Aromatic Plants of Kenya IV: Volatile and Some Non-Volatile Constituents of the Stem Bark of *Synadenium Compactum* N.E. Br. Var. *Compactum*

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The essential oil isolated by hydrodistillation from the stem-bark of *Synadenium compactum* N.E. Br. var. *compactum* (0.2 %) was analysed by GC and GC-MS. Fifty five compounds constituting about 89.9 % of the oil were separated from the oil and many of them were identified. The major constituents were α– and β-selinene (29.6 % and 19.3 %, respectively). The petroleum spirit extract of the stem bark yielded friedelinol, epifriedelinol and friedelin.

Key Words: *Synadenium compactum,* essential oil, α- and β-selinene, friedelinol, epifriedelinol and friedelin.

INTRODUCTION

Synadenium compactum n.e. br. var. *compactum* (Euphorbiaceae) is a shrub or tree 2-7 m with a silvery bark. The leaves are dark green elliptic or obovate, base cuneate, apex apiculate, margin finely serrated 3-9 cm, glabrous, midrib keeled beneath. *Synadenium compactum* var. *rubrum* has purplish-red leaves [1].

Synadenium compactum var. *compactum* is endemic in central Kenya in riverine and rocky areas and it is traditionally used for treatment of East Coast Fever in cattle, which is caused by *Theileria parva (parva)* [2]. The latex is irritant and causes inflammation of soft skin.

2-Methylbutanoate tetraacetate and 2-methylbutanoate pentaacetate derivatives of synadenol, which is a new lathyrane diterpenoid have been isolated from *Synadenium compactum* var. *compactum* latex [3].

Here we describe the constituents of the essential oil and some non-volatile compounds from the stem bark of S. *compactum* var. *compactum.*

EXPERIMENTAL

Plant Materials

The stem bark *of Synadenium compactum* var. *compactum* was collected at Nguu Ranch, Emali, Machakos, Kenya in December 1991. The identity of the plant was established at the National Herbarium, Nairobi, Kenya. Voucher specimens were deposited at the Department of Pharmacology and Pharmacognosy, University of Nairobi.

The stem bark was removed with a knife while fresh and dried at room temperature. The powder is highly irritant to the nose and eyes.

Essential oil isolation

The semi-dried stem bark was subjected to hydrodistillation for 3 hours in a Clevenger-like apparatus to give the essential oil. The oil was dried over anhydrous sodium sulphate and stored at 4^0C.

Gas chromatography

The essential oil was analysed by Hewlett-Packard 5890 gas chromatograph equipped with FID and coupled to a Hewlett-Packard 3393A integrator. Analytical conditions were as follows: a fused silica column (51 m x 0.22 mm i.d.) coated with methylsilicone (film thickness 0.12 mm; Hewlett-Packard); helium as the carrier gas, the oven temperature was held at 40^0C for 5 min, then programmed from 40^0C to 180^0C at 5^0C/min, subsequently from 180^0C to 280^0C at 20/min, then isothermal at 280^0C for 10 mm; detector temperature was 250^0C; the samples were injected on the GC column in the splitless mode.

Gas chromatography-mass spectrometry

The GC-MS analysis was carried out on a VG Masslab 12-250 instrument equipped with a Hewlett-Packard 5790 GC and a data system at an ionization voltage of 70 eV and in the electral impact mode using helium as carrier gas and the other GC analytical conditions identical to those mentioned above.

The identity of the constituents was established by computer mass spectral library search, comparison of MS with those published in the literature, comparison of retention times with those of reference compounds, and by peak enhancement.

Isolation of non-volatiles

Room dried and pulverised material of the stem bark (1740 g) of *S compactum* var. *compactum* was Soxhlet extracted with petroleum ether (60-80^{0}C) for 48 hrs and the solvent removed *in vacuo*. The brownish gummy residue was triturated in petroleum ether to deposit an off-white material which was decanted as a suspension. The remaining brownish gummy material which was insoluble in petroleum ether was then dissolved in chloroform and a few drops of methanol were added to yield white crystals. Thin layer chromatography of the crystals revealed presence of one minor and two major compounds. The crystals (2 g) were dissolved in chloroform and chromatographed on a normal silica gel column using chloroform, chloroform-methanol and finally methanol. The fractions obtained were evaporated to dryness, redissolved in chloroform and some drops of methanol were added until the solution turned cloudy. On storage at 4^{0}C, the second, third and fifth fractions yielded three different pure white glassy crystals.

RESULTS AND DISCUSSION

Table 1 shows the results of analysis of essential oil from the stem bark of *S. compactum* var. *compactum*. Fifty five compounds, constituting 89.9 % of the oil (0.2 %) were separated and 37 of them were identified. The main constituents of this oil were α- and β-selinene (29.6 % and 19.3 %, respectively).

Structures of the isolated compounds were elucidated using melting points, H NMR, MS and published literature. The compounds are known and have been isolated from other plants. These were friedelinol (D:A-friedooleanan-3α-ol) [4-12], epifriedelinol (D:A-friedooleanan3β-ol) [6,9-11] and friedelin (D:A-friedooleanan-3-one) [4,6-12]. However this is the first report on isolation of these compounds from *Synadenium* species. There is need to carry out pharmacological studies of these compounds to establish if they contribute to the activity against *Theileria parva (parva)*.

TABLE 1 : Chemical constituents of the essential oil from the stem bark of *Synadenium compactum* var. *compactum*

Component	%	Component	%
Prenal	0.01	amorphene?	3.43
Hexanal	t	germacrene-D	0.3
Hexanol	t	5-epi-aristolochene	5.91
benzaldehyde	t	β-selinene + unknown (minor)	19.31
p-tolylaldehyde	t	α-selinene	29.61
(E)-6-methylhepta-3-dien-2-one	t	α–muurolene	0.15
nonanal	0.01	β-bisabolene	0.3
1-acetyl-4-methylcyclohex-3-ene	0.01	calamenene	0.4
p-methylacetophenone	t	7-epi-α–selinene	6.28
decanal	0.03	two unknown compounds	1.8
(E)-2-decenal	0.02	three unknown compounds	0.3
unknown	0.3	α–calarone	t
(E)-2-undecenal	0.05	unknown	0.2
α–cubebene	0.05	unknown	2.4
unknown	0.5	β-caryophyllene oxide	0.3
β-copaene	6.5	unknown	0.6
unknown	0.7	salvial-4(14)-en-1-one	0.07
β-elemene	0.2	unknown	0.3
α-cedrene	0.2	β-oplopenone	0.2
β-cedrene + β-caryophyllene	0.3	unknown	1.2
geranyl acetate	t	unknown	0.4
trans-α-bergamotene	1.94	unknown	0.3
unknown	0.2	T-muurolol	t
unknown	0.2	unknown	0.5
α-humulene	0.2	unknown	1.0
(E)-β-farnesene	0.2	unknown	0.2
unknown	1.82	hexahydrofarnesyl acetate	t
allo-aromadendrene	0.2		

t = trace

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