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Review on Literature Study of Benzothiazole

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Subject: Medicinal chemistry

Abstract

literature study of benzothiazole gives idea about synthesis and development of benzothiazole derivatives which shows fungicidal, anticancer, HIV-I protease inhibitor, anti-arteriosclerosis activities. So, in future it becomes attractive target of extensive research due to its inherent diverse activities.

Keywords: *benzothiazole, synthesis, fungicidal, anticancer.*

Introduction

Heterocyclic compounds are those cyclic compounds whose ring contain besides, carbon, one or more atoms of other elements. The non-carbon atoms such rings are referred to as hetero atoms. The most common hetero atoms are nitrogen, sulphur and oxygen. The heterocyclic compounds having lesser common atoms such phosphorus, tin, boron, silicon, bromine, etc. have been a subject of much investigation in recent years. The heterocyclic compounds having three to six carbons in the ring are numerous, but only those having five or six atoms in the ring are by far the most important.

Heterocyclic compounds are very widely distributed in nature and are particularly important because of the wide variety of physiological activities associated with this class of substances. Several of the important compounds contain heterocyclic rings, e.g. most o the members of vitamin B complex, alkaloids, antibiotics, chlorophyll, other plants pigments, amino acids, dyes, drugs, enzymes, the genetic material, DNA etc. Few of the basics rings of the heterocyclic compounds are listed below.[1]

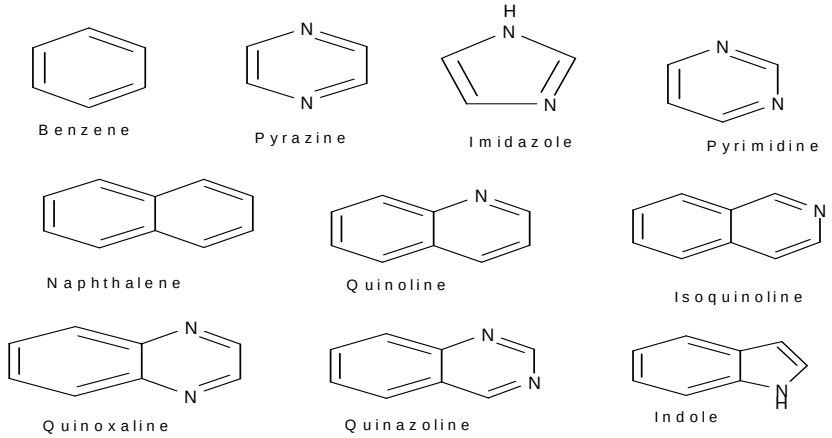
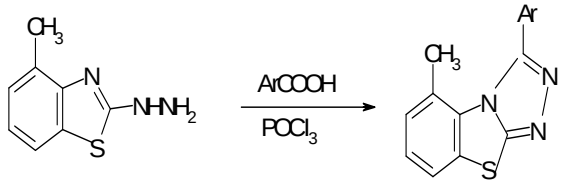


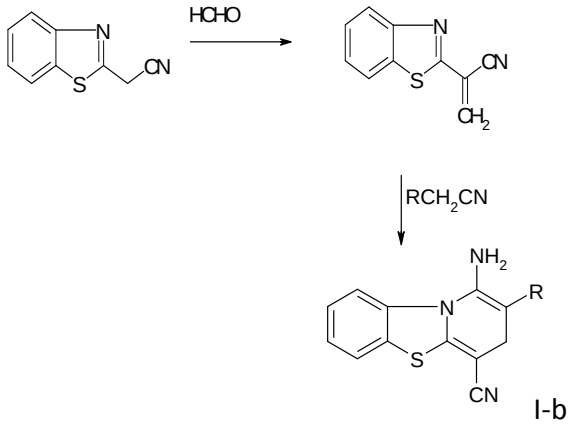
Figure 1: Different heterocyclic rings compound

Synthesis of benzothiazoles fused with various heterocyclic rings.

1. Dong H., Quan B. *et al*. synthesized 5-methyl-3-substituted-1,2,4-triazolo[3,4-b] benzothiazoles. A mixture of 2-hydrazino-4-methylbenzothiazole (1 mmol), various aromatic carbonic acids (1 mmol) and $POCl_3$ (5 ml) was heated under reflux for 12 hrs. A portion of $POCl_3$ was distilled out and the remaining reaction mixture poured into ice water.The solution was basified by adding potassium hydroxide solution,the deposited solid was filtered off and recrystallized with ethanolto give the 5-methyl-3-substituted-1,2,4-triazolo[3,4-*b*] benzothiazoles(I-a).[2]

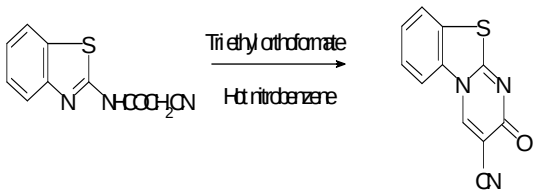


2. Zaki M., Fadda A. *et al*. reported the synthesis of 1-amino-3H-pyrido[2,1-*b*]- [1,3]benzothiazole-2,4-dicarbonitrile(a), 1-amino-4-cyano-3H-pyrido[2,1-*b*][1,3] benzothiazole-2-carboxamide(b), and1-amino-4-cyano-3H-pyrido[2,1-*b*][1,3] benzothiazole-2-carbothioamide(c) (I-b), which were synthesized by reacting equimolar amounts of 2-cynomethylbenzothiazole, formaldehyde and active methylene reagent in presence of ethanol and triethylamine.[3]

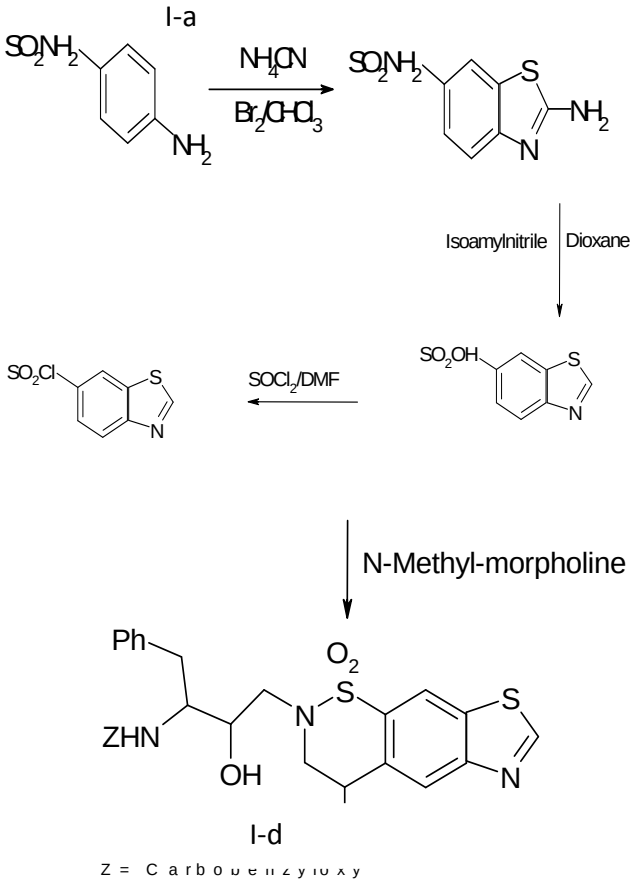


[R= CN (a), $CONH_2$ (b), $CSNH_2$ (c)]

3. Synthesis of 2-Oxo-2*H*- pyrimido[2,1-*b*]benzothiazole-3-carbonitrile(I-c) was reported by Stetinova J., kada R. *et al*. They synthesized it by N - (2-benzothiazolyl) cynoacetamide reacting with triethyl orthoformate in hot nitrobenzene. (one pot synthesis).[4]



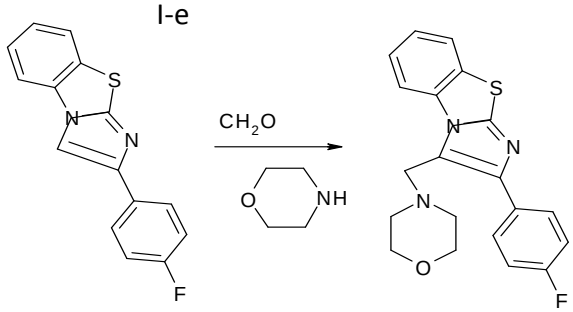
4. Nagarajan S., Getman D. *et al*. delivered the scheme for synthesis of 3-S-(N-Benzyloxyformamido)-2R-hydroxy-1-[(2-aminobenzothiazol-6-sulfonyl)-(2-methylpropyl) amino]-4-phenylbutane(I-d) by following steps. And gives potent inhibitors of HIV-I protease.[5]



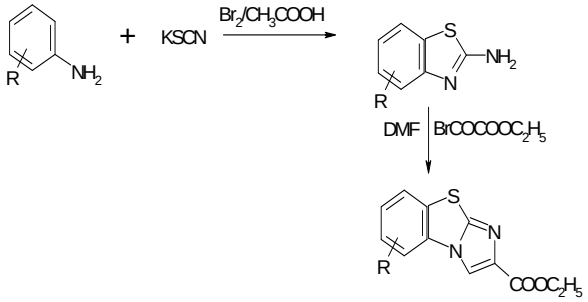
5. Synthesis of 3-(morpholinomethyl)-2-(4-fluorophenyl)imidazo[2,1-b] [1,3]

benzothiazole(I-e) was done by Geronikaki A., Babaev E. *et al*.[6]

I-e

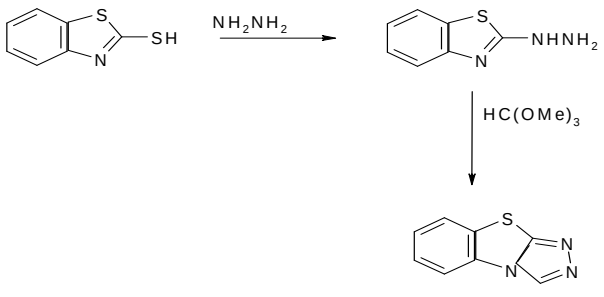


6. Trapani G., Franco M. *et al* reported the synthesis of substituted 2-ethoxycarbonyl-imidazo[2,1-*b*] benzothiazoles (I-f) with substituted aniline and potassium thio cyanate in presence of bromine, acetic acid and dimethyl formamide which shows anticancer activity.[7]



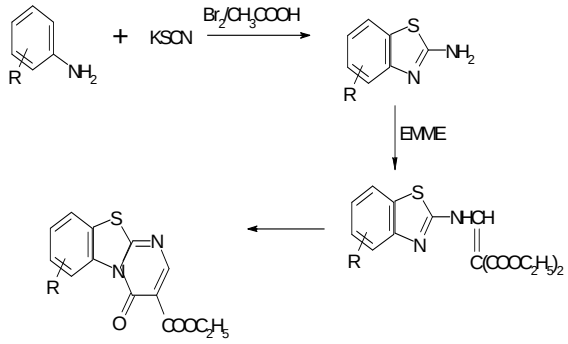
I-f

7. Latrofal A., Carottil A. *et al.* gave the scheme for synthesis of 1,3,4-triazolo[2,1-*b*]benzothiazole(I-g) from mixture of 2-hydrazinobenzothiazole, trimethyl orthofonnate and silica gel in xylene. [8]



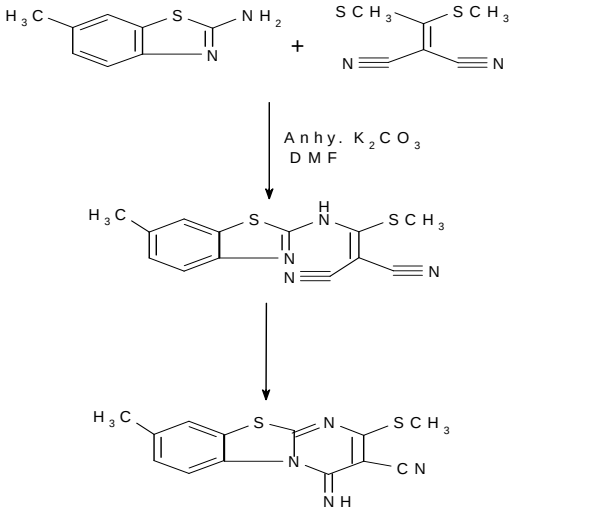
I-g

8. Trapanil G., Francol M. *et al* reported the synthesis of 3-(ethoxycarbonyl)-4*H*-pyrimido[2,1-*b*]benzothiazol-4-ones(I-h) from various substituted aniline and potassium thiocynate in presence of bromine, acetic acid and diethyl (ethoxymethylene) malonate [EMME].[9]



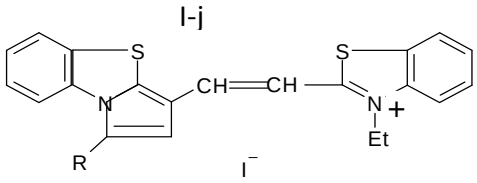
I- H

9. Kuberkar S. V., Pingle M. S. *et al*. reported a synthesis of 3-cyano-4-imino-2-methylthio- 8-methyl-4H-pyrimido[2,1-*b*] ,[1,3] benzothiazole(I-i) from 2-amino-6-methyl benzothiazole (0.01mol) and bis (methylthio) methylene malononitrile (0.01 mol) in 15 ml of N,N'- dimethyl formamide and anhydrous potassium carbonate (10mg) was refluxed for 5 hrs. The reaction mixture was cooled to room temperature and poured into ice cold water .The separated solid product was filtered, washed with water and recrystallized from a N,N'-dimethyl formamide-ethanol mixture.[10]



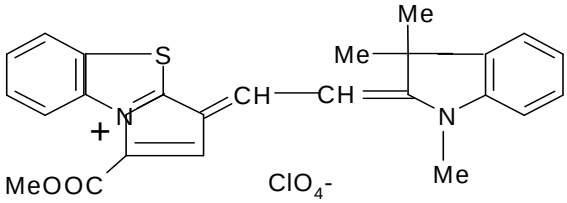
I- I

10. Briks Y., Romanov N. *et al.* reported synthesis of novel 1-R-3-{2-[3-ethyl-2(3*H*)-benzothiazolylidene]ethylidene}-3*H*-pyrrolo[2,1-*b*]benzothiazolium iodides(I-j) from 3-ethyl-2-methylbenzothiazolium iodide and anhydrous sodium acetate reacting with benzothiazole and acetic anhydride.[11]



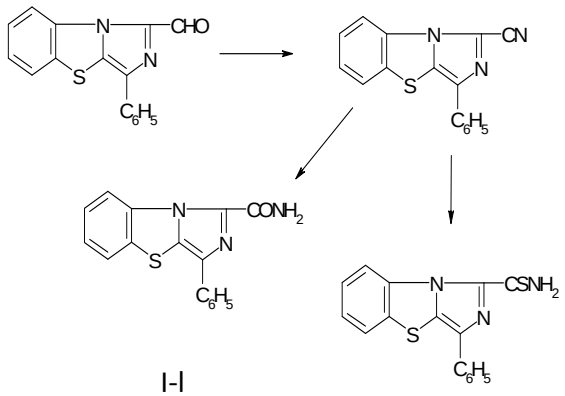
I-j

They also synthesized l-methoxycarbonyl-3-{2- [l, 3, 3-trimethyl-2, 3-dihydroindol-2-ylidene] ethylidene}-3*H*-pyrrolo [2, I-*b*] benzothiazolium perchlorate (I-k).



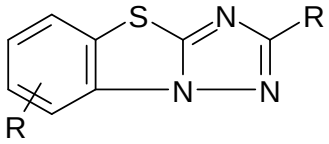
I-k

11. Avidon V., Shchukina N. *et al.* synthesized 1-cyano-3-phenyl imidazo benzothiazole (I-l) from aldehyde, hydroxylamine hydrochloride, sodium formate and formic acid then their derivatives were prepared.[12]



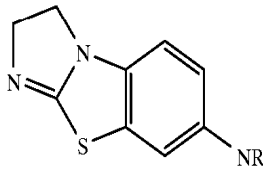
I-l

12. Paget C. *et al.* reported the synthesis of 5-methyl-2-trifluromethyl-s-triazolo [5,1-*b*]benzothiazole,2-methyl-s-triazolo[5,1-*b*]benzothiazole and 5-chloro-s-triazolo[5,1-*b*]benzothiazoles (I-m) which shows fungicidal activity.[13]



I-m

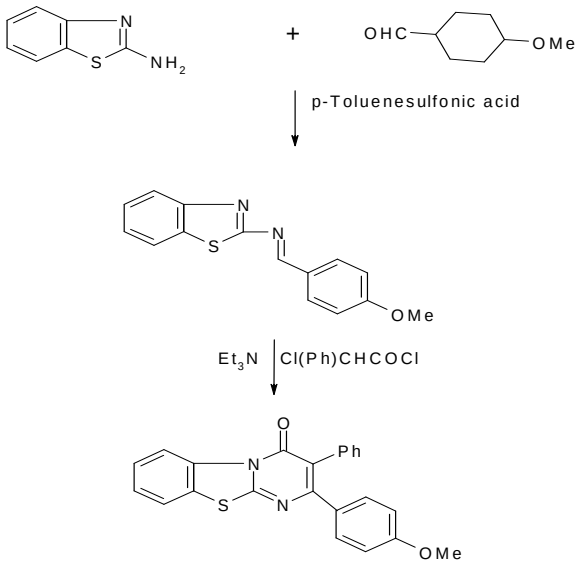
13. 2,3- dihydro-imidazo[2,1-*b*]benzothiazole derivatives(I-n) were synthesized by Brabander M., Lesage A. *et al* .[14]



I-n

14. Niwa R., Kato T. *et al.* planned the scheme for synthesis of 2-(p-methoxy phenyl)-3-phenylpyrimido[2,1-*b*]benzothiazole-4(4*H*)-one(I-o). Intermediate 2-(p-anisylideneamino) benzothiazole was obtained reacting 2-aminobenzothiazole with p-anisaldehyde in presence of p-toluenesulfonic acid.

    Then this intermediate was reacted with triethylamine in anhydrous 1, 2-dimethoxyethane (DME) to get final product which shows anti-arteriosclerosis activity.[15]



I-o

"Cite this article"

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