

**ARYLTETRALIN LIGNANS FROM *Linum mucronatum*  
BERTOL. SSP. *mucronatum***

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*The dried and aerial part of Linum mucronatum ssp. mucronatum was analyzed by gas chromatography-mass spectrometry (GC-MS). Two aryltetralin lignans, podophylloxyin, 6-methoxypodophylloxyin, and β-peltatin, were identified. This is the first report of the analysis of L. mucronatum ssp. mucronatum.*

**Key words:** *Linum mucronatum ssp. mucronatum*, lignan, aryltetralin lignan.

Lignans are phenolic compounds that are widespread in the plant kingdom and show a wide variety of biological activities: antitumour, anti-HIV, immunosuppressive, hipolipidemic, antifungal, phytoestrogenic, and antiasthmatic activities [1–6]. From a medical point of view, the most important compounds today are etoposide, teniposide, and etopos, semisynthetic derivatives of podophylloxyin which are used in cancer chemotherapy. Previous work has shown that the suspension and callus of the *Linum* species (Linaceae) are useful for the production and accumulation of podophylloxyin, 6-methoxypodophylloxyin, justicidin B, and isojusticidin B [7–15]. Generally, aryltetralin types of lignans have been reported in the section *Syllinum* [7–15]. A part of our ongoing study identified two lignans from *Linum mucronatum ssp. mucronatum*, which belongs to section *Linum*.

A number of lignans have been isolated from *Linum* species [8–15]. In continuation of our phytochemical investigation of *Linum* species we now report the identification of two lignans. Compounds were identified by comparison of MS and retention time of authenticated standards and also by comparison of published MS data.

This is the first report of the lignans from *L. mucronatum ssp. mucronatum*.

TABLE 1. Lignans Found in *Linum mucronatum ssp. mucronatum* and Its Content with the Mass Spectra and the Literature where These Compounds Were Identified

Compound	Mass spectrum <i>m/z</i> , %	Reference
6-Methoxypodophylloxyin	168 (35), 207 (4), 258 (3), 369 (6), 396 (12), 414 (18), 444 (100)	17
Podophylloxyin	168 (24), 181 (28), 189 (3), 394 (27), 399 (33), 414 (100)	18

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## EXPERIMENTAL

**Material.** Plant samples were collected from Yaylim Mountain near Elazig. The identification of the plants was confirmed by Prof. Haluk Evren (Dept. of Biology, University of Fyrat). A voucher specimen (number Her. Turcicum No: 1823) has been deposited at the herbarium of the Department of Biology, Faculty of Arts and Sciences (University of Fyrat).

**Sample Preparation.** Air-dried stems and leaves of *L. mucronatum* ssp. *mucronatum* were ground in a mortar. For analysis 200 mg dried and homogenized material was weighed in a Sovirel tube. A 2 mL portion of 80% methanol was added and the mixture was sonicated for 1 h. Then 4 mL dichloromethane and 4 mL H<sub>2</sub>O were added. The tube was closed, vortexed, and centrifuged at 1.000 g for 6 min. The aqueous layer was discarded and 1.50 mL of the organic layer was transferred into a 1.5 mL microtube (No. Ref. 72.690, Started, Numbrecht, Germany). The dichloromethane was evaporated using nitrogen and the residue was redissolved in 1.5 mL methanol. The tubes were centrifuged at 10.000 rpm for 10 min in an Eppendorf centrifuge 5414, and part of the liquid was transferred into a 0.8 mL Crimp Neck Vial (Art. No. 98819, Allettech/Applied Science B. V. Breda, The Netherlands) and closed immediately. The sample was ready for GC/MS-analysis.

**GC/MS-Analysis.** GC/MS-analysis of the lignan was performed on a Unicam 610 GC/MS. The gas chromatograph was equipped with a WCOT fused-silica CP-Sil 5CB (15 m × 0.31 mm i.d., 0.25 µm film thickness; Varian (Chrompack, The Netherlands). The following oven temperature program was used: 150 to 320°C at 15°C/min and maintained at 320°C for 5 min. The injector temperature was kept at 260°C. The carrier gas used was helium with an inlet pressure of 5 psi, at a linear gas velocity of 32 cm/s and a split ratio of 20:1. The injected volume was 4 µL. To obtain mass spectra, electron impact ionization (70 eV) was used; ion source temperature of 250°C, interface at 280°C and a scan speed of 2 scans/s with mass range of 34–600 u. The acquired data were stored and analyzed with Lucy Display V 2.70 software [16].

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