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A Review on synthesis of 2 4 5 triphenyl imidazole

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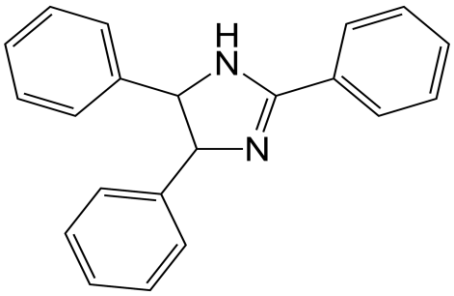
ABSTRACT :-

Based on a thorough examination of the literature, it has been found that imidazole derivatives possess a wide range of activities, such as antibacterial, analgesic, antitubercular, and anticancer properties. By making minor adjustments to the substituents on the fundamental imidazole structure, the potential for activity can be further enhanced. In comparison to certain other heterocyclic compounds, the histidine imidazole compound shares structural similarities, enabling easier interaction with protein molecules. Consequently, imidazole offers improved pharmacodynamic properties. Additionally, specific imidazole medications have the ability to directly block membranes at high doses without interfering with sterols and sterol esters. Recent therapeutic advancements have demonstrated that imidazole compounds exhibit enhanced efficacy and reduced toxicity. In response to the broad-spectrum effects of 2, 4, 5-triphenylimidazole derivatives, the decision was made to synthesize various 2, 4, 5-triphenyl-1-substituted imidazoles.

Key words:- Industrial; Medicinal; Biological; Imidazole; compounds Heterocyclic

Introduction:-

TRIPHENYL IMIDAZOLE



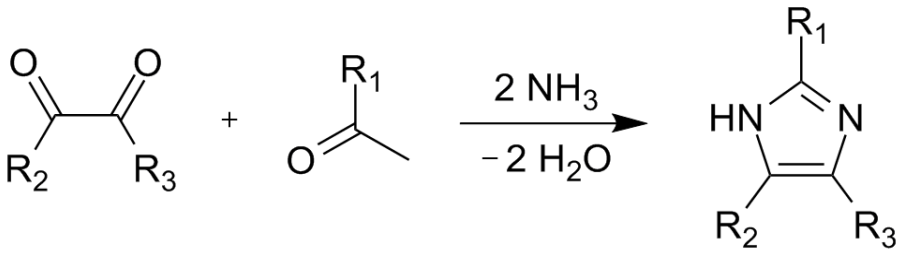
Imidazoles are widely recognized as one of the most well-known heterocycles, and they play a significant role in various natural products and pharmaceuticals. The chemical compound C21H16N2 has been identified since 1877, yet the crystal structure of the parent compound remains elusive despite the known structures of 36 derivatives of lophine. The arrangement of molecules in layers perpendicular to the b axis allows for the formation of hydrogen bonds between donor and acceptor atoms. The primary focus of research seems to be on developing new derivatives of 2,4,5-triphenylimidazole, which exhibit important biological activities such as analgesic and anti-inflammatory properties. Substituting the C-2 benzene nucleus with different groups has shown promising antifungal effects, while modifications at the 2 position of the imidazole ring have led to enhanced anti-inflammatory and antifungal activities. The addition of a thiol group to 2,4,5-triphenylimidazole has also resulted in increased activity, and replacing an abstractable hydrogen with an azole ring in the same compound has shown potent antibacterial and anti-inflammatory properties. In conclusion, imidazoles are indeed a crucial component in the field of medicinal research.

In the current study, a 1-H substituted 2,4,5 triphenyl imidazole derivative was synthesized and subjected to a biological activity screening. Imidazole holds great biological significance as it is a component of various important biological compounds. Histidine, an amino acid featuring an imidazole side chain, is particularly noteworthy. Histidine is present in numerous proteins and plays a crucial role in the structure and binding properties of enzymes like haemoglobin. Additionally, histidine can be decarboxylated to form histamine, a common biological molecule. Histamine is involved in allergic reactions and is a component of the toxin that mimics urticaria.

Imidazole:-

Imidazole, also known as 1,3-diaza-2,4-cyclopentadiene, is a five-membered ring system with 3 carbon atoms and 2 nitrogen atoms in positions 1 and 3, respectively, and a molecular formula of C_2H_2N. According to IUPAC nomenclature, imidazole is referred to as 1,3-diazole, with one of the nitrogen atoms in the ring bearing a hydrogen atom, resembling a pyrrole-type nitrogen. Imidazole is considered to be a basic aromatic compound, less basic than ammonia but more basic than pyridine. It displays tautomerism due to the hydrogen atom that can be found on either of the two nitrogen atoms.

Heinrich Debus synthesized imidazole for the first time in 1958, although different imidazole derivatives had already been reported as early as the 1840s. The imidazole depicted below was synthesized using formaldehyde and glyoxal in the presence of ammonia. (2)



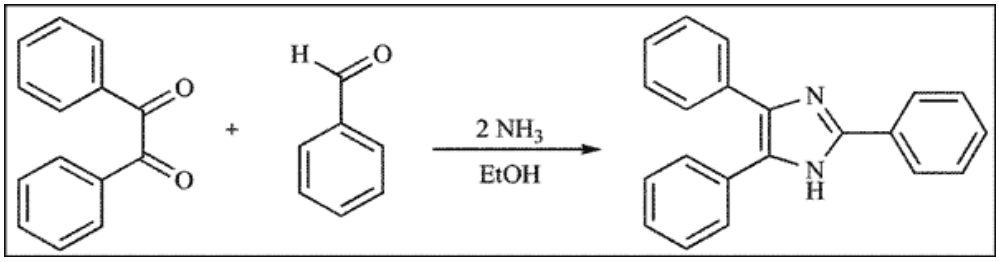
Chemical science.

Leucine is amphoteric, acting as both an acid and a base, while imidazole also exhibits amphoteric properties. The acidic pKa value is 14.5, with N-1 serving as a proton donor. The fundamental pKa of the conjugate is approximately 7. The basic site is located at N-3. Protonation of imidazole leads to the formation of the symmetric imidazolium cation.

General methods for synthesis of 2,4,5 triphenyl imidazole:-

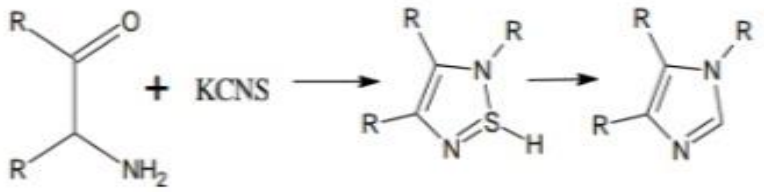
1)Radziszewski synthesis:-

The synthesis of 2, 4, 5-triphenyl-imidazole was reported by Radziszewski through the condensation of a dicarbonyl compound and aldehydes in the presence of ammonia.



2)Wallach synthesis:

The traction of N. N dimethylformamide with phosphorus pentachloride which is a chlorine- containing compound on reduction with hydroiodic acid gives N-methylimidazole by using the same conditions N. N- dimethylformamide is converted to chlorine compound which on reduction gives



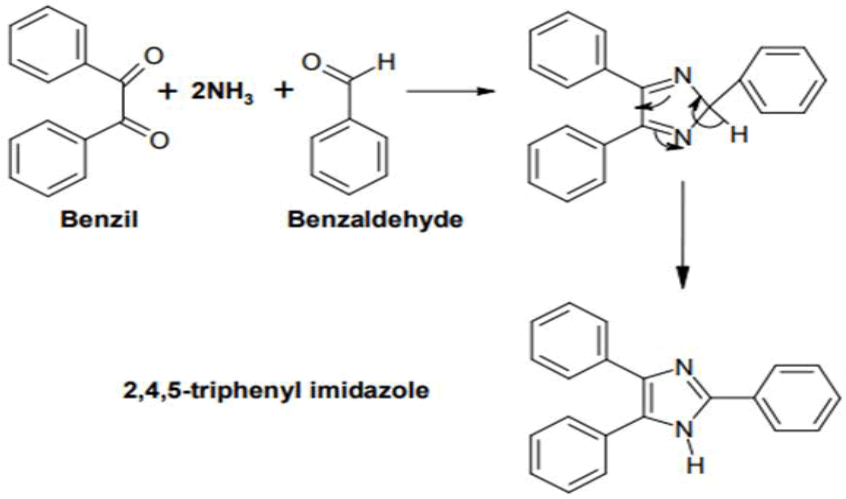
EXPERIMENTAL PROCEDURE:-

1. The synthesis of 2, 4, 5-triphenyl imidazole involved refluxing benzil, benzaldehyde, and ammonium acetate in an acetic acid medium at 100°C for a duration ranging from 5 to 24 hours.
Step 2:

The acid chloride was produced through the process of refluxing acid with an excess of thionyl chloride at a temperature of 80°C for a duration of 2-3 hours. The excess thionyl chloride was then eliminated through distillation.

Step 3:

The 1-substituted 2,4,5-triphenyl imidazoles were synthesized by refluxing 2,4,5-triphenyl imidazole and acid chloride in benzene as the solvent, with pyridine serving as a catalyst for a period of 4-5 hours. The resulting product was then isolated, dried, and subjected to recrystallization using ethanol.



Application of industrial purpose:-

Imidazole has been widely utilized as a corrosion inhibitor for various metallic elements, such as copper, for a considerable period of time. The prevention of copper corrosion is of utmost importance, particularly in aquatic systems where the conductivity of copper decreases due to corrosion.

Imidazole plays a significant role in numerous important industrial and technical chemicals. One example is the fire retardant polybenzimidazole (PBI), which contains imidazole fused to a benzene ring and bonded to another benzene. Imidazole is also present in various chemicals used in the fields of photography and electronics.

Although imidazole itself does not possess explicit functions, it serves as a precursor to a range of agrichemicals, including enilconazole, climbazole, clotrimazole, prochloraz, and bifonazole.

Conclusion:

The imidazole moiety has garnered significant attention in the field of therapeutic chemistry. Its analogues have proven to be effective against a variety of clinical disorders, which are briefly discussed in this article. Imidazole holds a unique position in the realm of medicinal chemistry, offering a broad range of therapeutic applications. Numerous methods for synthesizing imidazole have been developed, and their diverse structure-activity relationships hold great potential in the field of medicinal chemistry. Therefore, the purpose of this article is to thoroughly examine the published research on the introduction, chemistry, synthesis, properties, industrial applications, biological applications, and medicinal applications of imidazole derivatives. This will allow for a better understanding and exploration of their various properties and pharmacological potentials.

Various compounds have been synthesized and are currently undergoing therapeutic efficacy testing. Thanks to peer review and research on the biological and medicinal applications of imidazole derivatives, a comprehensive evaluation of these substances is available.

Imidazole has been utilized in the synthesis of numerous compounds with diverse pharmacological properties in the past, and it continues to hold promise for future applications against various pathological diseases. Additionally, imidazole has been found to have several industrial uses, thanks to an improved technique that yields high quantities of this compound. Furthermore, the chemical structure of imidazole compounds lends itself to a wide range of commercial applications.

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