Synthetic Communications: An International Journal for Rapid Communication of Synthetic Organic Chemistry
Publication details, including instructions for authors and subscription information:
http://www.tandfonline.com/loi/lsyc20

A One Pot Synthesis of 5,7-Diphenyl-2,3-dihydro-1H-pyrrolizine

R. W. Soeder [a], K. Bowers [a], L. D. Pegram [a] & C. P. Cartaya-Marin [a]
[a] Department of Chemistry, Appalachian State University, Boone, NC, 28608, USA
Published online: 23 Sep 2006.

To cite this article: R. W. Soeder, K. Bowers, L. D. Pegram & C. P. Cartaya-Marin (1992) A One Pot Synthesis of 5,7-Diphenyl-2,3-dihydro-1H-pyrrolizine, Synthetic Communications: An International Journal for Rapid Communication of Synthetic Organic Chemistry, 22:19, 2737-2740, DOI: 10.1080/00397919208021537

To link to this article: http://dx.doi.org/10.1080/00397919208021537

SYNTHETIC COMMUNICATIONS, 22(19), 2737-2740 (1992)

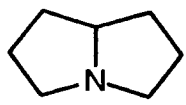
A ONE POT SYNTHESIS OF 5,7-DIPHENYL-2,3-DIHYDRO-1H-PYRROLIZINE

R.W. Soeder*, K. Bowers, L.D. Pegram and C.P.Cartaya-Marin*

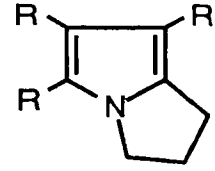
Department of Chemistry, Appalachian State University, Boone, NC 28608 USA.

Abstract: 5,7-Diphenyl-2,3-dihydro-1H-pyrrolizidine was synthesized from dibenzoylmethane and pyrrolidine in one step in 60% yield.

The pyrrolizine skeleton, an azabicyclo[3.3.0]octane ring system (**1**), is an essential part of the biologically active pyrrolizidine alkaloids[1], mitomycin antibiotics[2] and ant venom alkaloids[3]. The biological properties of these alkaloids include antitumor, hypotensive, anti-inflammatory, carcinogenic and hepatotoxic activity[4]. 2,3-Dihydro-1H-pyrrolizine derivatives (**2**) are potent anti-neoplastic and anti-inflammatory agents[5,6].



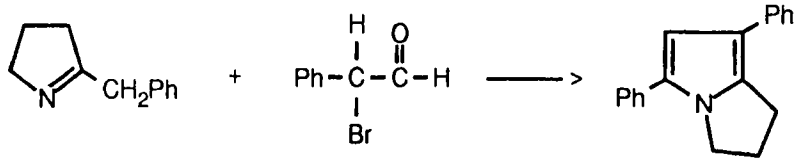
1



2

* To whom correspondence should be addressed

Equation 1

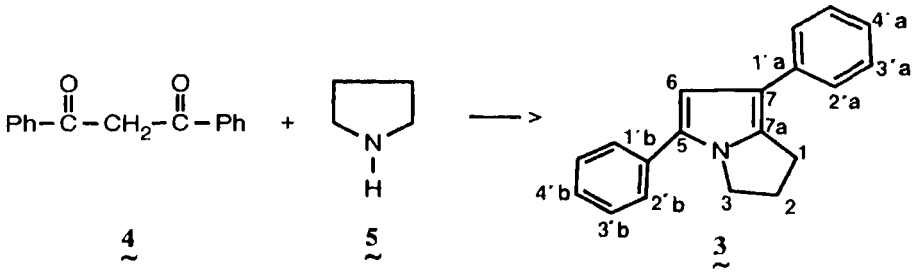


3

The synthesis of 5,7-diphenyl-2,3-dihydro-1H-pyrrolizine (**3**) has been reported by Dannhardt[7] in 15% overall yield by the reaction of 2-benzyl-Δ–1-pyrrolidine with α-bromophenylacetaldehyde (equation 1) in ethanol for two days at room temperature.

A one pot synthesis of 5,7-diphenyl-2,3-dihydro-1H-pyrrolizine (**3**) from readily available starting materials has been developed in this laboratory. The reaction of 1,3-diphenyl-1,3-propandione (dibenzoylmethane) (**4**), 1.7 equivalents of pyrrolidine (**5**) and molecular sieves in a limited amount of benzene for 1 hour at high temperature using a Dean-Stark trap for the removal of water produced compound **3** in 60% yield after recrystalization (equation 2). Reaction of dibenzoylmethane (**4**), and pyrrolidine (**5**) with benzene as solvent, under milder conditions, such as lower temperatures, higher dilution or ethanol as solvent gave high yields of the corresponding enaminone. The products from these reactions were characterized ^{1}H NMR, ^{13}C NMR and gas chromatography/mass spectrometry (GC/MS).[8]

Equation 2



4 5 3

The scope and limits of this reaction is currently under investigation.

Acknowledgment: We would like to thank the Department of Chemistry of Appalachian State University for the generous financial support and Professors Huw Davies and Mark Welker of Wake Forest University for the use of their 200 MHz NMR spectrometer.

References

1. Robins, D.J. *Advances in Heterocyclic Chemistry*; Wiley & Sons: New York; Vol. 2, p 247.
2. Nakano, K. *Heterocyclics* **1979**, *13*, 373.
3. Jones, T.H.; Blum, M.S.; Fales, H.M.; Thompson, C.R. *J. Org. Chem.* **1980**, *45*, 4778.
4. Chamberlain, R.A.;Chung, J.Y.L. *Tetrahedron Lett. 23*, 2619.
5. Dannhardt, G.; Steindl, L. *Heterocycles* **1985**, *23*, 1219.

6. Dannhardt, G.; Obergrusberger, R. *Arch. Pharm.* **1979**, *312*, 896-907.

7. Dannhardt, G.; Lehr, M.; Steindl, L. *Chem. Ztg.* **1986**, *110*, 267-271.

8. Physical data: MP=149-150°(uncor.) from ethanol.

^{1}H NMR(Varian XL-200) δ=2.51-2.68(2H.m), 3.15(2H,t, J=7.3Hz), 4.18(2H,t,J=7.0Hz), 6.78(1H,s), 7.14-7.33(2H,m) 7.35-7.47(4H,m), 7.51-7.63(4H,m).

^{13}C NMR(decoupled)(Varian XL-200) with assignment,[ ]=rel. intensity δ=25.22[4.0] C_2, 27.79[4.1] C_1, 46.53[4.2] C_3, 108.52[4.7] C_6, 116.01[1.1] C_7, 124.56[5.1] & 125.82[5.2] $C_{4'a}$ & $C_{4'b}$, 125.05[9.8], 125.64[9.6], 128.48[9.9] & 128.57[9.9] $C_{2'a}$, $C_{3'a}$, $C_{2'b}$, & $C_{3'b}$, 129.18[1.0] C_{7a}, 133.25[1.2] C_5, 135.84[1.2] & 136.25[1.2] $C_{1'a}$ & $C_{1'b}$.

MS (Finnigan-MAT ITD) Molecular mass($C_{19}H_{17}N$)= 259; 260(M+1)(12), 259(M)(100), 258(M-1)(51), 230(M-C_2H_2,H)(6), 191(M-C_4H_8N)(5), 182(M-C_6H_5)(19), 128(10),115(9), 102(6), 91(6), 77(22).

(Received in USA 7 May, 1992)