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LIGNANS AND FATTY-ACID COMPOSITION OF *Arctium lappa* SEEDS

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Arctium lappa L. (burdock) is a popular medicinal plant in folk medicine and has for a long time attracted the attention of researchers. It is widely distributed in western Siberia as a weed and is used as an antibacterial and anti-inflammatory agent [1–3] to treat malignant tumors [4, 5] and several other diseases [6–8]. Such a broad spectrum of therapeutic activity for burdock is due to the chemical composition that includes essential oils, phenolic compounds (lignans, flavonoids, tanning agents), organic acids, alkaloids, and trace elements [9–12]. The lignans and carboxylic acids are of significant interest.

Lignans are widely distributed in the plant world both in the free state and as glycosides. They accumulate in all plant organs but mostly in seeds, roots, wood, and woody stems. Lignans are specific for determining plant groups and exhibit antibacterial activity.

Fatty acids exhibit anti-inflammatory activity and affect the biosynthesis of prostaglandins, playing an important role in diseases that damage the skeletal-muscular system. Drugs obtained from burdock can be standardized for these classes of biologically active compounds.

The goal of our work was to determine arctiin and arctigenin and to study the fatty-acid composition of burdock seeds.

Seeds of *A. lappa* were taken from the natural population (in the vicinity of Tomsk). Lignans and carboxylic acids were isolated by extraction from the ground dry raw material. Carboxylic acids were converted to methyl esters by the literature method [13]. Alcohol extracts were analyzed for lignan content using TLC and HPLC; for carboxylic acids, using GC–MS.

TLC analysis of the alcohol fraction showed the presence of arctiin and arctigenin. These lignans were determined quantitatively using HPLC. The components were identified qualitatively using spectral ratios (standard solutions) at wavelengths 210, 240, and 280 nm and retention times. Quantitative determinations were performed with calibration by standard solutions. Absorption at 210 nm was used for the quantitative determinations. The calibration curve showed a linear dependence in the studied (10–1000 mg/mL) determined concentration range. The contents of arctiin and arctigenin in the seed samples were 53.7 ± 0.5 and 9.7 ± 0.3 (0.5 and 0.1%) mg/g of dry sample, respectively. The relative uncertainty in both instances was <5%.

The fatty-acid esters determined as normalized percent of the total of all identified esters were (% GC–MS): 14:0, tr.; 16:1, tr.; 16:0, 6.8; 18:0, 3.5; 18:1(9), 26.7; 18:1(12), 1.6; 18:2, 60.3; 20:0, 0.7; 22:0, 0.3; 24:0, 0.2.

Linoleic acid (18:2) had the greatest percent content. Small amounts of myristic (14:0) and palmitoleic (16:1) acids were also observed. This agreed with the literature data. 12-Octadecenoic acid (18:1) and the three acids 20:0, 22:0, and 24:0 were detected for the first time in burdock seeds. The fatty-acid composition of burdock on average corresponded to the fatty-acid composition in food plant lipids (sunflower, corn, and soy oils). However, the content of unsaturated acids in it was very high whereas the content of octadecanoic acid was slightly reduced.

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