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DIFFERENT BIOLOGICAL ACTIVITIES OF SUBSTITUTED BENZIMIDAZOLE DERIVATIVES-A REVIEW ARTICLE

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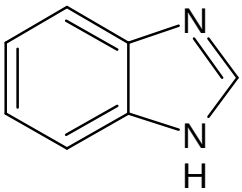
ABSTRACT

Benzimidazole and its derivatives are considered as an important heterocyclic compound that exhibits a wide range of pharmaceutical applications including anti-cancers, anti-microbial, anti-hypertensive, anti-viral, anti-fungal, anti-HIVs, anti-convulsant, and anti-diabetics. In spite of their wide ranging activities, the synthesis of Benzimidazoles and its derivatives. The present review article focuses on substituted benzimidazole derivatives with potential activities.

KEYWORDS: Heterocyclic compound, benzimidazole, biological activity.

INTRODUCTION

Benzimidazole is a important heterocyclic aromatic organic compound. Benzimidazole moieties are regarded as an important compound due to their wide range of applications in pharmaceutical chemistry. This compound is bicyclic in nature which consists of the combination of benzene and imidazole nucleus. The most well-known benzimidazole compound in nature is N-ribosyl-dimethylbenzimidazole, which treat as axial ligand for cobalt in vitamin B12.[1]



Benzimidazole
Fig. 1.

The benzimidazoles are also wellknowm as benziminazoles or benzoglyoxalines. They have been also familiar also as derivatives of o-phenylenediamine, especially in the early literature. Thus, benzimidazole following to this nomenclature would be called methenyl-o-phenylenediamine and 2-methylbenzimidazole would be also called ethenyl-o-phenylenediamine.And they have been named as derivatives of the grouping consisting the imidazole portion of the ring.[2]

The numbering system in benzimidazoles is as follows;

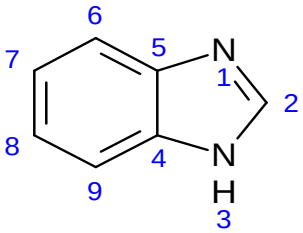
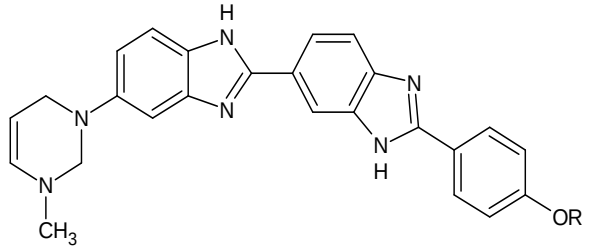


Fig.-2.

LITERATURE REVIEW

Anticancer Activity

- Acar Çevik U, Saglık BN, Korkut B, ozkay Y, Ilgın S et al.,(2018) synthesized 4-(5-chloro-1*H*-benzimidazol-2-yl)-benzoic acid benzylidene hydrazide derivatives and evaluated their anticancer activity against A549 (human lung adenocarcinoma) and MCF-7 (human breast adenocarcinoma) cells.[3]



R=ET, H
Fig-3.

- Wang Z, Deng X, Xiong S, Xiong R, Liu J, Zou L, Lei X, Cao X, Xie Z, Chen Y, Liu Y et al.,(2017) series of chrysin benzimidazole derivatives were prepared and evaluated for their anticancer activity.[4]

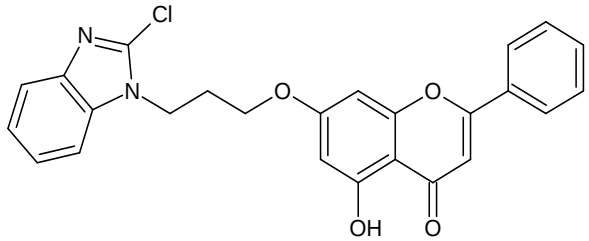
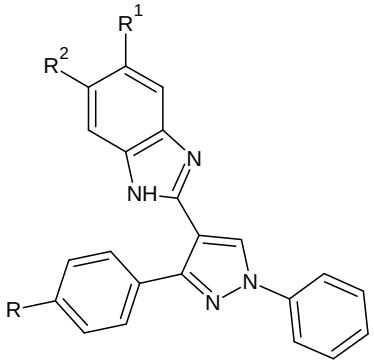


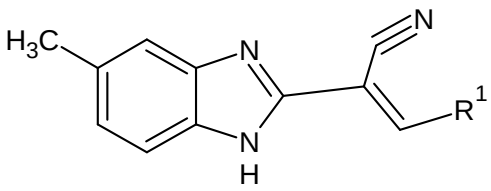
Fig.-4.

- Reddy TS, Kulhari H, Reddy VG, Bansal V, Kamal A, Shukla R et al.,(2015) series of different pyrazole containing benzimidazole derivatives have been designed, synthesized and screened for their potential anti-proliferative activity against three human tumor cell lines - lung (A549), breast (MCF-7), and cervical (HeLa).[5]



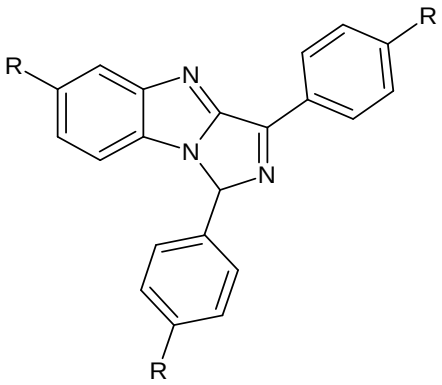
R=methyl, chloro, bromo, fluro.
Fig.-5.

- Refaat HM et al.,(2010) synthesized 2-substituted benzimidazole derivatives and screened for anticancer activity.[6]



R=CH_3, Cl, Br.
Fig.-6.

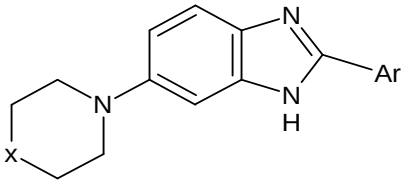
- Demirayak S, Kayagil I, Yurttas L et al.,(2011) synthesized 1,3-diarylpyrazino[1,2-a]benzimidazole derivatives and investigated of their anticancer activities.[7]



R=CH_3, C_2H_5.
Fig.-7.

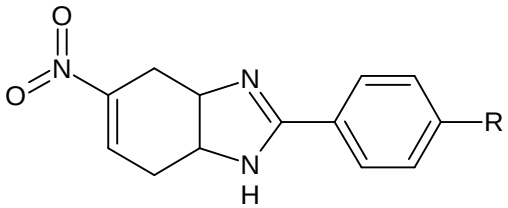
Antioxidant Activity

- Özil M, Parlak C, Baltaş N et al., (2018) 2-(aryl)-6-morpholin-4-yl(or 4-methylpiperazin-1-yl)-1*H*-benzimidazole derivatives were designed and synthesized and evaluated for *in vitro* antioxidant activities.[8]



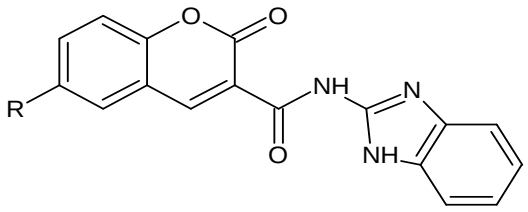
X=Nmethyl, O.
Fig.-8.

- Archie SR, Das BK, Hossain MS, Kumar UT et al.,(2017) synthesised 2-substituted-5-nitro benzimidazole derivatives and evaluated their antioxidant activity.[9]



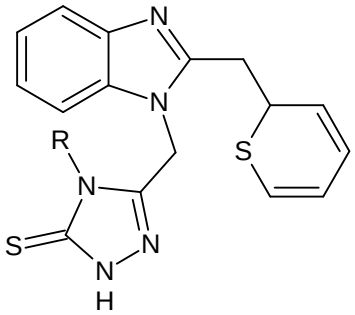
R=Methyl, ethyl.
Fig.-9.

- Arora RK, Kaur N, Bansal Y, Bansal G et al.,(2014) series of 2-substituted benzimidazoles,derivatives were synthesised and evaluated for its antioxidant activity.[10]



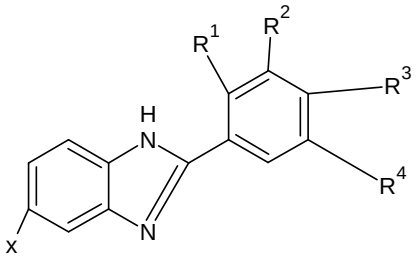
R=methyl, chloro.
Fig.-10.

- Menteşe E, Yılmaz F, Baltaş N, Bekircan O, Kahveci B et al.,(2015) triheterocyclic compounds containing benzimidazole, were synthesized and screened for their antioxidant activities.[11]



R=methyl, ethyl, propyl.
Fig.-11.

- Zhou B, Li B, Yi W, Bu X, Ma L et al.,(2013). 2-arylbenzimidazole derivatives were synthesized and evaluated for their antioxidant activity.[12]



X, R1, R2, R3, R4= H, OH, OMe.
Fig.-12.

Antimicrobial Activity

- Liu HB, Gao WW, Tangadanchu VK, Zhou CH, Geng RX et al.,(2018) series of aminopyrimidinyl benzimidazoles were synthesised and evaluated for its antimicrobial activity.[13]

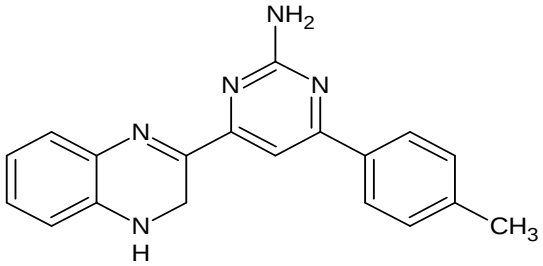
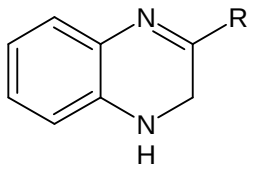


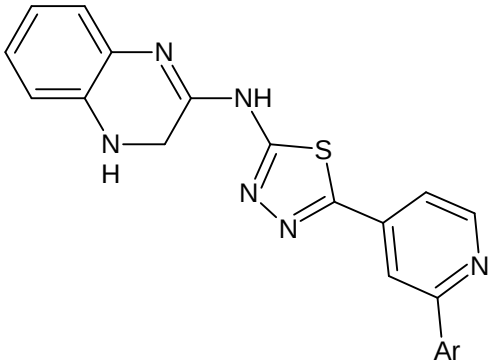
Fig.-13.

- El-Gohary NS, Shaaban MI et al.,(2018) benzimidazole derivatives were synthesized and evaluated for antimicrobial activity toward Escherichia coli, Bacillus cereus, Staphylococcus aureus, Candida albicans.[14]



R=H, Amino, Methyl.
Fig.-14.

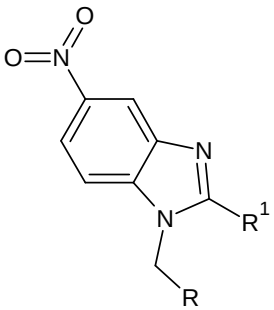
- Barot KP, Manna KS, Ghate MD et al.,(2017) Synthesised benzimidazole derivatives and screened for its antimicrobial activity.[15]



Ar=substituted hydrazide derivatives.
Fig.-15.

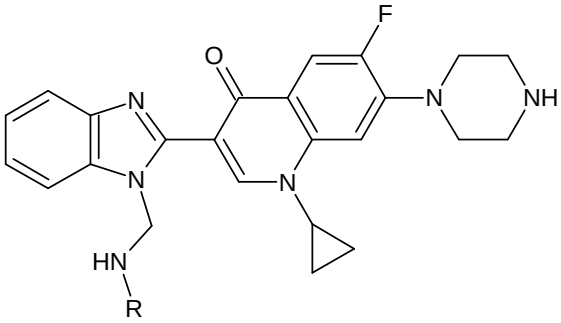
Miscellaneous Activities

- Alam F, Dey BK, Sharma K, Chakraborty A, Kalita P et al.,(2017) synthesized derivatives of benzimidazole andscreened for its anthelmentic activity.[16]



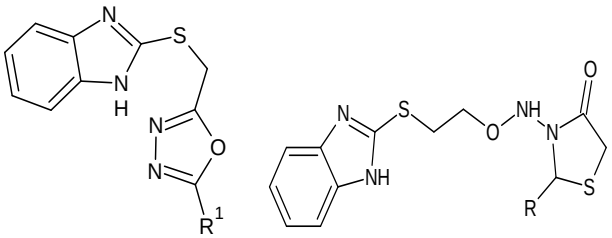
R=benzyl chloro, fluro benzyl.
R^1=N N dimethyl ,N N di ethyl.
Fig.-16.

- Muluk R, Kothawade P, Kulkarni G, Ingale P et al.,(2017) synthesized a series of novel benzimidazole and evaluated for antidiabetic activity.[17)]



R=Methyl, ethyl.
Fig.-17.

- Shingalapur RV, Hosamani KM, Keri RS, Hugar MH et al.,(2010) Series of benzimidazole derivatives, a group of 4-thiazolidinones and 1,3,4-oxadiazoles containing 2-mercapto benzimidazole nucleus were synthesized and evaluated for in vivo anticonvulsant activity by Maximal Electroshock (MES) model and antidiabetic activity using Oral Glucose Tolerance Test (OGTT).[18]



R=hetero ring/halogenated aryl group.
Fig.-9. **Fig.-20.**

CONCLUSION

The benzimidazole ring is an crucial pharmacophore in the field of drug discovery. Some substituted benzimidazole derivate drugs are having more effective activity. The synthesis of benzimidazole derivatives is a lucky scaffold, having a variety of therapeutic uses. From this literature review concluded that benzimidazole posess various biological activities like anticancer activity, anti parasitic activity, antioxidant activity, antimicrobial activity, antidiabetic activity, anthelmentic activity, anticonvulsant activity.

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