

POLYPHENOLS FROM CERTAIN *Gossypium hirsutum* VARIETIES

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The majority of biologically active compounds used in medicine as antioxidant, antiviral [1, 2], antitumor, and anti-inflammatory [3] agents are polyphenols of natural origin.

In continuation of research on polyphenols of various *Gossypium hirsutum* L. cotton varieties [4-6], we studied three cotton varieties C-4727, Ok-dare-6, and Ch-3010 cultivated in the Republic of Karakalpakstan.

The polyphenol content in various organs of the studied varieties were determined by the literature method [7]. Table 1 lists the results.

It can be seen that bark of the roots and stems and the seeds contain the greatest quantity of polyphenols. Leaves and bod leaves have much less.

Successive treatment of the raw material with CHCl_3 and aqueous acetone with subsequent evaporation of the acetone, treatment of the aqueous remainder with ethylacetate and *n*-butanol, concentration of the ethylacetate and butanol extracts, and addition to the concentrated extracts of petroleum ether isolated from the separated organs the total phenolic compounds.

Paper chromatography (PC) of the ethylacetate fraction of polyphenols from C-4727 cotton root bark detected (+)-catechin (**1**), (-)-epicatechin (**2**), (\pm)-gallocatechin (**3**), (-)-epigallocatechin (**4**), and traces of three proanthocyanidins. Chromatography of the butanol fraction of polyphenols showed that it contained mainly proanthocyanidins with traces of catechins.

The catechin content was determined quantitatively by PC of the ether-soluble fraction of total polyphenols and colorimetry by the literature method [8].

It was found that the principal components of the phenolic compounds from various cotton organs were **1** and **3**, which made up 32-35 and 37-40%, respectively, of the total catechins. Other polyphenols were present in small quantities. It was also found that the proanthocyanidin content in the total polyphenols varied from 1.55 (in leaves) to 4.67% (in root bark).

Column chromatography over silica gel of the catechin mixture with subsequent rechromatography of the resulting fractions isolated pure components that were identified as (+)-catechin, mp 171-173°C, $[\alpha]_D^{20} +17.1$ in acetone:water (1:1), $R_f 0.64$ in *n*-butanol:acetic acid:water (40:12:28) (system 1); (-)-epicatechin, mp 263-265°C, $[\alpha]_D^{20} -60^\circ$ (*c* 1.25, acetone:water), λ_{max} 276 nm (ethanol), $R_f 0.57$ (system 1); (\pm)-gallocatechin, mp 168-171°C, λ_{max} 271 nm (ethanol), optically inactive, $R_f 0.50$ (system 1); and (-)-epigallocatechin, mp 217-219°C, $[\alpha]_D^{20} -39.1$ (1.30, methanol), $R_f 0.40$ (system 1). Proanthocyanidins were isolated and studied using the butanol fraction from plant roots. It was chromatographed over columns of cellulose (system 1) and Sephadex G-50 using acetone:water (1:1).

The total polyphenols from cotton leaves were chromatographed over a polyamide column using CHCl_3 : CH_3OH (9:1 and 8:2) to isolate pure compounds with $R_f 0.75$ and 0.80 (system 1). The physicochemical properties of these compounds identify them as the flavonols quercetin (**5**), mp 312-315°C, λ_{max} 270 nm (ethanol), $R_f 0.07$ in CH_3COOH (15%) and quercitrin (**6**), mp 183-185°C, $R_f 0.74$ in ethylacetate:HCOOH:water (10:2:3) (system 2), λ_{max} 350 and 255 nm (ethanol).

A methanol extract of cotton flowers in the presence of HCl (1%) was obtained for an investigation of the anthocyanidins content. PC detected two compounds with $R_f 0.36$ and 0.23 (system 7) that were identified as gossypicyanin and chrysanthemine [9].

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TABLE 1. Polyphenols Content in Various Cotton Organs

Variety	Polyphenols content, %				
	Leaves	Pod leaves	Bark		Seeds
			roots	stems	
C-4727	3.8-6.2	4.2-8.2	6.4-9.2	5.2-8.1	6.2-10.0
Ok-dare-6	3.5-5.9	4.1-8.0	6.5-9.1	5.0-8.5	6.0-9.7
Ch-3010	4.0-6.3	5.3-7.9	6.1-9.5	5.7-9.0	6.4-9.3

TABLE 2. Composition of Ether-soluble Polyphenols Isolated from Various C-4727 Cotton Organs

Polyphenol	Polyphenol content, %				
	Leaves	Pod leaves	Bark		Seeds
			roots	stems	
1	36.12	37.55	31.25	35.56	35.65
2	7.35	6.74	7.56	6.63	6.33
3	42.64	41.25	45.01	37.51	39.33
4	6.24	6.63	10.54	11.34	12.45

The results indicate that the catechins content in leaves and bolls of all three varieties gradually declines with growth. The proanthocyanidins content in root and stem bark reaches a maximum at the end of the vegetative period.

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