

Synthesis and Characterization of New Naphthoquinonic Derivatives Containing the Pyrazole Ring: Pyrazolynaphthoquinones

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Abstract: The reaction of 3-aminopyrazole (**1**) with 1,2-naphthoquinone-4-sulfonic acid sodium salt (**2**) was studied in different aqueous media. The novel pyrazolynaphthoquinones synthesized were physical and spectroscopically characterized, including 2D NMR spectroscopy (HETCOR). The possible reaction mechanism is proposed.

Introduction

Quinones and naphthoquinones are widely distributed in nature and play a vital role in certain cellular functions [1]. On the other hand, pyrazoles are important synthetic intermediates in the construction of many complex molecules with interesting biological activities [2,3].

For these reasons, and in our search of compounds with important bioactivities, we have prepared a new type of naphthoquinonic derivatives containing the pyrazole ring as nitrogenated heterocycle.

In this communication we describe the synthesis and characterization of a new type of compounds, the pyrazolynaphthoquinones **3-5**, which were obtained by the reaction of 3-aminopyrazole (**1**) and 1,2-naphthoquinone-4-sulfonic acid sodium salt (**2**).

Experimental

IR (KBr), UV-visible (MeOH), NMR and mass spectra were recorded in a Nicolet 5-SXC FT IR, Shimadzu UV-160A, Bruker AC 200 E and a Finningan 3300 (at 30 y 70ev), respectively.

The ^1H and ^{13}C spectra were run in DMSO- d_6 (the center of the solvent peak was used as internal standard which was related to TMS) and they were calculated by the ACD program. Compounds **1** and **2** were purchased from Aldrich Co. and Sigma, respectively.

Derivatives **3-6** were isolated and purified by radial preparative chromatography, electrophoresis and recrystallization from organic solvents.

Results and Discussion

Preliminary experiments investigating the reaction between 3-aminopyrazole (**1**) and 1,2-

naphthoquinone-4-sulfonic acid sodium salt (**2**) showed different structures. It was seen that the medium conditions (basic, neutral, acidic and heat) were responsible for the pathway of the reaction. Therefore, the reaction was studied exhaustively and was found that in the pH range 10.4-2.0 and at room temperature, 2-hydroxy-N-(3-pyrazolyl)-1,4-naphthoquinone-4-imine (**3**) was obtained as unique product (71%). In aqueous HCl 0.5 N and at room temperature, a mixture of **3** (20%), N-(3-pyrazolyl)-4-amino-1,2-naphthoquinone (**4**, 5%) and 2-(3-pyrazolylamino)-N-(3-pyrazolyl)-1,4-naphthoquinone-4-imine (**5**, 43%) were isolated. On the other hand, in aqueous HCl 0.5 N at reflux, the reaction afforded a mixture of **4** (7%) and 2-hydroxy-1,4-naphthoquinone (*Lawson*, 17%).

The spectral data [including the 2D NMR spectroscopy (HETCOR)] were consistent with the proposed structures for **3-5**. The possible reaction mechanism is discussed and evidence is presented to discard the existence of isomers arising from the tautomeric equilibrium of the pyrazole ring.

References and Notes

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