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The Non-occurrence of Cedrene and Cedrol in *Juniperus communis* L.

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It is proposed that the presence or absence of cedrene and cedrol can be used to differentiate between the sections *Sabina* and *Oxycedrus* in the genus *Juniperus*. Neither cedrene nor cedrol have been detected in the ethereal oil from the wood of *Juniperus communis* L., which belongs to the section *Oxycedrus*.

The genus *Juniperus*, which comprises about 60 species, is divided into three sections: *Caryocedrus*, *Oxycedrus* and *Sabina* [1]. No investigation of the extraneous matter of the monotypic section *Caryocedrus* has been made. Most of the investigations of the species belonging to *Oxycedrus* and *Sabina* have been concentrated on the ethereal oil. Erdtman [2] quotes cedrene and cedrol as typical constituents of the wood of junipers. It was of interest to check this statement in the case of the ethereal oil from the wood of *Juniperus communis* L. The oil was fractionally distilled. From the fraction (No. 3, Table 2) corresponding to the boiling point of cedrene no cedrene glycol could be obtained. An infrared spectrum of the fraction showed that it did not contain cedrene. From a higher boiling fraction (No. 10, Table 2) crystals, m.p. 75—76°, were slowly deposited. The infrared spectrum of this compound was not identical with the spectrum of cedrol. No additional crystalline substances could be obtained in spite of prolonged cooling or storage at room temperature (two years). As cedrol crystallizes well, these results are taken as evidence of the absence of cedrene and cedrol from the oil.

In the light of this discovery a closer scrutiny of the literature was made, with interesting results (Table 1).

It has been claimed that cedrene occurs in *J. oxycedrus* L.[19]. The constants given for this cedrene, however, show such a great divergence from those for natural cedrene that this claim is not worthy of consideration. It must be remarked that a negative sign does not necessarily exclude the presence of the substances, since the investigations are far from complete. This is especially true of cedrene, a liquid hydrocarbon. Nevertheless it seems possible to differentiate the sections *Sabina* and *Oxycedrus* by the presence or absence of cedrene and cedrol in the ethereal oil from the wood.

Table 1. Occurrence of cedrene and cedrol in junipers. The species have been arranged according to Pilger [3].

		Species	Part	Cedrol	Cedrene	Ref.
Oxycedrus		*J. communis* L.	Wood	–	–	This paper
		J. communis L. var. *saxatilis* Pall.	Branches	–	–	4
		J. oxycedrus L.	Wood	–	–	5
		J. taxifolia Hook. et Arn.	Branches	–	–	6
Sabina	The Old World	*J. sabina* L.	Branches	–	–	7
		J. semiglobosa Regel	»	+	–	8
		J. seravschanica Komarov	»	+	(+)	9
		J. excelsa Bieb.	»	+	+	10
		J. polycarpos C. Koch	»	(+)	–	11
		J. procera Hochst.	Wood	+	(+)	12, 13
		J. chinensis L.	»	+	(+)	14
		J. phoenicea L.	Branches	–	–	15
		J. turkestanica Komarov	»	+	–	8
	America	*J. mexicana* Schiede	Wood	(+)	(+)	16
		J. occidentalis Hook.	»	+	+	17
		J. virginiana L.	»	+	+	18

+ The substance has been isolated.
(+) The substance is either incompletely characterized or the method of identifying it is unknown.
– The substance has not been found.

EXPERIMENTAL

The ethereal oil was obtained, in connection with other work [20], by extraction of wood meal (13 kg) with ether, separation of the acidic components, and steam distillation of the neutral oil. The steam distillate (234 g, 1.8 % of the air-dried wood) had the following constants: d_{15}^{15} 0.937, n_D^{20} 1.507, α_D^{20} −24°, E. No. 7.2. It was fractionated in a 1 m spinning band column, giving the fractions in Table 2.

Table 2. Fractional distillation of 234 g of ethereal oil. Yield 185 g, 79 %.

Distillate,	g	B.p. °C,	mm Hg	d_4^{20}	n_D^{20}	α_D^{18}
1.	5.4	116–26	14	0.9172	1.4980	−27.7
2.	14.1	126–27	14	9238	5014	−44.8
3.	52.8	127–28	14	9273	5031	−62.3
4.	19.6	128–38	14	9207	5074	−34.0
5.	16.3	138–40	14	9250	5125	+3.0
6.	25.8	140–42	14	9252	5143	+2.3
7.	7.9	130–32	9	9259	5154	−1.5
8.	9.4	132–43	9	9498	5135	−4.1
9.	7.7	143–45	9	9737	5069	−7.3
10.	7.4	145–47	9	9779	5068	−7.7
11.	8.8	147–54	9	9815	5102	−10.2
12.	4.1	154–58	9	9870	5138	−8.3
13.	3.7	158–68	9	9970	5197	−21.1
14.	2.1	168–72	9	9972	5235	+0.7

The constants of the fraction No. 3 corresponded fairly well with those reported for natural cedrene [21]. Five grams of this fraction were oxidized with $KMnO_4$ according to a method described in the literature [22]. No cedrene glycol could be found. Comparison of the infrared spectrum of the fraction with a spectrum given by Plattner *et al.*[23] showed that no cedrene was present.

After two months, crystals were slowly formed in fraction No. 10. Four months later the crystals were filtered (yield 90 mg, m.p. 70—75°). Recrystallisation from methanol-water raised the melting point to 75—76°. An infrared spectrum established that the compound was not cedrol.

All attempts to obtain additional crystalline substances by prolonged cooling or storage of the fractions at room temperature for a long time (two years) failed.

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