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Orange Peel Waste Serves as an Effective Catalyst in the Straightforward Synthesis of Certain Benzimidazole

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Abstract:*The biological and other actions of benzimidazole and its derivatives span a fairly wide range. They consist of many different activities, such as those that are anti-inflammatory, anthelmintic, fungicidal, and anti-parasitic. In this study, we created a number of substituted benzimidazole derivatives by synthesising them from waste orange peels that contain an organic acid those catalyses the process. High purity and exceptional yield are provided by this.*

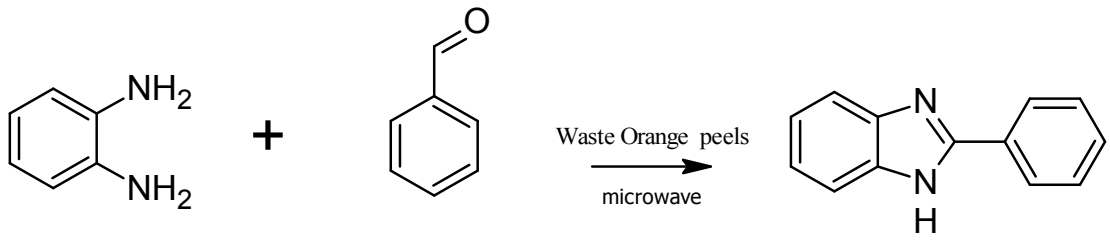
Keywords: Excellent Yield, Waste Orange Peels, and Benzimidazole Derivatives

I. INTRODUCTION

In the production of pharmacological and bioactive compounds, benzimidazole and imidazole are crucial and practical intermediates [1–10]. Many antivirals, antimalarial, antifungal, antiparasitic, and other therapeutic and pharmacological compounds include the benzimidazole ring [10–14]. For the synthesis of 2-substituted benzimidazole, there are two general approaches [8–19]. The most often used technique is the condensation reaction of o-phenylenediamine [11–15] with carboxylic acids or their derivatives, such as nitriles, imidates, or orthoesters [16–19], when combined with extremely high temperatures, microwave radiation, or strongly acidic conditions. The second includes the alternating condensation of o-phenylenediamine with an aldehyde, which results in an oxidative cyclocondensation reaction of Schiff bases.

The creation of benzimidazoles has involved the employment of a variety of oxidants and catalysts. Despite the fact that many of these procedures have been successful, some of them have one or more drawbacks, such as low yields, the use of volatile or toxic organic solvents, the demand for excessive amounts of catalysts or reagents, the need for specialised equipment, or unpleasant reactions. conditions. Thus, it remains a difficult research task to develop a practical, highly productive, and environmentally friendly method for the synthesis of benzimidazoles. We wish to describe a straightforward process for the manufacture of 2-arylbenzimidazoles utilising the condensation reaction of o-phenylenediamine in light of the important biological activity of benzimidazoles and in accordance with our research work in the synthesis of this ring system [20-24]. aromatic aldehydes, etc. discarded orange peels act as a catalyst when present.

Reaction Scheme



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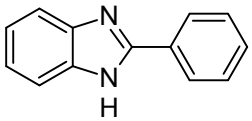
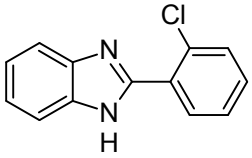
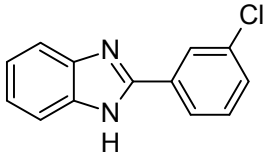
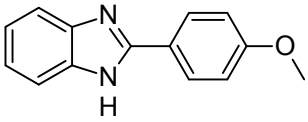
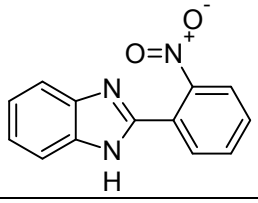
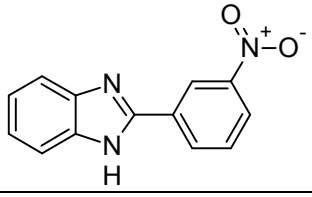
Experimental

The method using paraffin tubes is used to record melting points. TMS served as the internal standard and CDCl3 served as the solvent as NMR spectra were collected using a Bruker Advance I 300 NMR spectrophotometer. With a Shimadzu FTIR spectrophotometer, IR spectra in the frequency range of 4000-450 cm-1 were captured in Nujol mull. S.d.fine chemicals were used. By using thin layer chromatography on silica gel G plates, the compound's purity was examined. [25-27]

Experimental procedure for synthesis of 2 substituted benzimidazole derivative

Add 10 mmol of a substituted aromatic aldehyde, 10 mmol of orthophenyldiamine, and 3-5 ml of the juice from used orange peels to the mixture. exposed for 20 to 50 seconds, in three batches of ten seconds, to a chemical reaction in a microwave. Via thin layer chromatography, the reaction is being watched. Water is added once the reaction is finished, and the product is extracted in an organic solvent such dichloromethane and refined over silica. Around 85–90% of the product was obtained with good purity. There is no adverse effect. The catalyst is recycled and utilised five to six times.

Observation Table

Sr. No	Aromatic Group	Time Seconds	(%)Yield	MP (0C)
1.		75	85	290
2.		60	90	134
3.		60	95	229
4.		95	95	221
5.		60	95	254
6.		60	96	301
7.		60	95	303

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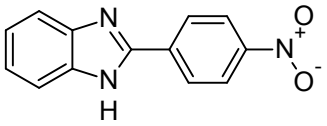
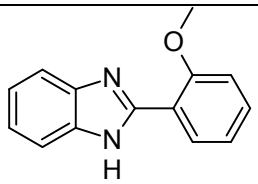
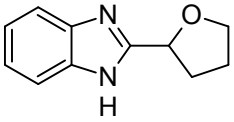
				
8.		95	70	267
9.		80	50	285

II. DISCUSSION

We have created a green synthesis method for benzimidazole derivatives. Waste orange peels are used as a catalyst. They contain various acids that lead to the condensation of orthophenyldiamines with aromatic aldehydes. Produced with good yield and purity.

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