ALKALOIDS OF Solanum tuberosum

A. Nabiev and R. Shakirov

UDC 547.944/94

The plant S. tuberosum has been studied previously [1-4]. However, the top shoots, the roots, and the skin of the tubers of a local potato in the period of complete ripeness of tubers have not been investigated chemically.

The comminuted air-dry raw material was extracted with 5% acetic acid by the method of Kuhn and Low [5]. The alkaloids were precipitated with 25% ammonia. The dried precipitate was treated with methanol. The concentrated methanolic solution was passed through a column filled with silica gel and was exhaustively eluted with methanol. The results of quantitative determinations of the total alkaloids are given in Table 1.

The mixture of alkaloids obtained from various parts of the potato consisted mainly of three substances, with R_f 0.08, 0.35, and 0.56 [TLC, silica gel, solvent: ethanol–chloroform (1 : 1)]. The substance with R_f 0.56 was absent from the skin.

From 2.46 g of the combined alkaloids isolated from the top shoots of S. tuberosum (gathered on June 10, 1971) by treatment with ethanol we isolated a base with R_f 0.08, mp 268-272°C (ethanol), $[\alpha]_D$ −54° (c 0.612; pyridine), $C_{45}H_{73}NO_{15}$ (I). After isolation of the alkaloid (I), the ethanolic mother solution was separated on a column of silica gel. From an ethanol–chloroform (2 : 8) eluate was isolated an alkaloid with R_f 0.56, mp 249-251°C (methanol), $[\alpha]_D$ −37.04° (c 0.594; pyridine), $C_{33}H_{53}NO_6$ (II), and an ethanol–chloroform (3 : 7) eluate yielded a substance with R_f 0.35, mp 234-238°C (methanol), $[\alpha]_D$ −85.7° (c 0.51; pyridine), $C_{45}H_{73}NO_{14}$ (III).

The IR spectra of the bases (I), (II), and (III) were very similar to one another. They each contained the absorption band of a hydroxy group (3420 cm^{-1}) and of a double bond (1650 cm^{-1}) and a broad absorption band characteristic for glycoalkaloids at 1000-1150 cm^{-1} [6]. The mass spectra of (I), (II), and (III) had strong peaks of ions with m/e 150 (100%), 204, and 397, which are the main fragments in the mass-spectrometric decomposition of solanidine [7]. In fact, the hydrolysis of (I), (II), and (III) separately in 1 N ethanol-10 hydrochloric acid led to an aglycone with mp 218-219°C, identical with an authentic sample of solanidine (IR spectrum and melting point) [3]. The thin-layer chromatography of the neutral fractions of the hydrolyzates of (I), (II), and (III) on silica gel impregnated with 0.1 N boric acid [solvent: butan-1-ol–acetic

TABLE 1

Time of gathering	Organs of the plant	Vegetation period	Content of alkaloids, %
	Early Variety		
9. V. 1971	Top shoots (15-20 cm high)	Beginning of budding	0.35
The same	Roots	The same	0.42
10. VI. 1971	Top shoots (15-20 cm high)	Ripeness of the tubers	0.17
The same	Roots	The same	0.25
	Late Variety		
20. X. 1972	Top shoots	Ripeness of the tubers	0.14
The same	Skin of the tubers	The same	0.46

Order of the Red Banner of Labor Institute of the Chemistry of Plant Substances, Academy of Sciences of the Uzbek SSR. Translated from Khimiya Prirodnykh Soedinenii, No. 1, pp. 116-117, January-February, 1974. Original article submitted September 4, 1973.

acid−water (60 : 30 : 10); chromogenic agent: aniline hydrogen phthalate] showed spots of galactose, glucose, and rhamnose in the case of (I), glucose in (II), and glucose and rhamnose in (III).

The physicochemical constants of (I), (II), and (III) coincided with those of the known glycoalkaloids α-solanine, γ-chaconine, and α-chaconine, respectively [1, 8], as is confirmed by the results of a study of the products of the hydrolysis of (I-III).

LITERATURE CITED

1. R. Kuhn and I. Low, Angew. Chem., 66, 639 (1954).
2. V. A. Paseshnichenko and A. R. Guseva, Biokhimiya, 21, 585 (1956).
3. Kh. A. Aslanov, T. K. Kasymov, and A. S. Sadykov, Uzb. Khim. Zh., No. 2, 35 (1963).
4. O. V. Pogorelova, Farmatsiya, 17, 27 (1968).
5. R. Kuhn and I. Low, Ber., 80, 406 (1947).
6. R. Shakirov, R. N. Nuriddinov, and S. Yu. Yunusov, Khim. Prirodn. Soedin., 384 (1965).
7. H. Budzikiewicz, Tetrahedron, 20, 2267 (1964).
8. R. Kuhn, I. Low, and H. Trischmann, Ber., 88, 1492, 1690 (1955).