (*Ulex parviflorus* Pourr, *Erica multiflora* L., etc.) constitute a strong competition for the pollination. This raison makes the special fragance of the flowers a fundamental factor to insure pollination.

Different loquat parts as fruits, flowers and leaves are employed in folk medecine. The fruits are used as sedative agents, flowers are known as having expectorant properties and infusions of leaves are utilized to combact diarrhea and depression (Bensky and Gomble, 1986; Chang and But, 1986). Ripe fruits attract many kinds of birds while the fragrant flowers have special attraction for the bees. The characteristic aroma of the flowers supporte the interest in 1950s of the perfume industry in France and Spain. The essential oils from flowers and leaves were very appreciated but the yield was very small.

The knowledge of the quantitative yield and qualitative composition of the essential oil allow us to attribute a added value to the yielding fruit.

Materials and methods

The volatile oil was obtained by steam distillation from fresh flowers of *Eriobotrya japonica* (Thunb.) Lindl. Yield in essential oil for one *Eriobothrya japonica* (Thunb.) Lindl. inflorescence is listed in Table 1. Gas chromatography-mass spectrometry analyses were done on a thermo mass

spectrometer (model Trio 1000), combined with a thermo gas chromatograph (model 8000) (Fisons Instruments). A Hewlett-Packard DB-5 capillary column 25 m × 0.25 mm i.d. with a 0.25 mm film thickness was used. The column temperature program was 60ºC for 6 min, with 5ºC increases per min to 150ºC, which was maintained for 10 min. The carrier gas was helium at a flow rate of 2 ml/min (splitless mode). The quadrupole mass spectrometer was scanned ver the 28-400 a.m.u. range at scan.s-1 with an ionizing voltage of 70 eV and an ionization current of 150 mA. For the determination of the retention index the column oven temperature programming was 40ºC for 5 min, raised 3ºC per min to 280ºC and held there for 5 min. Injection and detector (ion trap) were kept at 260ºC and 270ºC with an ionization current of 40 mA. Kovat's retention indices were calculated using co-chromatographed standard hydrocarbons.

Table 1. Yield in essential oil for one *Eriobothrya japonica* (Thunb.) Lindl. inflorescence

n=10	Mean	Std. Dev.
No. of flowers/inflorescence	116	35
No. petals/flower	5	0
Weigth of 1 petal (g)	0.0064	0.0006
Weigth of the flower without petals (g)	0.1123	0.0084
Total weigth of the inflorescence (g)	21.4	6.33
Yield in essential oil of 100 g petals (ml)	0.05	0.025
Yield in essential oil/inflorescence (ml)	0.0018	0.0005

The individual compounds were identified by MS and their identity confirmed by comparison of their RIs, relative to C8-C30 n-alkanes, and by comparing their mass spectra and retention times with those of authetic samples or with data already available in the literature (Engel *et al.,* 1998; Adams, 2001).

Results and discussion

The volatile compounds identified in *Eriobotrya japonica* (Thunb.) Lindl. flowers are listed in Table 2, according to their chemical structures including their retention time, the retention index, the molecular weight and the percentage composition.

The essential oil contained a high proportion of hydrocarbon compounds, comprising over 90% of the total oil. In general hydrocarbon with odd number of carbon reach maximum levels in the essential oil (C21 12.8%, C23 44.1% and C25 12.8%). The second predominant class of compounds is due to fatty acids an fatty acid esters representing the 7.3% of the essential oil. Between this compounds it is interesting to note the presence of methyl linoleate (0.44%) because the favorable action of the methyl esters of the unsaturated fatty acid in some dermatitis. The composition of this essential oil probably represents a mean within considerable ecological variations across the harvesting area. In fact, chemical composition of the flowers essential oil of *Eriobotrya japonica* (Thunb.) Lindl. cultivated in Egypt (El-Hossary *et al*., 2000) presents a greater amount of esters and a lower percentage of hydrocarbons that the samples here analyzed, cultivated in the Alicante area.

References

Adams, R.P. (2001). *Identification of Essential Oil Components by Gas Chromatography-quadrupole Mass Spectroscopy*. Allured, Illinois.

Bensky, D. and Gomble, A. (1986). *Chinese Herbal Medicine: Materia Medica.* Eastland Press, *S*eattle, Wa.

Chang, H.M. and But, P.P-H. (1986). *Pharmacology and Applications of Chinesse Materia Medica,* Vols I and II. World Scientific Publising, Singapore.

El-Hossary, G.A., Fathy, M.M., Kassem, H.A., Kandil, Z.A. and Abdel Latif, H.A. (2000). Phytochemical and biological investigations of *Eriobotrya japonica* Lindl. growing in Egypt. *Bulletin of the Faculty of Pharmacy* (Cairo University), 38: 129-142.

Engel, R., Gutmann, M., Hartisch, C., Kolodziej, H. and Nahrstedt, A. (1998). Study on the composition of the volatile fraction of Hamamelis virginiana. *Planta Medica,* 64: 251-258.
Harborne, J.B. (1992). *Ecological Biochemistry*. Academic Press.
Rivas Martínez, S. (1983). Pisos bioclimáticos de España. *Lazaroa*, 5: 33-43.

Table 2. Identified compounds in the essential oil of *Eriobothrya japonica* (Thunb.) Lindl. fresh flowers

Rt	KI	Compound	Mw	Area (%)	Technique
Hydrocarbons					
(a) alkanes alkenes					
4.44	900	nonane	128	0.264	GC/MS; KI
22.76	1600	hexadecane	226	0.106	GC/MS; KI
24.99	1700	heptadecane	240	0.023	GC/MS; KI
27.09	1800	octadecane	254	0.077	GC/MS; KI
29.50	1900	nonadecane	268	0.091	GC/MS; KI
32.85	2000	eicosane	282	0.242	GC/MS; KI
37.75	2100	heneicosane	296	12.840	GC/MS; KI
44.61	2200	docosane	310	3.479	GC/MS; KI
48.51	2286	tricosene	322	0.499	GC/MS; KI
49.12	2300	tricosane	324	44.153	GC/MS; KI
49.97	2400	tetracosane	338	3.808	GC/MS; KI
50.45	2486	pentacosene	350	0.458	GC/MS; KI
50.64	2500	pentacosane	352	12.780	GC/MS; KI
51.20	2600	hexacosane	366	0.755	GC/MS; KI
51.82	2700	heptacosane	380	4.464	GC/MS; KI
52.50	2800	octacosane	394	0.316	GC/MS; KI
53.29	2900	nonacosane	408	1.567	GC/MS; KI
(b) aldehydes					
27.49	1792	hexadecanal	240	0.094	GC/MS; KI
30.10	1800	octadecanal	268	0.116	GC/MS; KI
(c) ketones					
28.13	1829	6.10.14-trimethyl-2-pentadecanone	268	0.120	GC/MS; KI
Esters					
17.64	1373	4-methoxy methylbenzoate	166	1.201	GC/MS; KI
19.53		4-methoxy ethylbenzoate	180	0.142	GC/MS
28.25	1847	phenyl ethyl octanoate	248	0.062	GC/MS; KI
Terpenoids					
(a) oxygenated sesquiterpene					
22.01	1563	nerolidol	222	0.353	GC/MS; KI
Fatty acids and fatty acid esters					
26.47		tetradecanoic acid	228	0.344	GC/MS
30.33	1922	methyl hexadecanoate	270	0.438	GC/MS; KI
31.90	1946	hexadecanoic acid	256	6.087	GC/MS; KI
37.33	2096	methyl linoleate	294	0.444	GC/MS; KI
Miscellaneus compounds					
14.93	1250	p-anisaldehyde	136	0.156	GC/MS; KI
20.77	1516	butylated hydroxytoluene	220	0.145	GC/MS; KI