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1,3-Dipolar cycloadditions of nonstabilised azomethine ylides at 3-substituted coumarins: synthesis of 1-benzopyrano[3,4-*c*]pyrrolidines

Vladimir S. Moshkin,* Vyacheslav Ya. Sosnovskikh, Pavel A. Slepukhin and Gerd-Volker Röschenthaler

*Ethyl (3a*S**,9b*R**)-2-methyl-4-oxo-1,2,3,3a,4,9b-hexahydrochromeno[3,4-*c*]pyrrole-3a-carboxylate* **8c** *adduct with oxalic acid*. Yield 84%, colourless powder, mp 164–166 °C. ^{1}H NMR (400 MHz, DMSO-d_6 + CCl_4 + CD_3CO_2D) δ: 1.10 (t, 3 H, Me, *J* 7.1 Hz), 2.40 (s, 3 H, MeN), 2.68 (dd, 1H, H-1′, *J* 9.1 and 8.4 Hz), 3.22 (t, 1H, H-1″, *J* 8.8 Hz), 3.41 (AB-system, 2 H, 3-CH_2, *J* 10.1 Hz), 3.90 (t, 1H, H-9b, *J* 8.4 Hz), 4.10 (q, 2 H, OCH_2, *J* 7.1 Hz,), 7.06 (d, 1H, H-6, *J* 8.2 Hz), 7.14 (td, 1H, H-8, *J* 7.5 and 1.1 Hz), 7.27–7.33 (m, 2 H, H-7, H-9). ^{13}C NMR (101 MHz, DMSO-d_6) δ: 13.6 (Me), 41.0 (C-9b), 43.6 (MeN), 57.3 (C-3a), 61.3 (C-1), 61.7 (C-3), 62.6 (OCH_2), 116.6 (C-6), 119.4 (C-9a), 125.1 (C-8), 129.2 (C-7), 129.3 (C-9), 149.5 (C-5a), 162.8 (CO_2H), 164.9 (C-4), 167.7 (CO_2Et). IR (ATR, ν/cm^{-1}): 1766, 1744, 1659, 1252, 1165, 1144, 1099, 758, 691. Found (%): C, 55.94; H, 5.21; N, 3.76. Calc. for $C_{15}H_{17}NO_4 \cdot (CO_2H)_2$ (%): C, 55.89; H, 5.24; N, 3.83.

*Ethyl (6a*S**,6b*R**,11*S**,11a*R**)-6-oxo-11-phenyl-6,6a,6b,7,8,9,11,11a-octahydrochromeno[3,4-a]pyrrolizine-6a-carboxylate* **10** *adduct with HCl*. ^{1}H NMR (400 MHz, DMSO-d_6) δ: 1.16 (t, 3 H, *J* 7.1 Hz), 1.94 (br. s, 1H), 2.19 (br. s, 2 H), 2.42 (br. s, 1H), 3.60 (br. s, 1H), 3.98 (br. s, 1H), 4.15 (ABX_3-system, 2 H, OCH_2, *J* 7.1 and 10.8 Hz), 4.94 (br. s, 1H), 5.42 (br. s, 2 H), 6.67 (dd, 1H, H-1, *J* 7.6 and 1.6 Hz), 6.91 (d, 2 H, Ph, *J* 7.6 Hz), 7.05 (t, 2 H, Ph, *J* 7.5 Hz), 7.14 (t, 1H, Ph, *J* 7.4 Hz), 7.17–7.24 (m, 2 H, H-2, H-4), 7.61 (d, 1H, H-4, *J* 7.0 Hz). IR (ATR, ν/cm^{-1}): 2323, 1766, 1731, 1239, 1154, 756, 734, 699. Found (%): C, 66.68; H, 6.00; N, 3.37. Calc. for $C_{23}H_{23}NO_4 \cdot HCl$ (%): C, 66.74; H, 5.84; N, 3.38.