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The reaction of deoxyvasicinone **1** with benzoic anhydride, bis(dimethylamino)methane and amyl nitrite are reported. Metallation of **1** is also described.

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In earlier publications [1,2] we have described several new reactions of deoxyvasicinone (**1**) with various electrophiles. It is the purpose of this note to report some new condensation reactions of **1** with electrophiles.

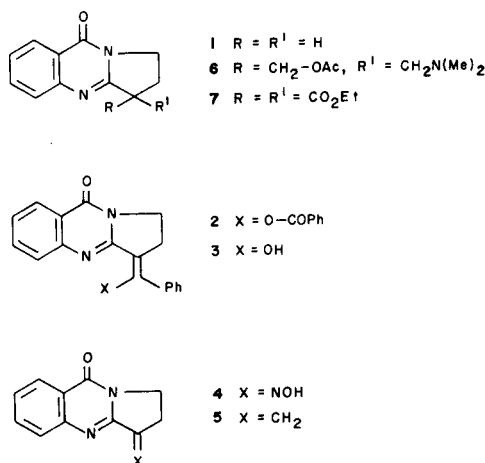
The formation of both *E* and *Z* enol acetates from the reaction between **1** and acetic anhydride [2] prompted us to investigate the reaction of **1** with benzoic anhydride. When **1** was treated with an excess of benzoic anhydride no significant reaction below 200° was observed. However condensation was rapid at 230° and two compounds of almost identical R_f value were obtained from the reaction mixture. The major product was shown by spectroscopic methods to be the enol benzoate **2** and the *Z* stereochemistry is assumed for steric reasons. The minor product was shown by elemental analysis and mass spectrometry to have the formula C₁₈H₁₄N₂O₂ however it was not possible to unambiguously deduce its structure from spectroscopic data alone. The structure of this minor product was elucidated by X-ray crystallographic techniques and shown to be the *Z*- α -hydroxybenzylidene derivative **3** [3]. A weak hydrogen bond between the hydroxyl hydrogen atom and the sp² nitrogen atom was also indicated in agreement with our previous postulate [2].

Taylor [4] has reported that the [1,2-*a*] analogue of **1** undergoes condensation with amyl nitrite to yield an oxime and with bis(dimethylamino)methane to yield an exocyclic methylene derivative. The reaction of **1** with these two reagents was investigated.

When **1** was treated with amyl nitrite under basic conditions the oxime **4** resulted. It was not possible to record the pmr spectrum of **4** because of the highly insoluble nature of the compound. When a solution of **1** in acetic anhydride was treated with bis(dimethylamino)methane the expected 3-exomethylene derivative **5** was isolated as the major product by column chromatography. A second more polar product was recovered from the column and shown by microanalysis and spectroscopy to have the structure **6**. The formation of **6** can be rationalised by the condensation of **1** with 2 moles of the amine followed by reaction with acetic anhydride.

Previously we noted [1] that deprotonation of **1** in a variety of solvent/base mixtures failed. However we have found that **1** can be lithiated smoothly at -20° using lithi-

um diisopropylamide. Reaction of the intermediate organometallic species with an excess of ethyl chloroformate gave the diester **7**. Treatment of lithiated **1** with other acyl halides *eg.* acetyl chloride failed to yield any isolable products.



EXPERIMENTAL

For general methods see references [1] and [2].

Reaction of **1** with Benzoic Anhydride.

Liquified benzoic anhydride (13 ml) and **1** (5 g) were heated at 230° for 2 hours. The cooled mixture was diluted with ethanol to yield a brown solid. The crude solid was dissolved in warm chloroform, decolourised with charcoal and concentrated *in vacuo* to yield colourless needles of pure **2** (1.39 g, 13%), mp 186-187°; ir (potassium bromide): 3050, 1738, 1682, 1250 cm⁻¹; pmr (deuteriochloroform): δ 8.08 (3H, complex), 7.96-7.04 (10H, complex), 6.58 (1H, dd), 41.2 (2H, t), 3.22 (2H, t); ms: m/e 394 (23%) M⁺.

Anal. Calcd. for C₂₅H₁₈N₂O₅: C, 76.1; H, 4.6; N, 7.1. Found: C, 75.8; H, 4.6; N, 7.1.

Concentration of the mother liquors from the crystallisation gave a solid which was repeatedly recrystallised from dimethylformamide to yield **3** (400 mg, 4%), as pale yellow prisms, mp 164-165°; ir (potassium bromide): 3600-3000 (broad and weak), 1675, 1630 cm⁻¹; pmr: due to the insolubility of this compound a satisfactory spectrum was not obtained; ms: m/e 290 (14%) M⁺.

Anal. Calcd. for C₁₈H₁₄N₂O₂: C, 74.15; H, 4.8; N, 9.7. Found: C, 74.1; H, 4.8; N, 9.9.

Reaction of **1** with Amyl Nitrite.

A solution of **1** (4.23 g) in ethanolic sodium ethoxide (prepared from sodium, 2.3 g) and absolute ethanol (150 ml) was stirred at room temperature and amyl nitrite (5.6 g) added. The mixture was warmed to 60° and stirred at this temperature for 40 minutes. The resulting orange solution was stirred at room temperature overnight and the solvent removed *in vacuo*. A pale green solid, which became pink on addition of aqueous acetic acid, was obtained. The mixture was treated with saturated aqueous sodium bicarbonate solution and the mixture then extracted with chloroform. From the dried chloroform extracts unreacted **1** (2.5 g) was recovered whilst filtration of the aqueous phase gave a pink solid. Recrystallisation of the solid from a large volume of ethanol gave the pure oxime **4** as lustrous needles (1.50 g, 71%, based on recovered starting material), mp > 300° dec; ir (potassium bromide): 3160, 1680, 1320 cm⁻¹; pmr: due to the insolubility of this compound pmr measurements were impossible *cf.* reference [4]; ms: m/e 215 (100%) M⁺.

Anal. Calcd. for C₁₁H₉N₃O₂: C, 61.4; H, 4.2; N, 19.5. Found: C, 61.7; H, 4.2; N, 19.4.

Reaction of **1** with bis(Dimethylamino)methane.

Acetic anhydride (60 ml) was added slowly to an ice-cold suspension of **1** (3.3 g) in freshly distilled bis(dimethylamino)methane (60 ml). The mixture was stirred at room temperature for one hour and the excess reagents removed *in vacuo*. The residue was treated with ice water, neutralised with solid sodium bicarbonate and then extracted with dichloromethane. The dried, concentrated organic extracts were chromatographed on a column of silica gel (100 g). Elution with ethyl acetate:light petroleum (1:1) gave crude **5** as syrup. Further purification by preparative tlc (5 plates, 20 × 20 cm, 2 mm thickness of Kieselgel 60F₂₅₄, Merck) using ether:light petroleum (1:3) gave pure **5** as colourless crystalline solid (660 mg, 19%), mp 140-144°; ir (potassium bromide): 3100, 1670, 1598 cm⁻¹; pmr (deuteriochloroform): δ 8.18 (1H, d, J = 7 Hz), 7.8-7.2 (3H, complex), 6.36 (1H, t), 5.48 (1H, t), 4.14 (2H, t), 3.24 (2H, complex); ms: m/e 198 (89%) M⁺.

Anal. Calcd. for C₁₂H₁₀N₂O: C, 72.8; H, 5.1; N, 14.1. Found: C, 73.2;

H, 5.5; N, 13.9.

Further elution of the column with ethyl acetate:light petroleum (4:1) gave pure **6** as a syrup which crystallised rapidly from toluene as colourless prisms, (840 mg, 17%), mp 110.5-111°; ir (potassium bromide): 2940, 2770, 1740, 1675, 1470, 1238 cm⁻¹; pmr (deuteriochloroform): δ 8.20 (1H, d, J = 7 Hz), 7.7-7.2 (3H, complex), 4.3 (2H, s), 4.14 (2H, t), 2.6-2.2 (10H, complex), 1.96 (3H, s); ms: m/e 314 (3%) (M - 1)⁺.

Anal. Calcd. for C₁₇H₂₁N₃O₃: C, 64.8; H, 6.7; N, 13.3. Found: C, 64.8; H, 6.7; N, 13.3.

3,3-Dicarbethoxy-1,2,3,9-tetrahydropyrrolo[2,1-b]quinazolin-9H-9-one.

A solution of **1** (0.93 g) in dry tetrahydrofuran (20 ml) was added dropwise over 30 minutes to a solution of lithium diisopropylamide (prepared by the addition of *n*-butyllithium solution (6.75 ml, 1.6 M in hexane), to anhydrous diisopropylamine (1.02 g) in dry tetrahydrofuran (10 ml) at -20° in a dry nitrogen atmosphere). The mixture (a deep burgundy red) was stirred at -20° for 1 hour and a solution of ethyl chloroformate (4.4 g) in dry tetrahydrofuran (10 ml) was added slowly. The burgundy colour was rapidly discharged and the mixture became pale-yellow and finally bottle green. The mixture was stirred at room temperature for 1 hour, solvents removed *in vacuo* and the residue partitioned between water (100 ml) and dichloromethane (3 × 100 ml). The combined, dried organic extracts were concentrated *in vacuo* to yield a colourless syrup (0.56 g). The syrup was chromatographed on silica-gel (20 g). Elution with ethyl acetate:light petroleum (1:4) gave **7** as colourless plates, (460 mg, 28%), identical in all respects (mp, mmp, tlc, ir) to an authentic sample [1].

REFERENCES AND NOTES

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