Microwaves promoted an efficient synthesis of 1-thiocarbamoyl-3,5-diaryl-4,5-dihydropyrazoles

Marina Ritter[1], Silvana Alves Rosa[1], Caroline Carapina da Silva[1], Alex C. F. Flores[2], Lucas Pizzuti[3] and Claudio Martin Pereira de Pereira[1*]

[1]Universidade Federal de Pelotas, RS, Brasil; [2] Universidade Federal de Santa Maria, RS, Brasil;

[3]Universidade Federal da Grande Dourados, MS, Brasil.

**claudiochemistry@gmail.com*

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INTRODUCTION

Pyrazoles are a class of heterocycles with five members, containing two atoms of nitrogen in adjacent positions. Diverse ranges of biological properties are associated with these molecules, including antimicrobial, antitumor, anti-inflammatory, antiviral, anticonvulsant and antidepressant activities[1].

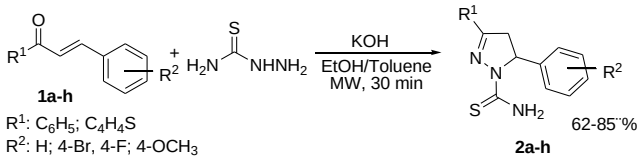
The current situation of environmental degradation demands from the chemical community the development of more efficient and cleaner methodologies in regard to energy consumption and reduction of waste. In agreement with this demand, we prepared several classes of heterocyclic compounds by non-conventional methods such as microwaves[2] and sonochemistry[3].

The success of microwave technology is based on the dipole rotation, which is responsible for heating the substances efficiently, occurring directly in the molecules.[4] In this work, we report the synthesis of pyrazoles derivated from chalcones under microwave irradiation.

RESULTS AND DISCUSSION

The reaction was performed at microwave using the precursors **1a-h** (chalcones prepared as recently reported[5]) and thiosemicarbazide in 10 mL of toluene/ethanol solution (3:1) with KOH 18% m/v as a catalyst. Pyrazoles **2a-h** were obtained in high yields. The reaction is shown in Scheme 1.

Scheme 1. Synthesis of pyrazoles **2a-h**.



1a-h

R^1: C_6H_5; C_4H_4S

R^2: H; 4-Br, 4-F; 4-OCH_3

2a-h

First, the molecules **2a-h** (Table 1) were isolated with chloroform and dried with anhydrous sodium sulfate. Then, they were filtrated and the solvent was evaporated to obtain the interesting compounds. These compounds were purified with a mixture of hexane and ethyl acetate under heating. The reactions were monitored by Mass Spectrometry analysis (CG/MS). All compounds exhibited physical and spectrometric properties consistent with the proposed structures and in agreement with the literature. The results are displayed in table 1.

Table 1. Pyrazoles **3a-h.**

	R^1	R^2	MW (g/mol)	Yield (%)
2a	C_6H_5	H	281,10	85
2b	C_6H_5	4-Br	359,01	79
2c	C_6H_5	4-Cl	315,06	62
2d	C_6H_5	4-OCH_3	311,11	77
2e	C_4H_4S	H	287,10	83
2f	C_4H_4S	4-Br	364,97	78
2g	C_4H_4S	4-Cl	321,02	74
2h	C_4H_4S	4-OCH_3	317,07	82

CONCLUSION

Concluding, we have developed an efficient and improved protocol for the preparation of a series of 1-thiocarbamoyl-3,5-diaryl-4,5-dihydropyrazoles from chalcones and thiosemicarbazide under alkaline catalysis. Our procedure in microwaves offers advantages compared to conventional method[6], such as improved yields and lower reaction time. Microwave reduced the time of reaction to 30 minutes, whereas in method using reflux, the time necessary was since 3 to 6 hours, which makes it a useful and environmentally attractive strategy for the synthesis of pyrazoles derivatives.

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