Chemistry of Natural Compounds, Vol. 31, No. 6, 1995

ALKALOIDS OF THE CULTIVATED SPECIES *Aconitum paniculatum* AND *A. ferox*

I. A. Bessonova, Sh. A. Saidkhodzhaeva, and S. K. Usmanova

UDC 547.944/945

Continuing a study of the alkaloids of cultivated species of the genus *Aconitum* L. [1], we have investigated the epigeal part of *Aconitum paniculatum* Lam. and the hypogeal part (roots with rhizomes) of *Aconitum ferox* Wall ex Seringe cultivated in the Polar-Alpine Botanical Garden and sent to us by A. P. Gorelova.

Aconitum paniculatum (panicled monkshood) is a mountain-forest species grown from seeds collected in the wild and obtained from the botanical garden of Sarajevo (Yugoslavia). *Aconitum ferox* is a species of the Tibetan-Himalayan flora grown from seeds of a culture origin and sent from Cluj (Romania) [2].

There has been a previous report of the isolation from the cultivated plant *A. paniculatum* of new alkaloids: paniculamine — a denudatine type with a N-oxide group [3] — and panicudine, having the structure of 6-hydroxy-11-deoxy-13-dehydrohetisine [4]. Continuing the study of the alkaloids of this plant, we have investigated the epigeal part (stems and leaves) gathered during the budding period. The air-dry comminuted raw material (850 g), previously treated with sodium carbonate solution, was extracted with chloroform. The alkaloids were extracted from the concentrated chloroform solution with 5% sulfuric acid. The total alkaloids (1.57 g or 0.18% on the weight of the dry raw material) were obtained from the acid solution in the usual way. When the total alkaloids were treated with acetone, a precipitate (0.59 g) deposited, and this was crystallized from acetone–methanol (45:3). The crystals so obtained (0.22 g) were chromatographed on silica gel. Via the hydrochloride, ethereal eluates yielded lappaconitine (42 mg), mp 227°C (from acetone) [5]. Chloroform eluates yielded panicudine (15 mg) and paniculamine (9 mg).

The mother solution (0.37 g) was treated with chloroform. The chloroform-soluble part (0.31 g) was crystallized from ethyl acetate–hexane to give anthranoyllycoctonine (0.28 g), mp 161-162°C [6]. The chloroform-insoluble part (0.06 g) was chromatographed on alumina. The treatment of chloroform eluates with acetone yielded panicudine (40 mg). The alkaloids were identified by direct comparison with authentic specimens (TLC, mixed melting points, and IR, mass, and PMR spectra.).

This the first time that lappaconitine and anthranoyllycoctonine have been isolated from this plant.

It is interesting to note that neither in the roots nor in the epigeal part of a plant cultivated in the Polar-Alpine Botanical Garden did we detect paniculatine [7] and heterophylloidine (panicutine) [8], which are characteristic of a European variety of the species *A. paniculatum*.

The alkaloids of the cultivated plant *Aconitum ferox* have been studied for the first time. We obtained the total alkaloids from the epigeal organs of the plant (130 g) gathered in the period of incipient spring growth. The yield was 1.1% on the weight of the dry raw material. By chromatographing the total alkaloids, we isolated aconitine (20 mg), songorine (9 mg), and virescenine (110 mg), which were identified by comparison with authentic specimens obtained from *A. nasutum* [9], *A. anglicum* [1], and *Delphinium confusum* [10], respectively (TLC, mixed melting points, and mass, IR, and PMR spectra). The results obtained show that the alkaloid composition of the cultivated species *A. ferox* differs from that of the plant growing in the wild [11].

Institute of the Chemistry of Plant Substances, Academy of Sciences of the Republic of Uzbekistan, Tashkent, fax (3712) 89 14 75. Translated from Khimiya Prirodnykh Soedinenii, No. 6, pp. 914-915, November-December, 1995. Original article submitted April 17, 1995.

REFERENCES

1. Sh. A. Saidkhodzhaeva and I. A. Bessonova, Khim. Prir. Soedin., 761 (1995).
2. A. P. Gorelova, Introduction of Monkshoods into the Subarctic [in Russian], Apatity (1986).
3. I. M. Yusupova, I. A. Bessonova, and B. Tashkhodzhaev, Khim. Prir. Soedin., 277 (1995).
4. I. A. Bessonova, Sh. A. Saidkhodzhaeva, and M. F. Faskhutdinov, Khim. Prir. Soedin., 838 (1995) [in this issue].
5. S. Yu. Yunusov, Alkaloids [in Russian], Fan, Tashkent (1981), p. 92.
6. B. T. Salimov, M. S. Yunusov, and S. Yu. Yunusov, Khim. Prir. Soedin., 106 (1978).
7. A. Kats and E. Staehelin, Tetrahedron Lett., 1155 (1982).
8. A. Kats, J. Nat. Prod., **52**, 430 (1989).
9. A. N. Manukov, I. A. Bessonova, Z. M. Vaisov, and V. A. Chelombit'ko, Khim. Prir. Soedin., 770 (1993).
10. Z. M. Vaisov and M. S. Yunusov, Khim. Prir. Soedin., 801 (1986).
11. S. W. Pelletier, N. V. Mody, B. S. Joshi, and L. C. Schramm, in: Alkaloids: Chemical and Biological Perspectives, S. W. Pelletier (ed.), Wiley, New York, Vol. 2 (1984), Ch. 5, p. 216; J. B. Hanuman and A. Kats, J. Nat. Prod., **57**, 105 (1994).