EXPERIMENTAL

PLANT MATERIAL.—*M. athamanticum* rhizomes (1180 g) were collected from Col du Lautaret, France, at the beginning of the fruiting stage. Samples have been deposited at the Laboratoire de Pharmacognosie, UER de Pharmacie de Grenoble.

EXTRACTION OF THE PLANT MATERIAL.—The powdered rhizome tissue was successively extracted with hexane, $CHCl_3$, and MeOH. The residual material was boiled in H_2O for 1 h, and the aqueous extract was immediately lyophilized.

LITERATURE CITED

1. D. Barron, L. Kolodie, and A.M. Mariotte, *Plant. Med. Phytother.*, **17**, 107 (1983).
2. D. Barron, M. Kaouadji, and A.M. Mariotte, *Z. Naturforsh.*, **39c**, 167 (1984).

Received 26 September 1983

TERPENOIDS OF *MONARDELLA HYPOLEUCA*

BARRY D. TANOWITZ, DALE M. SMITH

Department of Biological Sciences, University of California, Santa Barbara, CA 93106

and STEVEN A. JUNAK

Santa Barbara Botanic Garden, 1212 Mission Canyon Road, Santa Barbara, CA 93105

Monardella hypoleuca Gray (Lamiaceae) is a suffrutescent perennial found on dry canyon slopes of southern California. A decoction of the plant has been used by the Western Indian tribes as an expectorant, stimulant, and an aid to digestion (1, 2). Our investigations have centered around species of the mint family that may have some pharmacological activity and were carried out in the hope of obtaining information that would be of value in systematic plant identification. This communication is the first in a series on the terpenoid constituents of the genus *Monardella*.

We have identified 12 terpenoid constituents by gc and gc/ms. The compounds identified and their relative percentages were: piperitone (0.2%), β-caryophyllene (0.7%), piperitenone (1.3%), α-thujene (3.4%), 1,8-cineole (4.3%), Δ-3-carene (8.7%), and *trans*-β-farnesene (76.0%). Other trace components were β-pinene, camphor, isoborneol, δ-cadinene, and an unidentified caryophyllene isomer. The presence of Δ-3-carene is of interest in that it has been found in *Lepichinia calycina* (3).

EXPERIMENTAL

PLANT MATERIALS.—Plants were collected by S.A.J. in Santa Barbara County, California. A voucher specimen is deposited in the Santa Barbara Botanic Garden Herbarium.

EXTRACTION AND ANALYSIS.—Three separate isolation techniques were performed: steam distillation using a modified Clevenger apparatus, distillation using a Likens-Nikersson apparatus, and solvent extraction (4). Relative percentages of components were slightly higher for oxygenated monoterpenoids and sesquiterpenoids but were within one standard deviation of the values reported here in five trial runs using solvent extraction. Solvent extraction was performed by grinding 25 g fresh leaves in a mortar and pestle with two successive washings of 100 ml each of *n*-pentane-Et_2O (2:1, v/v) and dry ice. The solution was filtered through glass wool over Na_2SO_4 and concentrated to dryness under N_2 in an ice bath. The residue was resolvated with 3 ml of hexane (boiling point, 68.5-69.4°) and refiltered with 0.5 μm Millipore Syringe filter equipped with a Swinney adaptor. The solution was analyzed immediately by gc and gc/ms. Two gas chromatographs equipped with flame ionization detectors were used. A Hewlett-Packard model 5831A gc was equipped with two columns, 3% SE-30 on Chromosorb WHP 80/100 (2 mm × 1.8 m glass column) and 3% OV-17 on Chromosorb WHP 100/120 HAW DCMS (2 mm × 1.8 m glass column). Analysis was done by temperature programming from 100-270°, 1.0 min initial hold, 10°/min, 5.0 min final hold. The carrier gas was Helium at 27 ml/min. A Hewlett-Packard model 5840 gc equipped with a

12-m fused silica capillary column coated with methyl silicon was used for comparison and analysis. Analysis was done by temperature programming from 60-240°, 1.0 min initial hold, 10°/min, 1.0 min final hold. Injection was splitless. A Hewlett-Packard model 5992A gc-mass spectrometer equipped with a column similar to the HP 5840 column and interfaced with an HP 9825 model data system was used to perform gc/ms analysis. Identification of compounds was made by direct comparison of Rt values of standard compounds and by computerized search with a stored HP mass spectral library in the gc/ms data system.

ACKNOWLEDGMENTS

We thank Dr. Robert Petty, Marine Sciences Analytical Laboratory, UCSB, for aid in compound identification and the use of the gc/ms. The Santa Barbara Botanic Garden provided funding for this research.

LITERATURE CITED

1. P. Train, J.R. Henrichs, and W.A. Archer, "Contributions toward a flora of Nevada," revised ed., Beltsville, MD: USDA, 1957, p. 139.
2. J.C.T. Uphof, "Dictionary of Economic Plants," 2nd ed., New York: Stechert-Hafner Service Agency, 1948, p. 88.
3. B.M. Lawrence and J.K. Morton, *Phytochemistry*, **18**, 1887 (1979).
4. B.D. Tanowitz, D.M. Smith, and S.A. Junak, *Phytochemistry*. (in press).

Received 29 September 1983

TERPENOIDS OF *HYPTIS EMORYI*

BARRY D. TANOWITZ,

Department of Biological Sciences, University of California, Santa Barbara, CA 93106

STEVEN A. JUNAK,

Santa Barbara Botanic Garden, 1212 Mission Canyon Road, Santa Barbara, CA 93105

and DALE M. SMITH

Department of Biological Sciences, University of California, Santa Barbara, CA 93106

Hyptis emoryi Torrey (Lamiaceae) is a large, aromatic shrub and common component of washes and canyons of the Colorado, Mojave, and Sonoran deserts of California, Arizona, and Baja California Norte (1). It is one of approximately 350 species confined to the New World (2). In recent years, various chemical components of a few species in the genus, including *H. emoryi*, have been examined extensively for tumorigenic properties (3-6), antifertility properties (7-9), and as a mycotoxin and phytotoxin (10). As part of a survey of pharmacological products produced by members of the mint family, we report terpenoid components for *H. emoryi*.

We have identified 34 volatile components from the essential oil of *H. emoryi* by gc and gc/ms. The compounds identified and their relative percentages were: γ-terpinene (0.1), (−)-carveol (0.4), piperitenol (0.6), bornyl acetate (0.6), geranial (0.7), L-carvone (0.7), β-phellandrene (0.8), piperitenone (1.1), camphene (1.1), piperitone (1.3), camphor (1.3), linalool (1.3), δ-cadinene (1.4), myrcene (1.8), terpinen-4-ol (1.9), neral (2.0), citronellal (2.0), β-caryophyllene (2.5), *trans*-β-farnesene (2.8), decyl acetate (3.0), β-pinene (5.0), limonene (5.6), α-pinene (6.6), γ-cadinene (6.7), 1,8-cineole (6.9), α-thujene (7.0), elemol (7.0), and borneol (11.9). Other trace components were α-phellandrene, sabinene, geraniol, terpinolene, linalyl acetate, α-humulene, and a monoterpene alcohol.