

appeared to be absent. The heartwood extract contained a dark violet coloured polymeric substance, but it has not been possible to obtain it pure.

Conclusion. Apart from juglone, the bark of *J. nigra* contains α -hydrojuglone-4-glucoside, myricetin, myricitrin, sakuranetin, sakuranin and neosakuranin. This appears to be the first report of the occurrence of myricetin or its derivative in the genus *Juglans*. These compounds appear to be absent in the sapwood and heartwood.

Acknowledgements—Our thanks are due to Professor R. H. Thomson, Department of Chemistry, University of Aberdeen, for samples of juglone and 4,8-dimethoxy-1-naphthol and to the U.S. Department of Agriculture for financial support.

Phytochemistry, 1972, Vol. 11, pp. 2636 to 2638. Pergamon Press. Printed in England.

LABIATAE

TERPENOID COMPOSITION OF SOME CANADIAN LABIATAE

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(Received 21 March 1972)

Key Word Index—Labiatae; essential oils; mono- and sesqui-terpenes.

The chemical composition of the essential oils of a number of Canadian Labiatae have been examined chromatographically. In each case the oil, which was obtained by micro-hydrodistillation of partially dried leaves, was analysed by a combination of techniques described previously.^{1,2} All components identified were characterized by a combination of relative retention, time data and IR spectroscopy. Voucher specimens of each plant studied can be found in the herbarium at the University of Waterloo.

Plant. *Agastache nepetoides* (L.) Kuntze. **Source.** Galt, Ontario. **Uses.** Not known. **Previous work.** None. **Terpenoid Composition.** Germacrene D (48.3%), caryophyllene (18.4%) and *trans*-ocimene (3.6%).

Plant. *Collinsonia canadensis* L. **Source.** Glen Morris, Ontario. **Uses.** Roots used medicinally.³ **Previous work.** The composition of the resin⁴ has been examined.

Terpenoid Composition. Germacrene D (46.0%), caryophyllene (5.3%), clemicin (3.6%) and β -elemene (3.3%).

Plant. *Glechoma hederacea* L. **Source.** Fredericton, New Brunswick. **Uses.** Leaves used in herb tea.³ **Previous work.** None.

Terpenoid Composition. Germacrene D (19.4%), germacrene B (13.9%), *cis*-ocimene (9.2%), β -elemene (8.9%), 1,8-cineol (6.2%), α -pinene (3.7%), myrcene (3.4%), β -pinene

¹ B. M. LAWRENCE, J. W. HOGG and S. J. TERHUNE, *J. Chromatog.* **50**, 59 (1970).

² B. M. LAWRENCE, S. J. TERHUNE and J. W. HOGG, *Flavour Ind.* **2**, 173 (1971).

³ J. C. TH. UPHOF, *Dictionary of Economic Plants*, J. Cramer, Würzburg (1968).

⁴ J. CHEVALIER and A. ABAL, *Bull. Sci. Pharmacol.* **14**, 513 (1907).

(2.9%), 3-octanone (2.7%), ϵ -bulgarene (1.9%), sabinene (1.5%), terpinen-4-ol (1.3%), 1-octen-3-ol (1.2%), γ -elemene (1.1%), α -terpinol (1.1%), β -bourbonene (1.0%), limonene (0.9%), ϵ -muurolene (0.9%), α -cadinol (0.9%) and borneol (0.9%).

Plant. *Isanthus brachiatus* (L.) BSP. *Source.* Belleville, Ontario. *Uses.* Not known. *Previous work.* None.

Terpenoid composition. α -Pinene (68.4%), β -pinene (13.6%), myrcene (5.8%), caryophyllene (3.0%), limonene (2.0%), α -humulene (1.7%), 1-octen-3-ol (0.6%), *trans*-verbenol (0.4%), 1,8-cineol (0.2%), terpinen-4-ol (0.2%) and α -terpineol (0.2%).

Plant. *Leonurus cardiaca* L. *Source.* Mississauga, Ontario. *Uses.* Leaves used as a dye source and in folk medicine.³ *Previous work.* The presence of leonurin⁵ and stachydine⁶ has been reported.

Terpenoid composition. Caryophyllene (39.8%), α -humulene (34.8%), α -pinene (5.6%), linalool (0.7%), β -pinene (0.5%) and limonene (0.4%).

Plant. *Lycopus uniflorus* Michx. *Source.* Laurel Creek, Ontario. *Uses.* Leaves used in folk medicine.³ *Previous work.* None.

Terpenoid composition. β -Pinene (22.3%), limonene (22.2%), β -phellandrene (21.4%), α -pinene (4.4%), sabinene (1.8%), myrcene (2.3%) and germacrene D (1.6%).

Plant. *Pycnanthemum virginianum* (L.) Durand & Jackson. *Source.* Galt, Ontario. *Uses.* Leaves used for flavouring purposes, by N. American Indians.³ *Previous work.* The presence of pulegone,⁷⁻⁹ carvacrol,^{8, 10} geraniol,⁸ limonene⁸ and menthone⁹ has been reported.

Terpenoid composition. Isomenthone (77.7%), pulegone (14.5%), limonene (1.8%), menthone (0.7%), α -pinene (0.5%), β -pinene (0.5%), myrcene (0.5%), 1-octen-3-ol (0.3%), 1,8-cineol (0.2%), camphene (0.1%) and sabinene (0.1%).

Plant. *Salvia nemorosa* L. *Source.* Hespler, Ontario. *Uses.* Not known. *Previous work.* None.

Terpenoid composition. Caryophyllene (38.8%), sabinene (12.3%), β -pinene (8.4%), germacrene D (6.2%), α -pinene (5.4%), caryophyllene oxide (4.3%), bicyclogermacrene (3.1%), *cis*-ocimene (2.7%), *trans*-ocimene (2.2%), α -humulene (1.6%) and terpinen-4-ol (0.5%).

Plant. *Satureja glabella* (Michx.) Briquet. *Source.* Barrier Island, Ontario. *Uses.* Not known. *Previous work.* None.

Terpenoid composition. Isomenthone (70.4%), pulegone (15.5%), isomenthol (4.1%), menthone (2.8%), neoisomenthol (2.6%), 3-octanol (0.7%), β -pinene (0.5%), limonene (0.5%), α -pinene (0.4%), neomenthol (0.3%) and germacrene D (0.3%).

Plant. *Satureja vulgaris* (L.) Fritch. *Source.* Erin, Ontario. *Uses.* Not known. *Previous work.* None.

Terpenoid composition. Germacrene D (51.8%) and caryophyllene (21.2%).

Plant. *Scutellaria galericulata* L. *Source.* Luther Lake, Ontario. *Uses.* Not known. *Previous work.* None.

Terpenoid composition. Caryophyllene (29.4%), *trans*- β -farnesene (17.0%), menthone

⁵ W. A. H. NAYLOR, *Pharm. J.* **54**, 181 (1894).

⁶ J. L. VAN EIJK, *Pharm. Weekblad* **87**, 38 (1953).

⁷ F. W. ALDEN, *Pharm. Rev.* **16**, 414 (1898).

⁸ E. R. MILLER, Univ. Wisconsin Experimental Station *Circular* No. 2 (April, 1918).

⁹ M. P. KIR'JALOV, *J. Appl. Chem. USSR* **12**, 285 (1939).

¹⁰ W. G. CORRELL, *Pharm. Rev.* **14**, 32 (1896).

(10.4%), 1-octen-3-ol (8.0%), β -cubebene (3.3%), α -humulene (2.6%), germacrene D (2.2%) and limonene (2.1%).

Plant. *Scutellaria parvula* Michx. *Source.* Colpoy Bay, Ontario. *Uses.* Not known. *Previous work.* None.

Terpenoid composition. α -Bisabolol (20.6%), *trans*- α -bergamotene (13.4%), β -bisabolene (6.0%), caryophyllene (5.2%), α -terpineol (4.0%), δ -cadinene (4.0%), *cis*- α -bisabolene (3.5%), α -cadinol (3.0%), *trans*- β -farnesene (2.6%), caryophyllene oxide (2.2%) and α -humulene (2.1%).

Plant. *Stachys germanica* L. *Source.* Guelph, Ontario. *Uses.* Not known. *Previous work.* None.

Terpenoid composition. β -Pinene (15.5%), α -pinene (8.4%), *cis*-ocimene (8.1%), *trans*- β -farnesene (7.0%), 1,8-cineol (6.0%), germacrene D (5.4%), limonene (2.2%), sabinene (1.8%), *p*-cymene (1.6%), myrcene (0.9%) and α -terpineol (0.7%).

Plant. *Teucrium canadensis* L. *Source.* Lake Mississqui, Quebec. *Uses.* Not known. *Previous work.* None.

Terpenoid composition. Germacrene D (32.7%), caryophyllene (13.6%), δ -cadinene (13.0%), α -humulene (10.2%), linalool (6.0%), copaene (2.2%) and 1-octen-3-ol (0.7%).

Acknowledgements—The authors acknowledge the financial assistance of the National Research Council of Canada via an Industrial Research Assistantship grant coded 'Spices 807', and an operating grant in aid of research. The interest of Stange Canada is also acknowledged.

Phytochemistry, 1972, Vol. 11, pp. 2638 to 2639. Pergamon Press. Printed in England.

TERPENOIDS OF SOME *MENTHA* HYBRIDS FROM CANADA

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Key Word Index—*Mentha*; Labiatae; essential oils; mono- and sesqui-terpenes.

As part of a chemical and cytological investigation of the genus *Mentha*, a number of hybrid species of Canadian origin have been examined chromatographically. The essential oils was obtained from each species by water distillation and analysed by a combination of previously described techniques.¹⁻³ Voucher specimens of each plant studied can be found in the herbarium at the University of Waterloo.

Plant. *Mentha* $\times$ *alopecuroides* Hull. *Source.* Long Beach, V.I., British Columbia. *Uses.* Not known. *Previous work.* None.

Terpenoid composition. Carvone (46.0%), limonene (22.8%), 1,8-cineol (4.7%), *cis*-dihydrocarvone (4.1%), dihydrocarvyl acetate (2.9%), β -bourbonene (1.9%), dihydrocarveol

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² B. M. LAWRENCE, S. J. TERHUNE and J. W. HOGG, *Flavour Ind.* **2**, 173 (1971).

³ B. M. LAWRENCE, S. J. TERHUNE and J. W. HOGG, *Phytochem.* **10**, 2827 (1971).