206. *Heterocyclic Ketones. Part I. β-Amino-ketones and Related Pyrazolines derived from Benzylidene- and Furfurylidene-acetone.*

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Mannich and Schütz (*Arch. Pharm.*, 1927, **265**, 684) have described the condensation of arylidene ketones (I) with formaldehyde and secondary base hydrochlorides as a method of preparing β-amino-ketones of the type (II).

$$\underset{\text{(I.)}}{R'\cdot CH{:}CH\cdot CO\cdot CH_3} + CH_2O + NHR_2,HCl \longrightarrow \underset{\text{(II.)}}{R'\cdot CH{:}CH\cdot CO\cdot CH_2\cdot CH_2\cdot NR_2,HCl} + H_2O$$

Benzylideneacetone (I; R′ = Ph) by this reaction gave with diethylamine hydrochloride and formaldehyde 1-diethylamino-5-phenyl-Δ^4-penten-3-one (II; R′ = Ph, $R_2 = Et_2$), from which these authors prepared the phenylhydrazone (III).

$$\text{(III.)}\quad \begin{array}{l} Ph\cdot CH{:}CH\cdot C\cdot CH_2\cdot CH_2\cdot NEt_2,HCl \\ \quad Ph\cdot NH\cdot N \end{array} \qquad \begin{array}{l} Ph\cdot CH-CH_2 \\ Ph\cdot N-\!\!-\!\!-N \end{array}\!\!\!> C\cdot CH_2\cdot CH_2\cdot NEt_2,HCl \quad \text{(IV.)}$$

Now, as the phenylhydrazones of α-unsaturated ketones change easily and sometimes uncontrollably into pyrazolines, the so-called phenylhydrazone (III) might be the isomeric pyrazoline (IV). It has now been shown, however, that the substance, although giving a positive test for pyrazoline by Knorr's reaction (which is not infallible, since it is given by phenylhydrazones containing only a trace of pyrazoline), gives aniline on reduction and must therefore actually be the phenylhydrazone (III).

When the compound (III) was boiled with acetic acid, the colour change characteristic of the conversion of phenylhydrazone into pyrazoline occurred, but the new pyrazoline could not be isolated. The phenylhydrazone of the piperidino-compound (II; R′= Ph, $R_2 = NC_5H_{10}$) was converted by such treatment into the corresponding *pyrazoline*, which was isolated.

In an analogous manner from furfurylideneacetone 1-*dimethylamino*-, 1-*diethylamino*-, and 1-*piperidino*-5-*furyl*-Δ^4-*penten*-3-*one* have been prepared (as hydrochlorides). The *phenylhydrazones* of the dimethylamino- and the piperidino-compound respectively have also been prepared and the latter has been converted into the isomeric 1-*phenyl*-3-(β-*piperidinoethyl*)-5-*furylpyrazoline hydrochloride*. The former gives the characteristic colour change on boiling with glacial acetic acid, but the pyrazoline could not be isolated.

Experimental.

1 : 5-*Diphenyl*-3-(β-*piperidinoethyl*)*pyrazoline*.—The phenylhydrazone of 1-piperidino-5-phenyl-Δ^4-penten-3-one hydrochloride (5·1 g.) and acetic acid (25 c.c.) were boiled under reflux for a few hours and the dark green solution was then treated with excess of sodium hydroxide. Ether extracted the *base*, which was obtained (nearly 2 g.) from light petroleum as a pale yellow solid (peculiar odour), m. p. 60° (Found : N, 12·7. $C_{22}H_{27}N_3$ requires N, 12·6%).

1-*Dimethylamino*-5-*furyl*-Δ^4-*penten*-3-*one Hydrochloride*.—The vigorous reaction which set in almost immediately when furfurylideneacetone (6·8 g.), dimethylamine hydrochloride (4·1 g.), and paraformaldehyde (2·1 g.) in alcohol (5 c.c.) were warmed gently under reflux, was completed by a few minutes' boiling. The solid obtained on cooling crystallised from alcohol in pale yellow leaves, m. p. 170° (mixed m. p. with dimethylamine hydrochloride, 120—130°) (Found : N, 6·3; Cl, 15·0. $C_{11}H_{16}O_2NCl$ requires N, 6·1; Cl, 15·5%). The *phenylhydrazone*, prepared by the method of Auwers and Voss (*Ber.*, 1909, **42**, 4411), formed long yellow needles from 95% alcohol; m. p. 185° (Found : N, 13·4; Cl, 11·2. $C_{17}H_{21}ON_3,HCl$ requires N, 13·15; Cl, 11·2%).

The following compounds were prepared by analogous methods, except that in the preparation of the β-amino-ketones a second portion of paraformaldehyde (1 g.) was added to the reaction mixture and the heating continued for some time to complete the reaction.

1-*Diethylamino*-5-*furyl*-Δ^4-*penten*-3-*one hydrochloride*, brownish hexagonal needles from aqueous acetone; m. p. 125° (Found : N, 5·5. $C_{13}H_{19}O_2N$,HCl requires N, 5·4%).

1-*Piperidino*-5-*furyl*-Δ^4-*penten*-3-*one hydrochloride* crystallised from alcohol in pale yellow, cubic plates which darkened on exposure to light; m. p. 192° (with darkening) (Found : N, 5·3; Cl, 12·9. $C_{14}H_{19}O_2N$,HCl requires N, 5·19; Cl, 13·17%). The *phenylhydrazone* formed long, dark yellow needles from alcohol; m. p. 182° (Found : N, 11·9; Cl, 9·6. $C_{20}H_{25}ON_3$,HCl requires N, 11·7; Cl, 9·9%).

1-*Phenyl*-3-(β-*piperidinoethyl*)-5-*furylpyrazoline Hydrochloride*.—1·5 G. of the phenylhydrazone were heated under reflux with acetic acid (8 c.c.) for ½ hour. The *pyrazoline hydrochloride*, obtained on cooling, crystallised from alcohol in almost colourless needles, m. p. 158° (Found : N, 11·5; Cl, 9·0. $C_{20}H_{25}ON_3$,HCl requires N, 11·7; Cl, 9·9%).

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