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A NOVEL PROCEDURE AND A TENABLE MECHANISM FOR THE SYNTHESIS OF 4-(4,5-DIPHENYL-1H-IMIDAZOL-2-YL)-1-PHENYL-1H-1,2,3-TRIAZOLE

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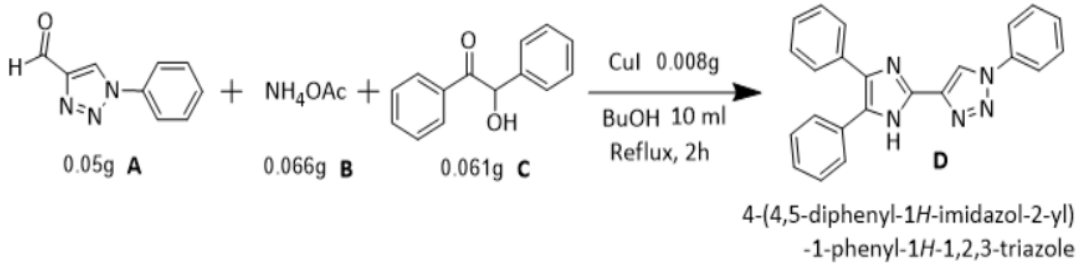
ABSTRACT
We developed a streamlined synthesis method for titled molecule, employing 1-phenyl-1H-1,2,3-triazole-4-carbaldehyde (reactant A), ammonium acetate (reactant B) and benzoin (reactant C), Copper Iodide (CuI) and Butanol (BuOH) as a solvent. A conceivable pathway for the reaction has been suggested. The synthesis procedure was characterized by the ease of handling of reagents and conducted on a microscale to ensure control, minimize reagent consumption, and enhance safety. The yield amounted to 43%.

KEYWORDS Triazole, anti-bacterial, microscale

INTRODUCTION
Heterocycles serve as pivotal players in the intricate realm of drug research and development [i]. Among these, 1,2,3-triazoles emerge less vulnerable to metabolic breakdown compared to their counterparts [ii]. The integration of 1,2,3-triazole motifs into drug compounds through the application of click chemistry methodologies has garnered considerable acclaim. This stems from their capacity to forge steadfast molecular bonds imbued with hydrogen interactions, thereby augmenting drug solubility and efficacy [iii]. Consequently, pharmaceuticals incorporating 1,2,3-triazole scaffolds have been meticulously crafted, exhibiting a kaleidoscope of biological attributes, including but not limited to, anticancer [iv,v], antimicrobial [vi,vii], antiviral [viii], and anti-HIV [ix] properties. For ages, humanity has poured its labour and intellect into the quest for pharmaceuticals that either surpass existing standards or unveil entirely novel mechanisms of action. Rambling the uncharted avenue bolsters the horizon of research. We refine the chemical synthesis of a well-documented compound and meticulously elucidated the elusive proposition underlying our innovative approach.

EXPERIMENTAL SECTION INCLUDING GENERAL PROCEDURE

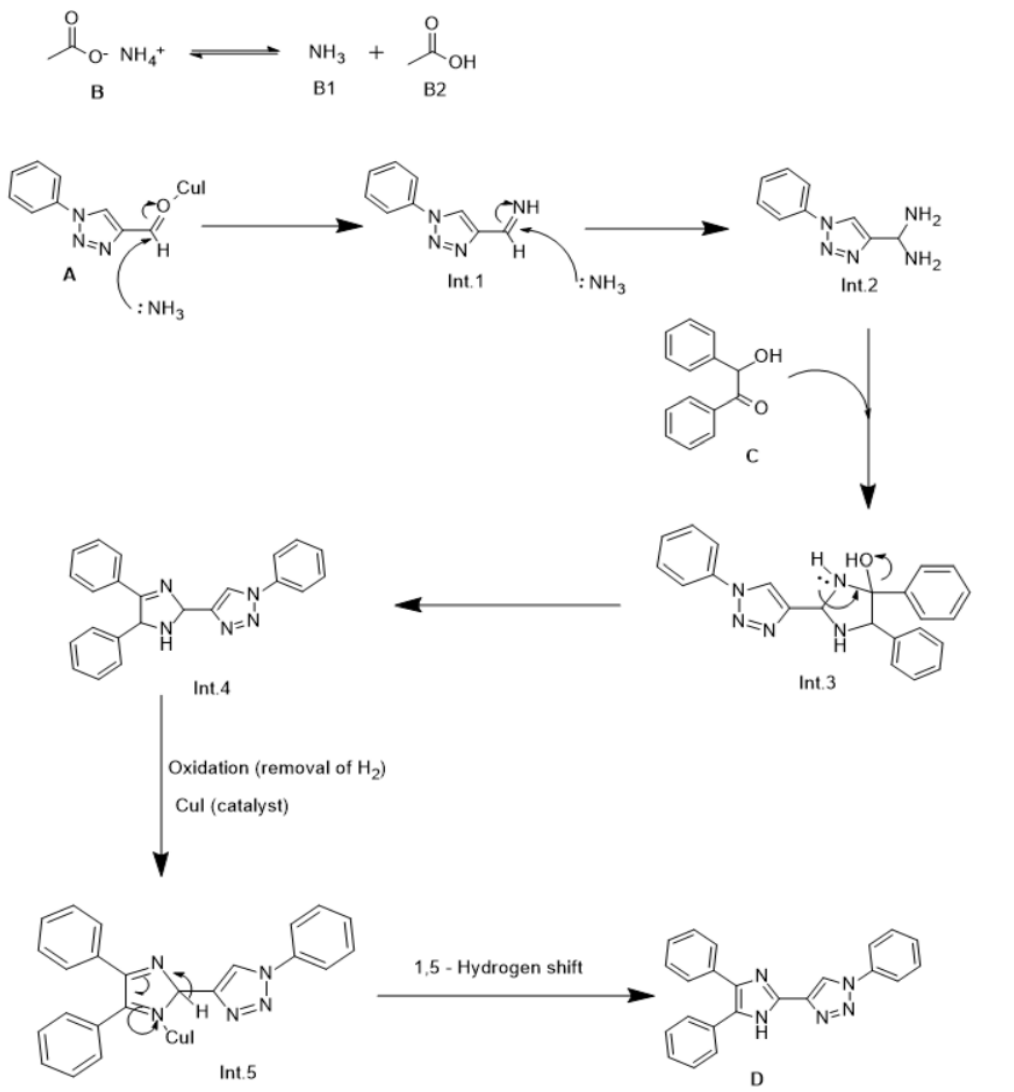
All chemical compounds were procured from Sigma-Aldrich and utilized in their pristine state without alteration. The method entails microlevel one-pot synthesis. Reactants A, B, C, solvent, and catalyst (in specified quantities) were conglomerated in a 50 ml r.b.f. and subjected to reflux. The advancement of reaction was gauged via TLC. On completion, solution was brought to r.t. and transferred onto crushed ice. The resultant precipitates were agitated and then filtered to procure an ample quantity of pure crude product (yellow, m.p. 210°C). Subsequently, the product underwent recrystallization utilizing ethanol solvent [x,xi].



Scheme S- Novel synthesis of the product D

RESULTS AND DISCUSSION

The proposed mechanism stems from a comprehensive review of pertinent literature and diverse experimental findings. Scheme S1 illustrates the tenable mechanism for the synthesis of product D. At the outset, condensation of reactant A with NH_3 derived from NH_4OAc yields Int. 1 which further reacts with NH_3 to form Int. 2. Concurrently, benzoin C reacts with Int.2 to form Int. 3. Following this, Int. 3 undergoes dehydration, leading to the formation of Int. 4, which is then oxidized in the presence of CuI catalyst to produce Int. 5. Ultimately, the desired product D is formed from the Int.5 via 1,5-[H] transfer [xii-xx]. The compound was characterized through 1H-NMR and mass spectra. The results of 1H-NMR spectra are- δ 13.00 (s,1H), 8.08 (s,1H), 7.47 (m,4H), 7.51 (m,4H), 7.41 (m,4H), 7.58 (m,3H). From the analysis of Mass spectra, mass of compound has been found to be 363.16 $gmol^{-1}$.



Scheme S1–Elucidation of the best plausible mechanism for the aforementioned reaction Scheme S
(Here, Int. stands for Intermediate)

CONCLUSION

Literature shows that the compound D is anti-bacterial in nature. The same procedure was performed with benzil, but to our knowledge, this reaction has not been reported using benzoin as a reactant. The benefit of this procedure lies in its cost-effectiveness and solubility. In an endeavour to synthesize a novel product, the benzoin (reactant C) was substituted with α-pyridoin. The target was to obtain a novel product. However, the outcome yielded a mixture of products, as evidenced by multiple spots on the TLC plate. Furthermore, even after a 24-hour reaction duration, some quantity of α-pyridoin remained unreacted.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS

All the authors contributed significantly to this manuscript, participated in reviewing/editing, and approved the final draft of this short communication. The research profile of the authors can be verified from their ORCID IDs given below:

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