1,4-ADDITION REACTIONS OF 4-(m-NITROBENZYLIDENE)-3,5-DIMETHYLISOPYRAZOLE

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Reactions of 4-(m-nitrobenzylidene)-3,5-di-methylisopyrazole(II) with hydrochloric acid in methanol, acetic anhydride, acetic acid, benzoyl chloride and dimethyl sulfate gave the 1,4-addition products(III, IV, V, VIII, and IX) in fairly good yields.

We reported previously¹ the reactions of 2-substituted benzyldeneacetylacetones with hydrazine dihydrochloride in methanol or acetonitrile gave 4-(a-methoxy-2-substituted benzyl)-3,5-dimethylpyrazoles and 4-(β-substituted benzylidene)-3,5-dimethylisopyrazoles, which was proposed to exist in a betain form based on its nmr data (the C₃- and C₅-methyl group showed the signal as singlet). Though only few papers² have been published on isopyrazole, there is no report³ on the isopyrazole derivatives possessing an exo–double bond at C₄. We wish to report here some reactivities of 4-(m-nitrobenzylidene)-3,5-dimethylisopyrazole(II) [mp 205-206⁰; both C₃- and C₅-methyl group appeared as singlet at δ(DMSO-d₆) 2.05], prepared from m-nitrobenzylideneacetylacetone(I).

Reaction of II with catalytic amount of hydrochloric acid in
methanol followed by neutralization gave a 90% yield of 4-(α-methoxy-μ-nitrobenzyl)-3,5-dimethylpyrazole (III) [M+ 261; δ(CDCl3) 2.20 (6H, s), 3.38 (3H, s), 5.38 (1H, s), 9.58 (1H, bs)], which is also obtained by condensation of I with hydrazine dihydrochloride in methanol.

Treatment of II with acetic anhydride or acetic acid at 70° gave a 92% yield of 1-acetyl-4-(α-acetoxy-μ-nitrobenzyl)-3,5-dimethylpyrazole (IV) [M+ 331; νCHCl3 1732 and 1730 cm⁻¹; δ(CDCl3) 2.10, 2.21, 2.60 and 2.63 (each 3H, each s)] or 4-(α-acetoxy-μ-nitrobenzyl)-3,5-dimethylpyrazole (V) as oil, whose structural assignment was based on its ir(NH band at 3460 cm⁻¹) and nmr data. The isopyrazole II was treated with bromine in acetic acid at room temperature to give a mixture of μ-nitrobenzaldehyde (VI) and 4-bromo-3,5-dimethylpyrazole (VII), presumably via V.

Reaction of II with benzoyl chloride in pyridine followed by treatment with ice water gave a 90% yield of 1-benzoyl-4-(α-hydroxy-μ-nitrobenzyl)-3,5-dimethylpyrazole (VIII) [νKBr max 3400 and 1720 cm⁻¹; δ(CDCl3) 2.01 and 2.63 (each 3H, each s), 3.00 and 5.91 (each 1H, each bs)].

It is interesting to note that treatment of II in absolute toluene with dimethyl sulfate under reflux in less than 0.5 h gave a 25% yield of 4-(α-methoxy-μ-nitrobenzyl)-1,3,5-trimethylpyrazole (IX) [M+ 275; δ(CDCl3) 2.11, 2.15, 3.38 and 3.75 (each 3H, each s), 5.35 (1H, s)].

The above results point out that only the 1,4-addition products were isolated, not the 1,2-addition product.
HETEROCYCLES, Vol 3, No 7, 1975

III \[\xrightarrow{\text{CH}_3\text{OH/HCl}}\] IV \[\xrightarrow{\text{Ac}_2\text{O}}\] V

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\begin{align*}
\text{NO}_2 & \quad \text{CH}_3 \quad \text{CH} \\
\text{NO}_2 & \quad \text{CH}_3 \\
\text{NO}_2 & \quad \text{CH}_3
\end{align*}
\]

(II) \[\xrightarrow{\text{C}_6\text{H}_5\text{COCl}}\] (II') \[\xrightarrow{\text{(CH}_3\text{)}_2\text{SO}_4}\] \[\xrightarrow{\text{Br}_2/\text{AcOH}}\]

(VIII) \[\xrightarrow{\text{NO}_2 \quad \text{CH} \quad \text{CH}_3 \quad \text{N}
\text{COC}_6\text{H}_5}\]

(IX) \[\xrightarrow{\text{NO}_2 \quad \text{CH}_3 \quad \text{N}\text{CH}_3}\]

(VI) \[\xrightarrow{\text{NO}_2 \quad \text{CH}_3}\]

(VII)
REFERENCES


Received, 15th May, 1975