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AN EFFICIENT TBAB CATALYZED SYNTHESIS OF 2-ARYL-BENZIMIDAZOLE DERIVATIVES

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ABSTRACT

A one pot synthesis of bioactive benzimidazole derivatives by reaction of *o*-phenylenediamine (OPD) with various aryl aldehydesin the presence of catalytic amount of tetrabutylammonium bromide (TBAB) in short reaction time at room temperature with excellent yield.

KEYWORDS: Tetrabutylammonium bromide [TBAB]; 2-Aryl-benzimidazoles; *o*-phenylenediamine; Short reaction time.

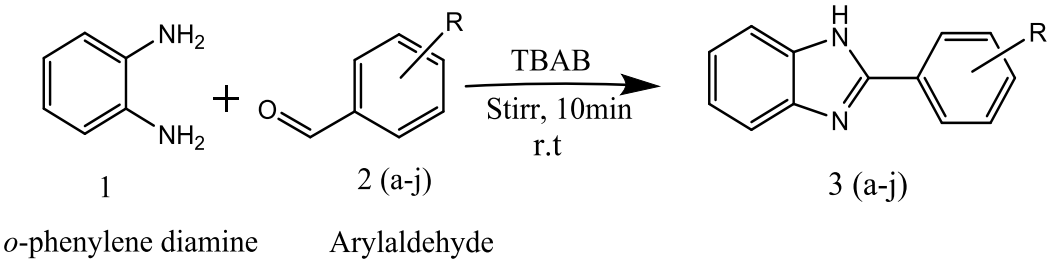
INTRODUCTION

Benzimidazole and their derivatives are very important class of heterocyclic compounds.[1] Substituted benzimidazoles have found applications in diverse therapeutic areas such as antihypertensive[2-3],antiulcer,[4-6] antiviral[7], antifungal[8-9], anti-tubercular[10], anti-oxidant[11-12], anti-cancer[13],anti-inflammatory[14], activities etc. Literature review reveals that various benzimidazole derivatives have excellent application in medicine praxis.[15] Generally 2-substituted benzimidazole derivatives are prepared by coupling of *o*-phenylenediamine and carboxylic acids[16-19], and by oxidative cyclo dehydrogenation of aniline schiffs bases, from the condensation of o-phenylenediamines and aldehydes.[20-25] These reported reactions usually requires longer reaction times, low yields, harsh reaction conditions and excessive use of reagents and catalysts. We wish to report environment friendly methodology to obtain this pharmacophore from condensation and cyclization of aryl aldehydes with *o*-phenylenediamine under phase transfer catalyst [TBAB] condition. As a part of our research program on development of environment friendly methods for the synthesis of heterocyclic compounds[26,27], we herein report the synthesis of 2-aryl benzimidazole derivatives starting from aryl aldehydes and o-phenylenediamine under stirring at room temperature in presence of catalytic amount of tetrabutylammonium bromide [TBAB].

RESULT AND DISCUSSION

In the current strategy, the synthesis of 2-aryl substituted benzimidazole derivatives has been carried out successfully by condensation and cyclization of aryl aldehydes with *o*-phenylenediamine in presence of tetrabutylammonium bromide in short reaction time (10 min) with excellent yield of the product. The progress of the reaction was monitored by TLC.

It is interested to note that no product formation was observed in the absence of catalyst. The results of synthesized products 3(a-j) are summarized in table. All the products are known compounds and were characterized by comparison of their physical and spectral data with authentic samples.



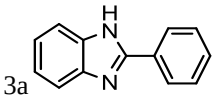
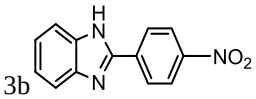
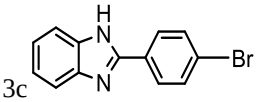
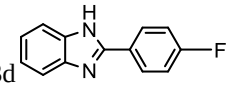
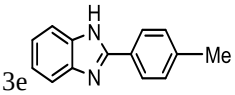
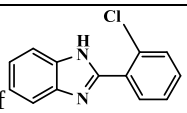
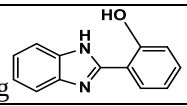
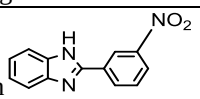
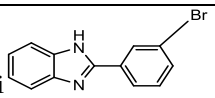
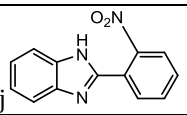
1 — *o*-phenylene diamine

2 (a-j) — Arylaldehyde

3 (a-j)

Scheme : Synthesis of 2-aryl-benzimidazoles with TBAB

Table: TBAB-Catalyzed Synthesis of 2-Aryl-benzimidazoles under mild conditions.

Entry	Products	R	Yields (%)	M.P;^{0}C
1	 3a	H	95	286-290
2	 3b	4-NO_2	90	310-312
3	 3c	4-Br	90	298-299
4	 3d	4-F	94	202-204
5	 3e	4-Me	94	272-274
6	 3f	2-Cl	95	156-158
7	 3g	2-OH	92	235-237
8	 3h	3-NO_2	95	205-207
9	 3i	3-Br	90	217-219
10	 3j	2-NO_2	95	263-265

EXPERIMENTAL

Chemicals used in this work were purchased from Aldrich and Merck chemical companies and used without purification. IR spectra were recorded on a Shimadzu 435-U-04 FT spectrometer as KBr pellets. ^{1}H NMR spectra were measured in DMSO-CDCl3 with a Bruker DRX-400 Advance instrument at 400 and 100 MHz, respectively, using Me4Si as internal standard. Mass spectra were recorded with a spectrometer Finnegan-MAT 8430 operating at an ionization potential of 70 eV. Melting points were measured on a SMPI apparatus.

GENERAL PROCEDURE FOR THE SYNTHESISOF 2-ARYL-BENZIMIDAZOLES DERIVATIVES (3a-j)

A mixture of o-phenylenediamine (10 mmole), aryl aldehydes (10 mmole) and phase transfer catalyst TBAB (catalytic amount) was stir for 10 min in ethyl alcohol (10 mL) at room temperature, after completion of reaction (monitored by TLC) the reaction mixture was poured on crushed ice, the solid was filtered and recrystallized from ethyl alcohol or subjected to purify the product by column chromatography. The corresponding 2-aryl-benzimidazole derivatives in 90 - 95% yield are obtained.

CONCLUSION

Here in we have developed an efficient and eco-friendly methodology for the synthesis of 2-aryl-benzimidazole derivatives from *o*-phenylenediamine (OPD) with various aryl aldehydes catalyzed bytetrabutylammonium bromide (TBAB). The present protocol has various advantages over reported methods such as nonpoisonous catalyst, easyworkout procedure, short reaction time and excellent yield.

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