

SYNTHESIS OF 2-DEOXYECDYSTERONE DERIVATIVES

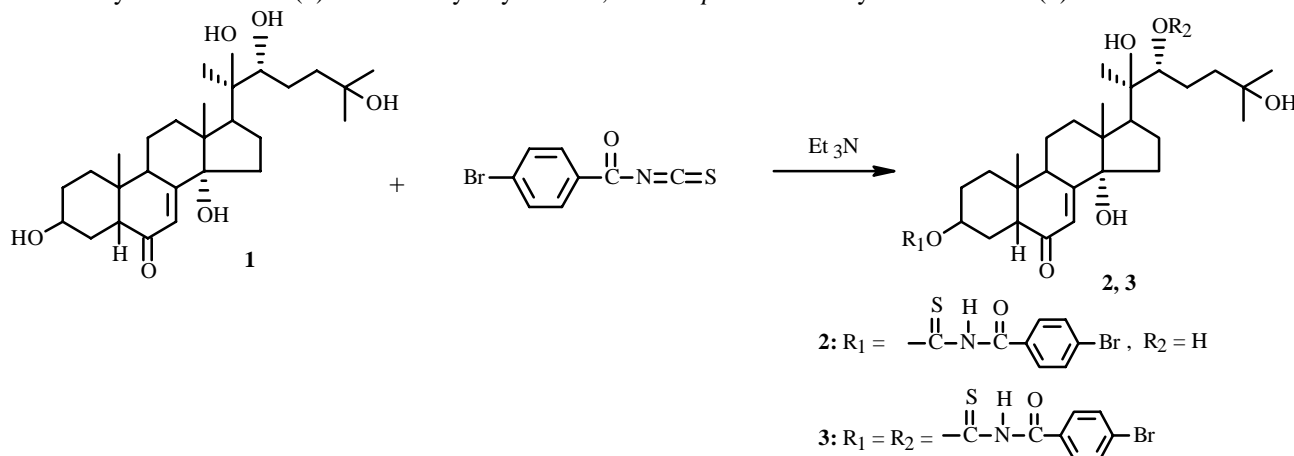
N. Sh. Ramazonov and I. D. Bobaev

UDC 547.926:591.147

Ecdysteroids are a group of natural compounds that have a strong tonic effect on mammals and exhibit various types of biological activity and possess tonic, adaptogenic, and hepatoprotectant properties [1].

The goal of the present investigation was to synthesize and study the properties of thiocarbamate derivatives of 2-deoxyeecdysterone (**1**) isolated from *Silene wallichiana* [2].

The reaction of **1** with *p*-bromobenzoylisothiocyanate produced the new derivatives 2-deoxyeecdysterone-3-*O*-*p*-bromobenzoylthiocarbamate (**2**) and 2-deoxyeecdysterone-3,22-di-*O*-*p*-bromobenzoylthiocarbamate (**3**).



The reaction was carried out in pyridine at 100–110°C for 4–5 h as before [3].

Methyl protons appeared as a singlet. Proton H-7 was a broad singlet; H-3 and H-9, broad multiplets. Aromatic protons appeared as well resolved doublets for an AB-system with SSCC = 8.8 Hz.

Table 1 shows that H-3 in **2** is shifted significantly to weak-field compared to H-3 in **1** whereas H-3 and H-22 are shifted in **3**. All remaining changes in the PMR spectra were insignificant. This indicates unambiguously that *p*-bromobenzoylisothiocyanate is in the 3-position in **2** and the 3- and 22-positions in **3**. Therefore, **2** is deoxyeecdysterone-3-*O*-*p*-bromobenzoylthiocarbamate; **3**, 2-deoxyeecdysterone-3,22-di-*O*-*p*-bromobenzoylthiocarbamate.

The synthesized compounds were brown crystals that were insoluble in water.

Column chromatography and TLC used CHCl₃:CH₃OH (15:1, **1**; 9:1, **2**; 4:1, **3**).

PMR spectra were recorded on a BS-567A spectrometer (100 MHz, Tesla, C₅D₅N, δ-scale, HMDS = 0.06 ppm); IR spectra, on a Perkin—Elmer System 2000 FT-IR Fourier-IR spectrometer in KBr disks.

Isolation of Phytoecdysteroids. Air-dried ground raw material (1.2 kg) of *Silene wallichiana* was exhaustively extracted with ethanol (5 L). The extract was condensed. The residue was diluted with water. The resulting precipitate was separated. The ethanol was evaporated. The aqueous residue was treated first with CHCl₃ and then with ethylacetate. The solvents were removed in vacuo.

The ethylacetate extract (10 g) was chromatographed over a column of Al₂O₃ (0.3 kg) with elution by system 2 to afford 2-deoxy-α-ecdysone (2 g, 0.165%), C₂₇H₄₄O₅, mp 234–235°C (aqueous ethanol), [α]_D²³ +92.2 ± 2° (c 1.0, CH₃OH) [4, 5]. Further elution of the column by the same solvent system produced **1** (1 g, 0.05%), C₂₇H₄₄O₆, mp 254–255°C (aqueous ethanol), [α]_D²³ +81.0 ± 2° (c 0.50, CH₃OH) [4, 5].

S. Yu. Yunusov Institute of the Chemistry of Plant Substances, Tashkent, fax (99871) 120 64 75. Translated from Khimiya Prirodnykh Soedinenii, No. 5, pp. 497–498, September–October, 2006. Original article submitted May 18, 2006.

TABLE 1. Chemical Shifts of Protons in 2-Deoxyecdysterone (**1**) and 2-Deoxyecdysterone-3-*O*- and 3,22-Di-*O*-*p*-bromobenzoylthiocarbamates (**2** and **3**)

Atom	Compound		
	1	2	3
H-3	4.07	5.45	5.40
H-7	6.14	6.19	6.21
H-9	3.48	3.46	3.50
H-22	3.81	3.82	5.34
CH ₃ -18	1.14	1.16	1.14
CH ₃ -19	1.02	1.04	1.04
CH ₃ -21	1.50	1.51	1.42
CH ₃ -26/27	1.33	1.35	1.28
Aromatic protons	-	7.67 (2H, d), 7.88 (2H, d)	7.64 (4H, d), 7.88 (4H, d)

Synthesis of 2-deoxyecdysterone-3-*O*- and 3,22-di-*O*-*p*-bromobenzoylthiocarbamates (2** and **3**)** was performed by the literature method [3]. The products were dissolved in ethylacetate and chromatographed over a column of Al₂O₃ to afford yellow and brown powders of **2** (71.2%), mp 229-230°C and **3** (15.1%), mp 244-246°C. TLC produced spots with *R_f* 0.83 (**2**) and 0.71 (**3**) (CHCl₃:C₂H₅OH, 5:0.5). **2** and **3** were soluble in DMF, trifluoroacetic acid, and pyridine.

IR spectrum (KBr, ν, cm⁻¹): (**2**) 3362 (N–H), 1673 (C=O), 1603 (arom. ring), 1268 (C–O–C), 1160 (C=S); (**3**) 3345 (N–H), 1681 (C=O), 1597 (arom. ring), 1237 (C–O–C), 1175 (C=S).

REFERENCES

1. Z. Saatov, D. A. Agzamkhodzhaev, and V. N. Syrov, *Khim. Prir. Soedin.*, 209 (1999).
2. Z. Saatov, M. B. Gorovits, and N. K. Abubakirov, *Khim. Prir. Soedin.*, 852 (1987); 546 (1988).
3. H. Sh. Ramazonov and V. N. Syrov, *Khim. Prir. Soedin.*, 449 (2006).
4. Y. K. Chong, M. N. Galbraith, and D. H. S. Horn, *J. Chem. Soc., Chem. Commun.*, 1217 (1970).
5. Z. Saatov, B. Z. Usmanov, and N. K. Abubakirov, *Khim. Prir. Soedin.*, 793 (1979).