



Trade Science Inc.

# Organic CHEMISTRY

An Indian Journal

Full Paper

OCAIJ, 4(9-11), 2008 [475-477]

## Microwave assisted, solvent-free synthesis of quinolinyl-1,2,4-s-triazolo[4,3-a]quinoxalines using IBD

P.K.Dubey\*, A.Naidu, K.Shiva Kumar

Department of Chemistry, College of Engineering, JNT University, Kukatpally, Hyderabad-500 085, (INDIA)

E-mail : shivakumarkota@yahoo.co.in

Received: 12<sup>th</sup> November, 2008 ; Accepted: 19<sup>th</sup> November, 2008

### ABSTRACT

Reaction of 2-chloro-3-hydrazinoquinoxaline (**1**) with 2-chloroquinoxalin-3-carboxaldehyde (**2**) under microwave irradiation yielded N-(2-chloro-4a,8a-dihydroquinoline-3yl-methyl)-N-3-chloro-quinoxalin-2yl)hydrazine (**3**) which on further reaction with IBD under solvent-free, microwave irradiation conditions resulted in the formation of the title compound (**4**). © 2008 Trade Science Inc. - INDIA

### INTRODUCTION

In recent years, organic transformations accelerated by microwave-irradiation, under solvent-free conditions, have gained wide popularity due to many practical advantages associated with them such as enhanced reaction rates, high yields, improved selectivity and environment-friendly reaction conditions<sup>[1-3]</sup>. The upcoming area of Green Chemistry, which involves carrying out reactions under solvent-free and microwave-irradiated conditions, aims at reducing the use of toxic solvents thereby preventing pollution in organic synthesis at source. Simultaneously, it is found that reactions under microwave-irradiation are clean, fast and economical. Fused 1,2,4-triazoles generate a widespread interest due to diverse biological activities<sup>[4]</sup>.

### RESULTS AND DISCUSSION

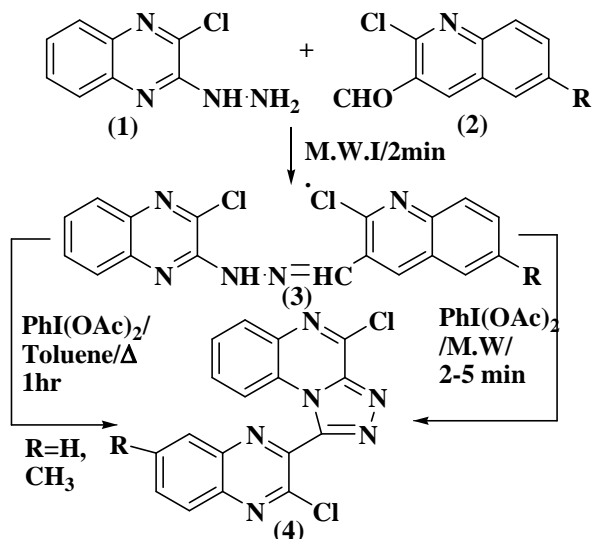
2-Chloro-3-hydrazinoquinoxaline<sup>[5]</sup> (**1**) on reaction with 2-chloroquinoxalin-3-carboxaldehyde<sup>[6]</sup> (**2a**), i.e., **2**, R = H) under microwave irradiation for 2 minutes resulted in the formation of N-(2-chloro-(**4a**), (**8a**)-

dihydroquinoline-3yl-methyl)-N-3-chloro-quinoxalin-2yl)hydrazine (**3a**), i.e., **3**, R = H). Structure of **3a** was assigned on the basis of spectral data. Thus, its IR spectrum in KBr showed a characteristic peak at 3433 cm<sup>-1</sup> (b, m, -NH stretching). Its <sup>1</sup>H-NMR spectrum (CDCl<sub>3</sub>/TMS) showed peaks at δ 7.5-8.0 (m, 8H, four quinoline aryl protons and four quinoxaline aryl protons), 8.7-8.8 (s, 1H, quinoline proton), 9.0-9.1 (s, 1H, N = -CH\*), 9.3 (s, 1H, NH, D<sub>2</sub>O exchangeable). Its CI mass spectrum in Q+1 mode showed molecular ion peak at 368 (base peak) corresponding to a molecular mass of 367. (**3a**) on further reaction with iodobenzenediacetate (IBD) under MW irradiation yielded 4-chloro-1-(2-chloroquinoline-3yl)-1,2,4-s-triazole[4,3-a]quinoline (**4a**, i.e., **4**, R = H). The structure of **4a** was assigned on the basis of spectral data. Thus, its IR (KBr) showed absence of characteristic peak at 3433 cm<sup>-1</sup> (b, -NH stretching) which was found in the IR of (**3a**) (i.e. **3**, R = H). Its <sup>1</sup>H-NMR spectrum (CDCl<sub>3</sub>/TMS) showed peaks at δ 7.2-8.3 (m, 8H, four quinoline aryl protons and four quinoxaline aryl protons), 9.0 (s, 1H, quinoline proton). Its CI mass spectrum in Q+1 mode showed molecular ion peak at 366 (base peak) corresponding

## Full Paper

to a molecular mass of 365. Alternatively, **(4a)** was also obtained by refluxing **(3a)** in toluene using IBD for 1 hr. This product was found to be identical in mp, mmp and co-TLC with the product obtained by microwave method.

It may be mentioned here that synthesis of **(4a)** has been reported by Reddy et al.<sup>[7]</sup> by cyclising **(3a)** with DDQ in refluxing toluene for 1 hr. **(3a)** in turn was prepared by these authors by the condensation of **(1)** with **(2a)** in DMF at RT for 2hr. In the present communication, we have reported a new method for the preparation of **(3a)** from **(1)** and **(2a)**, and subsequent cyclisation of **(3a)** to **(4a)** under solvent-less, solid phase and microwave conditions using IBD as cyclodehydrogenation agent, requiring hardly **(5)** min of reaction time (SCHEME 1).



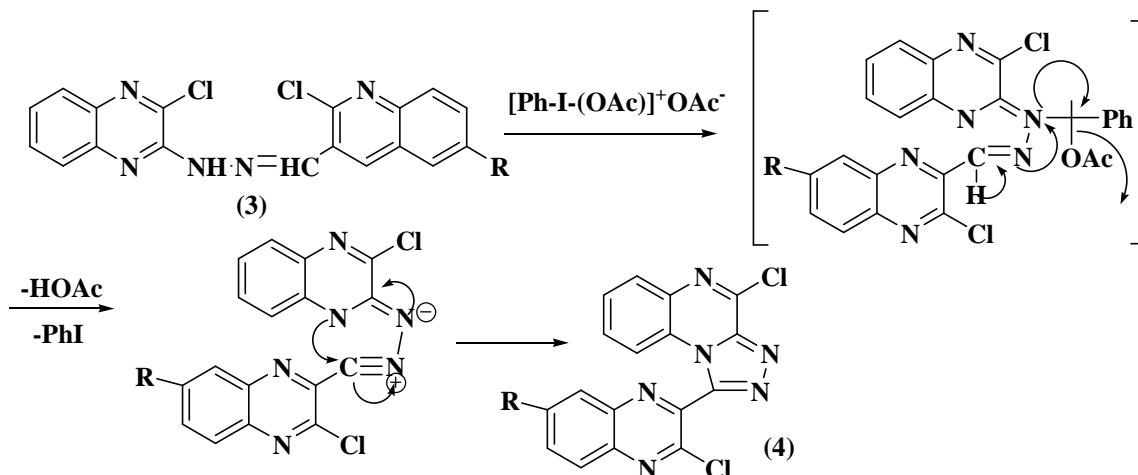
SCHEME 1

Similarly, treatment of **(1)** with **(2b)** (i.e. 2, R = CH<sub>3</sub>) resulted in the formation of **(3b)** (i.e. 3, R = CH<sub>3</sub>) which was confirmed by its spectral data. Thus, its IR (KBr) showed a characteristic peak at 3433 cm<sup>-1</sup> (b, m, -NH stretching). Its <sup>1</sup>H-NMR spectrum (CDCl<sub>3</sub>/TMS) showed peaks at δ 2.5 (s, 1H, -CH<sub>3</sub>\*), 7.5-8.0 (m, 8H, four quinoline aryl protons and four quinoxaline aryl protons), 8.7-8.8 (s, 1H, quinoline proton), 9.0-9.1 (s, 1H, N = -CH\*), 9.3 (s, 1H, -NH, D<sub>2</sub>O exchangeable) and its CI mass spectrum in Q+1 mode showed molecular ion peak at 383 (base peak) corresponding to a molecular mass of 382. Reaction of **(3b)** with IBD resulted in the formation of **(4b)** whose structure was confirmed by spectral data. Thus, its IR (KBr) showed the absence of characteristic peak at 3433 cm<sup>-1</sup> (b, m, -NH) which was found in the IR spectrum of **(3b)**. <sup>1</sup>H-NMR spectrum (CDCl<sub>3</sub>/TMS) of **(4b)** showed peaks at δ 2.5 (s, 1H, CH<sub>3</sub>\*), 7.2-8.3 (m, 8H, four quinoline aryl protons and four quinoxaline aryl protons), 9.0 (s, 1H, quinoline proton). Its CI mass spectrum in Q+1 mode showed the molecular ion peak at 381 (base peak) corresponding to a molecular mass of 380.

The reaction involving dehydrogenative cyclisation of **(3)** to **(4)** probably follows the mechanism shown below:

## EXPERIMENTAL

Melting points are uncorrected and were obtained in open capillary tubes in sulphuric acid bath. TLC checking was done on glass plates coated with silica



gel GF-254 and spotting was done using Iodine or UV lamp. IR spectra were recorded using Perkin-Elmer model 446, FTIR in KBr.  $^1\text{H}$  NMR spectra were recorded on a Gemini-200 and AU-400 operating at 200 MHz respectively. Microwave irradiations were carried out in KENSTAR-OM-34ECR domestic microwave oven.

### Preparation of 3

An intimate mixture of (1) (0.97 gm, 5 mmol) and (2) (5 mmol) was taken in a 50 mL of borosil flask and subjected to microwave-irradiation at 100% exposure intermittently at 30 sec intervals for 2 mins. On completion of the reaction, as monitored by TLC, the product was extracted into methanol ( $3 \times 10\text{ mL}$ ) and then poured into ice-cold water. The separated solid was filtered, washed with water and dried to obtain (3).

Yield of 3a = 1.65 gm (90%), yield of (3b) = 1.69 gm (89%); The crude (3) were recrystallised from ethanol to obtain pure 3; M.P. of (3a) was  $217^\circ\text{C}$  (Lit<sup>7</sup>. M.P =  $219^\circ\text{C}$ ) & that of 3b was  $221^\circ\text{C}$  (Lit<sup>7</sup>. M.P =  $222^\circ\text{C}$ )

### Preparation of 4

An intimate mixture of (3) (5 mmol) and iodobenzene diacetate (1.15 gm, 5.2 mmol) was taken in a 50 mL of borosil glass flask and subjected to microwave-irradiation at 100% exposure intermittently at 30 sec. intervals for 5 mins. On completion of reaction, as monitored by TLC, the product was extracted into methanol ( $3 \times 10\text{ mL}$ ) and the extract poured into ice-cold water. The separated solid was filtered, washed with water and dried to obtain crude 4.

Yield of (4a) = 1.59 gm (87%), yield of (4b) = 1.63 gm (86%); Recrystallisation of crude 4 from ethanol gave pure (4); M.P. of (4a) was  $>250^\circ\text{C}$  (Lit<sup>7</sup>. M.P  $>300^\circ\text{C}$ ) and that of (4b) was  $>250^\circ\text{C}$  (Lit<sup>7</sup>. M.P  $>300^\circ\text{C}$ )

### Alternate procedure for preparation of 4

A mixture of (3) (5 mmol) and iodobenzene diacetate (1.15 gm; 5.2 mmol) in toluene was refluxed for 1 hr. The reaction was monitored by TLC. After completion of the reaction, it was filtered, washed with methanol and dried to obtain crude (4).

Yield of (4a) = 1.48 gm (81%), yield of (4b) = 1.52 gm (80%); The crude (4) were recrystallised from ethanol to obtain pure (4).

## ACKNOWLEDGMENTS

The authors are immensely grateful to the University Grants Commission, Govt. of India, New Delhi, for financial assistance. They are also thankful to the authorities of Jawaharlal Nehru Technological University, Hyderabad (A.P), for providing laboratory facilities.

## REFERENCES

- [1] S.Caddik; Tetrahedron, **51**, 10403 (1995).
- [2] A.Loupy, A.Petil, J.Hamelin, F.Texier-Boullet, P.Jacquault, D.Mathe; Synthesis, 1213 (1998).
- [3] P.Liddstrom, J.Tiernery, B.Wathey, J.Westman; Tetrahedron, **57**, 9225 (2001).
- [4] J.E.B.Rivelt; J.Med.Chem., **34**, 151 (1999).
- [5] C.V.Reddysastry, V.S.H.Krishan, G.K.A.S.S. Narayana, K.Vemana, M.Vairamani; Indian J.Chem., **30B**, 936 (1991).
- [6] O.Meth-Cohn, B.Narine, B.Tarnawaski; J.Chem. Soc.Perk.Trans., **1**, 1520 (1981).
- [7] J.J.Reddy, D.Latha, Thirupathaiiah; Heterocycl. Commun., **9**, 243 (2005).