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REACTION OF 1-PHENYL-4-HYDRAZINO-4,5-DIHYDRO-6H-FURO-[2,3-d][1]BENZAZEPINE-5-CARBOXYLIC ACID HYDRAZIDE WITH AROMATIC ALDEHYDES[1)]

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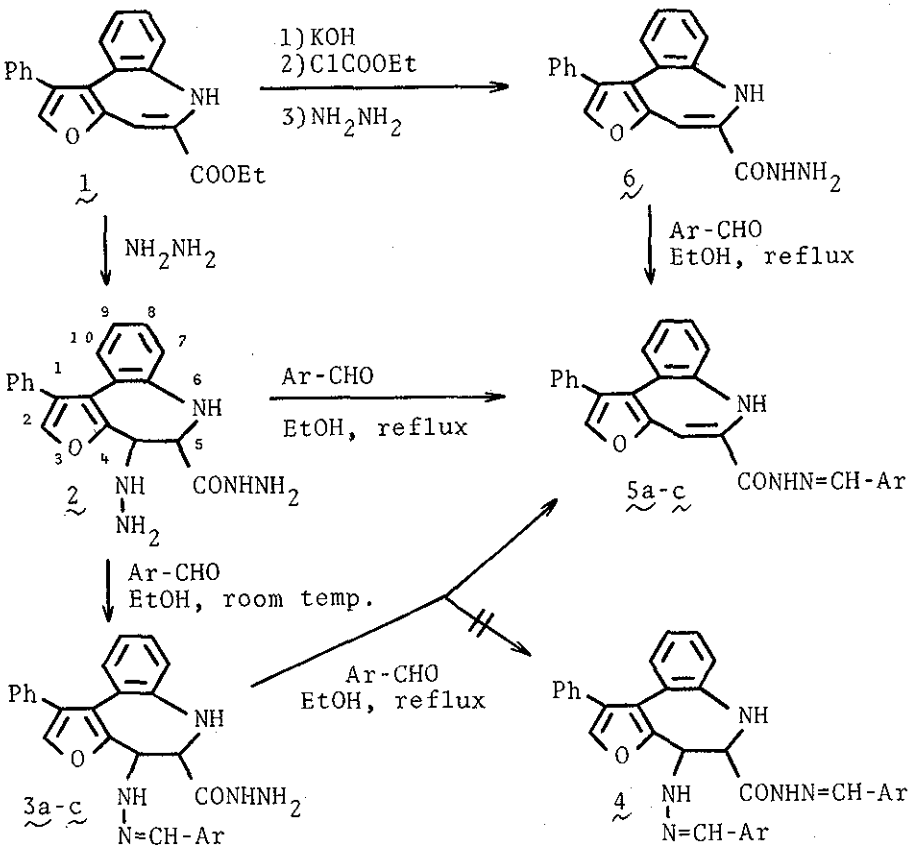
1-Phenyl-4-hydrazino-4,5-dihydro-6H-furo[2,3-d][1]-benzazepine-5-carboxylic acid hydrazide (2) reacts with aromatic aldehydes in ethanol to give saturated monoarylylidene compounds (3a-c) and unsaturated monoarylylidene compounds (5a-c), respectively.

The reaction of α,β-unsaturated esters with hydrazine hydrate has been reported by Godtfredsen et al.[2)]. We applied this reaction to the synthesis of 1-phenyl-4-hydrazino-4,5-dihydro-6H-furo-[2,3-d][1]benzazepine-5-carboxylic acid hydrazide (2) from ethyl 1-phenyl-6H-furo[2,3-d][1]benzazepine-5-carboxylate (1)[3)] having a α,β-unsaturated α-amino ester moiety in the molecule. Next 2 was allowed to condense with aromatic aldehydes to afford saturated monoarylylidene compounds (3a-c) and unsaturated monoarylylidene compounds (5a-c). However in this case diarylylidene compounds (4) were not obtained.

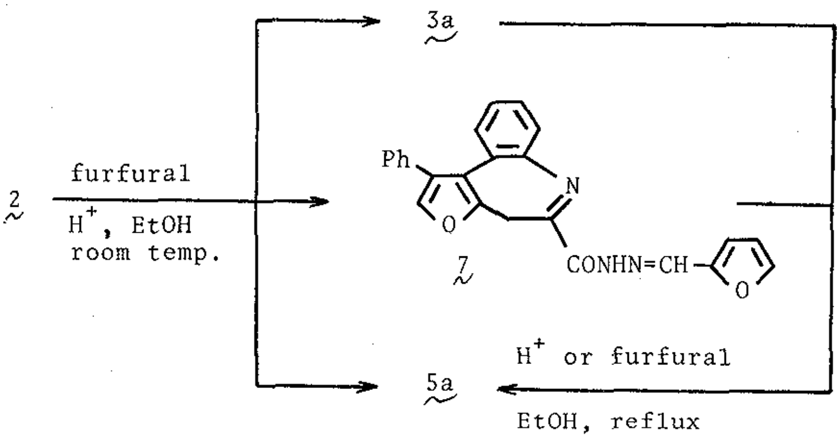
2 was prepared in 60-70% yield by heating the mixture of 1 and hydrazine hydrate at 90-100° for 10 min or refluxing of ethanolic solution of 1 and hydrazine hydrate in the presence of sodium hydroxide. In the nmr spectrum of 2, doublets (J=16 Hz) observed at δ 3.97 and 3.76 were assigned to C_4-H and C_5-H of trans configu-

ration. **2** reacted with excess of aromatic aldehydes in ethanol at room temperature for 1-1.5 hr to give the corresponding monoarylylidene compounds (3a-c) in good yields. In the case of the reaction of **2** with excess of aromatic aldehydes in ethanol under reflux for 10 hr, unsaturated monoarylylidene compounds (5a-c) were obtained quantitatively. However, diarylylidene compounds (4) were not formed. Similarly, **5a-c** were synthesized from **3a-c**. **5a-c** were completely identical with the compounds prepared from **6** (*via* 3 steps from **1**) by mixed melting point tests and comparison of their ir spectra.



Ar; a=2-furyl, b=phenyl, c=*p*-chlorophenyl

Furthermore, 2 reacts with four equivalents of furfural in ethanol containing a small amount of acetic acid at room temperature for 7 hr to give a new product 7 (44%), along with 3a (12%) and 5a (22%), respectively. The formation of 7 seems to be due to the 1,2-hydride shift to carbonium ion resulting from the elimination of 4-hydrazino group and consequent transfer of nitrogen lone pair. 7 was also isomerized to 5a by heating in ethanol containing acetic acid or furfural. The structures of these compounds synthesized here were supported by their elemental analyses and spectral data[4].



References

1) This constitutes Part XLIII of a series entitled "Studies on Heterocyclic Compounds" Part XLII: A. Tanaka, T. Usui and S. Yoshina, J. Pharm. Soc. Japan, submitted.

2) W. O. Godtfredsen and S. Vangedal, Acta Chem. Scan., 1955, 9, 1498.

3) K. Yakushijin, S. Yoshina and A. Tanaka, Heterocycles, 1977, 6, 721.

4) Elemental analyses (EA) and spectral data of **2**, **3a**, **5a**, **5b**, **6** and **7**.

2 [mp 158-159°, colorless scales (EtOH)]

EA Found C; 65.41, H; 5.42, N; 20.23%.

Calcd. for $C_{19}H_{19}N_5O_2$ C; 65.31, H; 5.48, N; 20.05%.

IR (KBr, cm^{-1}) 3495, 3455, 3390, 3340, 3240, 1668, 1634.

NMR (δ in $CDCl_3$) 7.95 (1H, bs, NH), 7.67 (1H, s, C_2-H), 7.24 (5H, s, phenyl-H), 7.22-6.71 (4H, m, C_{7-10}-H), 5.96 (2H, bs, NH x 2), 3.77 (4H, b, NH_2 x 2), 3.97 and 3.76 (2H, d x 2, J=16 Hz, $C_{4,5}$-H).

MS (m/e) 349 (M^+).

3a [mp 207-208°, colorless needles ($EtOH-CHCl_3$)]

EA Found C; 67.51, H; 4.89, N; 16.31%.

Calcd. for $C_{24}H_{21}N_5O_3$ C; 67.43, H; 4.95, N; 16.39%.

IR (KBr, cm^{-1}) 3463, 3360, 3238, 3255, 3195, 1668, 1615.

NMR (δ in DMSO-d_6) 11.21 (1H, bs, NH), 8.35 (1H, s, N=CH), 7.94 (1H, s, C_2-H), 7.82, 6.85 and 6.62 (3H, d, d and m, furyl-H), 7.43 (2H, bs, NH x 2), 7.23 (5H, s, phenyl-H), 7.22-6.51(4H, m, C_{7-10}-H), 4.92 (2H, bs, NH_2), 3.81 and 3.62 (2H, d x 2, J=16 Hz, $C_{4,5}$-H).

MS (m/e) 427 (M^+).

5a [mp 151-152°, reddish needles ($EtOH-CHCl_3$)]

EA Found C; 70.69, H; 5.20, N; 9.32%.

Calcd. for $C_{24}H_{17}N_3O_3$EtOH C; 70.73, H; 5.25, N; 9.52%.

IR (KBr, cm^{-1}) 3315, 3190, 1625.

NMR (δ in DMSO-d_6) 11.76 (1H, bs, NH), 8.35 (1H, s, N=CH), 7.91 (2H, s, ring-H), 7.41 (5H, s, phenyl-H), 7.18-6.45 (8H, m, ring-H and NH), 4.37 (1H, t, OH), 3.52 and 1.11 (5H, C_2H_5).

MS (m/e) 395 (M^+).

5b [mp 224-226°, reddish needles ($EtOH-CHCl_3$)]

EA Found C; 69.31, H; 4.86, N; 8.47%.

Calcd. for $C_{26}H_{18}N_3O_2Cl \cdot EtOH$ C; 69.20, H; 4.98, N; 8.65%.

IR (KBr, cm^{-1}) 3310, 3185, 1620.

NMR (δ in DMSO-d_6) 11.67 (1H, b, NH), 8.31 (1H, s, N=CH), 7.77 (1H, s, C_2-H), 7.66 and 7.43 (4H, d x 2, *p*-chlorophenyl-H), 7.28 (5H, s, phenyl-H), 7.07-6.35 (6H, m, C_4-H, NH and C_{7-10}-H).

MS (m/e) 439 (M^+).

6 [mp 212-213°, orange needles (EtOH)]

EA Found C; 71.99, H; 4.67, N; 13.04%.

Calcd. for $C_{19}H_{15}N_3O_2$ C; 71.91, H; 4.76, N; 13.24%.

IR (KBr, cm^{-1}) 3295, 3235, 3190, 3130, 1653, 1630.

NMR (δ in DMSO-d_6) 9.73 (1H, b, NH), 7.81 (1H, s, C_2-H), 7.36 (5H, s, phenyl-H), 7.12-6.35 (6H, m, C_4-H, NH and C_{7-10}-H), 4.48 (2H, b, NH_2).

MS (m/e) 317 (M^+).

7 [mp 162-163°, pale yellow prisms (EtOH)]

EA Found C; 73.00, H; 4.21, N; 10.37%.

Calcd. for $C_{24}H_{17}N_3O_3$ C; 72.90, H; 4.33, N; 10.63%.

IR (KBr, cm^{-1}) 3260, 1662.

NMR (δ in $CDCl_3$) 10.52 (1H, bs, NH), 8.38 (1H, s, N=CH), 7.52, 6.84 and 6.47 (3H, d, d and m, furyl-H), 7.45 (1H, s, C_2-H), 7.32 (5H, s, phenyl-H), 7.17 (4H, m, C_{7-10}-H), 3.84 (2H, s, C_4-H).

MS (m/e) 395 (M^+).

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