Essential Oil Contents and Chemical Composition of Turkish Laurel Leaves

By Olcay Anac, Department of Chemistry, Istanbul Technical University, Istanbul, Turkey

Laurus nobilis L., an evergreen tree, is cultivated in many temperate and warm parts of the world, particularly in the countries bordering the Mediterranean. As such Turkey produces varied and valued kinds of plants such as rose and jasmine. The coastal states of Turkey which have an altitude of 700 meters also produce important quantities of laurel trees.[1]

Since 1968 Turkey has been exporting dried laurel leaf (bay leaf) and laurel oil at a variable amount. A summary of the annual export figures for laurel leaves can be seen in Table I.[2]

As known, oil produced from laurel leaves and fruits is a valuable adjunct in the flavoring of all kinds of food products. The oil is also used for medical purposes in antirheumatic medicines as an analgesic, and in the composition of soaps having good-cleansing effect and the properties to clean and cure pimples and wounds.[1]

During the last ten years, *Laurus nobilis* L. has been an interesting subject for many researchers from Albania[3] to Japan[4] and from Greece[5] to Argentina.[6] However little has been published on the oil of Turkish laurel leaves even though Turkey has a great exporting capacity in this area.

Experimental

Fresh and dried laurel leaves investigated in this study were harvested from mature trees in Istanbul. Essential oils of ground leaves were prepared in the laboratory by steam distillation using an apparatus similar to Clevenger system.[7]

Table I. The Exported Amounts of Dried Laurel Leaves

Year	Laurel Leaves (kg)
1968	1077492
1969	1150248
1970	1230297
1971	1473055
1972	1363839
1973	1565073
1974	1340826
1975	1207731
1976	1718024
1977	1209077
1978	2113108
1979	1876609

 0272-2666/86/0005-7301$02.00/00

Table II. The Yields and Some Physicochemical Properties of the Oils

Oil*	Yield ml/100 g Material	Specific Gravity at 15° C	Optical Rotation	Refractive Index at 20° C
I	0.86	0.93338	-18° 33'	1.4631
II	0.99	0.93247	-17° 43'	1.4582
III	1.29	0.92508	-10° 40'	1.452

* I - From fresh leaves - March harvest
II - From fresh leaves - June harvest
III - From dried leaves - June harvest

Table III. Gas Chromatographic Analysis of the Oil of Turkish Laurel Leaves

Compound	Relative Percentage I (March)	II (June)	III (Dried June)
alpha-pinene	1.96	3.68	1.98
camphene	0.47	0.31	0.51
beta-pinene	4.54	7.89	4.81
myrcene	0.08	0.26	-
gamma-phellandrene	0.19	0.25	-
limonene	0.75	0.85	0.86
1,8-cineole	28.08	40.62	42.70
gamma-terpinene	0.18	0.37	0.08
p-cymene	1.13	1.38	1.70
cis-3-hexenol	0.22	-	0.16
linalool	1.88	0.29	1.85
linalyl acetate	0.17	0.06	0.14
alpha-terpineol	2.77	5.28	1.64
alpha-terpinyl acetate	27.72	15.74	21.18
nerol	0.75	1.03	0.48
geranyl acetate	0.23	0.06	0.10
geraniol	0.28	0.11	0.30
methyl eugenol	5.16	5.13	1.64
eugenol	3.48	2.09	2.03

Table IV. Some Literature Values About the Composition of Laurel Leaves Oil[8,9]

Compound	Relative Percentage
2-methylbutanol	0.03
alpha-pinene	6.87-3.80
camphene	0.62-0.24
beta-pinene	4.57-2.90
sabinene	8.76-4.50
delta-3-carene	0.54-0.15
myrcene	1.06-0.33
alpha-phellandrene	0.40-0.07
alpha-terpinene	0.95-0.23
3-methylbutanol	0.21
limonene	1.64-0.77
1,8-cineole	55.90-37.20
gamma-terpinene	1.68-0.37
p-cymene	1.16-0.62
terpinolene	0.68-0.12
cis-3-hexenol	0.03
trans-sabinene hydrate	0.25
copaene	0.03
linalool	11.18-1.51
beta-cubebene	0.03
cis-p-menth-2-en-1-ol	0.05
bornyl acetate	0.44
terpinen-4-ol	4.60-2.38
caryophyllene	0.60-0.30
mrytenal	0.17
allo-aromadendrene	0.80
borneol	0.46
alpha-terpineol	4.61-1.60
alpha-terpinyl acetate	10.00-6.11
trans-carveol	0.08
alpha-selinene	0.06
alpha-cadinene	0.16
gamma-cadinene	0.05
calamenene	0.02
methyleugenol	5.19-0.99
eugenol	4.45-trace
acetoeugenol	0.14-trace

As the essential oil was comprised of two phases, at the end of the distillation they were combined and dried over anhydrous Na_2SO_4.

The yields and some physicochemical properties of the oils are shown in Table II.

The IR spectra of all samples showed the same peaks in a complete accordance.

The operation conditions for gas chromatography may be summarized as follows. Chromatograms were obtained using a Shimadzu 5A F.I.D. GC with the injector and detector temperature of 250°C. All chromatograms were run for 2 min isothermal at 110°C and then programmed to 240°C at 2°/min and then held at 240°C until complete on 20 m. x 0.25 glass capillary column coated with Carbowax 20 M.

The compounds were identified by the technique of peak enrichment.

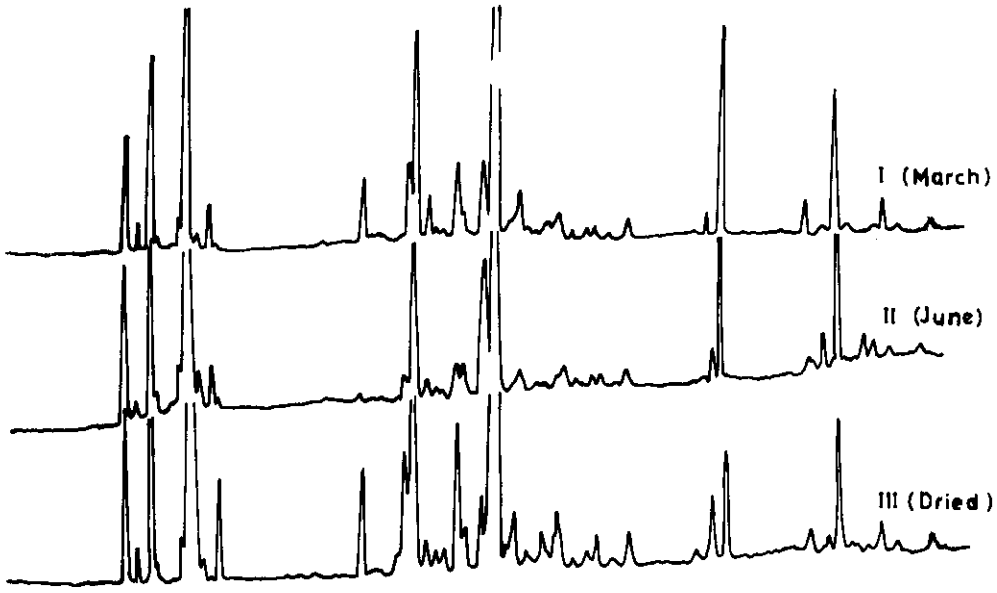

Figure 1. The Chromatograms

The relative percentages of constituents found in the oils can be seen in Table III and chromatograms in figure 1. For the purpose of comparison, some literature values showing the composition of the oils can be seen in Table IV.[8,9]

Results and Discussion

As expected, dried leaves harvested in June gave the highest oil yield (1.29%) while fresh March leaves gave the lowest (0.86%). The yield of oil from the dried leaves was also higher than the literature value.[10]

When we investigated the analysis results of these three oils from GC (Table III), it could be seen that the compositions were different and drying could affect the qualitative composition. For example, the percentages of 1.8-cineole, the main component of *Laurus nobilis* L. were 28.08%, 40.62% and 42.70% in the March, June and dried June samples respectively while the highly volatile components were a little higher on the sample of June than March.

The previously published component percentages (see Table IV) showed some differences between origins. Some of these values were in agreement with those found for the Turkish oils (camphene, α-phellandrene, limonene, α-terpineol, methyl eugenol, eugenol). Others were not in agreement (β-pinene, α-terpinylacetate, α-pinene, myrcene, p-cymene, cis-3-hexenol), nevertheless no major differences were found between the Turkish oils and those normally found in commerce.

References

Address correspondence to Dr. Olcay Anac, Department of Chemistry, Istanbul Technical University, Maslak, Istanbul, Turkey.

1. Yilmaz Bozkurt, Faik Yaltirik, Metin Özdönmez, Türkiye'de Orman Yan Ürünleri (By-Products of Forests in Turkey), İstanbul Üniversitesi Orman Fakültesi Yayınları, p.13,15, 1982
2. DIE, Dış Ticaret Yıllık İstatistikleri, 1968-1979 (statistics of Exporting), İstatistik Genel Müdürlüğü
3. U. Asllani, Essential Oils from *Laurus nobilis* L., Bull. Univ. Shtelenon, Tiranes, Ser., Shkencat Natyr. **23**(3), 93-113, 1969
4. T. Yoshido, On the Oil Containing Tissue, The Essential Oil Contents and Chemical Composition of Essential Oil in Laurel Leaf, Nettai Nogyo, **23**(1), 6-10, 1979
5. B. G. Skrubis, The Drying of Laurel Leaves, Perfum. Flavor., **7**(5), 37-40, 1982
6. H. H. Huergo, and J. A. Retamar, Essential Oil of *Laurus nobilis*, Rivista Ital., **60**(11), 635-6, 1978
7. E. Gildemeister and Fr. Hoffmann, Die Atherischen Öle, Vol.II, p.23, 1960, Akademie-Verlag, Berlin
8. B. M. Lawrence, Progress in Essential Oils, No.32, Perfum. Flavor., **6**(2) 59, 1981
9. A. A. Zola, J. P. Le Vanda, and F. Guthbrod, L'huile Essentielle de Laurier Noble, Rivista Ital., **59**,374-378, 1977
10. M. G. Pertoldi, and B. Stancher, Characterization of the Essential Oil of Laurel, Atti Congr.Qual., 6th, 303-20, 1967