IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Synthesis Of 2, 4, 5 -Triphenyl Imidazole

Ms. Sayali Barade 1, Ms. Reshma Devkate 2

Institute of pharmaceutical sciences and Research (for girls)(college code -6914) pune-solapur Highway , Swami chincholi (Bhigwan), Tal- Daund,Dist-pune413130

ABSTRACT

A simple, highly adaptable ,and effective synthesis of 2, 4, 5 -tri substituted imidazole is obtained.2, 4, 5-triphenyl imidazole is used for anti-cancer, anti-microbial, anti-inflammatory, anti-tubercular, and analgesic action.2, 4, 5 -triphenyl imidazole are synthesized by refluxing benzil, ammonium acetate, and benzaldehyde at 100°c for 5-24 hours.

Keyword : Anti-inflammatory activity, Anti-cancer, 2,4,5-triphenyl imidazole

INTRODUCTION

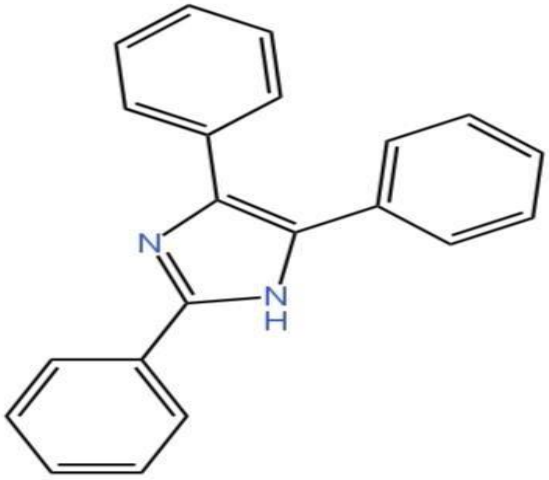
Imidazole is a heterocyclic compound, and these activities are important for biological activity. Imidazole is synthetic with naturally occurring derivatives.(14) Derivative of imidazole is used for anti- cancer, anti-inflammatory action.(13,17,18)Triphenyl imidazole was discovered in 1877. The crystal structure of 36 ancestral lophine is known; the three phenyl rings are bonded to imidazole, and they are not coplanar . This phenyl ring attached to the 2,4,5 position of imidazole ring. In this class, compound mechanism of action is inhibiting cyclooxygenase COX2(19)

Imidazole derivative are available in different pharmacology action(1) :

- Anti-depressant activity
- Anti-viral activity
- Anti-angiogenesis
- Anti-bacterial activity
- Anti-leishmanial activity

Chemical structure :The 2,4,5-triphenylimidazole molecule is present in 42 bonds(5) These molecules were divided in the Following way :

- 1 Five-membered ring
- three six-membered rings
- 23 aromatic bonds
- 3 rotatable bonds
- 23 multiple bonds



2,4,5-triphenylimidazol

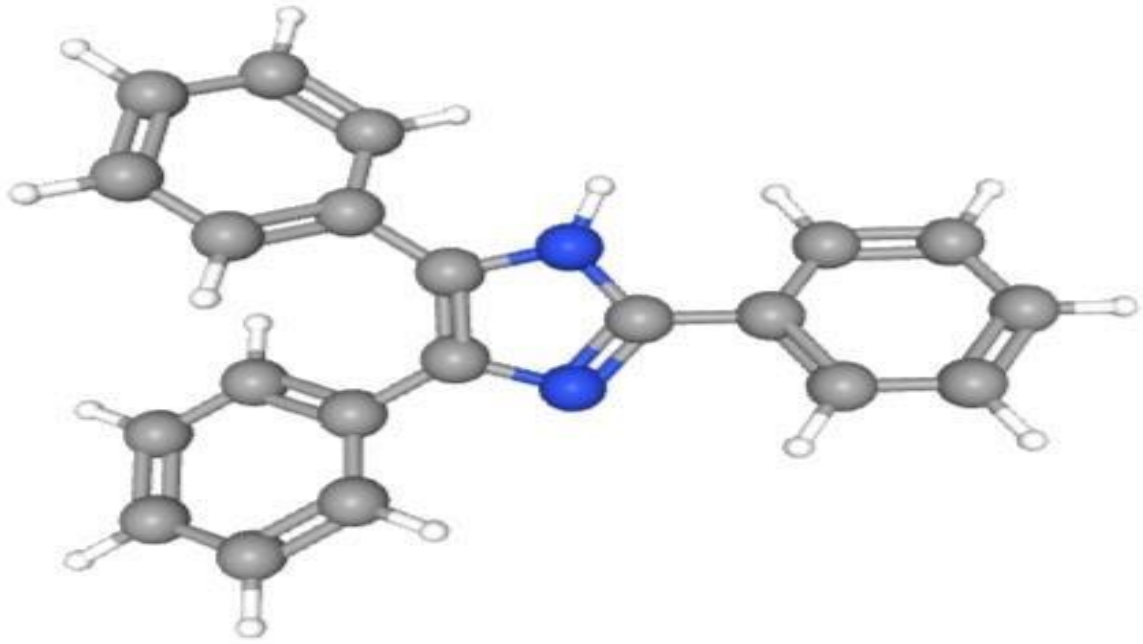
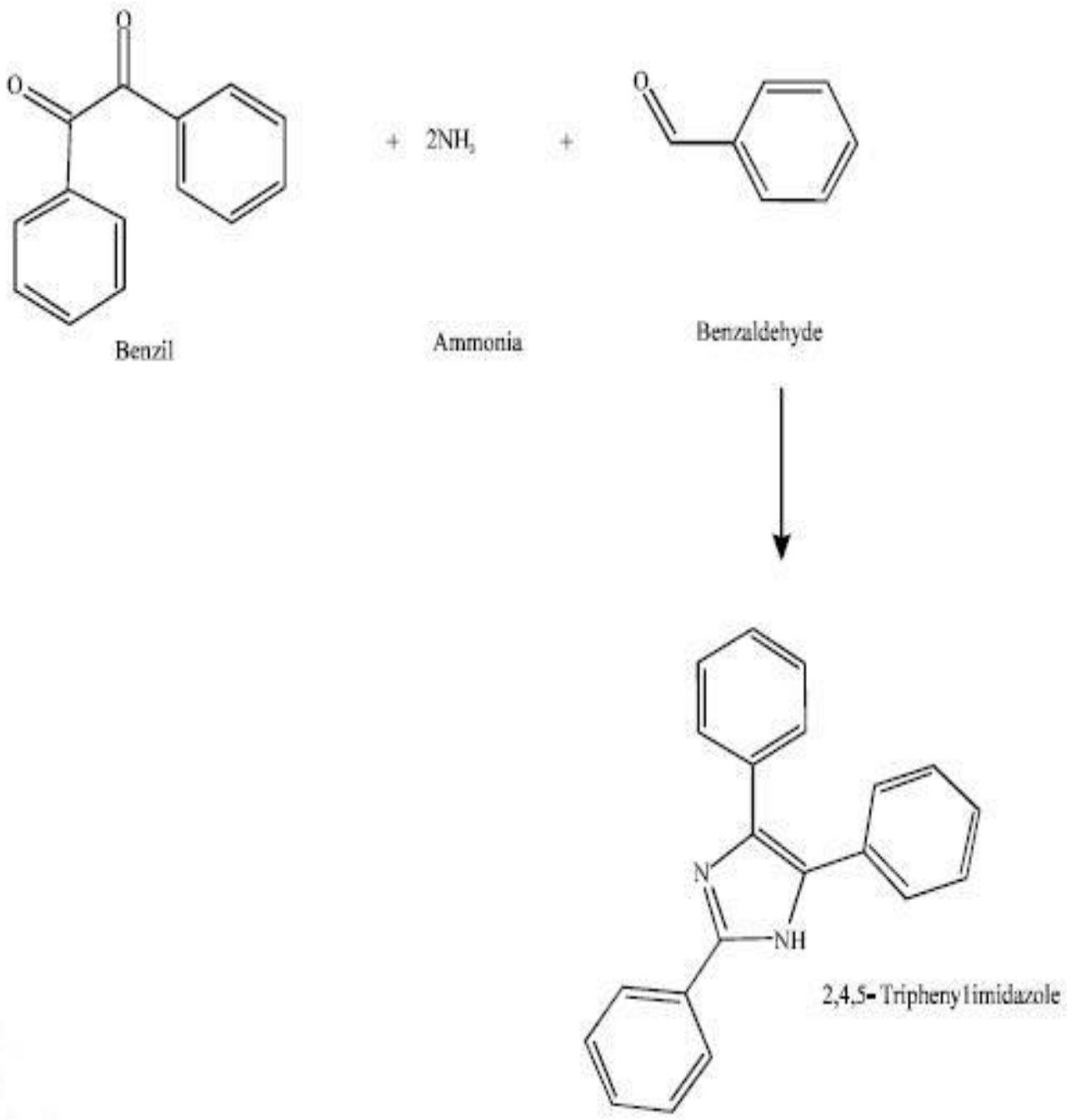


Fig.1 3D structure of 2 , 4 ,5-triphenyl imidazole

Scheme of Reaction

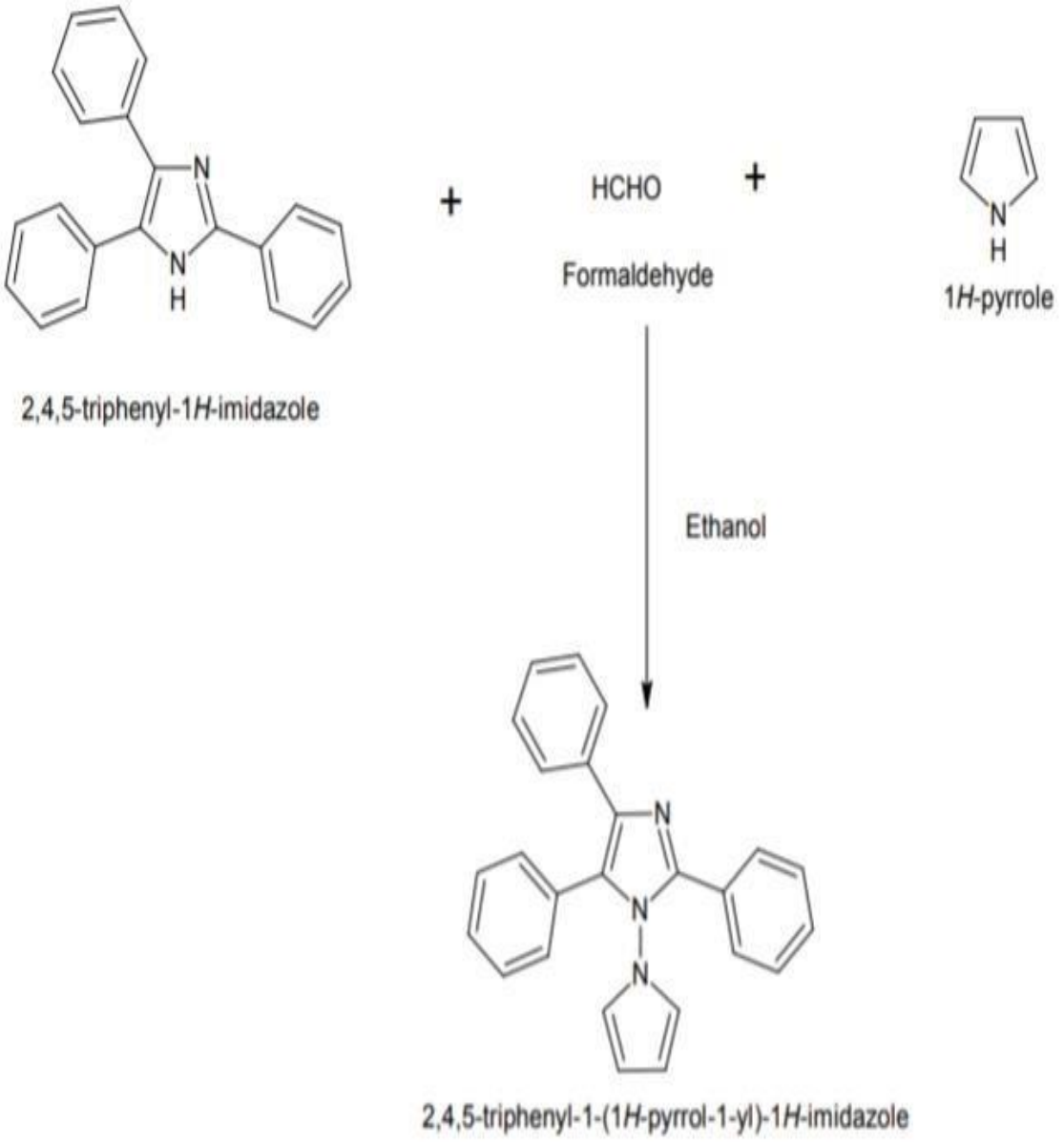
• Step-1

2,4,5-triphenylimidazole is synthesized by refluxing benzil, ammonium acetate,and benzaldehyde at 100°Cfor 5-24 hr.(18)



• step-2

2,4,5-triphenyl imidazole react with formaldehyde and pyrrole in the presence of ethanol to give the Formation of 2,4,5-triphenyl-1-(1-H pyrrole -1-yl)-1H-imidazol



2,4,5-triphenyl-1*H*-imidazole

2,4,5-triphenyl-1-(1*H*-pyrrol-1-yl)-1*H*-imidazole

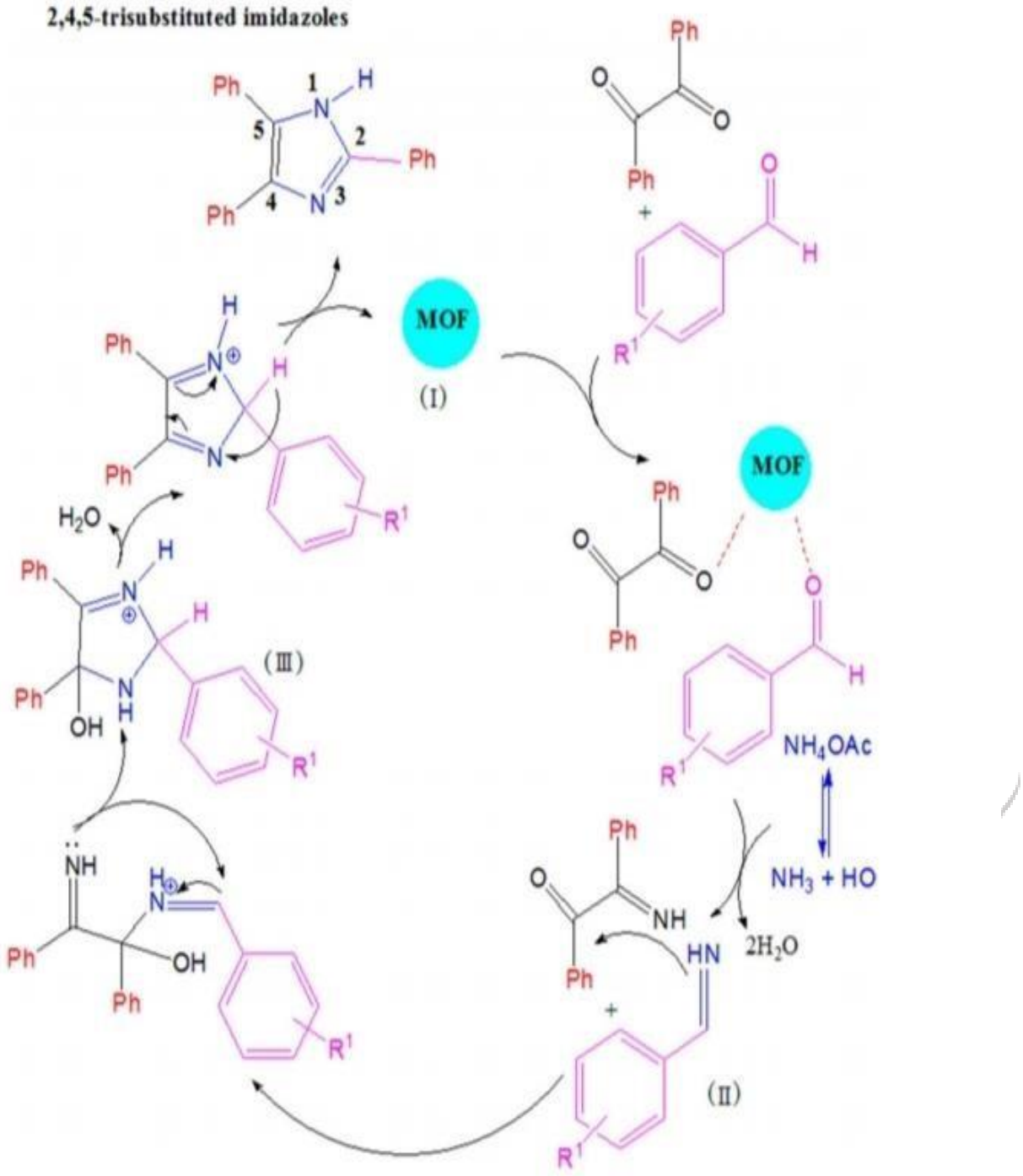


Fig.2 Mechanism of action 2,4,5- trisubstituted imidazole

Procedure : Step 1: First,take 1 gram of benzil and 1 gram of ammonium acetate, then place them in a round bottom flask . Then add 2ml of glacial acetic acid with 2 mL of benzaldehyde in round bottom flask . Then set the assembly and RBF on a water bath heating up to 100°C. After 3 to 4 hours, the reaction is completed. Now add 150 ml water and then add 2ml of ammoniu hydroxide to neutralize the acid with continuous stirring precipitate. After filtration, solid mass is washed with toluene and recrystalized in methanol.(12)

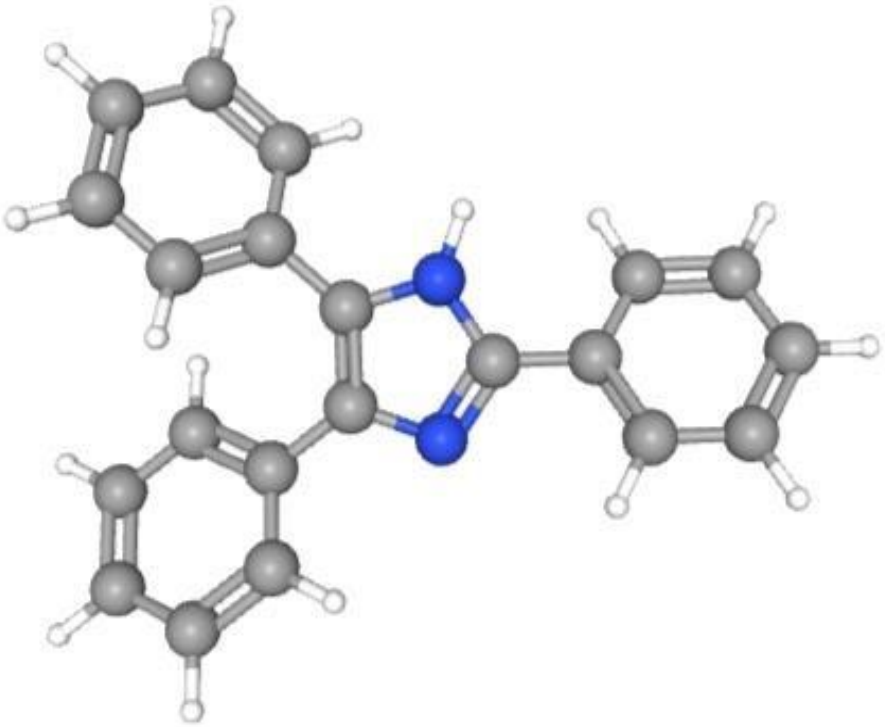
Fig.3 product of 2,4,5-triphenyl imidazole

Step 2: The blend of ethanolic solution of 0.01M sample and formaldehyde 3 gram was slowly added to ethanolic solution of pyrrole. The reaction mixture was agitated for more than one hour at room temperature and kept over night in a refrigerator. The solid form was filtered and washed with Ethanol.

Chemical properties

- Melting temperature - 274-278°C
- Boiling temperature - 427.96°C
- Density - 1.0874
- Refractive index - 1.8000
- Storage condition - Dry room temperature
- Color - White , Orange, Green • Solubility - Dissolve in methanol and does not dissolve in Water
- pKa value - 11.66
- Type of product - powder or crystal
- percent purity - 97%
- wavelength - 300nm

Physical properties



IUPAC name : 2,4,5-triphenyl 1H Imidazole

Molecular weight : 296.4 g/mol

Molecular Formula : C21H16N2

Synonyms : lophine, 1H imidazole

Brand name : Thermo Scientific Alfa Aesar

Uses: Most common use of 2,4,5- triphenyl Imidazole

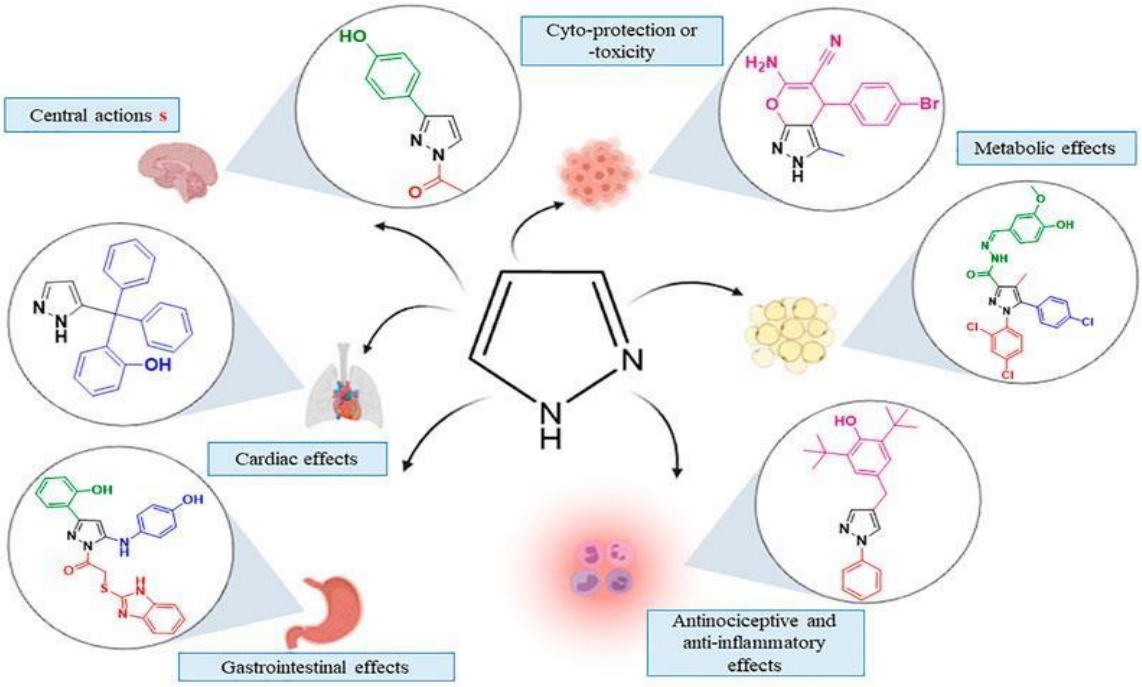


Fig.4 Uses of imidazole

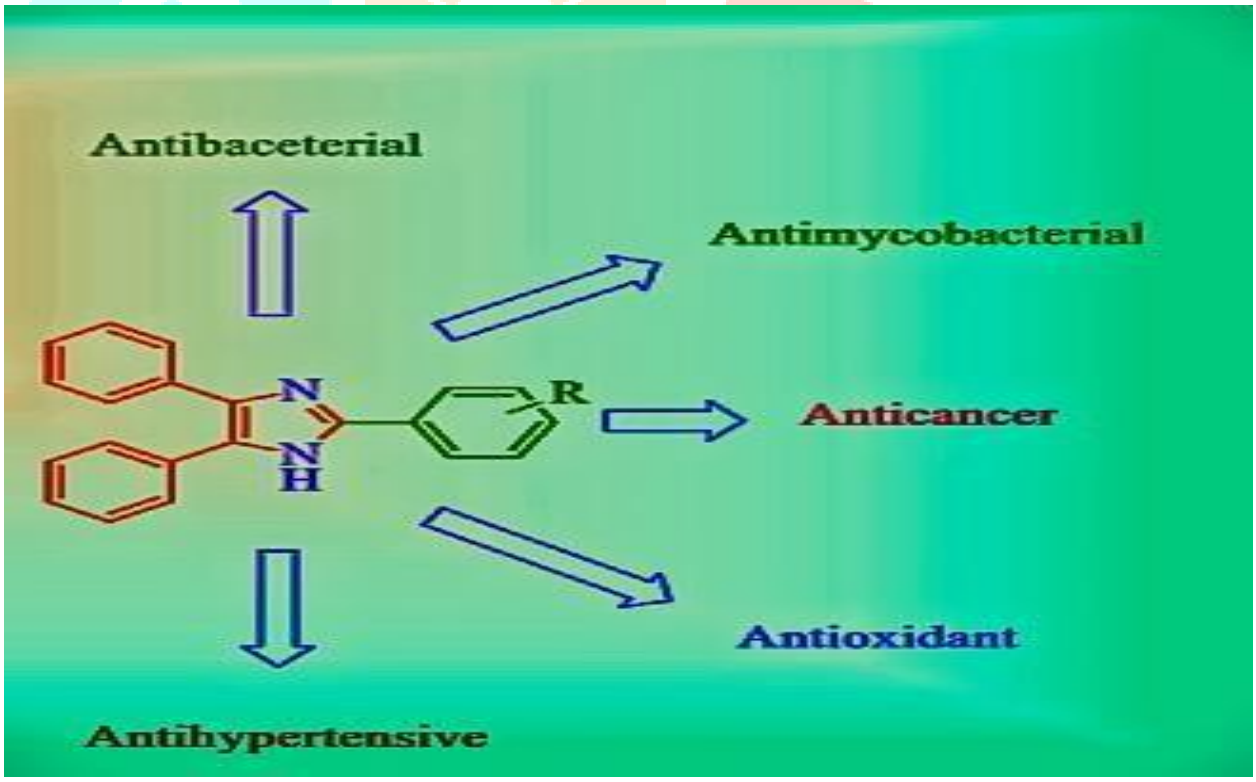


Fig.5 Uses of 2,4,5-triphenyl imidazole

Anti-inflammatory activity

2,4,5-triphenyl imidazole are derivatives of the imidazole ring, which has the largest antiinflammatory activity.(9) Inflammation was identified two thousand years ago by Celsus by the four Latin words: rubor, calor, tumor & dolor.

Anti-inflammatory drugs are most commonly used for rheumatoid arthritis and other inflammatory disease. These are long - term effects such as gastrointestinal ulceration, bleeding and nephrotoxicity.(21)

Anti-cancer Activity

Imidazole has anticancer activity. Imidazole was used as an anticancer agent and started with decarbazine, which triggered activity in the advancement of imidazole agents(22).

MTT Assay

This assay is Conscious, perceptible, and reliable assay for determining number of viable cells in a given Culture. It is a colorimetric - based assay to convert tetrazolium salt MTT, then form a pale yellow substrate into Formazan and purple dye.

Then cellular reduction is used as NADH/ NADPH, which is a pyridine nucleotide cofactor. Formazan product has low aqueous solubility and availble in purple crystal. These are dissolved in the Solubilization buffer, which is beneficial to product Formation. Then we measured the intensity range of 550 – 620 nm.

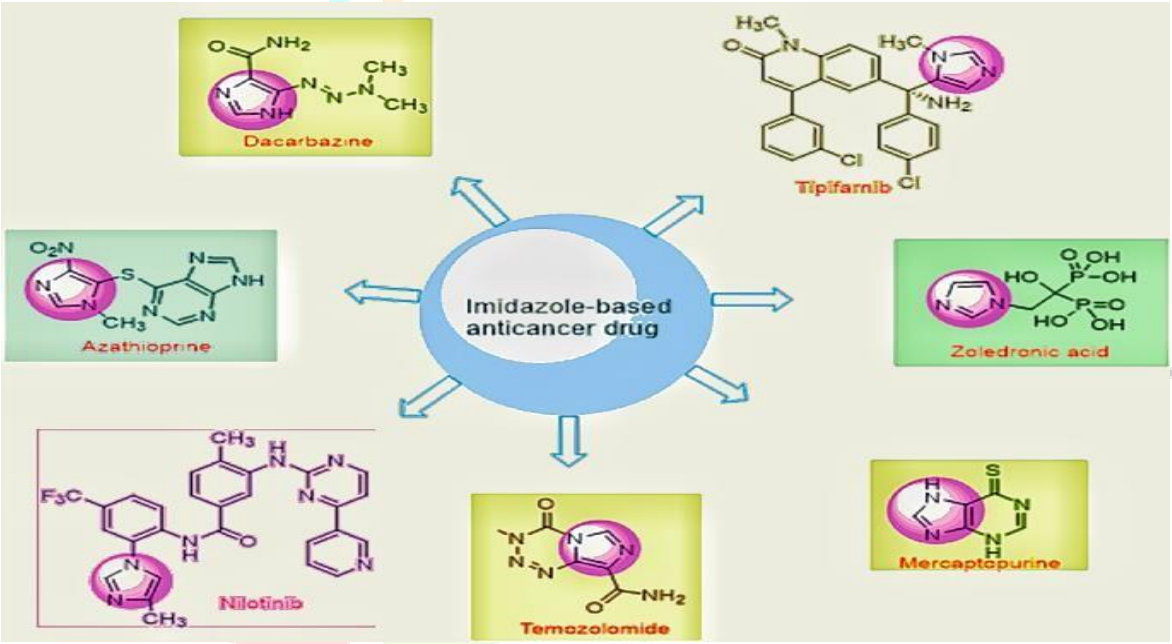


Fig.6 Imidazole based anti-cancer drug

Anti-fungal activity

Anti- fungal drug inhibit DNA synthesis and also inhibit the biosynthesis of ergosterol and disturb the synthesis of triglycerides and phospholipids. Anti-fungal drug are useful for treatment of vulvovaginal candidiasis, and topical drugs are also useful for the treatment of tinea pedis, tinea cruris, tinea corparis, tinea versicolor.(4)

A Marketable drug for anti-fungal activity

- Ketoconazol
- Miconazole
- Clotrimazole
- Econazole
- Tinidazole

- Fenticonazole
- Bifonazole
- Parconazole

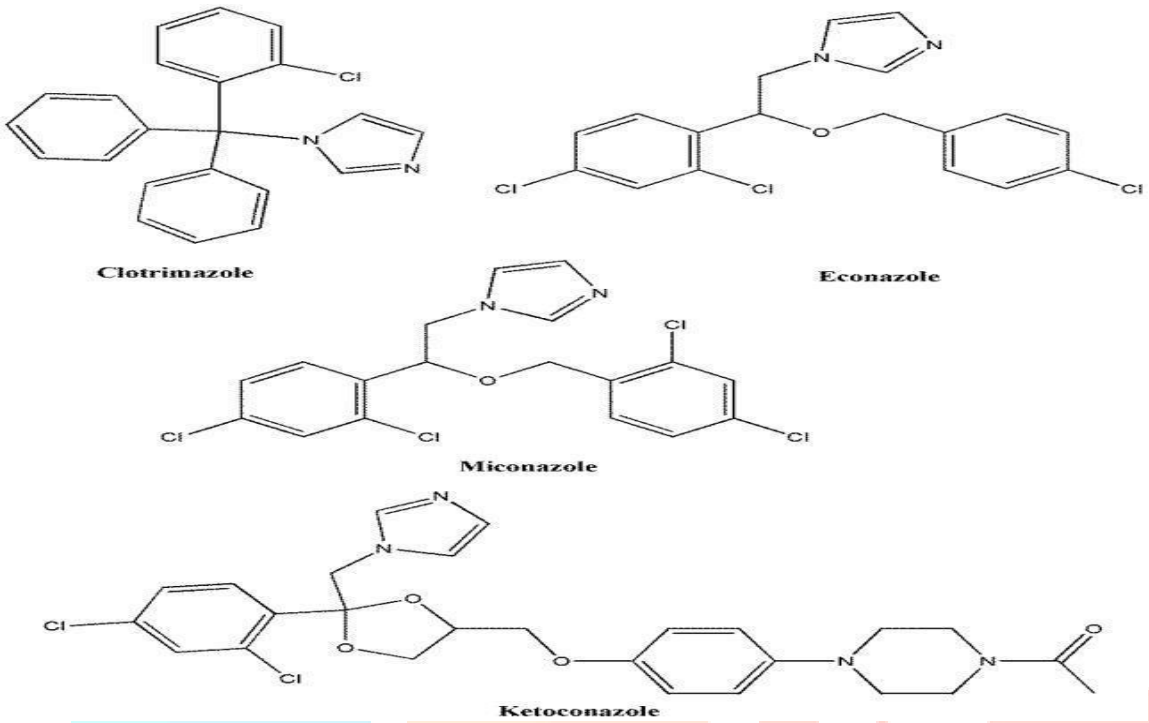


Fig.7 Market available anti-fungal drug

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