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REACTIONS OF NON-AROMATIC HETEROCYCLES WITH DIKETENE

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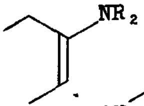
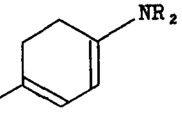
The enamines of cyclic ketones (I) and the dienamine II have been shown to react with diketene (III) to give chromone derivatives or analogous structures (IV) (1,2).



I



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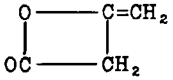

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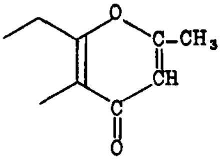
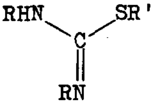
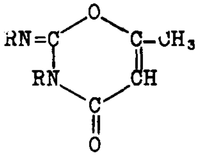


IV

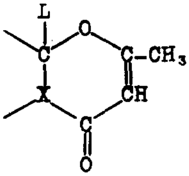
Furthermore, acyclic isothioureae (V) react with diketene to yield 1,3-oxazines (VI) (3a).



V



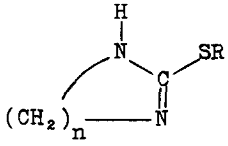
VI



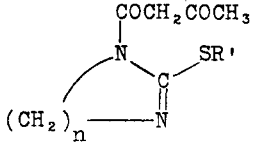
VIIa L = NR_2; X = CH
b L = SR'; X = N

Whereas cycloadducts carrying an angular amino group (VIIa) were postulated as intermediates in the conversion of enamines (I) into IV, it has been stated that un-dethioalkylated cyclo-adducts (VIIb) result from the reactions of certain isothioureae (V) with diketene under special conditions (3b).

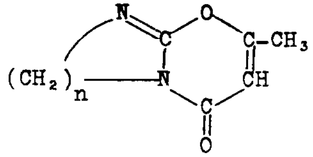
As part of a study of the chemistry of non-aromatic heterocycles (4) we report the preliminary results of a series of reactions between cyclic isothioureae (VIII; n = 2,3,4) and diketene. Product analysis showed that the reaction path depends upon the size of the ring, on the experimental conditions and possibly on the radical linked to the sulphur atom.



VIII



IX



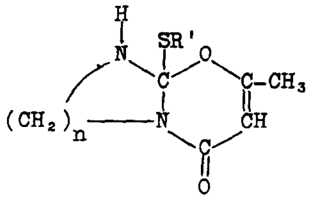
X

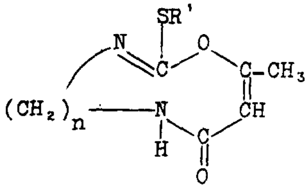
1) N-Acetoacetyl derivatives (IX) are formed from 2-methyl- and 2-benzyl-thioimidazolines (VIII; n = 2), but not from the larger-ring isothioureae (VIII, n = 3, 4).

2) A single sulphur-free product was obtained in good yield from 2-methylthio-tetrahydropyrimidine (VIII, n = 3) and only in trace amounts from the 2-benzyl analog. We assign to this compound the fused-ring structure 2-methyl-4-oxo-4,6,7,8-tetrahydropyrimido[2,1-b]1,3-oxazine (X; n = 3).

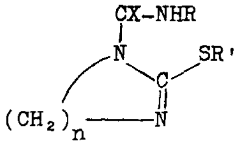
3) Several adducts were furthermore obtained from the reactions of the imidazoline-, pyrimidine-, and diazepine-isothioureae with diketene. In some cases, two isomeric 1:1 adducts arise from a single reacting system, neither one being identifiable with the N-acetoacetyl derivative eventually formed. For example, the two isomers obtained from 2-benzylthio-tetrahydropyrimidine (VIII; n = 3, R' = $C_6H_5CH_2$) have different m.ps. (135°, 200°), U.V. spectra (λ max. 293,304 $m\mu$) and solubilities, while their I.R. and N.M.R. spectra show close similarities. The isomers are interconverted in acid solution

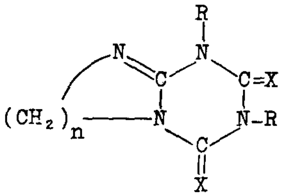
or upon heating above the m.p. The data at hand suggest two formulae for consideration: the condensed-ring structure XI and the enlarged-ring structure XII (5). Structure XI is particularly attractive because of its stereochemical implications.


XI


XII

It is interesting to recall at this point that cyclic isothioureae react with iso(thio)cyanates giving the N-substituted (1:1) adducts (XII) and de-thioalkylated (1:2) cyclo-adducts (XIII) (4).


XII


XIII

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