Chemistry of Natural Compounds, Vol. 33, No. 1, 1997

POLYPHENOLS OF THE FRUITS OF SOME VARIETIES OF POMEGRANATE GROWING IN UZBEKISTAN

S. M. Mavlyanov, Sh. Yu. Islambekov, A. K. Karimdzhanov, and A. I. Ismailov

UDC 547.982/83/84

Continuing a search for promising tannide-bearing plants [1-3] with the aim of using them to produce drugs and high-quality tanning agents, we have investigated the polyphenols of the fruits of several varieties of *Punica granatum* (Kazaki, Shirindona, Achchikdona, Kai, Kizil) growing on the territory of Uzbekistan,

By a method developed earlier [1], from the peel of pomegranates of the Kazaki variety we isolated ethyl acetate and butanol fractions of the total polyphenols (2.9% and 6.8%, respectively, of the weight of the raw material). Their tannide contents, determined by the VEM method [4], were 74 and 89%, respectively.

By means of two-dimensional PC in the solvent systems butan-1-ol–acetic acid–water (40:12:28) and 2% acetic acid it was established that the ethyl acetate extract contained 11 polyphenols, and the butanol extract seven. The ethyl acetate fraction was first separated on a column of rawhide powder into fractions soluble in water, in acetone, and in aqueous acetone. It was established by qualitative reactions (mixture of 1% aqueous solutions of $FeCl_3$ and $K_3Fe(CN)_6$, 5% aqueous solution of Na_2CO_3) that the water-soluble fraction contained mainly flavonols, and the other fractions phenolic acids and hydrolyzable tanning agents and compounds related to them. The water-soluble fraction was rechromatographed on polyamide using as eluents mixtures of chloroform and methanol in various ratios, The fractions soluble in acetone and in aqueous acetone were chromatographed on column of silica gel using as eluents diethyl ether and ethyl acetate in various ratios.

As a result, we isolated several compounds, which were identified from their physicochemical properties as pelargonidin 3-O-glucoside, quercetin, quercimeritrin, gallic and ellagic acids, punicalin, and punicalagin [5] and corylagin [6]. The main compound of the polyphenol complex was a substance with the composition $C_{41}H_{28}O_{27}\cdot xH_2O$ in the form of yellow crystals, which were identified as granatin B.

The qualitative and quantitative compositions of the products of complete acid hydrolysis (ellagic and gallic acids, glucose) were identical with those of geranin [7-11]. However, in the PMR and ^{13}C NMR spectra of the compound under investigation there were slight differences in the chemical shifts of the signals from the latter. The results of a study of the spectral characteristics of the methyl and acetyl derivatives of the compound isolated, and also of its derivative with *o*-phenylenediamine, permitted the conclusion that it was identical with granatin B, isolated previously from Japanese varieties of *Punica granatum* [12].

A comparison with the aid of high-pressure liquid chromatography (HPLC, Milikhrom-1A, Separon C_{18} column) of the qualitative composition and the polyphenols content of the peel of a Kazami pomegranate with the polyphenols of the pomegranate varieties mentioned above showed the identity of their qualitative compositions and only slight differences in the quantitative levels of individual components.

It was also established by HPLC that the anthocyan compositions of the juices of all the pomegranate varieties were represented by pelargonidin 3-O-glucoside, a pelargonidin 3,5-di-O-glycoside, a cyanidin 3-O-glycoside, a delphinidin 3-O-glycoside, and a delphinidin 3,5-di-O-glycoside, the level of anthocyan pigments being considerably higher in the juices of the Achchikdona, Kai, and Kizil varieties than in that of the Shirindona variety, which explains the more intense coloration of the former. The amount of sugars in the juices ranged from 15% (Achchikdona) to 21% (Shirindona), and the level of organic acids (citric, malic, ascorbic, etc.) from 0.9 to 3.0%.

According to preliminary results, the polyphenols of the peel of all the pomegranate varieties studied possess a pronounced antitumoral and antiviral action.

A. S. Sadykov Institute of Organic Chemistry, Academy of Sciences of the Republic of Uzbekistan, Tashkent, fax (3712) 62 70 71. Translated from Khimiya Prirodnykh Soedinenii, Vol. 33, No. 1, pp. 124-126, January-February, 1997. Original article submitted May 6, 1996.

0009-3130/97/3301-0098$18.00

REFERENCES

1. S. M. Mavlyanov, Sh. Yu. Islambekov, F. G. Kamaev, and A. I. Ismailov, Khim. Prir. Soedin., 40 (1994).
2. Sh. Yu. Islambekov, S. M. Mavlyanov, F. G. Kamaev, and A. I. Ismailov, Khim. Prir. Soedin., 45 (1994).
3. S. M. Mavlyanov, Sh. Yu. Islambekov, A. K. Karimdzhanov, and A. I. Ismailov, in: Abstracts of Lectures at a Republican Conference on Problems of the Development of the Chemical Technology of Import-Replacing Production in Uzbekistan [in Russian], Tashkent (1995), p. 320.
4. Gravimetric Unitary Method of Investigation in the Leather Industry (VEM) [in Russian], Gostekhizadat, Moscow (1955), p. 320.
5. W. Mayer, A. Corner, and K. Andra, Liebigs Ann. Chem., 196 (1977).
6. O. T. Schmidt and R. Lademann, Liebigs Ann. Chem., 232 (1951).
7. T. Okuda, T. Yoshida, and T. Hatano, Tetrahedron Lett., 2561 (1980).
8. T. Okuda, H. Naeshiro, and K. Seno, Tetrahedron Lett., 4421 (1977).
9. T. Yoshida and T. Okuda, Heterocycles, 1743 (1980).
10. T. Okuda, T. Yoshida, and H. Naeshiro, Tetrahedron Lett., 3721 (1976).
11. S. M. Mavlyanov, Sh. Yu. Islambekov, and A. K. Karimdzhanov, Khim. Prir. Soedin., 534 (1984).
12. T. Okuda, T. Hatano, H. Nitta, and R. Fujii, Tetrahedron Lett., 4361 (1980).