

SHORT  
COMMUNICATIONSOximation of  $\alpha$ -Santonin

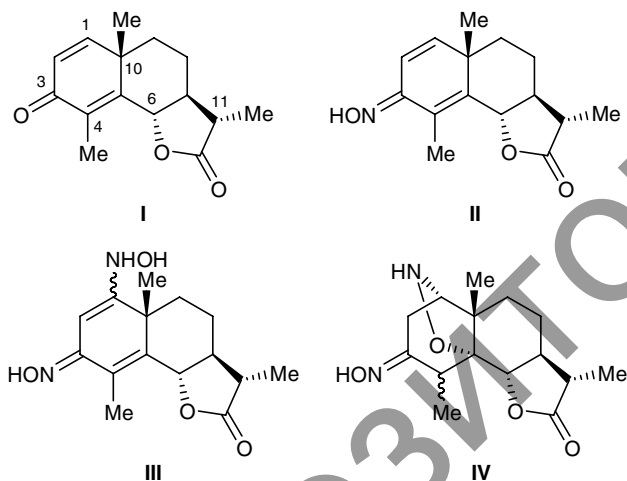
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Received March 15, 2006

DOI: 10.1134/S1070428007010204

The oximation of sesquiterpene  $\gamma$ -lactone  $\alpha$ -santonin (I) with hydroxylamine hydrochloride in methanol in the presence of sodium methoxide was studied in [1–3]. This reaction gave oxime II and two conjugate Michael addition products III and IV, the yield of the target oxime being only 25–28%.

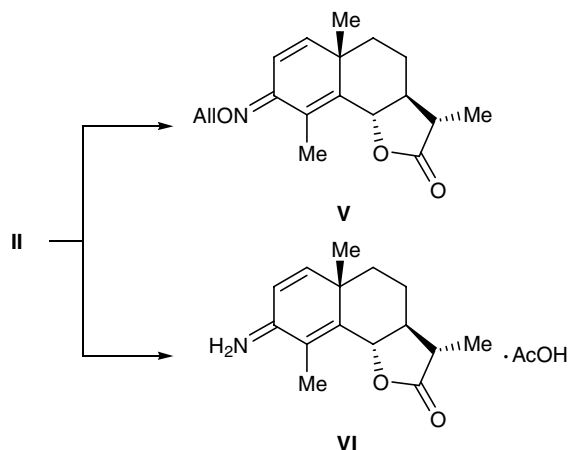


We have found that the oximation of ketone I in boiling pyridine leads to the formation of oxime II as the only product (yield 90–95%). With a view to obtain practically important derivatives of oxime II, it was brought into reaction with allyl bromide in DMF in the presence of potassium *tert*-butoxide; as a result, 50% of the corresponding oxime ether V was isolated. The reduction of II with zinc in acetic acid gave 70% of ammonium acetate VI.

**3-Hydroxyiminoeudesma-1(2),4(5)-dien-6,12-olide (II).** Hydroxylamine hydrochloride, 0.172 g (2.5 mmol), was added under stirring to a solution of 0.50 g (2 mmol) of compound I in 3 ml of pyridine, and the mixture was heated for 10 h under reflux. The solvent was distilled off under reduced pressure, the

residue was dissolved in ethyl acetate, the solution was washed with 3% hydrochloric acid, dried over  $\text{MgSO}_4$ , and evaporated under reduced pressure, and the residue was recrystallized from ethanol. Yield 0.480 g (92%), colorless crystals, mp 203–205°C. IR spectrum,  $\nu$ ,  $\text{cm}^{-1}$ : 3550 (NOH), 1780 (C=O), 1650 (C=N), 1620 (C=C).  $^1\text{H}$  NMR spectrum,  $\delta$ , ppm: 2.06 s (3H, 4- $\text{CH}_3$ ), 1.28 s (3H, 10- $\text{CH}_3$ ), 1.18 d (3H, 11- $\text{CH}_3$ ,  $J = 6.0$  Hz), 6.84 d (1H, 2-H,  $J = 10.0$  Hz), 5.96 d (1H, 1-H,  $J = 10.0$  Hz), 9.21 br.s (1H, NOH). Found, %: C 68.83; H 7.08; N 5.13.  $\text{C}_{15}\text{H}_{19}\text{NO}_3$ . Calculated, %: C 68.96; H 7.28; N 5.36.

**3-Allyloxyiminoeudesma-1(2),4(5)-dien-6,12-olide (V).** Allyl bromide, 0.1 ml (0.37 mmol), was added under stirring to a solution of 0.1 g (0.37 mmol) of oxime II and 0.042 g (0.37 mmol) of potassium *tert*-butoxide (prepared from 0.028 g of metallic potassium and 1 ml of *tert*-butyl alcohol) in 2 ml of DMF. The mixture was heated for 10 h at 80–90°C, the solvent was distilled off under reduced pressure, the residue was dissolved in ethyl acetate, and the solution was washed with water, dried over  $\text{MgSO}_4$ , and evaporated under reduced pressure. The product was isolated



from the residue by column chromatography on silica gel using hexane–ethyl acetate as eluent. Yield 0.057 g (50%), colorless crystals, mp 70–71°C. IR spectrum,  $\nu$ ,  $\text{cm}^{-1}$ : 1750 (C=O), 1660 (C=N), 1630 (C=C).  $^1\text{H}$  NMR spectrum,  $\delta$ , ppm: 2.36 s (3H, 4- $\text{CH}_3$ ), 1.07 s (3H, 10- $\text{CH}_3$ ), 1.12 d (3H, 11- $\text{CH}_3$ ), 6.81 d (1H, 2-H,  $J = 10.0$  Hz), 5.94 d (1H, 1-H,  $J = 10.0$  Hz), 4.84 d (1H, 6-H,  $J = 10.0$  Hz), 5.06 s (1H,  $\text{CH}_2\text{ON}$ ), 4.72 d (1H,  $\text{CH}_2\text{ON}$ ,  $J = 5.0$  Hz), 6.10 m (1H, =CH), 5.37 d (1H,  $\text{CH}_2=$ ,  $J = 15.0$  Hz), 5.28 d (1H,  $\text{CH}_2=$ ,  $J = 10.0$  Hz). Found, %: C 71.58; H 7.34; N 4.45.  $\text{C}_{18}\text{H}_{23}\text{NO}_3$ . Calculated, %: C 71.76; H 7.64; N 4.65.

**(3aS,5aS,9bS)-3,5a,9-Trimethyl-2-oxo-2,3,3a,4,5,5a,8,9b-octahydronaphtho[1,2-*b*]furan-8-ylammonium acetate (VI).** Zinc dust, 0.3 g (0.8 mmol), was added under stirring to a solution of 0.2 g (0.76 mmol) of oxime **II** in 2 ml of acetic acid. The mixture was stirred for 2 h at 18–20°C, poured into water, and extracted with chloroform. The extract was dried over  $\text{MgSO}_4$ , the solvent was distilled off under reduced pressure, and the residue was recrystallized from ethanol. Yield 0.163 g (70%), colorless crystals, mp 131–

133°C. IR spectrum,  $\nu$ ,  $\text{cm}^{-1}$ : 3250 ( $^+\text{NH}_3$ ), 1780 (C=O), 1650 (C=S), 1600 ( $\text{CO}_2^-$ ).  $^1\text{H}$  NMR spectrum,  $\delta$ , ppm: 2.14 s (3H, 9- $\text{CH}_3$ ), 1.04 s (3H, 5a- $\text{CH}_3$ ), 1.10 d (3H, 3- $\text{CH}_3$ ,  $J = 6.0$  Hz), 5.78 d.d (1H, 7-H,  $J = 10.0$ , 7.5 Hz), 5.40 d (1H, 6-H,  $J = 10.0$  Hz), 3.58 br.s (1H, 8-H), 4.84 d (1H, 9b-H,  $J = 10.0$  Hz), 5.67 br.s (3H,  $\text{CH}_3\text{CO}$ ). Found, %: C 66.27; H 7.94; N 4.26.  $\text{C}_{15}\text{H}_{21}\text{NO}_2 \cdot \text{CH}_3\text{CO}_2\text{H}$ . Calculated, %: C 66.45; H 8.14; N 4.56.

The IR spectra were measured in KBr on an Alatar-360 spectrometer. The  $^1\text{H}$  NMR spectra were recorded from solutions in  $\text{CDCl}_3$  on a Bruker WP-200 SY instrument (200.13 MHz) using tetramethylsilane as internal reference.

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