

DIELS-ALDER REACTION OF 1,2,3-TRIAZINE WITH ENAMINES

Teruyo Sugita*, Junko Koyama, Kiyoshi Tagahara, and Yukio Suzuta
 Kobe Women's College of Pharmacy, Kobe 658, Japan

Abstract — 1,2,3-Triazine has been shown to react with enamines to afford products of [4+2]cycloaddition reaction. Loss of nitrogen and pyrrolidine from the initial bicycloadducts afford 2,3-disubstituted pyridines.

In a recent report, heterocyclic azadienes have been shown to participate in Diels-Alder reactions with a variety of diene systems. The review¹, however, does not mention as concerns the reaction of 1,2,3-triazine in detail. Now we report here the results obtained by the treatment of 4-methyl-1,2,3-triazine with cycloalkanone pyrrolidine enamines.

4-Methyl-1,2,3-triazine was synthesized from 3-methylpyrazole according to the method of Igeta and co-workers². Treatment of 4-methyl-1,2,3-triazine with several cycloalkanone pyrrolidine enamines by the following methods gave 2,3-disubstituted pyridines.

Method A : A solution of enamine (1.3 ~ 1.4 equiv) in dry CHCl_3 was treated with 4-methyl-1,2,3-triazine in CHCl_3 under nitrogen, and resulting solution was warmed at 50-60°C for 20-23 h.

Method B : A mixture of 4-methyl-1,2,3-triazine and enamine (1.3 ~ 1.4 equiv) in dry CHCl_3 was heated in a sealed glass tube at 60-150°C for 0.5-19 h.

The crude products were separated by preparative thin layer chromatography on silica gel.

The results are summarized in Table. In each case cycloaddition occurs across N-3/C-6 of the 1,2,3-triazine nucleus and the nucleophilic carbon of the dienophile attaches to C-6 of the 1,2,3-triazine. Product (10) is an alkaloid isolated and characterised by Edwards and Elmore from a South American plant, *Fabiana imbricata*³.

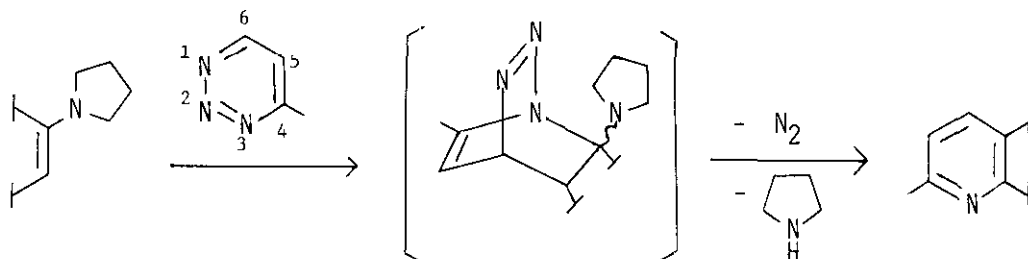

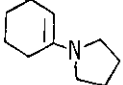
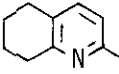

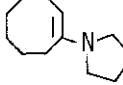
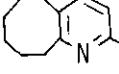
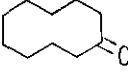
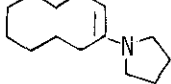
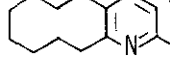
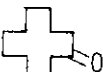
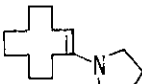
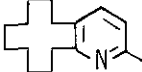

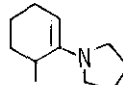
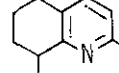

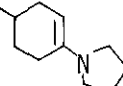
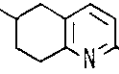

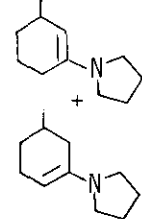
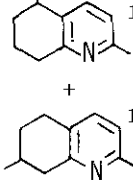


Table Reaction of enamines with 4-methyl-1,2,3-triazine

cycloalkanone	enamine	product	method	reaction conditions	yield %
		 4)	A B B B	50-60°C, 23h 60°C, 19h 100°C, 1.5h 150°C, 0.5h	17 20 45 26
		 5)	B B	50-60°C, 23h 100°C, 2h	44 69
		 6)	B B	50-60°C, 24h 100°C, 2h	10 27
		 7)	B B	50-60°C, 23h 100°C, 2h	11 34
		 8)	A	50-60°C, 20h	16
		 9)	A	50-60°C, 23h	25
		 10) * + 10')	A B	50-60°C, 21h 100°C, 2h	15 (10:10' =1:6) 56 (10: 10' =1:4)

* The used enamine was a mixture of Δ^1 - and Δ^6 - isomers, so that the product was found from its NMR spectrum to be the corresponding mixture of 5- and 7-methyl isomers.

REFERENCES AND NOTES

- 1) Dale L. Boger, *Tetrahedron*, 1983, **39**, 2869.
- 2) A. Ohsawa, H. Arai, H. Ohnishi, and H. Igeta, *Chem. Comm.*, 1980, 1182.
- 3) D. E. Edwards and N. F. Elmore, *Can. J. Chem.*, 1962, **40**, 256.
- 4) picrate, mp 152-153°C ; $^1\text{H-NMR}(\text{CDCl}_3)$ δ : 2.45(3H, s, 2-Me), 6.76(1H, d, J=8Hz, 3-H), 7.13(1H, d, J=8Hz, 4-H) ; MS m/z : 147.1050(M^+ , calcd for $\text{C}_{10}\text{H}_{13}\text{N}$, 147.1047).
- 5) picrate, mp 161-162.5°C ; $^1\text{H-NMR}(\text{CDCl}_3)$ δ : 2.50(3H, s, 2-Me), 2.72 and 2.94(4H, t each, J=6Hz, 5 and 10-H₂), 6.91(1H, d, J=8Hz, 3-H), 7.26(1H, d, J=8Hz, 4-H) ; MS m/z : 175.1358(M^+ , calcd for $\text{C}_{12}\text{H}_{17}\text{N}$, 175.1360).

- 6) picrate, mp 166-168°C ; $^1\text{H-NMR}(\text{CDCl}_3)$ δ : 2.51(3H, s, 2-Me), 2.81 and 2.95(4H, t each, J=6.5Hz, 5 and 12-H₂), 6.92(1H, d, J=8Hz, 3-H), 7.34(1H, d, J=8Hz, 4-H) ; MS m/z : 203.1664(M⁺, calcd for C₁₄H₂₁N, 203.1672).
- 7) picrate, mp 143-144°C ; $^1\text{H-NMR}(\text{CDCl}_3)$ δ : 2.49(3H, s, 2-Me), 2.62 and 2.81(4H, t each, J=7.5Hz, 5 and 14-H₂), 6.91(1H, d, J=8Hz, 3-H), 7.35(1H, d, J=8Hz, 4-H) ; MS m/z : 231.1991(M⁺, calcd for C₁₆H₂₅N, 231.1985).
- 8) picrate, mp 115°C ; $^1\text{H-NMR}(\text{CDCl}_3)$ δ : 1.35(3H, d, J=7Hz, 8-Me), 2.51(3H, s, 2-Me), 2.72(2H, t like, 5-H₂), 2.99(1H, m, 8-H), 6.88(1H, d, J=8Hz, 3-H), 7.24(1H, d, J=8Hz, 4-H) ; MS m/z : 161.1191(M⁺, calcd for C₁₁H₁₅N, 161.1203).
- 9) picrate, mp 134-136°C ; $^1\text{H-NMR}(\text{CDCl}_3)$ δ : 1.08(3H, d, J=6.5Hz, 6-Me), 2.49(3H, s, 2-Me), 6.91(1H, d, J=8Hz, 3-H), 7.26(1H, d, J=8Hz, 4-H) ; MS m/z : 161.1181(M⁺, calcd for C₁₁H₁₅N, 161.1203).
- 10) + 10') MS m/z : 161.1205(M⁺, calcd for C₁₁H₁₅N, 161.1203) ; $^1\text{H-NMR}(\text{CDCl}_3)$ δ : 10)- 1.26(3H, d, J=7Hz, 5-Me), 2.50(3H, s, 2-Me), 6.95(1H, d, J=8Hz, 3-H), 7.41(1H, d, J=8Hz, 4-H) : 10')- 1.09(3H, d, J=6.5Hz, 7-Me), 2.50(3H, s, 2-Me), 6.91(1H, d, J=8Hz, 3-H), 7.28(1H, d, J=8Hz, 4-H).

Received, 18th July, 1985