

LIPIDS OF *Cardaria repens* SEEDS AND FLOWERETS

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Cardaria repens (Schrenk) Jarm. (Cruciferae), hoarycross, is a medicinal perennial from 20 to 80 cm in height. It grows in all regions of Central Asia. Its seeds are very small and are encased mainly in flattened spherical pods with 2-3 in each [1].

We investigated lipids of the seeds, pods, and flowerets. The mass of 1000 seeds ranges from 1.6 to 1.8 g. The ratio of seed and pod masses is 1:1.3. Neutral lipids were extracted from air-dried ground samples by extractive benzene with boiling point 75-85°C; polar lipids (glyco- and phospholipids), by CHCl₃:CH₃OH (2:1 by vol.). The latter extract was freed of nonlipid components and washed with aqueous CaCl₂ solution (0.05%). The CHCl₃:CH₃OH extracts were analyzed by TLC on silicagel using hexane:diethylether (8:2). Both polar and neutral lipids were found. The yields of the extracts were established after separating neutral lipids from the CHCl₃:CH₃OH extract by column chromatography over silicagel with elution by CHCl₃. The lipid content in various *C. repens* organs was determined gravimetrically:

	Lipid content, mass %	
	neutral	polar
Seeds	12.6	1.9
Pods	1.4	0.3
Flowerlets	3.6	1.7

The qualitative composition of neutral and polar lipids was established by analytical TLC on silicagel using the solvent systems hexane:diethylether (8:2) for neutral lipids and CHCl₃:(CH₃)₂CO:CH₃OH:CH₃COOH:H₂O (65:20:10:10:3) for glycolipids. Phospholipids were analyzed by two-dimensional TLC using CHCl₃:CH₃OH:NH₄OH (65:25:4) and CHCl₃:CH₃OH:(CH₃)₂CO:CH₃COOH:H₂O (10:5:4:2:1). Classes of neutral lipids were detected using H₂SO₄ (50% aqueous) and heating; glycolipids, the Vaskovsky method and Dragendorff's and ninhydrin solutions [2].

According to the analytical results, the neutral lipids of various organs contain the usual set of lipid classes: hydrocarbons, sterols and their esters with high-molecular-weight fatty acids, free fatty acids, and triacylglycerides. The triacylglycerides dominated significantly in the seed lipids; sterol esters with fatty acids and hydrocarbons, in flowerets and pods.

The contents of glycolipid classes were found in the following order: seeds, sterolglycosides > sterolglycoside esters > monogalactosyldiglycerides > digalactosyldiglycerides; pods, sterolglycoside esters > sterolglycosides > digalactosyldiglycerides; flowerets, sterolglycosides > sterolglycoside esters > digalactosyldiglycerides.

The identified phospholipids of seeds and pods fell in the following order: phosphatidylcholines > phosphatidylethanolamines > phosphatidylinositols. The flowerets phospholipids contained these same components but their contents were practically the same.

The fatty-acid composition of acyl-containing neutral lipids was determined using base hydrolysis. Neutral lipids of seeds were saponified by KOH solution (0.5%) in CH₃OH at 40°C with constant stirring on a magnetic stirrer for 1 h; lipids of flowerets and pods, by KOH solution (20%) in CH₃OH with boiling for 10 h. Fatty acids were separated from saponified lipids by diethylether and as their methyl esters [3] and were analyzed by GC on a Chrom-5 instrument using a steel column (2.5 m length) packed with Reoplex-400 (5%) on N-AW (0.16-0.20 mm) at 190°C and N₂ flow rate 30 mL/min. Table 1 lists the composition and content of the acids.

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TABLE 1. Fatty-acid Composition of Neutral Lipids of *Cardaria repens* (GC, %)

Acid	Seeds	Pods	Flowerets
12:0	0.5	3.5	2.8
14:0	0.6	1.6	4.3
15:0	0.3	1.8	Tr.
16:0	6.1	4.8	8.8
16:1	2.5	1.9	1.6
18:0	2.2	2.9	10.5
18:1	21.9	20.9	3.2
18:2	18.6	3.2	3.7
18:3	27.8	0.7	11.1
20:0	9.0	12.3	21.9
20:1	-	8.4	Tr.
21:0	-	2.7	1.9
22:0	-	7.5	10.3
22:1	10.5	19.2	18.3
24:0	-	6.4	Tr.
Unid.	-	2.2	1.6
$\Sigma_{\text{sat.}}$	18.7	43.5	60.5
$\Sigma_{\text{unsat.}}$	18.3	54.3	37.9

The types of acids and their content differs considerably depending on the plant organ. The total content of unsaturated acids in seeds is almost 4.5 times greater and in flowerets almost two times less than the saturated acids. Their ratio is almost the same only in pods.

Substantial variations in the acid content are seen mainly for the C-18 and 22:1 (erucic) isologs, which is characteristic for the Cruciferae family. Erucic and 18:1 acids dominate in the pod lipids; 20:0 and 22:1, in the flowerets. The ratio of acids is different for seed lipids. The contents of 18:1, 18:2, and 18:3 are significant and vary from ~19 to 28%. Erucic acid is only 10.5%, which is almost two times less than its content in flowerets and pods.

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