Characterization of Mumijo (Shilajit) from Different Regions by FTICR Mass-Spectrometry

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1. INTRODUCTION

Native Mumijo is a blackish-brown exudation, of variable consistencies, obtained from steep rocks of different formations found in the Himalayas at altitudes between 1000-5000 m, from Arunachal Pradesh in the East, to Kashmir in the West. Mumijo also is found in other mountain ranges of the world, e.g. Afganisthan (Hindukush, Badakh-Shan), Australia (Northern Pollock Ranges), and in the former USSR (Tien-Shan, Pamir, Caucasus, Ural) (1).

2. MATERIALS AND METHODS

Kyrgyz, Altaic, Kazakh and Indian mumijo from drugstore were used for analysis without further purification. All experiments were performed on a commercial mass-spectrometer 7 Tesla Finnigan LTQ FT (Thermo Electron, Bremen, Germany) equipped with electrospray ion source (Finnigan Ion Max Source). Mumijo samples were dissolved in 1:4 water-acetonitrile solution and analyzed using electrospray ionization both in positive and negative modes. For accurate molecular mass measurements FTICR mass spectra were acquired using selected ion monitoring (SIM) scanning with 100 Da mass range.

For interpretation of FTICR data and comparison of different samples Kendrick and van Krevelen diagrams were used (2). All FTICR mass spectra were also processed using FIRAN software for determination of stoichometric formulas (3).

3. RESULTS AND DISCUSSION

It was found that all mumijo samples could be efficiently ionized by ESI both in positive and negative modes. Data from different mumijo samples are occupying the same regions on van Krevelen diagram. Differences between Indian and kirghisian samples were found in broader variety of observable ions in Indian sample in region higher then 800 Da.

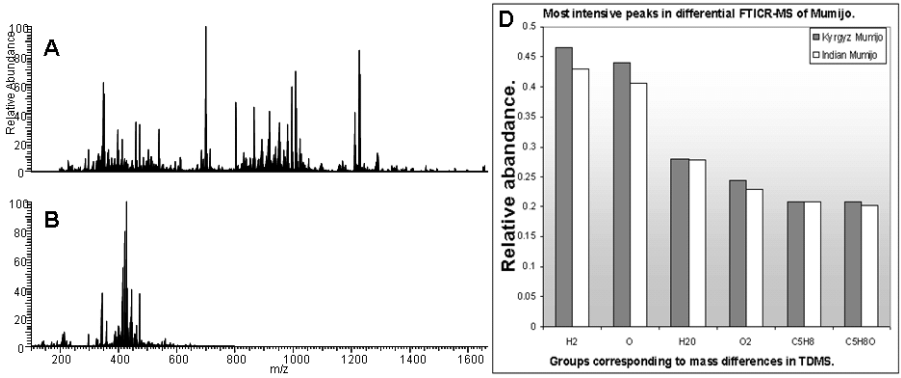

Figure 1. FTICR Mass-spectra of Indian (A), and Kyrgyz mumijo (B), (negative mode, equal concentrations of sample). Most intensive peaks in differential FTICR-MS of mumijo samples (D).

Stoichiometric formulas for ions in this region shows them to be highly saturated with low-oxygen contains (fatty acids esters etc.). Total mass difference statistics (TDMS) for different mumijo samples gives the same set of characteristic functional groups with very similar abundances (Figure 1).

4. CONCLUSIONS

Mumijo from different regions differ significantly in mass spectra but obey similar general stoichiometric characteristics. Mass spectrometry gives advance in understanding of its composition variety.

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