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CONFOLIDINE, A NEW ALKALOID FROM THE AERIAL PART OF *Convolvulus subhirsutus*

N. A. Razzakov and S. F. Aripova

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A new tropane alkaloid was isolated from the aerial part of Convolvulus subhirsutus *(Convolvulaceae, morning-glory). The structure was established as (±)3 α-vanillyl-N-formylnortropane based on spectral data (IR, mass, PMR) and acid hydrolysis.*

Key words: *Convolvulus subhirsutus*, tropane base, confolidine, structure.

Plants of the *Convolvulus* genus (Convolvulaceae, morning-glory) are typical alkaloid-bearers and rich sources of physiologically active tropane alkaloids.

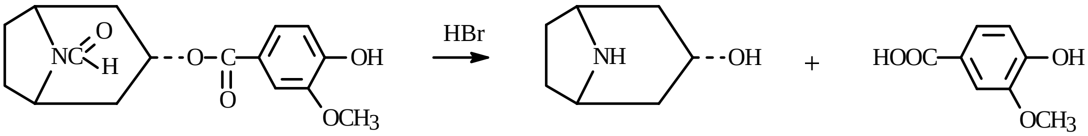
Alkaloids were first isolated from plants of this genus by Orekhov and Konovalova in 1932. They detected in *C. pseudocanthabrica* two alkaloids, convolvine and convolamine [1], which were isolated later by Yunusov et al. from *C. subhirsutus* [2].

During further research on the alkaloid composition of *C. subhirsutus*, 17 alkaloids were isolated. Of these, 8 were known in the literature, including one (phyllalbine) that was isolated for the first time from plants of the morning-glory family. Structures were established for 9 new alkaloids, among which two were dimeric [3].

In continuation of the study of alkaloids from *C. subhirsutus* Rgl. et Schmalh., we isolated a base with mp 178-179°C from the aerial part of this plant from a new location (Tashkent district, near Tepar) and called it confolidine (**1**).

The IR spectrum of **1** exhibits absorption bands for active H (3422 cm^{-1}), stretching and deformation vibrations of $-CH_2$ and $-CH_3$ groups (3000-2880, 1451, 1381 cm^{-1}), conjugated ester carbonyl (1706 cm^{-1}), amide carbonyl (1647 cm^{-1}), and 1,3,4-trisubstituted benzene (1591, 870, 818 cm^{-1}).

Acid hydrolysis of confolidine produced the aminoalcohol nortropine (**2**), which was identified as the aminoalcohol from hydrolysis of convolvine [2]. The acid part of the hydrolysate produced acid **3** with mp 205-207°C, which was identified as vanillic acid.



1 **2** **3**

The mass spectrum of **1** contains peaks for ions with *m*/*z* 305 (83%) $[M]^+$, 277 $[M - 29]^+$, 151 (100%), 138, and 110. The base peak is that with *m*/*z* 151, which is formed from the molecular ion by cleavage of the –C–O–CO bond and loss of an aminoalcohol. This peak and that with *m*/*z* 110 are diagnostic for tropane alkaloids in which the aminoalcohol part is esterfied by vanillic acid. This is analogous to the known alkaloid convolidine, which is also obtained from this plant. The peak with *m*/*z* 138 (92%) arises by loss from the molecular ion of 167 amu and corresponds to the aminoalcohol part of the alkaloid. The presence in the mass spectrum of peaks with *m*/*z* 108 (50%), 109 (67%), and 110 (77%), which are formed from ions with *m*/*z* 277 and 276 by loss of a fragment of 167 amu, is also diagnostic for alkaloids derived from nortropane. An absorption band

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S. Yu. Yunusov Institute of the Chemistry of Plant Substances, Academy of Sciences of the Republic of Uzbekistan, Tashkent, fax (99871) 120 64 75. Translated from Khimiya Prirodnykh Soedinenii, No. 1, pp. 46-47, January-February, 2004. Original article submitted November 17, 2003.

for amide carbonyl in the spectrum of **1** and a peak with *m/z* 276 that arises from the molecular ion by loss of 29 amu in the mass spectrum indicate that a formyl group is bonded to the N atom.

Substitution in the benzene ring was confirmed by the presence in the NMR spectrum of signals from *ortho-* and *meta*-aromatic protons at 7.45-7.67 ppm (2H, m) and at 6.85 (1H, d, J = 7 Hz).

The spectrum also exhibits signals for an aldehyde proton at 8.10 ppm (1H, s); methine protons, 5.30 ppm (1H, t, H-3β), 4.60 ppm (1H, m, H-1α), and 4.08 ppm (1H, m, H-5α); and methoxyl, 3.80 ppm.

Confolidine and acetic anhydride in pyridine form the O-acetyl derivative. This is consistent with the PMR spectrum, in which a 3H singlet for the methyl protons of the acetoxyl appears at 2.27 ppm. The aromatic proton (at 6.85 ppm) undergoes a shift to weak-field (d, 7.06, J = 7 Hz) in the O-acetyl derivative of **1**.

Comparison of the NMR and mass spectra of confolidine with mass spectra of convolidine shows that **1** differs from convolidine by the presence of the formyl group on the N atom and from confoline by the presence of the hydroxyl instead of one of the methoxyls on the aromatic ring.

Thus, the spectral data and chemical transformations of the alkaloid lead to the conclusion that confolidine has the structure (±)3α-vanillyl-N-formylnortropane (**1**).

EXPERIMENTAL

IR spectra were taken on a Model 2000 Fourier IR spectrometer (Perkin—Elmer) in KBr disks; mass spectra, on an MX 1310 spectrometer with direct sample insertion into the ion source. PMR spectra were recorded on a Tesla BS-667 A/100 MHz instrument ($CDCl_3$ solvent, 0 = HMDS, δ-scale).

Isolation of Confolidine (1). The air-dried aerial part (2285 g) of *C. subhirsutus* was moistened with NH_4OH solution (5%), placed in a percolator, and treated with $CHCl_3$ after 2 h. The layer was decanted daily (6 decantations). The combined $CHCl_3$ extracts were condensed to a volume of 1 L and treated with H_2SO_4 solution (5%, 100 mL × 5). The acidic solution was made basic with conc. NH_4OH solution. Alkaloids were extracted with $CHCl_3$. The $CHCl_3$ extracts were combined, dried, filtered, and condensed to afford total bases (8.1 g), which represented 0.36% of the air-dried plant mass.

Part of the total was chromatographed over an aluminum-oxide column with elution by benzene, $CHCl_3$, and $CHCl_3$:CH_3OH mixtures in various ratios. The individual benzene eluates afforded a base (35 mg) with mp 178-179°C, R_f 0.72 (TLC, silica gel, $CHCl_3$:CH_3OH 9:1, system 1).

Confolidine Acetate. Base **1** (10 mg) was wetted with several drops of pyridine and acetic anhydride (1 mL). The reaction mixture was left for 1 d at room temperature. Then, the excess of acetic anhydride and pyridine was removed in vacuum. The solid was purified over a column of Al_2O_3 by elution with acetone to afford the acetate of the base (6 mg) with mp 170-171°C, R_f 0.95 (system 1).

Hydrolysis of Confolidine (1). A solution of **1** (20 mg) in HBr (2 mL, 16%) was refluxed for 4 h and treated with ether. The ether extract was dried and condensed to afford an acid (6 mg) with mp 205-207°C that was identified as vanillic acid. The acidic solution was made basic with conc. NH_4OH solution. The alkaline solution was evaporated to dryness in a ceramic boat. The solid was dissolved in $CHCl_3$:CH_3OH (9:1) to afford an amorphous substance (3 mg) that was identical to an authentic sample of nortropine (TLC, silica gel, R_f 0.1, system 1).

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