Chemistry of Natural Compounds, Vol. 43, No. 2, 2007

COMPARATIVE ANALYSIS OF SESQUITERPENE LACTONES FROM *Mikania cordifolia* COLLECTED FROM THREE DIFFERENT LOCATIONS

P. A. de Oliveira,[1] L. E. Gregorio,[1] and D. C. R. de Oliveira[2] UDC 547.314

The sesquiterpene lactone composition of extracts of Mikania cordifolia *collected from Ribeirao Preto-SP (Brazil), Sao Carlos-SP (Brazil), and Campos de Jordao-SP (Brazil) were comparatively analyzed by HPLC. The results indicate that all specimens have the melampolide type sesquiterpene lactones analyzed and this kind of structure can be used as taxonomic marker for* M. cordifolia.

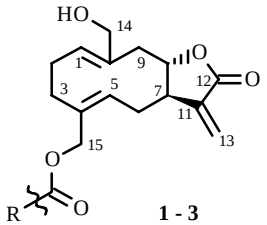
Key words: *Asteraceae*, *Mikania cordifolia*, sesquiterpene lactones, HPLC.

The species *Mikania cordifolia* (L.S.) Willd. (Asteraceae, Eupatorieae) is widely distributed in America and can be found throughout Brazilian territory. *M. cordifolia*, as well other *Mikania* species, is known popularly as "guaco" and has been used for treatment of respiratory problems [1]. The aqueous extract of this species is used by ancient rainforest inhabitants to treat snake bites and, due to this application, it has been called "snake vine" [1, 2]. Biological activities described for *M. cordifolia* include antitrichomonal, antitrypanosomal, and insecticide activities [3, 4]. The genus *Mikania* has been extensively studied and for *M. cordifolia* the presence of diterpenes, sesquiterpenes, and phenylpropanoid has been described [5–10].

Sesquiterpene lactones are considered one of the largest groups of secondary plant metabolites. These compounds possess a broad variety of conspicuous biological activities against all types of harmful organisms and many of them possess potentially therapeutic activities, such as anti-inflammatory [11]. Besides these particulars, this group of compounds is considered a chemotaxonomic marker for Asteraceae [12].

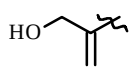
In the present work, the composition of sesquiterpene lactones of *M. cordifolia* collected in three different locations in São Paulo State – Brazil were qualitatively studied using an aqueous extraction method which is similar to the extraction procedure used in folk medicine [1].

HPLC analysis of the aqueous/dichloromethanic extracts of *M. cordifolia* showed the presence of all three sesquiterpene lactones analyzed. The sesquiterpene lactones are produced and stored in glandular trichomes [12]; as a consequence, it is possible to analyze these compounds after a simple extraction with water.



1 - 3

1: R = 

2: R = 

3: R = 

1) Departamento de Quimica, Faculdade de Filosofia, Ciencias e Letras de Ribeirao Preto, Universidade de Sao Paulo, Brazil; 2) Departamento de Fisica e Quimica, Faculdade de Ciencias Farmaceuticas de Ribeirao Preto, Universidade de Sao Paulo, Av. do Cafe, s/n, 14040-903, Ribeirao Preto – SP, Brazil, e-mail: drolivei@fcfrp.usp.br. Published in Khimiya Prirodnykh Soedinenii, No. 2, pp. 117-118, March-April, 2007. Original article submitted January 30, 2006.

 0009-3130/07/4302-0140

TABLE 1. Sesquiterpene Lactone Composition (%) of *M. cordifolia* from Ribeirao Preto (Cerrado), Sao Carlos (Cerrado) and Campos de Jordao (Forest) (May 2000)

Compound	Retention Time	Ribeirao Preto*	Sao Carlos**	Campos de Jordao***
1	12.0	29.2	24.9	20.5
2	18.9	Tr.	71.3	28.3
3	19.5	22.9	Tr.	42.4
Unidentified **4**	16.0	10.3	-	-
Unidentified **5**	23.7	6.9	-	-
Unidentified **6**	31.9	21.0	Tr.	Tr.
Total		90.3	96.2	91.2

Tr.: trace
Altitude (m): *595, **854, ***1030.

TABLE 2. Yield of Three *M. cordifolia* extracts

Specimens	Aqueous extract mass (g)/final volume (L)	CH_2Cl_2 extract mass (g)/final yield, %
Ribeirao Preto	35.9/0.6	48.8/0.14
Sao Carlos	11.9/1.8	468.7/0.42
Campos de Jordao	122.5/2.0	186.9/0.15

All *M. cordifolia* specimens analyzed showed at least one type of the sesquiterpene lactones tested (Table 1). The specimen from Ribeirao Preto yielded the compounds **1** and **3** and a variety of other compounds in small proportions that were not identified.We identified two lactones (**1** and **2**) in the specimen collected from Sao Carlos, and all three compounds in the specimen collected from Campos de Jordao. However, it was not possible to establish any relation between the amounts of these lactones and the collecting site vegetation.

According to our findings, the *M. cordifolia* specimens analyzed, despite some differences in proportions, showed compositions rich in melampolides; for that reason, this substances should be considered as a taxonomic marker for this species and a source for investigation of therapeutics for these compounds.

EXPERIMENTAL

Plant Material. The specimens were collected from three different locations in Brazil with two distinct vegetations and were identified by Dr. Roberto Lourenco Esteves (Departamento de Biologia Animal e Vegetal, Universidade Estadual do Rio de Janeiro, Brazil). Voucher specimens were deposited at the Herbarium Bradeanum (Universidade Estadual do Rio de Janeiro) and the Herbarium of FFCLRP (Universidade de Sao Paulo).

Extraction. The powdered aerial parts of *M. cordifolia* collected from Ribeirao Preto, Sao Carlos, and Campos de Jordao (Sao Paulo state, Brazil) were extracted with distilled H_2O (1:10 w/v), and these aqueous extracts were submitted to liquid-liquid extraction with CH_2Cl_2. The final extracts were concentrated under reduced pressure, and the yield of the process is presented in Table 2.

Isolation of Sesquiterpene Lactones. A sample of *M. cordifolia* was collected in August 2005 from Ribeirao Preto, the same place as the studied material, for the isolation of sample sesquiterpene lactones 14-hydroxy-15[2′,33-epoxy,2′-methylpropanoyloxy]-germacra-1(10)*E*,4*Z*-11(13)-trien-12,8α-olide (**1**), 14-hydroxy-15[2′-hydroxymethylacryloyloxy]-germacra-1(10)*E*,4*Z*-11(13)-trien-12,8α-olide (**2**), and 14-hydroxy-15[2′-hydroxy-2′-methylpropanoyloxy]-germacra-1(10)*E*,4*Z*-11(13)-trien-12,8α-olide (**3**). Fresh leaves (353.6 g) were quickly rinsed in CH_2Cl_2 for 15 s at room temperature, and this leaf rinse extract was concentrated under reduced pressure and separated by TLC (silica, CH_2Cl_2–MeOH 95:5). The three samples obtained were identified by NMR spectra compared to the literature [10].

HPLC Analysis. The extract analysis was carried out on Shimadzu equipment with a Spherisorb ODS-2 column (5 μm, 4.6 mm × 250 mm) and UV detector (215 nm). The mobile phase consisted of H_2O (phase A) and H_3CCN (phase B). A gradient solvent program ran phase B from 15% to 40% in 20 min, 40% held for 5 min, 40–15% in 5 min, and 15% held for 5 min at a flow rate of 1.0 mL/min. The volume of injection was 20 μL after each sample was dissolved in methanol (1 mg/1mL). Sesquiterpene lactones were identified by co-injection with samples obtained from *M. cordifolia*.

ACKNOWLEDGMENT

The authors are grateful to Dr. Roberto L. Esteves for botanical identification of plant material, to Dr. Noberto Peporine Lopes for collecting the specimens, and to CNPq, CAPES, and FAPESP for financial support.

REFERENCES

1. J. Caribe and J. M. Campos, *Plantas que ajudam o homem*, Cultrix, Sao Paulo, 1991, 319 pp.
2. W. B. Mors, M. C. Nascimento, B. M. R. Pereira, and N. A. Pereira, *Phytochemistry*, **55**, 6, 627 (2000).
3. A. R. Arias, E. Ferro, A. Inchausti, M. Ascurra, N. Acosta, E. Rodriguez, and A. Fournet, *J. Ethnopharmacol.*, **45**, 35 (1995).
4. S. M. Serrano, J. J. Nogal, M. R. A. Diaz, J. A. Escario, A. R. Fernandez, and A. G. Barrio, *J. Ethnopharmacol.*, **71**, 101 (2000).
5. P. Boeker, J. Jakupovic, F. Bohlmann, and G. Schmeda-Hirschmann, *Planta Med.*, **53**, 105 (1987).
6. F. Bohlmann, A. A. Natu, and P. K. Mahanta, *Phytochemistry*, **17**, 3, 483 (1978).
7. V. Castro, J. Jakupovic, and F. Bohlmann, *Phytochemistry*, **28**, 527 (1989).
8. M. D'Agostino, F. De Simone, F. Zollo, and C. Pizza, *Fitoterapia*, **62**, 5, 461 (1990).
9. W. Herz, *J. Indian Chem. Soc.*, **75**, 10, 559 (1998).
10. A. B. Gutierrez, J. C. Oberti, V. E. Sosa, and W. Herz, *Phytochemistry*, **26**, 2315 (1987).
11. P. Bremner and M. Heinrich, *J. Pharm. Pharmacol.*, **4**, 453 (2002).
12. O. Spring, *Biochem. Syst. Ecol.*, **17**, 7/8, 509 (1989).