HETEROCYCLES, Vol. 6, No. 7, 1977

SYNTHESIS OF 1H-PYRANO[2,3-c]PYRAZOLE-4-ONES

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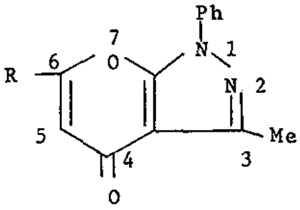
Various derivatives of the ring system- 1H-pyrano[2,3-c]pyrazole-4-one have been obtained by the condensation of 4-acetyl-3-methyl-1-phenylpyrazol-5-one with appropriate esters followed by cyclization with acids. Further reactions gave other derivatives of 1H-pyrano[2,3-c]pyrazole-4-one.

A number of 1H-pyrano[2,3-c]pyrazole-6-ones are known for quite sometime[1] but in contrast its other isomeric system the 1H-pyrano[2,3-c]pyrazole-4-one has not been described. We have now synthesized a number of 1H-pyrano[2,3-c]pyrazole-4-ones in good yields.

The condensation of 4-acetyl-3-methyl-1-phenylpyrazol-5-one (I)[2] and diethyl oxalate in the presence of sodium ethoxide in ethanol gave a pyruvate which on cyclization with hydrochloric acid gave ethyl 3-methyl-4-oxo-1-phenyl-1H-pyrano[2,3-c]pyrazole-6-carboxyl-



II R= CO_2Et
III R= CO_2H
IV R= Me
V R= Ph
VI R= $CONH_2$
VII R= CN
VIII R= tetrazol-5'-yl

ate (II) in 86% yield. II: mp 184-185°; ir ν_{max}^{KBr} : 1738 (C=O,ester); 1655 cm^{-1} (C=O, pyrone). nmr ($CDCl_3$) δ: 7.00 (s, 1H, C_5H); 2.60 (s, 3H, C_3Me); 7.62 (m, 5H, N_1Ph); 1.40 (t, 3H, J=7.5 Hz, ester Me) and 4.40 (q, 2H, J=7.5 Hz, ester CH_2). Hydrolysis of II with a mixture of hydrochloric acid and glacial acetic acid gave the acid III in 74% yield. III: mp 281-282°(decomp.); ir ν_{max}^{KBr} : 3000-2500 (br., OH); 1720 (C=O, acid); and 1630 cm^{-1} (C=O, pyrone); nmr ($CDCl_3/DMSO-d_6$) δ: 6.82 (s, 1H, C_5H); 2.50 (s, 3H, C_3Me); and 7.65 (m, 5H, N_1Ph).

When I was condensed with ethyl acetate in the presence of sodium hydride in dioxane and the diketone thus formed was cyclized with hydrochloric acid, 3,6-dimethyl-1-phenyl-1H-pyrano[2,3-c]pyrazole-4-one (IV) was obtained in overall 31% yield. IV:mp 152-153°; ir ν_{max}^{KBr} : 1660 cm^{-1}(C=O, pyrone); nmr ($CDCl_3$) δ : 5.98 (s, 1H,C_5H); 2.38 (s, 3H, C_6Me); 2.60 (s, 3H, C_3Me); and 7.47 (m, 5H, N_1Ph). A similar condensation of I with ethyl benzoate gave V in 71% yield.

V: mp 210-211°; ir ν_{max}^{KBr} : 1655 cm^{-1} (C=O, pyrone); nmr ($CDCl_3$) δ: 6.64 (s, 1H, C_5H); 2.63 (s, 3H, C_3Me); and 7.62 (m, 10H, N_1Ph and C_6Ph).

Treatment of an ethanolic solution of II with ammonia gave the amide VI in 79% yield. VI: mp 272-273°; ir ν_{max}^{KBr} : 3400 (NH); 1695 (C=O, amide); and 1660 cm^{-1} (C=O, pyrone); nmr (DMSO-d_6) δ : 6.85 (s, 1H, C_5H); 2.52 (s, 3H, C_3Me);and 7.80 (m, 5H, N_1Ph). VI on heating in N,N-dimethylformamide with p-toluenesulfonyl chloride and pyridine[3] resulted in the formation of VII. yield 91%. VII: mp 150-151°, ir ν_{max}^{KBr} : 2230 (C≡N); and 1665 cm^{-1} (C=O, pyrone); nmr ($CDCl_3$) δ: 6.78 (s, 1H, C_5H); 2.61 (s, 3H, C_3Me); and 7.60 (m, 5H, N_1Ph). While reaction of the nitrile VII with sodium azide in N,N-dimethylformamide[4] afforded the 3-methyl-1-phenyl-6-(tetrazol-5'-yl)-1H-pyrano[2,3-c]pyrazole-4-one (VIII) in 87% yield. VIII: mp 267-268° ; ir ν_{max}^{KBr} : 3070 (NH); and 1655 cm^{-1}(C=O, pyrone); nmr ($CDCl_3$/DMSO-d_6) δ: 7.05 (s, 1H, C_5H); 2.58 (s, 3H, C_3Me), and 7.62 (m, 5H, N_1Ph). All the compounds gave satisfactory elemental analyses.

Further work on these lines is in progress.

ACKNOWLEDGEMENT We are grateful to Liverhulme Trust for the award of a fellowship to M.A.K. and to Coordenação de Aperfeiçoamento de Nível Superior (CAPES) for the fellowship to M.C.P.

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Received, 16th May, 1977