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ESSENTIAL OILS OF SOME AMAZONIAN LABIATAE, 1. GENUS *HYPTIS*

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The genus *Hyptis* (Labiatae) is composed of 400 species that occur in tropical America (1). Many of these plants are quite aromatic and are reported to possess medicinal properties (2, 3). Several species of *Hyptis* have been found to possess significant pharmacological activities (4, 5).

Essential oils from aerial parts of some species of the genus *Hyptis* were reported earlier (6-8). In this report, we present the chemical constituents of the essential oils from four species of *Hyptis* occurring in the Amazon (Table 1). Two of these, *Hyptis suaveolens* Poit. and *Hyptis goyazensis* Benth., were studied by us previously (9). Now, in addition, many other terpenoid constituents are reported.

TABLE 1. Essential Oils of *Hyptis* Species: Collection Data and Yields

Ref. No.	Common Name	Species	Origin	Oil Yield %
020A	Mentrasto	*H. suaveolens*	Aripuanã, MT[a]	0.6
21A	Alfavacão	*H. mutabilis*	Aripuanã, MT	0.3
M-76	Alfavacão	*H. mutabilis*	Taciateua, PA[b]	0.4
M-24	Estoraque	*H.* spp.	Bujaru, PA	0.2
M-46	Romaninho	*H. goyazensis*	S. Caetano, PA	0.6

[a]Mato Grosso.
[b]Pará.

DISCUSSION

Identification of many of the components was accomplished by comparison of mass spectra and gas chromatographic retention data of authentic compounds. Remaining components were identified by comparison of their mass spectra to those in the data system library and in the literature. Peaks whose identities were confirmed by comparison of their spectra and their gc retention data with those of authentic compounds are so indicated. α-Pinene, myrcene, and β-caryophyllene are the only constituents present in all species studied (Table 2). 1,8-Cineole and β-caryophyllene are the same principal components in the oils of

TABLE 2. Chemical Composition of Essential Oils from *Hyptis* Amazonian Species

Component	RRT[b]	020A[c]	021A[c]	M-76[c]	M-24[c]	M-46[c]
α-Thujene	0.401	—	—	1.80[d]	—	—
α-Pinene[a]	0.413	1.46[d]	16.75[d]	0.30	0.51[d]	12.75[d]
Camphene[a]	0.431	0.25	0.09	—	—	2.16
Sabinene	0.487	—	—	0.33	—	—
β-Pinene[a]	0.493	—	7.12[1]	0.51	0.27	8.35
Myrcene[a]	0.518	1.03	0.15	1.85	1.26	0.96
α-Phellandrene[a]	0.541	0.93	18.44	—	—	0.35
Δ^3-Carene[a]	0.559	—	0.13	—	—	0.87
α-Terpinene	0.567	0.23	0.12	0.74	—	0.78
p-Cymene[a]	0.589	—	1.14	15.14	—	1.65
Limonene[a]	0.596	—	—	—	7.60	—
β-Phellandrene[a]	0.599	—	7.05	—	—	—
1,8-Cineole[a]	0.600	30.38	—	5.67	—	23.89
cis-β-Ocimene	0.614	0.16	—	0.74	0.26	—
trans-β-Ocimene	0.635	0.52	0.68	—	1.31	—
γ-Terpinene	0.655	0.47	0.70	1.93	—	1.49
α-Terpinolene	0.717	1.59	0.45	—	—	0.64
Cimenenol	0.722	—	—	0.33	—	—
Linalol[a]	0.742	0.34	0.29	1.77	—	0.70
Fenchol	0.769	—	—	—	—	0.19
Camphor[a]	0.833	1.56	—	—	1.27	1.75
Borneol[a]	0.876	0.62	—	—	—	13.00
4-Terpineol	0.901	0.45	—	0.34	—	1.01
α-Terpineol	0.928	0.52	—	0.43	0.43	1.86
Estragol	0.955	—	—	—	13.37	1.21
Carvone[a]	1.040	—	—	—	2.43	—
Nerol[a]	1.060	—	—	—	0.82	—
Bornyl acetate[a]	1.121	—	—	—	0.24	—
Thymol[a]	1.137	—	—	7.85	—	—
Carvacrol[a]	1.151	—	—	0.35	—	—
Germacrene C	1.201	0.37	—	—	—	—
δ-Elemene	1.221	5.24	—	1.44	—	—
α-Copaene	1.293	—	2.00	—	—	—
β-Bourbonene	1.311	2.48	3.24	—	—	—
β-Elemene	1.324	2.52	2.88	—	0.53	—
Calarene	1.348	—	—	—	—	3.53
β-Caryophyllene	1.377	10.37	13.10	12.35	2.35	3.09
α-Humulene	1.437	2.07	3.24	2.95	2.17	—
Aromadendrene	1.450	0.42	—	0.59	—	—
α-Guaiene	1.496	0.63	—	—	—	—
γ-Elemene	1.517	13.58	0.59	—	—	—
β-Bisabolene	1.533	—	—	5.56	—	—
δ-Cadinene	1.560	—	1.16	—	—	—

[a]Identity confirmed by ms and gc comparisons to authentic standard.
[b]Retention time relative to methyl pelargonate (IS).
[c]Plant reference number.
[d]Percent of oil, relative to quantitation report on the INCOS data system.

H. suaveolens and *Hyptis mutabilis* (Rich.) Brig., respectively, collected in the Brazilian Northeast (8). The difference in the chemical composition of the two species of *H. mutabilis* collected in the Amazon is attributed to ecological aspects.

EXPERIMENTAL

The aerial parts of the plant were collected in Aripuanã, state of Mato Grosso and Taciateua, São Caetano and Bujaru in the state of Pará. Voucher specimens were deposited in the herbarium of the Department of Botany of INPA under number 84254, 84255, 72094, 69738, and 69749, respectively. The samples were air dried, then subjected to steam distillation, according to the usual techniques (10). The yields are reported in Table 1. The oils obtained were dried with anhydrous Na_2SO_4, filtered, and sealed in glass vials under N_2 atmosphere.

The volatile oils were each analyzed by glc on a Carlo Erba (FID) instrument, using a 30 m × 0.25 mm fused silica capillary column containing a 0.25 μm film of SE-54. Hydrogen was used as the carrier gas, adjusted to a linear velocity of 33 cm/sec (measured at 150°); split flow was adjusted to give a 20:1 ratio, and septum sweep was a constant 10 ml/min. Splitless injection of 2 μl, of a 1:1000 *n*-hexane solution was followed by a delay of 30 sec before beginning purge. Injection was done with the oven at 50°. After a 3 min initial wait, the temperature was programmed at 6°/min to 230°.

The oils were submitted to gc/ms separation on a Finnigan 4021 quadrupole mass spectrometer, which includes on INCOS data system, coupled to a gc equipped with an identical 30m SE-54 fused silica capillary column. Injection and oven-programming temperature were the same as above except a 4°/min gradient was used. The ms was in EI mode at 70eV. The quadrupole filter was scanned from 34 to 434 daltons once every second and resulting spectra were stored on a disc for latter recall.

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UNSATURATED PYRROLIZIDINES FROM BORAGE (*BORAGO OFFICINALIS*), A COMMON GARDEN HERB

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Borage (*Borago officinalis* L., Boraginaceae) is of Mediterranean origin but is cultivated throughout the world. Commercial seed catalogs suggest use of the leaves to prepare salads or drinks. Most members of the family contain toxic pyrrolizidine alkaloids, and a high degree of cytotoxicity was recently reported for *B. officinalis* (1). The species is said to contain alkaloids (2,3), but none has been characterized. As part of our program in the testing of possible natural toxins in the human food chain, we have analyzed *B. officinalis* and found it to contain lycopsamine and supinidine viridiflorate (cynaustine or amabiline). These unsaturated pyrrolizidines are suspected poisons, but the low alkaloid level may account for the lack of acute toxicity reports during borage use. A mixture of lycopsamine and intermedine has, however, been reported to carcinogenic (4).