

Characterization of α -Cleavage Products of Bis-(3-alkyl-6,8-dimethoxyisochroman-5-yl)methanes and 3-Alkyl-6,8-dimethoxyisochromans under Mass Spectrometric Studies

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Summary: Electron ionization mass spectra of bis-(3-methyl-, 3-undecyl- and 3-pentadecyl-6,8-dimethoxyisochroman-5-yl)methanes (**2a-c**) and 3-(methyl, undecyl and pentadecyl)-6,8-dimethoxyisochromans (**1a-c**) are studied with the help of LREIMS. The molecular formulae of these compounds are further confirmed by HREIMS peak matching of molecular ion peaks exhibited by EIMS.

Introduction

5,6-Dimethoxyisochromans [1], 5,7-dimethoxyisochromans [2] and 6,7-dimethoxyisochromans [3] have long been synthesized. A number of 1-alkyl and 1-aryl derivatives of 6,7-dimethoxyisochroman have been studied for their biological properties [3]. A survey of the literature reveals that the synthesis of 6,8-dimethoxyisochroman or its 1-substituted derivatives have never been attempted, probably due to the relative inaccessibility of the precursor 3,5-dimethoxyphenethyl alcohol, since this compound is not available commercially. The 6,8-dimethoxyisochroman series has so far been represented by (\pm)-3-pentyl-6,8-dimethoxyisochroman and (\pm)-3-pentyl-5-butyl-6,8-dimethoxyisochroman prepared as related compounds during the synthesis of the fungal metabolite fusamarin [4]. A large number of dimeric alkaloids called bis-alkaloids are known to occur naturally and have been synthesized. Most of these compounds belong to the bis-indole and bis-isoquinoline groups and arise through the various types of couplings between monomer units. However, there are only a few reports of bis-isochromans in the literature [3,5].

We have reported [6] already the syntheses of 3-(methyl, undecyl and pentadecyl)-6,8-dimethoxyisochromans (**1a-c**) and bis-(3-methyl-, 3-undecyl- and 3-penta-decyl-6,8-dimethoxyisochroman-5-yl)methanes (**2a-c**). In this article we wish to report EIMS of these compounds (**1a-c** & **2a-c**). The molecular formulae of these

compounds were further confirmed by HREIMS peak matching of molecular ion peaks exhibited by EIMS are listed in Table-1.

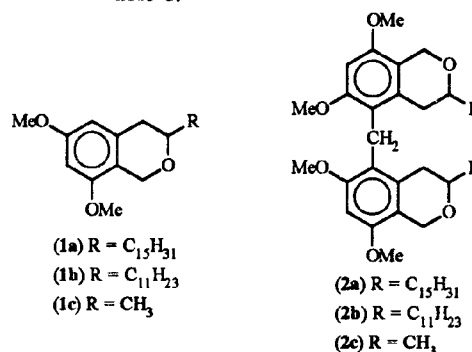


Table-1: HREIMS of molecular ion peaks of the compounds (**1a-c** & **2a-c**).

Compd.	Mol. Formulae	M(m/z)	
		Calc.	Found
1a	C ₂₆ H ₄₄ O ₃	404.3290	404.3285
1b	C ₂₂ H ₃₆ O ₃	348.2664	348.2660
1c	C ₁₂ H ₁₆ O ₃	202.1099	202.1095
2a	C ₅₃ H ₈₈ O ₆	820.6580	820.6580
2b	C ₄₃ H ₇₂ O ₆	708.5329	708.5325
2c	C ₂₃ H ₃₂ O ₆	428.2199	428.2189

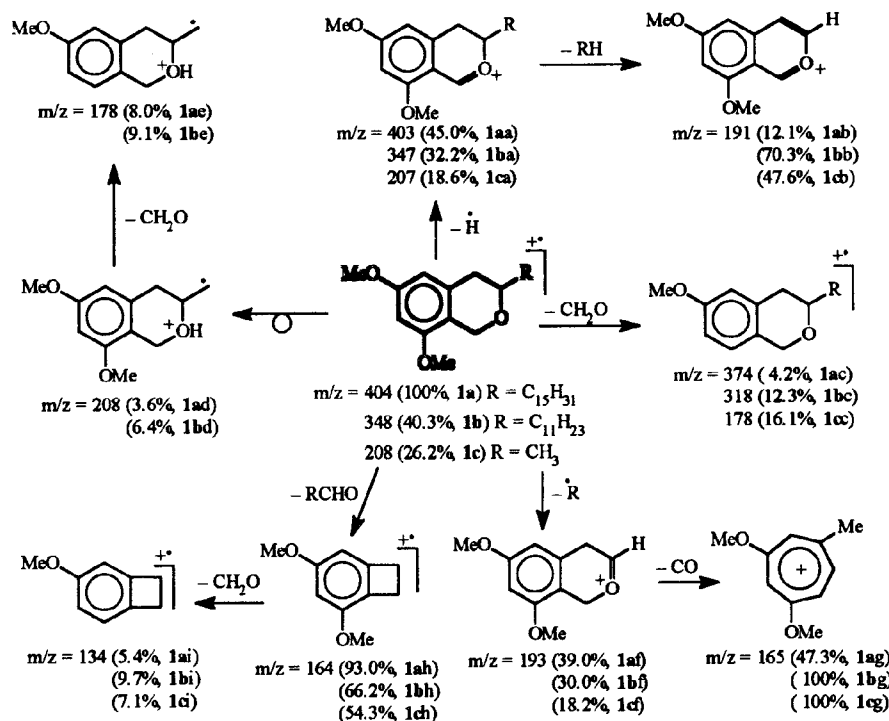
Results and Discussions

The mass fragmentation patterns of these compounds (**1a-c** & **2a-c**) are assigned with the help of LREIMS and are depicted in Schemes 1-2.

3-Alkyl-6,8-dimethoxyisochromans (**1a-c**).

The EI (+ve) mass spectra of (**1a-c**) exhibited highly abundant [M⁺] peaks at m/z 404 (C₂₆H₄₄O₃,

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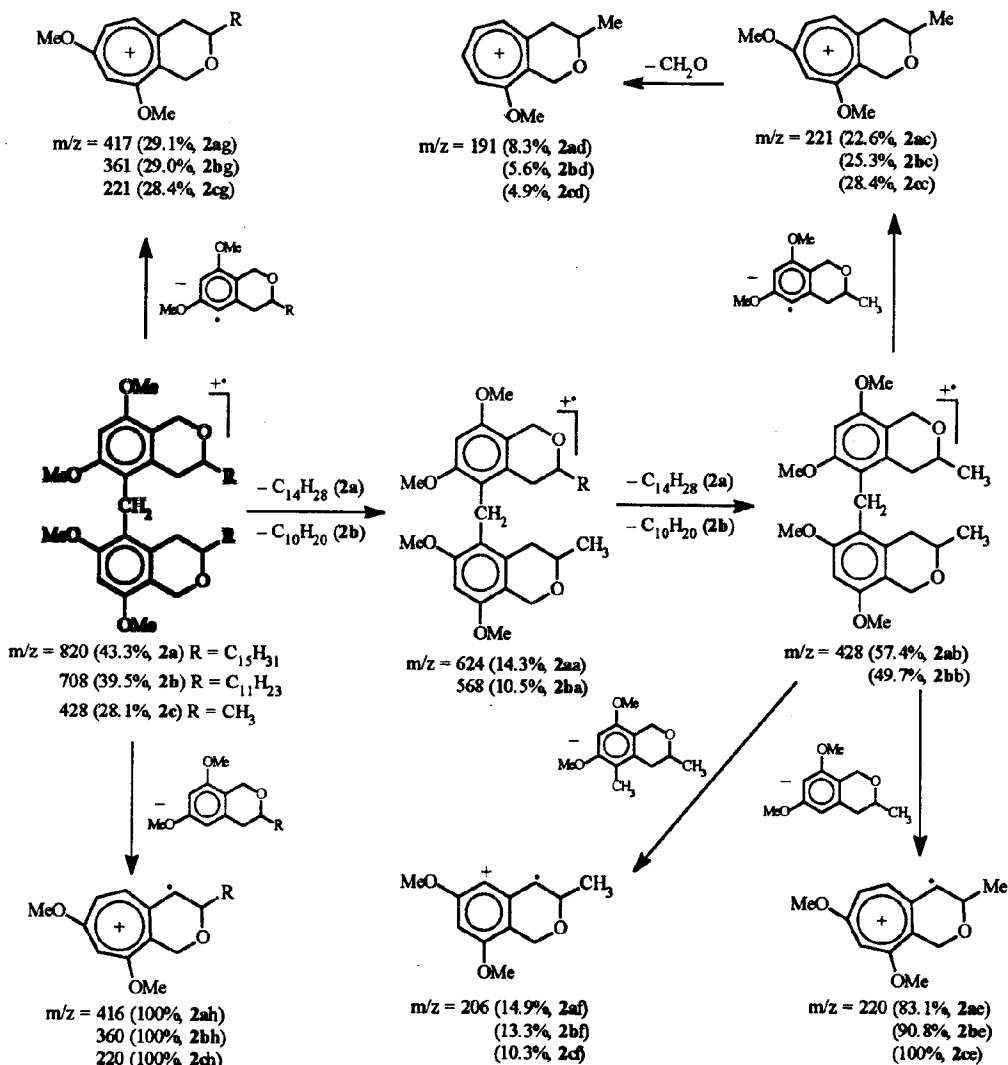
(Scheme-1)

1a), 348 ($C_{22}H_{36}O_3$, **1b**) and 208 ($C_{12}H_{16}O_3$, **1c**). The removal of H radical from (**1a-c**) yielded the corresponding isochroman cations at m/z 403 ($C_{26}H_{43}O_3$, **1aa**), 347 ($C_{22}H_{35}O_3$, **1ba**) and 207 ($C_{12}H_{15}O_3$, **1ca**) followed by the elimination of pentadecane from (**1aa**), undecane from (**1ba**) and methane from (**1ca**) afforded corresponding 3,4-dehydro-6,8-dimethoxyisochroman cations at m/z 191 ($C_{11}H_{11}O_3$, **1ab-cb**) and the expulsion of CH_2O molecule from the molecular ions produced radical cations at m/z 374 ($C_{25}H_{42}O_2$, **1ac**), 318 ($C_{21}H_{34}O_2$, **1bc**) and 178 ($C_{11}H_{14}O_2$, **1cc**). The γ -hydrogen rearrangement of molecular ions yielded radical cations at m/z 208 ($C_{12}H_{16}O_3$, **1ad-bd**) followed by the expulsion of CH_2O molecule afforded other cations at m/z 178 ($C_{11}H_{14}O_2$, **1ae-be**). The removal of pentadecanyl, undecanyl and methyl radicals from (**1a-c**) respectively produced isolated isochroman cations at m/z 193 ($C_{11}H_{13}O_3$, **1af-cf**) followed by the removal of CO molecule caused ring opening to yield other cations at m/z 165 ($C_{10}H_{13}O_2$, **1ag-cg**). The elimination of hexadecanal, dodecanal and ethanal from (**1a-c**) respectively afforded radical cations at m/z 164 ($C_{10}H_{12}O_2$, **1ah-ch**) followed by

the removal of CH_2O molecule produced other radical cations at m/z 134 ($C_9H_{10}O$, **1ai-ci**) (Scheme-1).

Bis-(3-alkyl-6,8-dimethoxyisochroman-5-yl)methanes (2a-c).

The EI (+ve) mass spectra of (**2a-c**) exhibited intense $[M]^+$ peaks at m/z 820 ($C_{53}H_{88}O_6$, **2a**), 708 ($C_{45}H_{72}O_6$, **2b**) and 428 ($C_{25}H_{32}O_6$, **2c**). The removal of tetradecene from (**2a**) and decene from (**2b**) yielded cations at m/z 624 ($C_{39}H_{60}O_6$, **2aa**) and 568 ($C_{35}H_{52}O_6$, **2ba**) followed by the loss of another molecule of tetradecene from (**2aa**), and decene from (**2ba**) afforded radical cations at m/z 428 ($C_{25}H_{32}O_6$, **2ab-bb**) which are identical to (**2c**). The removal 6,8-dimethoxy-3-methylisochroman radical from (**2c** & **2ab-bb**) afforded corresponding benzyl cations (tropylium ion) at m/z 221 ($C_{13}H_{17}O_3$, **2ac-cc**) followed by the loss CH_2O molecule produced new benzyl cations at m/z 191 ($C_{12}H_{15}O_2$, **2ad-cd**). The expulsion of 3,5-dimethyl-6,8-dimethoxyisochroman molecule from (**2c** & **2ab-bb**) yielded radical cations at m/z 206 ($C_{12}H_{14}O_3$, **2af-cf**) and the removal of 3-methyl-6,8-dimethoxyisochroman molecule from (**2c**



(Scheme-2)

& **2ab-bb**) yielded radical cations at m/z 220 (C₁₃H₁₆O₃, **2ac-ce**). The removal of 6,8-dimethoxy-3-alkylisochroman radical and molecule from (**2a-c**) afforded cations and radical cations at m/z 417 (C₂₇H₄₅O₃, **2ag**), 361 (C₂₃H₃₇O₃, **2bg**), 221 (C₁₃H₁₇O₃, **2cg**), 416 (C₂₇H₄₄O₃, **2ah**), 360 (C₂₃H₃₆O₃, **2bh**) and 220 (C₁₃H₁₆O₃, **2ch**) respectively (Scheme-2).

Experimental

Compounds (**1a-b** and **2a-b**) were prepared according to the literature procedure [6]. All of these

compounds were characterized by IR, MS and ¹H-NMR spectral data. The EIMS were recorded on MAT-311 instrument with an accelerating voltage of 3 kV and ionization energy of 70 eV. The temperature of the ion source was maintained at 250°C.

References

1. J. N. Srivasta and D. N. Chaudhary, *J. Org. Chem.*, **27**, 4337 (1967).
2. J. N. Srivasta and D. N. Chaudhary, *J. Indian Chem. Soc.*, **40**, 865 (1963).
3. A. Miyake, K. Itoh, N. Tada and Y. Oka, *J.*

- Takeda Res. Lab.*, 41 (1/2), (1982).
4. S. M. Afzal, P. Pike, N. H. Rama, I. R. Smith, E. S. Turner and W. B. Whalley, *J. Chem. Soc. Perkin Trans. 1*, 81 (1980)
 5. J. Mukherjee, J. N. Chaherjea and S. C. Sengupta, *Indian J. Chem.*, 13, 859 (1957).
 6. N.H. Rama, A. Saeed, C. W. Bird and J. Cobb, *J. Heterocyclic Chem.*, 32, 1075 (1995).