Berberis ALKALOIDS

XIII. AN INVESTIGATION OF THE ALKALOIDS OF Berberis heteropoda

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Turkestan barberry, Berberis heteropoda, belongs to the family Berberidaceae, and forms strongly branched bushes about 2-3 m high. It grows on rocky mountain slopes with a northern exposure, in ravines, and in river valleys up to a height of 1500 m above sea level, producing thickets. It is distributed mainly in Central Asia and Kazakhstan [1, 2]. Berberine, palmatine, columbamine, jatrorrhizine, oxyacanthine, and berbamine have previously been isolated from the roots of this plant [3].

In continuation of investigations of plants of the Berberis genus, we have studied the bark of the stems, roots, young shoots, and leaves of B. heteropoda from two growth sites. The isolation and separation of the bases was effected by the method described in [4, 5]. Information on the determination of the total bases and the main alkaloids present in them is given in Table 1. By separating the total alkaloids of the roots we isolated, in addition to alkaloids obtained previously [3], magnofluorine, berbamunine, and oblongine, and from the roots collected in Osh province we obtained reticuline, glaucine, and ℓ-tetrahydroberberberine [4].

The bark of the barberry stems from Ferganan province was distinguished by a higher level of oxyacanthine than the bark of the plants from Osh province. The main alkaloids from the bark of the stems and young shoots collected in Osh province were berberine, magnoflorine, and oxyacanthine. Glaucine and thalicmidine [4] were isolated from the alkaloids of the leaves. The alkaloids obtained were identified on the basis of physicochemical constants and spectral characteristics, and also by comparison with authentic specimens.

Thus, the roots, bark of the stems, young shoots, and leaves of B. heteropoda have been studied for their alkaloid content. By the separation of the total alkaloids, 13 bases have been isolated, of which magnoflorine, berbamunine, oblongine, reticuline, glaucine, and thalicmidine have been isolated from this plant for the first time, and *l*-tetrahydroberberine from the Berberis genus for the first time.

TABLE 1. Amounts of Alkaloids in Various Organs of B. heteropoda

Plant organ	Collection site	Vegetation period	Total alkaloids, % on the weight of the dry plant	Amounts of the main alkaloids, %		
				berberine bisulfate	magnoflorine iodide	oxyacanthine
Bark of the stems	Shakhimardan, Fergana province	Fruit ripening, July 28, 1988	2,29	0,42	0,34	0,65
Roots	Chilisaiskoe gorge, Osh province	End of vegetation, October 15, 1988	4,69	0,74	0,66	0,69
Young shoots	"	"	0,79	0,29	0,11	0,21
Bark of the stems	"	"	1,5	0,35	0,26	0,44
Leaves	"	"	0,12	0,03	—	0,06

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Berberis ALKALOIDS

XIV. DYNAMICS OF THE ACCUMULATION OF ALKALOIDS IN Berberis oblonga

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The study of plants of the genus Berberis (Berberidaceae) is due to the presence in them of the alkaloid berberine, which, in the form of the bisulfate, is used as a cholagogue [1, 2]. The level of berberine in different species of barberry ranges from 0.3 to 1% [3].

The roots of B. oblonga gathered in Kazakhstan at the stage of unripe fruit yielded 0.30% of berberine [3]. We have previously isolated a number of isoquinoline alkaloids in a study of various organs of this plant [4].

We have now studied the dynamics of the accumulation of alkaloids in the roots, young stems, and leaves of B. oblonga growing on the bank of the Chilisai in the Navkat region of Osh province. Results on the determination of the total alkaloids and the amounts of the main alkaloids are given in Table 1. The total alkaloids from each sample were separated by methods described in the literature [5, 6]. The total amount of alkaloids in the roots proved to be highest at the end of vegetation, while in the young shoots and leaves it was during the mass flowering period. The level of alkaloids in the epigeal part decreased sharply towards the end of vegetation, while in the roots an increase in their total amount was observed, which is in harmony with the laws established by S. Yu. Yunusov [7]. The main alkaloids in the roots and young shoots were bergerine, magnoflorine, and oxyacanthine, while in the leaves the main alkaloid was glaucine.

TABLE 1. Dynamics of the Accumulation of Alkaloids in Various Organs of B. oblonga during the Phases of Vegetation

Phase of development of the plant	Plant organ	Total amount of alkaloids, %	Quaternary bases, %	Tertiary bases, %	Levels of the main alkaloids			
					berberine iodide	oxyacanthine	magnoflorine iodide	glaucine
Mass-flowering period, May 18, 1989	Roots	4,3	2.2	2,1	0,66	0.45	0,61	—
	Young shoots	1,40	0,50	0,90	0,30	0,35	0,11	—
	Leaves	0,39	0,15	0,24	0.05	0,05	—	0,16
Fruit-ripening period, August 25, 1989	Roots	5.20	2,90	2,30	1,05	0,05	0,01	—
	Young shoots	1,1	0,3	0,08	0,22	0.24	0,03	—
	Leaves	0.28	0,08	0,20	0,04	0,04	—	0,13
	Fruit	0,09	0,01	0,03	Tr.	0 03	—	—
End of vegetation, October 23. 1989	Roots	6,6	4.15	2,45	1,22	1.01	1.11	—
	Young shoots	0 54	0,31	0.23	0,14	0,21	0.05	—
	Leaves	0,05	0,03	0,03	0.01	0,02	—	0,02

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