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NOTE

Fatty Acids of Some Moss Species from Germany

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The fatty acid composition of three mosses collected in Germany was preliminary analyzed by gas chromatography (GC-FID) and gas chromatography-mass spectrometry (GC-MS) for the first time. It was found that *Hypnum jutlandicum* could be a promising source of elaidic acid (24.36 %) while *Bryum moravicum* could represent an interesting reservoir of α-linolenic acid (19.55 %).

Key Words: Bryophytes, Phytochemistry, Elaidic acid, α-Linolenic acid.

Bryophytes are a large group of spore producing land plants. The phytochemistry of bryophytes has been neglected for a long time because they are very small and difficult to collect in large amounts as pure samples[1]. Although many chemical constituents have been elucidated in these plants such as lipophilic terpenoids[2,3], acetogenins[4] and bisbibenzyl compounds[5] literature reports on fatty acids in bryophyte plants are relatively poor.

Our continuing investigation of these compounds from mosses[6-8] has led to the identification of acetylenic fatty acids[9]. Up to date, there are no data in literature on fatty acids of the mosses which are examined in this study. The aim of the study is to investigate their fatty acids by gas chromatography (GC) and gas chromatography/mass chromatography (GC-MS) in corresponding chloroform/methanol extracts 1:1. Therefore, we have randomly chosen the three unrelated representatives, two pleurocarpus/*Brachythecium rutabulum* (Hedw.) Schimp. (Brachytheciaceae) and *Hypnum jutlandicum* Holmen & E. Warncke (Hypnaceae)/and one acrocarpous/*Bryum moravicum* Podp. (Bryaceae)/.

B. rutabulum (BEOU 4702) and *B. moravicum* (BEOU 4278) were collected in Köln in December 2007 while *H. jutlandicum* (BEOU 4711) was collected in the surrounding of Bonn in the same period. Voucher specimens have been deposited in the Herbarium of the Institute of Botany, University of Belgrade, Serbia (bryophyte collection-BEOU).

All moss species were carefully selected and cleaned from soil and other contaminants and the gametophyte tips were used for the extraction. Air-dried parts of each sample were ground (1 g) and extracted three times with chloroform-methanol (1:1 v/v) for 1 h at room temperature. The extracts were evaporated to dryness and further *trans*-esterified with 5 % H_2SO_4 in MeOH (v/v) for 4 h at 80 °C. The resulting methyl esters of fatty acids were analyzed by comparing its GC FID chromatogram with that of standard mixture (Supelco 37) obtained under the same conditions and/or by analysis of GC-MS data using NIST 5 and Wiley 7 libraries.

GC analysis was performed on Agilent 7890A GC system equipped with 5975C MSD and FID detector, using DB-23 column (30 m × 0.25 mm × 0.25 μm). Injection volume was 1 μL and injector temperature was 220 °C with 10:1 split ratio. Carrier gas (He) flow rate was 0.9 mL/min while column temperature was linearly programmed in a range of 150-240 °C at a rate of 4 °C/min and hold at 240 °C for 10 min. Transfer line was heated at 240 °C. The FID detector temperature was 300 °C. EI mass spectra (70 eV) were acquired in m/z range 40-500.

It was identified 15 fatty acids in *B. rutabulum*/C14:0 1.47 %, C15:0 1.80 %, C16:0 33.95 %, *cis* C16:1 2.59 %, *trans* C16:1 4.50 %, methyl phytanate 3.90 %, C18:0 3.26 %, C18:1n9c 9.95 %, C18:1n9t 5.61 %, C18:2n6e 7.45 %, C18:3n3 10.65 %, C20:0 0.89 %, C20:4n6 7.89 %, C20:5n3 5.40 % and C24:0 1.30 %/, 15 fatty acids in *H. jutlandicum* / C14:0 1.59 %, C15:0 1.10 %, C16:0 16.88 %, *cis* C16:1 1.83 %, *trans* C16:1 1.61 %, C18:0 4.09 %, C18:1n9c 6.12 %, C18:1n9t 24.36 %, C18:2n6e 6.45 %, C18:3n3 5.84 %, C20:0

5.25 %, C20:4n6 2.55 %, C22:0 9.41 %, C24:0 9.21 % and C26:0 3.72 %/ and 13 fatty acids in *B. moravicum* /C16:0 25.77%, *cis* C16:1 1.82 %, *trans* C16:1 2.22 %, C18:0 2.81 %, C18:1n9c 6.62 %, C18:1n9t 5.11 %, C18:2n6e 10.32 %, C18:3n3 19.55 %, C20:0 1.18 %, C20:4n6 12.17 %, C20:5n3 4.20 %, C22:0 4.39 % and C24:0 3.84 %/.

Inferred from obtained results pleurocarp *H. jutlandicum* could be a promising source of elaidic acid (8.87 %, the yield) while acrocarp *B. moravicum* could represent an interesting reservoir of α-linolenic acid (9.94 %, the yield). A possible and the most appropriate way for the production of large amount of these moss species that can be used for the isolation of elaidic acid and α-linoleic acid are corresponding *in vitro* cultures. Further studies are needed to compare the content of these fatty acids of *in vitro* grown and the plants from natural habitats. Therefore, the axenically cultures of *H. jutlandicum* and *B. moravicum* have been establishing.

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