LIPIDS AND CARBOHYDRATES FROM *Capparis spinosa* ROOTS

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Capparis spinosa is a member of the Capparaceae family. Lipids and carbohydrates from this plant have not previously been studied. Only data from a study of the alkaloids, flavonoids, and glycosides have been published [1-5].

Herein we report results from an investigation of lipids and carbohydrates from roots of *C. spinosa* growing in Xinjiang Autonomy Region of China. Lipids and carbohydrates were isolated successively from a single portion of raw material. Lipids were extracted from air-dried ground raw material by $CHCl_3$:CH_3OH (1:1, v/v). The extract was purified of nonlipid components by washing with aqueous $CaCl_2$ solution (0.05%). The yield of lipids was 0.54% of the raw material mass. Lipids were separated into neutral lipids (NL), glycolipids (GL), and phospholipids (PL) by CC over silica gel. NL were eluted by $CHCl_3$; GL, by acetone; PL, by CH_3OH. The NL content was 53.0%; GL, 37.2; PL with pigments, 9.8% of the total mass.

The qualitative compositions of the individual lipid groups were established by analytical TLC over silica gel using the solvent systems hexane:diethylether (4:1) for NL; $CHCl_3$:$(CH_3)_2CO$:CH_3OH:CH_3CO_2H:H_2O (65:20:10:10:3) for GL, and $CHCl_3$:CH_3OH:NH_4OH (13:7:1) for PL.

Lipid classes were identified by their chromatographic mobility compared with authentic compounds and qualitative reactions. Specific reagents for NL, GL, and PL classes were prepared as before [6].

Hydrocarbons, esters of sterols and high-molecular-weight fatty acids, triacylglycerides, free fatty acids, free sterols, and aliphatic alcohols were identified in the NL.

The principal classes of GL were monogalactosyldiglycerides, sterolglycosides, and cerebrosides. Esters of sterolglycosides and digalactosylglycerides were also present.

The main PL were phosphatidylinosites, phosphatidylcholines, and phosphatidylethanolamines. Phosphatidic acid and *N*-acylphosphatidylethanolamines were observed in trace quantities.

The total lipids were hydrolyzed by KOH in CH_3OH (20%) with boiling on a water bath for 1 h in order to determine the fatty-acid composition. Fatty acids were converted to the methyl esters by freshly prepared diazomethane [6].

The fatty-acid composition of the total lipids was established using the methyl esters and GC (15% Reoplex-400 on Chromaton N-AW). The results were as follows (mass %): 10:0, 0.1; 12:0, 0.3; 14:0, 0.6; 15:0, 0.5; 16:0, 16.1; 16:1, 8.0; 17:0, 1.4; 18:0, 3.0; 18:1, 19.7; 18:2, 34.6; 18:3, 7.7; 20:0, 0.5; 22:0, 7.5.

The pulp from lipid isolation was used to extract carbohydrates. For this, we isolated successively from the remaining *C. spinosa* raw material by extraction with water at room temperature the water-soluble polysaccharides (WSPS); at 100°C, polysaccharides (PS); with a mixture of oxalic acid (0.5%) and ammonium oxalate (0.5%) solutions, pectinic compounds (PC), and with base solution (5%), hemicellulose (HC).

Total acid hydrolysis of these carbohydrates was performed as before [7]. The content and monosaccharide composition of the carbohydrates (Table 1) were studied by PC (*n*-butanol:pyridine:water, 6:4:3, anilinium acid phthalate developer) and GC (Chrom-5 chromatograph, Silicone XE-60, 210°C, N_2 carrier gas, 60 mL/min) of the aldononitrile acetates [8].

WSPS were a white powder with a cream tint that dissolved in water and gave no color reaction with iodine. The IR spectrum of the WSPS contained absorption bands at 880 cm^{-1} (β-glycoside bond) and 820 cm^{-1} (pyranose ring). Table 1 shows that the WSPS consisted mainly of xylose, arabinose, and galactose in a 4.0:10.3:5.1 ratio. It was probably a xylogalactoaraban.

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TABLE 1. Content and Monosaccharide Composition of *Capparis spinosa* Carbohydrates

Polysaccharide	Carbohydrate yield, %	Monosaccharide composition						
		Rha	Xyl	Ara	Glc	Man	Gal	UAc
WSPS	3.0	-	4.0	10.3	1.0	2.7	5.1	-
PS	1.7	Tr.	3.3	20.0	11.0	1.0	1.2	+
PC	3.5	1.0	6.4	16.9	9.3	2.8	9.3	+
HC	2.7	-	9.9	12.2	Tr.	Tr.	3.2	+

In contrast with the WSPS, paper chromatography identified uronic acid in the PS, PC, and HC in addition to the sugars shown in Table 1.

The PC were a light brown powder that was very soluble in water and formed a viscous solution with $[\alpha]_D^{20}$ +141° (*c* 0.5, H_2O). The PC hydrolysate contained the sugars shown in Table 1 and galacturonic and glucuronic acids, which were identified by paper chromatography. The dominant monosaccharides were arabinose, glucose, and galactose. The IR spectrum of the PC exhibited absorption bands at 718, 810, 988, 1094, 1303, 1430, 1603, and 3000-3600 cm^{-1}. The IR spectroscopic data and the high positive value of specific rotation of the PC indicated that uronic acid monomers in the pyranose form were bonded by β-glycoside bonds [9].

HC was a dark brown powder that was very soluble in base. An aqueous solution of HC did not give a reaction for starch with iodine. The hydrolysate of HC contained galacturonic acid in addition to neutral monosaccharides according to paper chromatography. The dominant components of the HC were arabinose, xylose, and galactose. Therefore, HC was a heteropolysaccharide.

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