Chemistry of Natural Compounds, Vol. 43, No. 6, 2007

B R I E F C O M M U N I C A T I O N S

PECTINIC SUBSTANCES FROM *Alcea rosea* FLOWERS

D. A. Rakhimov,[1] S. K. Atkhamova,[2] and A. M. Khvan[2]

UDC 547.917

We have previously studied polysaccharides from representatives of the Malvaceae family [1]. Herein we present data for pectinic substances obtained by various methods from flowers of the red and black forms of *Alcea rosea* L. collected in 2001 in Syrdarin Oblast of Uzbekistan during mass flowering.

Air-dried raw material was treated twice with boiling alcohol (82%, 1:5 ratio) to remove alcohol-soluble sugars, low-molecular-weight compounds, and dyes and was extracted with water at room temperature. Water-soluble polysaccharides were completely removed from the remaining raw material. Pectinic substances (PS) were isolated by two methods using 0.7% HCl (1) and 0.3% HCl and 0.3% oxalic acid (1:1 ratio) (2) at 70°C. PS were precipitated from the extracts by alcohol. The yield of PS from the red form (I) was 7.8 and 9.4%; from the black form (II), 6.7 and 8.1%, respectively. It can be seen that the yield of PS from the red form is greater than from the black form for both types of extraction. Extraction by the mixture of acids was carried out with a larger volume for both the red and black forms.

The PS were amorphous powders of red and violet color with an aromatic aroma and sour-slimy taste. They were insoluble in most organic solvents. They dissolved in water, DMSO, and formamide to form viscous solutions. The solutions gave a negative reaction for starch. The molecular weight (MW) of the PS determined by viscosimetry [2] was 30,000 (red form) and 40,000 (black form) for pectins extracted by 0.7% HCl. The MW of pectins was 45,000 (I) and 50,000 (II) if the mixture of 0.3% HCl and 0.3% oxalic acid was used as the extractant. Table 1 gives the PS content and qualitative properties (%) obtained by titration [3].

PS extracted by the mixture of HCl and oxalic acid typically had a high degree of esterification, 71.4% (I) and 81.1% (II). This enabled them to be assigned as highly esterified pectins.

The monosaccaride compositions of the PS were determined by total acid hydrolysis (2 N H_2SO_4 at 100°C for 12 h). The hydrolysates were treated with $BaCO_3$ until neutral, centrifuged, evaporated, and analyzed by PC and GC [4].

TABLE 1. Physicochemical Properties of Pectinic Substances from Flowers of the Red (I) and Black (II) Forms of *Alcea rosea* L.

Raw matl.	1% aq. soln.			Titration data, %				
	$[\alpha]^{20}_D$	η	pH	K_c	K_e	K_o	λ	CH_3O
				Extractant 0.7% HCl				
I	+197°	5.8	3.29	28	32	60	53.3	4.2
II	+225°	6.3	3.42	28	35.2	63.2	55.7	7.0
				Extractant 0.3% HCl + 0.3% $C_2H_2O_4$				
I	+202°	6.5	4.2	12	30	42	71.4	7.8
II	+221°	7.0	4.4	8.0	34	42	81	9.1

η, relative viscosity; $[\alpha]_D^{20}$, specific rotation; K_c, free carboxylic groups; K_e, esterified carboxylic groups; K_o, total carboxylic groups; λ, degree of esterification; CH_3O, methoxy group.

1) S. Yu. Yunusov Institute of the Chemistry of Plant Substances, Academy of Sciences of the Republic of Uzbekistan, Tashkent, fax (99871) 120 64 75; 2) A. S. Sadykov Institute of Bioorganic Chemistry, Academy of Sciences of the Republic of Uzbekistan, Tashkent, fax (99871) 262 70 71. Translated from Khimiya Prirodnykh Soedinenii, No. 6, pp. 567-568, November-December, 2007. Original article submitted July 9, 2007.

0009-3130/07/4306-0685

The hydrolysis products of the pectins (in both forms) contained D-galacturonic and D-glucuronic acids and the monosaccharides: rhamnose, arabinose, and galactose in 18:3:1 (red form) and 10.4:2.2:1 (black form) ratios.

Partial hydrolysis of pectin from the black form (1 N H_2SO_4, 100°C, 1-4 h) showed that arabinose and galactose units were practically completely cleaved already after 1 h. Therefore, these monosaccharides were contained in side chains. After hydrolysis for 4 h, the pectin was rhamnoglucogalacturonan in 35% yield, $[\alpha]_D^{20}$ +230°, and consisted of rhamnose and glucuronic and galacturonic acids.

REFERENCES

1. S. K. Atkhamova, R. K. Rakhmanberdyeva, and D. A. Rakhimov, *Khim. Prir. Soedin.*, 756 (1997).
2. S. L. Kovalenko and O. D. Kurilenko, *Ukr. Khim. Zh.*, **31**, No. 21, 175 (1965).
3. G. B. Aimukhamedova, D. E. Alieva, and N. P. Shelukhina, *Properties and Use of Pectinic Sorbents* [in Russian], Ilim, Frunze (1984), p. 6.
4. N. P. Yuldasheva, D. A. Rakhimov, and E. S. Kondratenko, *Khim. Prir. Soedin.*, 172 (1985).