A GLUCOSIDE OF A FUROCOUMARINIC ACID – A NEW COMPONENT OF Ficus carica

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It is known that all the organs of Ficus carica L. (fig) contain the furocoumarins psoralen and bergapten [1]. On studying fig leaves collected in Georgia, we isolated a third component with the composition $C_{17}H_{18}O_9$ which gave the Molisch reaction for glycosides.

The dried and comminuted leaves (1 kg) were treated with boiling 80% methanol. The extracts were concentrated in vacuum, and the residue (230 g) was washed with chloroform and chromatographed on a column filled with polyamide. Elution with 80% ethanol gave 0.12% of a yellow crystalline substance with mp 125°C (from methanol), R_f 0.38 [hexane–benzene–methanol (5 : 4 : 1) system; paper impregnated with a 10% solution of formamide in methanol]. The substance did not give a coloration with diazotized sulfanilamide, it fluoresced in UV light, and was soluble in chloroform and ethanol and sparingly soluble in water.

Its UV spectrum had maxima at 224, 243, 251, 278, and 316 nm (log ε 4.23, 3.97, 3.97, 4.11, 3.95), showing the presence in the substance of an aromatic nucleus and conjugated double bonds. The IR spectrum exhibited absorption bands at 1710-1730 cm^{-1} (carbonyl of a lactone or of an acid), 1618 cm^{-1} (C = C bond in conjugation), and a broad band in the 3200-3650 cm^{-1} region (OH group). The NMR spectrum (solution in $CDCl_3$ taken on a Jeol instrument at 69 MHz) had the proton signals characteristic for psoralen – doublets with δ 8.00 and 6.13 ppm, J = 10 Hz, and 7.52 and 6.90 ppm, J = 2.5 Hz, corresponding to the H-4, H-3 and H-4', H-5' protons, and a broadened singlet at 7.1-7.25 ppm (2 H) corresponding to the H-5 and H-8 protons. However, according to the IR spectrum, this substance is not psoralen but a derivative of furocoumarinic acid. Consequently, the doublets at 8.00 and 6.13 ppm must be ascribed to the olefinic protons of this acid present in the cis position. The absence of a bathochromic shift of the maxima in the UV region of the spectrum in the presence of sodium methoxide, and the solubility of the substance in aqueous sodium bicarbonate solution shows that this acid is substituted at the phenolic hydroxyl. The signals in the 3-4.5-ppm region (6 H) and the 5.2-ppm region permit the assumption that this substituent is glucose. After acid hydrolysis for five hours, an aglycone with mp 160-161°C was obtained which was identified by its IR spectrum and R_f value as psoralen.

The presence of glucose in the hydrolysate was established by paper chromatography. Bands at 1087, 1022, and 840 cm^{-1} permit the assumption that the glucose is present in the substance in the furanose form and is attached to the aglycone by a β-glycosidic linkage.

Thus, the component obtained is identical with the O-β-D-glucofuranosylfurocoumarinic acid isolated previously from Coronilla [2]. This is the first time that psoralen has been found in the fig in the form of a glycoside.

LITERATURE CITED

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2. A. Stoll, A. Pereira, and I. Renz, Helv. Chim. Acta, 33, No. 6, 1637 (1950).

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