Rearrangement Reactions of 4-Chloromethyl-1,4-dihydro-1,2,6-trimethylpyridine-3,5-dicarboxylate

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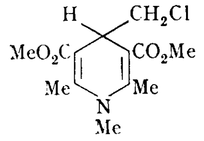
WE have extended our studies[1] on the reactions of the dialkyl 4-chloromethyl-1,4-dihydro-2,6-dimethylpyridine-3,5-dicarboxylates to the *N*-methyl derivative (I) and we now report several novel rearrangements of this substance.

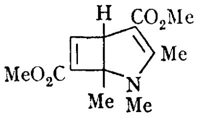
Thus, with potassium t-butoxide in 1,2-dimethoxyethane, (I) yields the valency tautomers (II) and (III), and either can be made the major product by varying the concentration of the reagent. In carbon tetrachloride solution the colourless bicyclic ester (II) isomerised quantitatively to the yellow azepine (III). Acidification of (II) with subsequent basification gave the pyrrole (IV; R = H) which was also obtained together with methyl acetoacetate from (I) direct, by the action of alcoholic potassium hydroxide.

Hydrogenation of the azepine (III) in cyclohexane in presence of platinum gave the perhydro-derivative but when methanol was used as solvent dimethyl 2,3-dimethylterephthalate (V; R = Me) was obtained, presumably by hydrogenolysis of the valency tautomer (VI).

Photolysis of the azepine (III) in cyclohexane (a Pyrex filter being used) gave the pyrrole (IV; R = Me) which like (IV; R = H; above) has also been synthesised by a conventional method. In boiling benzene, (III) is isomerised quantitatively to the ylid (VII) which also has been obtained either by pyrolysis of (I) or by treatment of (I) with sodium methoxide and pyrolysis of the resulting oil. The ylid (VII) results from ring fission and prototropic rearrangement of the valency tautomer (II). With aqueous potassium hydroxide, (VII) gave (VIII; R = CO_2Me) in high yield, a conversion which was reversed by using hot methanolic methylamine. Similar reactions of (VIII; R = CO_2Me) with ammonia, *p*-chloroaniline, or dimethylamine gave products analogous to (VII). Steam-distillation of (VII) from an acid solution gave (VIII; R = H) which was converted into the corresponding miinium salt by the action of ammonia. The structures (VII) and (VIII) emphasise the reluctance of compounds to exist as cyclobutadiene derivatives; the n.m.r. spectra of (VII) and (VIII) are characterised by the low-field absorption associated with the acidic protons, *e.g.* about τ −3 to



(I)



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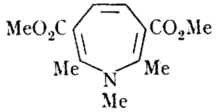

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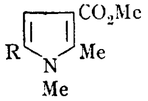
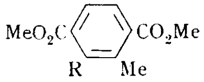
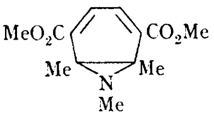


(IV)



(V)



(VI)

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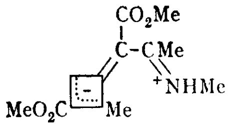
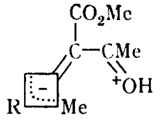
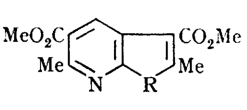
[1] P. J. Brignell, E. Bullock, U. Eisner, B. Gregory, A. W. Johnson, and H. Williams, *J.*, **1963**, **4819**; E. Bullock, B. Gregory, and A. W. Johnson, *J.*, **1964**, **1632**; M. Anderson and A. W. Johnson, *Proc. Chem. Soc.*, **1964**, **263**.



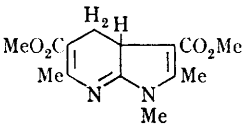
(VII)



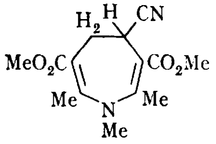
(VIII)



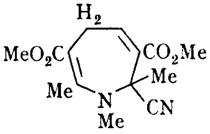
(IX)



(X)



(XI)



(XII)

—4 for (VII) and about τ —6 for (VIII; R = H or CO_2Me).

Treatment of the dihydropyridine (I) with hot ethanolic potassium cyanide gave an oil which underwent further reaction on chromatography on silica. The main product was dimethyl 2-amino-3-methylterephthalate (V; R = NH_2), converted by deamination into (V; R = H).[2] A second major product was the furopyridine (IX; R = O); a small amount of the corresponding azaindole (IX; R = NMe) was also present as well as a compound which appears to be the dihydro-azaindole (X). The formation of these cyanide rearrangement products can be rationalised by postulating the cyanodihydroazepines (XI) and (XII) as intermediates. Satisfactory analyses have been obtained for all the compounds described and spectral properties consistent with the postulated structures have been observed.

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[2] M. Cachia and H. Wahl, *Bull. Soc. chim. France*, 1958, 1418.