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Synthesis of Substituted Benzimidazole Derivatives using Alanine as Catalyst

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Abstract: *Both benzimidazole and its derivatives have a wide range of biological actions. They possess a range of fascinating biological traits, such as anticancer, antidiabetic, antiviral, and antibacterial. In the presence of alanine and sonication, orthophenylene diamine was coupled with an aromatic aldehyde to create novel benzimidazole derivatives. The solution made use of a novice course that was also financially viable.*

Keywords: O-Phenylenediamine, Catalyst, Green Route.

I. INTRODUCTION

Benzimidazole and its equivalents demonstrate a variety of biological actions in the pharmaceutical industry. The benzimidazole group is present in a wide variety of bioactive compounds, including those having anticancer, antiviral, and antihypertensive properties. They demonstrate antiviral action against the herpes (HSV-1) virus, HIV, and influenza viruses [1-6]. Moreover, they are employed in clinical medicine as an antiviral, antitumor, and anti-ulcer drug. Treatment options for them include the management of ischemia repression, traumatic hypertension, and obesity [7–10]. This benzimidazole make it feasible to develop highly desired, widely used organic compound chemical processing techniques that are simple, successful, environmentally safe, and commercially viable. It is possible to make 2-substituted benzimidazole in a variety of ways. The majority of the time, O-phenyldiamines is condensed with a range of carbonyl substances, such as carboxylic acid, nitriles, imides, orthoesters, orthoformate, and orthoacetate [11–19]. Reacting it with various aromatic aldehydes and o-Phenylenediamine while employing cobalt (II), magnesium chloride, chloride hexahydrate, ferric chloride, and ferrous sulphate as catalysts is a quick and practical technique to create 2-arylbenzimidazole. In the presence of strong oxidising agents such I2/KI/K2CO3, N-halosucciamide (Cl, Br, I), Yb (OTf)3, PEG-100, and (NH4)H2PW12O4 as well as mineral acids like hydrochloric acid and polyphosphoric acid, O-Phenylenediamine condensation with carbonyl compounds occurs [18-22]. Without considerably boosting activity, the method works with substituted o-Phenylenediamine, aromatic, unsaturated, and aliphatic aldehydes. It converts Phenylenediamine and aldehydes into variously substituted benzimidazole in good yields without the need of solvents. A few methods made no claims that they were ubiquitous or flexible enough to work with various beginning materials. These techniques consume more organic solvent, produce less, are not recyclable, have lower purity, take longer, and cause more pollution.

II. EXPERIMENTAL

Using the basic paraffin Bath method, the melting point is determined. H1NMR spectra (CDCl3) were acquired using a Bruker Advance I 300 NMR spectrophotometer, with TMS serving as the internal standard. Nujol mull IR spectra in the frequency region of 4000-450 cm-1 were recorded using a Shimadzu FTIR spectrophotometer. Use of S.d.fine chemicals. On silica gel-G plates, the purity of the compound was analysed using thin-layer chromatography. [28-30]

Experimental procedure for synthesis of 2 substituted benzimidazole derivative

A mixture of 10 mmol of substituted aromatic aldehyde, 10 mmol of orthophenyldiamine, and 5 mmol of alanine was treated to a chemical reaction at 84 0 °C for the specified period in a sonicator. Using thin-layer chromatography, the reaction is observed. After the reaction is complete, water is added, and then the product is extracted with organic

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solvent and purified using silica. The product was roughly 90% pure when it was obtained. There are no adverse effects. The catalyst is recycled five to six times.

Observation Table

Sr. No	Aromatic Group	Time (Min)	(%) Yield	MP (0C)
1	2-phenyl-1H-benzimidazole	85	75	290
2	2-(2-chlorophenyl)-1H-benzimidazole	75	80	134
3	2-(3-chlorophenyl)-1H-benzimidazole	75	96	229
4	2-(4-methoxyphenyl)-1H-benzimidazole	95	86	221
5	2-(2-nitrophenyl)-1H-benzimidazole	70	95	254
6	2-(3-nitrophenyl)-1H-benzimidazole	70	92	301
7	2-(4-nitrophenyl)-1H-benzimidazole	70	96	303
8	2-(2-methoxyphenyl)-1H-benzimidazole	95	60	267
9	2-(tetrahydrofuran-2-yl)-1H-benzimidazole	80	80	285

III. DISCUSSION

We have created a superior method for the synthesis of benzimidazole derivatives in terms of time, purity, yield, and cost. The catalyst employed in this process is recyclable. Low-priced and easily accessible catalyst.

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