

## Structure Determination of New Abietane Diterpenes from *Hyptis Martiusii* by NMR Analysis

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**Keywords:** NMR analysis; *Hyptis martiusii* Benth; abietane diterpenes

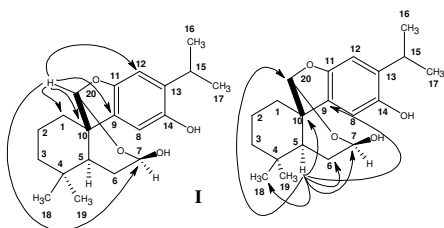
**Abstract:** *Hyptis martiusii* Benth (Labiatae) is a shrub well dispersed on Araripe's Plateau, Crato-CE. It was chosen for phytochemical analysis due to the popular medicinal uses of its congener *Hyptis suaveolens*. Although several secondary metabolites have been isolated by the chromatography analysis of hexane and EtOH extracts from roots of *Hyptis martiusii*, only two novel abietane diterpenes have been chosen for this study. Thus, the structure determination of 7,8-seco-abietane, HMR-1, and C-20 rearranged spiro diterpene, HMR-2, was performed by spectroscopical studies, including modern NMR sequences ( $^1\text{H}, ^1\text{H}$  – COSY, NOESY, HMQC). HMBC experiments also played a very important role in this study because of the small amount of material isolated.

*Hyptis martiusii* Benth (Labiatae) is a shrub well dispersed all over the Araripe's Plateau, Crato-CE, Brazil, where it draws attention to its beautiful white fluffy ball inflorescences. The genus *Hyptis* is known in the country particularly by the popular medicinal uses of *H. Suaveolens*. According to Lorenzi & Matos, it is used for menstrual cramps, digestive disturbances, cold, fever and respiratory problems<sup>1</sup>. Antifungal, antibacterial and anticonvulsant properties are also mentioned by Azevedo *et al.*<sup>2</sup>, but no phytochemical studies of *H. martiusii* have been published to date.

Chromatography analysis of organic solvent extracts from the aerial parts and roots of *H. martiusii* has made it possible to isolate several known and unknown diterpenes<sup>3</sup>. Two novel, recently isolated, abietane diterpenes were chosen for this study. Successive column chromatography of hexane extract from roots of *H. martiusii* allowed the isolation of HMR-1,  $[\alpha]_{\text{D}} = + 89^\circ$  (c. 0.1,  $\text{CHCl}_3$ ). The  $^1\text{H}$  NMR spectrum showed an isopropyl group (1.17 &

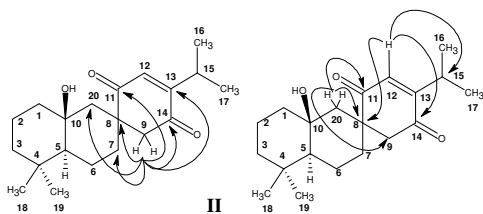
1.18, two methyl doublets, and 3.12, a heptet methine, two angular methyls (0.94 & 0.96, s, 3H each), a triplet at 4.76, and three singlets at 5.64, 6.53 and 6.64 (one hydrogen each), besides complex multiple signals between 1.10 and 2.00 ppm. Its  $^{13}\text{C}$  NMR (BB) spectrum showed 19 signals; 7 in the  $\text{sp}^2$  region (four nonhydrogenated, three monohydrogenated) and 12  $\text{sp}^3$  carbons [4 methyls (two methyls of the isopropyl coincidents), 4 methylenes, 2 methynes and 2 quaternaries]. No carbonyl was detected either by NMR or FT-IR analysis. MS analysis revealed a molecular ion at  $m/z = 314$  (100%), compatible with an MF  $\text{C}_{20}\text{H}_{28}\text{O}_4$ , and so 7 DBE's. Since no carbonyl is present, but an isopropyl benzene moiety with 4 DBE's, HMR-1 must possess three extra cycles. Two hemiketal moieties would fit the only two methyne carbons at 89.1 and 106.8 ppm, with the latter being not part of the benzene ring. Thus, structure I (below) has been suggested. The final structure has been defined based on the HMBC analysis, particularly by the

correlations depicted with arrows on structure I.



Chromatographic analysis of the EtOH extract from roots yielded 3 mg of another diterpene designated as HMR-2, mp 165.2-167.6 °C. The  $^1\text{H}$  NMR spectrum revealed the isopropyl moiety [ $\delta\text{H}$  1.10 and 1.11, doublet each, and 2.98 (heptet)], a pair of doublets at 3.21 and 3.33 (one hydrogen each), a vinyl hydrogen at 6.41, but only two single methyls.

The  $^{13}\text{C}$  NMR, BB and DEPT spectra showed two conjugated ketone carbonyls (204.23 and 199.75), a carbon-carbon double bond (159.44 and 133.25) and 16  $\text{sp}^3$  carbons in the range of 17.86-72.96 (2  $\text{CH}_3$ , 7  $\text{CH}_2$ , 2  $\text{CH}$  and 3C). The HMQC spectrum showed all direct C,H correlations but, because of the small amount of material isolated, HMBC experiments played a very important role in the final structure proposition (structure II). Selected and important long-range C,H correlations observed for HMR-2 through HMBC analysis are shown with arrows on structures II. Carbon assignments for both HMR-1 and HMR-2 are depicted in Table 1.



**Table 1.** Carbon assignments for HMR-1 and HMR-2

Carbon #	HMR-1	HMR-2	Carbon #	HMR-1	HMR-2
1	37.6	41.8	11	152.2	204.2
2	19.0	17.8	12	106.5	133.2
3	40.9	42.1	13	134.9	159.4
4	33.8	33.2	14	147.5	199.7
5	43.1	51.9	15	27.3	27.2
6	29.6	18.0	16	22.7	21.6
7	89.1	35.3	17	22.7	21.5
8	109.8	50.7	18	23.5	21.9
9	131.6	48.6	19	31.8	32.6
10	45.8	72.6	20	106.8	46.8

To our knowledge, both the 7,8-*seco*-abietane, HMR-1, and the C-20 rearranged spiro diterpene, HMR-2, have not been described in the literature yet.

#### **Acknowledgements**

The authors thank IBAMA, CNPq/PRONEX/ and PADCT/CAPES/FUNCAP.

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