VOLATILE COMPONENTS OF *SINDORA VELUTINA*

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IBRAHIM JANTAN & NOR AZAH MOHD. ALI. 1991. Volatile components of *Sindora velutina*. The essential oil of *Sindora velutina* was analysed by means of gas chromatography (GC) and gas chromatography/mass spectrometry (GC/MS). Twenty-five compounds were observed in the gas chromatogram and a total of 20 compounds were identified as sesquiterpenoid hydrocarbons. The major components were α-copaene (41.3%) and β-cubebene (15.4%) and β-cadinene (7.2%).

Key words: Sindora velutina - sepetir oil - sesquiterpenes - α-copaene - β-cubebene - cadinenes

Introduction

Sindora species (family Leguminosae) locally known as sepetir are generally tall trees, capable of growing up to a height of 45 *m*. They are usually found scattered throughout Peninsular Malaysia especially in lowland forests and hillsides (Ho 1982). *Sindora velutina,* one of the five *Sindora* species found in Peninsular Malaysia, is commonly used for the manufacture of cabinets and furniture.

Occasionally, a small amount of wood oil known locally as 'minyak sepetir' is extracted from *Sindora* wood by the 'Orang Asli', either by tapping or chopping holes in the wood trunk in a manner similar to the tapping of oleo resins from the *Dipterocarpus* species of Peninsular Malaysia (Burkill 1966, Gianno 1986). The wood oil is used traditionally to treat skin diseases and as illuminants. In the Phillippines, the wood oil from *S. supa* is used for treating skin diseases, making paints and varnishes and for adulterating other oils (Burkill 1966).

This paper reports on the chemical constituents of the wood oil obtained from *S. velutina* as part of a survey of essential oils from Malaysian timbers as sources of chemical feedstock for pharmaceutical and industrial preparations.

Material and methods

Collection of materials

The essential oil was obtained by chopping the trunk of a *S. velutina* tree which was 85 *cm* in diameter and about 40 *cm* in height, at Gunung Inas Forest Reserve near Baling, Kedah. More than 30 *l* of clear yellow oil were collected from the tree by the foresters of the Forest Department of Kedah, Malaysia and 100 *ml* of this oil were sent to the Forest Research Institute Malaysia (FRIM) for analysis. The oil was stored in an air tight glass container and kept in a cool and dark place.

Purification of the essential oil

The crude oil (100 *ml*) was water distilled for 8 *h* to give a colourless oil (95 *ml*) with a faint woody odour and a resinous residue. The oil was dried over anhydrous sodium sulphate overnight and then gave the following physical properties: d^{25}: 0.946, viscosity at 25°*C* (η) : 15 cps, boiling range: 250 to 280°*C*.

Analysis of the essential oil

GC analysis was carried out on a HP gas chromatograph model 5840 A equipped with FID detector using silicon CP Sil 8 and OV 351 capillary columns (both 25000 × 0.2 *mm* I.D.) and helium as carrier gas at 1 to 2 *ml* min^{-1}. The column conditions were programmed as follows:

a) With silicon CP Sil 8 (5% phenyl, 95% methyl) initial temperature 80° *C* for 10 *min*, then 3°*C* min^{-1} to 180°*C* for 1 *min;*
b) With silicon OV 351 (carbowax 20M/nitro terephtalic acid) initial temperature 60°*C* for 10 *min*, then 3°*C* min^{-1} to 180°*C* for 1 *min*.

The GC/MS data were obtained with a HP model 5890 Series 2 (70 *eV* direct inlet) using silicon OV 1 (15000 × 0.2 *mm* I.D.) initially at 60°*C* for 10 *min*, then 3°*C* min^{-1} to 180°*C* for 1 *min* with helium as carrier gas.

Kovats retention indices

Kovats indices were obtained from the gas chromatogram by logarithmic interpolation between bracketing alkanes. The homologous series of C_{13} - C_{22} n-alkane were used as standards (Kovats 1965).

Results and discussion

The identities of the volatile components of *S. velutina* were assigned by comparing their GC retention times with those of authentic samples on columns of different polarity. The components were also identified by GC/MS and comparison of the spectra thus obtained with authentic spectral data. Figure 1 shows the gas chromatogram of the essential oil. The names of the oil components and their peak area percentages are listed in Table 1.

The chromatogram shows the presence of 25 components in the oil of which 20 were identified. These compounds are sesquiterpenoids hydrocarbons. The identified compounds accounted for 93.9% of the oil. From the mass fragmentation pattern analysis the unidentified compounds were assigned the formula C_{15} H_{24} which suggests that they were also sesquiterpene hydrocarbons.

The major components of the oil were tricylic sesquiterpene hydrocarbons, namely α-copaene and β-cubebene which accounted for 41.3 and 15.4% of the oil respectively. Cadinenes were present at 15.1% in which β-cadinene (7.2%) was

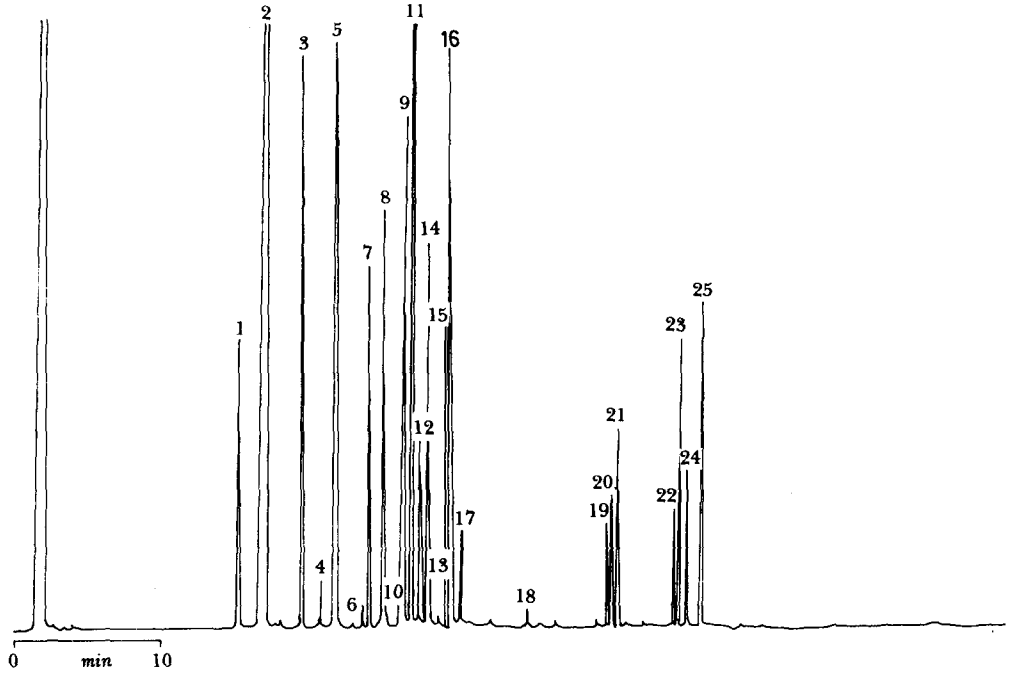

Figure 1. Gas chromatogram obtained with capillary OV 351 column for the wood oil of *Sindora velutina*, for identity of peaks, see Table 1

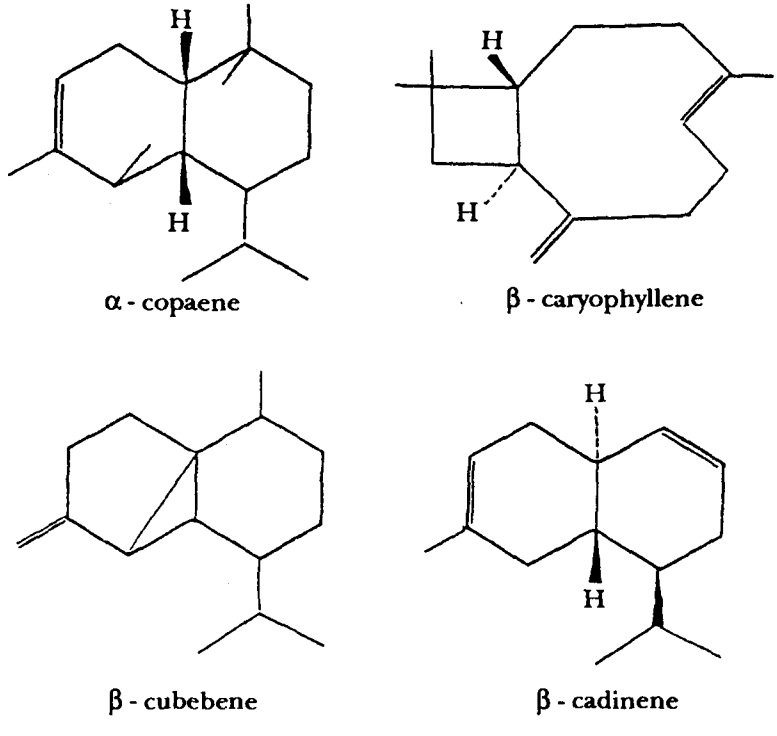

Figure 2. The major components of the essential oil of *Sindora velutina*

the most abundant isomer. The structures of the major components are shown in Figure 2. The other cadinenes were ε-cadinene (3.6%), α-cadinene (1.9%), γ-cadinene (1.0%), τ -cadinene (0.9%) and δ -cadinene (0.4%) arranged in decreasing order of percent concentration. β -caryophyllene (5.5%), humulene (2.05%), aromadendrene (2.8%), α-elemene (0.3%), alloaromadendrene (1.9%), ylangene (0.04%), d-selinene (0.2%), γ-muurolene (2.3%) and α-cubebene (1.2%) were the other sesquiterpene hydrocarbons present. Three sesquiterpene alcohols, namely laevojujenol, τ-cadinol and α-cadinol were present at 0.7, 1.4 and 1.3% concentration respectively.

Table 1. Composition of the essential oil of *Sindora velutina* on OV 351 column

Peak number	Compound	Retention indices (*KI)	%	Identified
1	α -cubebene	1440	1.2	a, b
2	α -copaene	1474	41.3	a, b
3	ε -cadinene	1504	3.6	b
4	d -selinene	1535	0.2	b
5	β -caryophyllene	1556	5.5	a, b
6	$C_{15}H_{24}$	1592	0.3	b
7	alloaromadendrene	1599	1.9	a, b
8	humulene	1624	2.05	a, b
9	aromadendrene	1654	2.8	a, b
10	ylangene	1662	0.04	b
11	β -cubebene	1668	15.4	b
12	γ -cadinene	1678	1.0	b
13	α -elemene	1682	0.3	b
14	γ -muurolene	1688	2.3	b
15	α -cadinene	1717	1.9	b
16	β -cadinene	1724	7.2	b
17	δ -cadinene	1740	0.4	b
18	$C_{15}H_{24}$	1848	0.2	b
19	$C_{15}H_{24}$	2000	0.7	b
20	laevojujenol	2006	0.7	b
21	τ -cadinene	2012	0.9	b
22	$C_{15}H_{24}$	2126	0.6	b
23	α -cadinol	2142	1.3	a, b
24	$C_{15}H_{24}$	2154	0.7	b
25	τ -cadinol	2183	1.4	a, b

(a - coinjection with authentic sample; b - mass fragmentation; *KI of compounds on CP Sil 8 column were also determined)

Conclusion

The study showed that the wood oil of *S. velutina* was a mixture of sesquiterpenoid hydrocarbons. Similar to other oils rich in sesquiterpenes such as patchouli and gurjun, sepetir oil can possibly find use as fixative in perfumery .

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