The Essential Oils of the Sassafras Laurels

I. Ocotea pretiosa, *Brazilian Sassafras, Safrole type*

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Introduction

BRAZILIAN sassafras oil is obtained by steam distilling chips of *Ocotea pretiosa* (Nees) logs. The tree grows abundantly in the forests of the Itajai River watershed at an altitude of 600 mts.

This region is an intermediary plateau lying between the coastal plain of the Atlantic seaboard and the high plateau of the Serra Geral.

There are many other laurels growing in this region, but only *Ocotea pretiosa* (Nees) has furnished an essential oil of commercial importance.

Oil of *Ocotea pretiosa* gained its place as a substitute for the safrole fraction of camphor oil, which became unobtainable during World War II.

Oil of *Ocotea pretiosa* has erroneously been called oil of *Ocotea cymbarum*, under which designation it has been imported by the United States.

The name Brazilian sassafras indicates its origin and that it contains safrole, but correctly speaking it is oil of *Ocotea pretiosa*, Nees.[1, 2, 3, 4]

It has retained its place amongst the commercial essential oils ever since.

This study of the sassafras laurels of southern Brazil seeks to answer some of the following questions:

Sassafras wood occurs in three different colours, very dark brown, brown and yellow bands and yellow.

(1) How does the oil differ from one coloured wood to another in regards to yields and physico-chemical properties?

(2) Do old logs and roots yield normal oils?

(3) What kinds of oils do the leaves and bark produce? This is of importance in the economy of future reforestation with *Ocotea pretiosa*.

All botanical material used in this study came from the township of Ituporanga, State of Santa Catarina, Southern Brazil.

Parts of the tree studied: It was planned to study the yields and the principal physico-chemical characteristics of the essential oils obtained from the heart wood and sap wood of the logs of dark brown, brown and yellow bands, and yellow varities; the branches, bark, root and leaves.

Moreover, old logs and branches of sassafras left on the fields as the land was cleared of virgin forest, were chipped and distilled. The yields and physico-chemical properties of the essential oils were determined.

These old logs showed no sap wood and were charred. The wood was of the yellow and dark brown varieties.

Apparatus and process used in obtaining the oils: The wood was chipped and the bark was rough cut in a knife-mill prior to being steam distilled in an all glass still at atmospheric pressure. The leaves were distilled whole. All distillations were carried to exhaustion of the material's essential oil content. The condensed steam and essential oil were separated in a glass receiver, which permitted separation of oil of specific gravity greater, and less, than that of water.

Results obtained: The results are shown in Tables II, III, IV, V, and VI, in which some data is repeated in order to facilitate comparison.

Where mention is made of fractions, this means those fractions which occur naturally in the course of distillation. This phenomenon is caused by variations in composition of the condensed oil causing variations in specific gravity.

Experimental Procedures

Ester number, ester number after acetylation and carbonyl number were determined according to the procedures given in *The Essential Oils*, Vol. I, by E. S. Guenther.[5] The safrole content was determined by the cryoscopic method.[6] The cineole content was determined according to the procedure of Kleber and von Rechenberg.[7] The camphor content of the leaves was determined gravimetrically as the semicarbazone.[8]

Characteristics of Brazilian sassafras oil: So as to have points of reference for comparing the characteristics of the essential oils obtained in this study, the characteristics of Brazilian sassafras oil, obtained from the sassafras laurel *Ocotea pretiosa* Nees are shown in Table I.

The values of these characteristics are the analytical results of 78 samples from Brazilian producers of this oil and which were analysed in the Instituto de Pesquisas Tecnológicas.

The numbers given in the table are the averages of those values and the variation shown is the value of the standard deviation, supposing a normal distribution.

TABLE I

The average characteristics for brazilian sassafras oil, extracted from the sassafras laurel, *Ocotea pretiosa* Nees.

Specific gravity at 25°C	1·0844 ± 0,00254
Refractive index at 20°C	1·53539 ± 0,00081
Optical rotation at 25°C	—1·82° ± 0,34

Freezing point, °C	8,14 ± 0,48
Percentage safrole	89,4 ± 1,71

Appreciation of the Results

Due to the difficulties of obtaining the samples and the relatively small quantities used in the determinations of yields and the physico-chemical characteristics the values obtained may be considered as pointers in a more detailed study. Some general observations, however, may be made.

The results obtained show that the yield of oil is greater from old trees (dark brown wood) than from younger trees (yellow and brown banded and yellow woods).

The yields from trees felled some years ago, are of the same order as those from trees recently cut down. Since a tree felled some years ago loses water continuously until it attains conditions of equilibrium as regards its humidity the above mentioned similarity of yields also signifies loss of oil on natural drying out. There was an appreciable change in the optical rotation, however, the safrole content of the oil remained practically the same.

The yields of oil from the root bark and the trunk bark are much greater than those from the respective woods, however, with lower safrole contents, there appearing in the bark oil small quantities of cineole and camphor.

The shade-dried leaves show a yield of oil of the same order as the log wood. The oil separates in the receiver in two fractions, of which the more dense than water one has an appreciable safrole content. The less dense one contains little safrole and it is coloured by azulene.

Such results show that a greater yield of oil per tree could be obtained from a tree recently cut down, and distilling, besides the log wood, the branches, leaves and bark.

TABLE II

PHYSICAL PROPERTIES OF THE ESSENTIAL OIL FROM THE LOG WOOD OF RECENTLY FELLED TREES (NEW WOOD)

	Dark brown wood	*Yellow and brown banded wood*	*Yellow wood*	*Heart wood of yellow wood*	*Sap wood of yellow wood*	*Large branches of yellow wood*	*Yellow wood of roots*
Specific gravity at 25°C ..	1·0921	1·0902	1·0862	1·0917	1·0862	1·0642	1·0917
Refractive index at 20°C ..	1·5372	1·5369	1·5360	1·5370	1·5360	1·5312	1·5370
Optical rotation at 25°C ..	—1·4°	—1·9°	—1·5°	—1·3°	—1·5°	—5·0°	—1·4°
Solubility in 80% (v/v) alcohol	10:86	10:90	10:100	10:90	10:100	10:80	10:80
Freezing point °C	+9·5	+9·0	+8·8	+9·7	+8·8	+5·9	+9·5
Colour	Colourless	Pale yellow	Yellow	Pale yellow	Yellow	Pale yellow	Colourless
Odour	Safrole	Safrole valeric acid	Safrole cineole	Safrole valeric acid	Safrole	Safrole	Safrole

TABLE III

PHYSICAL PROPERTIES OF THE ESSENTIAL OILS FROM THE LOG WOOD OF TREES FELLED SOME YEARS AGO (OLD WOOD)

	Dark brown wood	*Yellow wood*	*Large branches Dark brown wood*
Specific gravity at 25°C	1·0927	1·0781	1·0899
Refractive index at 20°C	1·5372	1·5350	1·5362
Optical rotation at 25°C	—8·0°	—10·0°	—6·0°
Solubility in 80% v/v alcohol	10:80	10:80	10:80
Colour	Pale yellow	Pale yellow	Pale yellow
Odour	Safrole	Safrole	Safrole

TABLE IV

PHYSICO-CHEMICAL PROPERTIES OF THE ESSENTIAL OILS OF BARK AND LEAVES

	Trunk bark	*Root bark*	*Leaves 1st fraction*	*Leaves 2nd fraction*
Specific gravity at 25°C	1·0173	1·0519	1·0323	0·9926
Refractive index at 20°C	1·5198	1·5263	1·5248	1·5185
Optical rotation at 25°C	—10·1°	—6·2°	+2·3°	0·0°
Solubility in 80% v/v alcohol	10:120	10:80	10:80	10:110

TABLE IV—*Continued*

	Trunk bark	*Root bark*	*Leaves* *1st fraction*	*2nd fraction*
Freezing point °C	—0·4	+3·6	+2·1	—
Colour	Colourless	Pale green	Pale yellow	Dark blue
Odour	Safrole-cineole	Safrole-cineole	Safrole-violet	Safrole
Ester number	1·5	1·5	0	10·8
Ester number after acetylation	34·6	25·7	43·1	81·3
Carbonyl number	9·1	10·5	39·8	27·2
Acid number	0·7	1·4	2·8	4·8
% Cineole	3·0	2·2	—	—
% Camphor	0·4	0·4	—	—

TABLE V

THE YIELD OF ESSENTIAL OIL AND ITS SAFROLE CONTENT IN DIFFERENT PARTS OF THE TREE, *Ocotea pretiosa* (Nees)

	Recently felled trees (new wood)							*Trees felled some years (old wood)*		
	Dark brown wood Log wood	*Yellow and brown banded wood Log wood*	*Yellow wood Log wood*	*Yellow wood Heartwood*	*Yellow wood Sap wood*	*Yellow wood Large branches*	*Yellow wood Root wood*	*Dark brown Log wood*	*Yellow and brown banded wood Log wood*	*Dark brown wood Branches*
% Yield of oil ..	2·5	2·2	2·2	1·7	1·8	1·4	2·1	2·1	1·0	1·5
% Safrole content of the oil	94·5	92·1	92	93	92	81·2	94·5	94·5	88	93

TABLE VI

THE YIELD OF ESSENTIAL OIL AND ITS SAFROLE CONTENT IN DIFFERENT PARTS OF THE TREE *Ocotea pretiosa* (Nees)

	Recently felled trees *Bark of the trunk*	*Bark of the root*	*Shade dried leaves* *1st fraction*	*2nd fraction*	*Total*
% Yield of oils	4·3	4·9	2·08	0·54	2·62
% Safrole content of the oil	59	73	64·7	14·0	54·3

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