Essential oil of Artemisia Pallens Wall (Davana): a study of minor constituents

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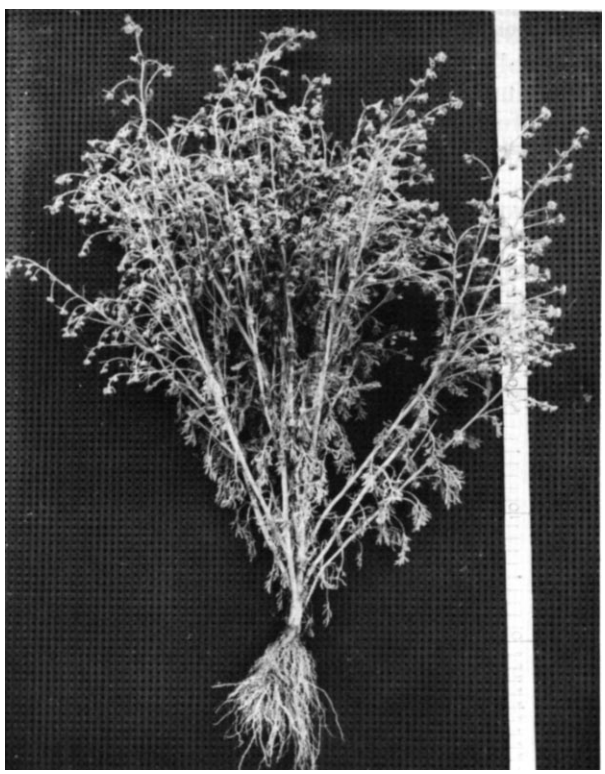
Artemisia Linn is a large genus, comprising some 280 species found in the northern hemisphere. About 34 species occur in the temperate region of the north western Himalayas (W.I.R.M. 1948). Artemisias are bitter aromatic herbs or low shrubs often with much divided leaves and inconspicuous flowers borne on numerous small heads. Some of them are medicinal and are the source of santonin, a valuable anthelmintic drug. Several species yield essential oil and a few are reported to be useful as fodder. The species which are used for production of essential oils are *A. absinthium* Linn. and *A. dracunculus* Linn. *Artemisia pallens* is a minor item in the essential oil trade and is produced only in India.

Artemisia pallens Wall (Fam. Compositae), commonly known as davana or devanam in South India, is one of the minor but delicately fragrant items among the various species of *Artemisia* yielding essential oil of commercial importance. The herb is highly priced and prized for its exquisite and deep, mellow, persistent, characteristically fruity odour. As a common practice, davana is offered mixed with other flowers in temples in South India. It is also artistically blended in floral chaplets worn by South Indian ladies. The exquisite and delicate scent of davana leaves is agreeable and welcome to everyone.

Attempts to exploit davana in industry started when it was marketed as sachet powder for preserving delicate fabric against moths. Work on experimental distillation of oil was taken up by Sastry (1946) as long ago as 1921. The oil has not attained any particular importance in the industry, due mainly perhaps to high cost. Commercial production and marketing of davana oil was done by M. Sundra Rao near Mysore and later by the Central Indian Medicinal Plants Organization at its Regional Centre in Bangalore, where work on various aspects is still continuing.

Lewis (1967) found the oil to contain: hydrocarbons (20%); "esters" (65%); alcohols and other oxygenated compounds (15%). According to Lewis (1967), the "ester" was the major constituent, having the characteristic smell of davana. Saponification gave 10% cinnamic acid while the alcohol part was a high boiling viscous oil. IR spectrum of the "ester" indicated a vinyl group and a carbonyl group. The UV spectrum indicates it to be a saturated ketone or an aldehyde and not an ester. The compound is yet to be identified.



Artemisia Pallens Wall (Davana)

Baslas (1971) tentatively identified fenchyl alcohol, cinnamyl cinnamate, caryophyllene, cadinene (no isomer given), various phenols, and acids. However, according to Range Gowda and Ramaswamy (1965) no phenol could be detected. Baslas also found a number

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of sesquiterpene hydrocarbons and oxygenated compounds, none of which was identified. Simpa and Van der Wal (1968) found a new sesquiterpene ketone which was named davanone. Naegeli et al (1970) isolated a new sesquiterpene ketone and named it artemone. Thomas and Pitton (1971) proved that natural davanone, the main component of the oil, was cis-davanone (6S,7S,10R,2,6,10 trimethyl-7,10 oxidodeca-2,11 dien-5-one, the cis-threo-isomer). Later, Thomas and co-workers (1974) identified in a fraction (1% of the oil) linalool, dehydro-α-linalool, terpinen-4-ol and a new C_{11} terpenoid which was named nordavanone (3S,4S,7R-3,7-dimethyl-oxido-non-8 en-2-one). Further work done by Thomas and co-workers (1974) showed the presence of 4 novel norsesquiterpenoids which were named davanafurans (3-methyl-7-(2-methyl-fur-5-yl)-3,6-oxido-1-octenes). These compounds were observed to be responsible for the characteristic odour of the oil. These davanafurans (0.8% of the oil) were found to exist in the oil in the following proportions; trans-(erythro)-davanafuran (5%), trans-(threo)-and cis-(erythro)-davanafuran (19%), and cis-(threo)- davanafuran (76%). Again, these authors isolated another ketone, named iso-davanone (2,6,10-trimethyl,6-10-oxidodeca-2,11 dien-5 one).

It will be seen from the above that work on the presence of minor constituents has not been done so far. The present communication gives data on this aspect only.

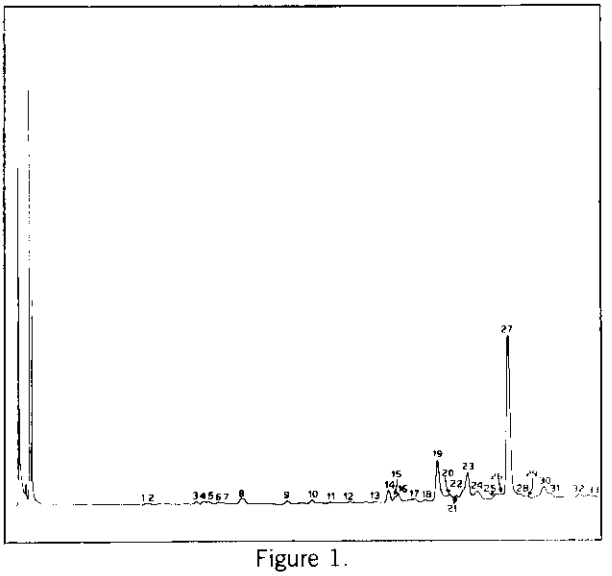

Figure 1.

A sample oil of *Artemisia pallens* Wall from cultivated plants (Bangalore) was studied by GLC[a] (see fig. 1). A glass column 3.6 m x 2.0 mm I.D. was used. The stationary phase was UCCW 10% on Chromosorb W (A/W-DMCS) 80-100 mesh; the column temperature was 70-200°C; and the carrier gas was nitrogen. The chart speed was 5 mm/minute; the detector and injector temperature, 250°C: the attenuation 256; the range 10; and the sample size 4.5 μl (1:30 solution of oil in chloroform).

Data on identification of minor compounds is given in Table I. In figure 1 it will be observed that out of 32 peaks, 13 have been identified. None of these compounds except linalool have so far been reported. It is likely that the major peak (peak no. 27, which constitutes as much as 55.28% of the oil) could be the compound indicated by Lewis (1967). However, it is probably cis-davanone, identified by Thomas (1971).

Table I. GLC examination of oil of Artemisia pallens (Davana)

Peak No.	Retention Time (Minutes)	Compound	Percentage
1.	13.20	u.i.	trace
2.	14.54	camphene	trace
3.	18.10	p-cymene/sabinene/ gamma-terpinene	0.63
4.	18.65	1,8-cineole	0.32
5.	19.22	u.i.	0.63
6.	20.22	u.i.	0.63
7.	20.56	u.i.	0.63
8.	22.31	linalool	1.01
9.	26.69	u.i.	0.49
10.	29.05	iso-borneol	0.51
11.	30.64	geraniol	trace
12.	32.50	borneol	trace
13.	34.90	u.i.	trace
14.	36.22	eugenol	3.14
15.	36.80	u.i.	0.57
16.	37.12	u.i.	2.71
17.	38.60	methyl eugenol	trace
18.	39.50	u.i.	trace
19.	40.86	u.i.	14.01
20.	41.94	u.i.	0.55
21.	42.54	methyl isoeugenol	0.50
22.	43.24	u.i.	2.84
23.	43.67	acetoeugenol	7.92
24.	44.49	gamma-cadinene	2.80
25.	46.32	u.i.	1.76
26.	46.70	u.i.	0.21
27.	47.59	u.i.	55.28
28.	48.30	u.i.	1.26
29.	49.10	u.i.	trace
30.	50.60	u.i.	1.67
31.	51.30	u.i.	0.16
32.	54.20	farnesol	0.44

u.i. = unidentified

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[a]Perkin Elmer model 3920