Synthesis of 2,5-Dihydro-1,2,4-triazines and Their Reactions with Dimethyl Acetylenedicarboxylate

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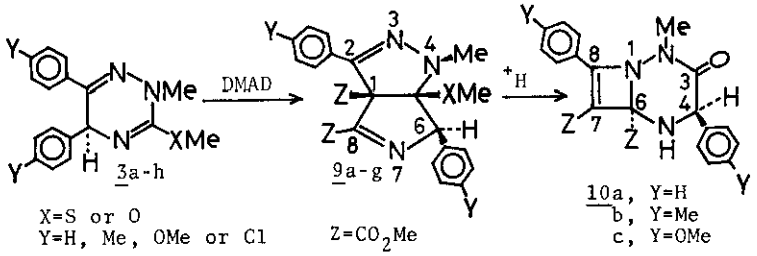
Sodium borohydride reduction of 3-methylthio-5,6-diphenyl- (1a), 5,6-bis-tolyl- (1c), 5,6-bis-anisyl-(1e) and 5,6-bis-p-chlorophenyl-1,2,4-triazine (1g) afforded the corresponding 2,5-dihydro-1,2,4-triazines (2a, 2c, 2e and 2g). 3-Methoxy-5,6-diphenyl- (1b), 5,6-bis-tolyl- (1d), 5,6-bis-anisyl- (1f) and 5,6-bis-p-chlorophenyl-1,2,4-triazine (1h) also gave the corresponding 2,5-dihydro-1,2,4-triazines (2b, 2d, 2f and 2h) on similar reduction. Reaction of 2a-h with MeI/NaH generally gave the corresponding N_2-methylated analogs (3a-h) as major products. The structures of 3a and 3b were established by their chemical conversion to known 2-methyl-5,6-diphenyl-1,2,4-triazine-3(2H)-one (6) and its 4,5-dihydro derivative (5), respectively. Treatment of 3a-h with dimethyl acetylenedicarboxylate (DMAD) gave the corresponding 2,6-diaryl-4-methyl-5-methylthio- (or 5-methoxy-) 1,8-bis-methoxycarbonyl-3,4,7-triaza-bicyclo[3.3.0]-octa-2,7-dienes (9a-f) and the similar analog 9g from 3h. Acidic hydrolysis of 9a (or 9b), 9d and 9e gave another new ring system of 2-methyl-3-oxo-4,8-diaryl-6,7-bis-methoxycarbonyl-1,2,5-triaza-bicyclo[4.2.0]-octa-7-enes (10a-c). On the other hand, DMAD with 2,3-dimethyl-5,6-diphenyl-2,5-dihydro-1,2,4-triazine (13) afforded two 1:2 adducts of unknown structure, while DMAD with 3-methylthio-2,5,6-trimethyl-1,2,4-triazine (14) gave a small amount of 2,3-bis-methoxycarbonyl-4,5-dimethyl-pyrrole (17). The 2-acetyl derivative (12) of 2a with DMAD gave no isolable product. Analogously, sodium borohydride reduction of 3-methylthio-5-phenyl- (18a), 3-methoxy-5-phenyl- (18b), 3-methylthio-5,6-dimethyl- (18c), 3-methoxy-5,6-dimethyl- (18d), 3-methylthio-5-methyl- (18e), 3-methoxy-5-methyl- (18f), 3-methylthio- (18g) and 3-methoxy-1,2,4-triazine (18h) gave the corresponding 2,5-dihydro-1,2,4-triazines (19a-h). The structures of 19a-h were established by spectral comparison with the known, corresponding 4,5-dihydro tautomers. Some mechanistic comments are given for the formation of 9 and 17.



3a-h
X=S or O
Y=H, Me, OMe or Cl

9a-g
Z=CO_2Me

10a, Y=H
b, Y=Me
c, Y=OMe