Efficient sonochemical synthesis of thiazolidinones from piperonilamine

Juliano Bosenbecker, Daniela P. Gouvêa, Thayli R. Araujo, Venise A. Gouvêa, Wilson Cunico*

Núcleo de Química Aplicada (NuQuia), Departamento de Química Orgânica, UFPel, Pelotas, RS, Brazil

*wjcunico@yahoo.com.br

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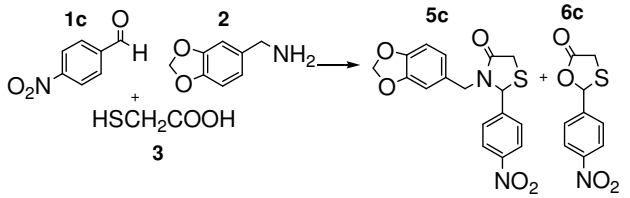
INTRODUCTION

Thiazolidinones are important five-membered heterocycles that have valuable biological activities in the medicine chemistry[1]. Recently, we published an efficient, solvent free improved synthesis of 2-(alkyl/aryl)-3-arylamino-1,3 thiazolidin-4-ones from hydrazones.[2] In our research program, there is also an interest in improving the methodologies for the preparation of such heterocycles by non-traditional conditions like sonocatalysis. Ultrasound irradiation has been utilized to accelerate a number of synthetically useful reactions during the last few years. In continuation of our studies, the aim of this paper is the sonocatalysis synthesis of heterocyclic thiazolidinones from the cyclocondensation reaction of piperonilamine, arenealdehydes and mercaptoacetic acid.

RESULTS AND DISCUSSION

The conventional syntesis of thiazolidinones **5a-k** is carried out with one equivalent of piperonylamine, one equivalent of arenealdehyde and three equivalents of mercaptoacetic acid for 16 h.[3] The study of reaction conditions in ultrasound irradiation for the preparation of compound **5c** is summarized in Scheme 1 and the progress of reaction was monitored by GC analysis.

Scheme 1



Equimolar proportion amine:aldehyde:acid	Yield (%)[b]	GC-Analyses (%)	
		5c	By-product
1:1:1	62	68	20
1:1:3	65	73	17
1:2+3[a]	100	42	48
1:1+1[a]	92	89	-
1:1+3[a]	85	88	4

[a] – mercaptoacetic acid added after 2,5 minutes. [b] – crude product

So, the thiazolidinones **5a-**j were synthesized in good yields from the reaction of one equivalent of piperonilamine **2** and one equivalent of arenealdehydes **1a-j** using ultrasound irradiation for 2.5 minutes. After this time, the mercaptoacetic acid **4** was added and the reactions were sonicated for more 2.5 min. The structures of heterocycles **5a-j** were confirmed by ^1H,^{13}C NMR.

Scheme 2

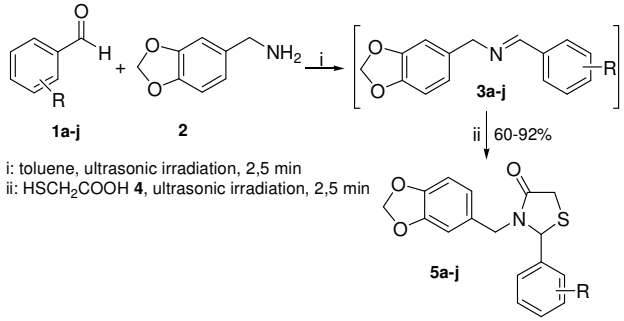


Table 1. Yields of thiazolidinones **5a-k**

Product	R	Ultrasound yield (%)[a]	Conventional yield (%)[b]
5a	2-NO_2	82	69
5b	3-NO_2	85	77
5c	4-NO_2	92	90
5d	2-F	65	71
5e	3-F	60	75
5f	4-F	70	51
5g	2-OCH_3	66	65
5h	3-OCH_3	74	84
5i	4-OCH_3	72	81
5j	4-CN	79	70

[a] Yields of isolated compounds
[b] Data from the literature Ref [3]

CONCLUSION

The sonochemistry procedure can be used as a replacement for conventional thermal synthetic methodology, allowing rapid access to a wide range of thiazolidinones and reducing the reaction times.

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