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Review Article

A REVIEW: ANTIMICROBIAL AGENTS BASED ON NITROGEN AND SULFUR CONTAINING HETEROCYCLES

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ABSTRACT

At present, heterocyclic compounds and their derived forms have become strong reflection in medicinal research field because of their positive pharmacological and biological properties. Heterocycles are prosperous in nature and have expanded additional importance because their structural subunits are established in many natural products such as antibiotics, vitamins, and hormones. Thiazine moieties present in compounds have multiplicity of medicinal activities such as antihypertensive, antitumor, antimicrobial, antibacterial, anticoagulant, antifungal, anticancer, and antiviral. This review article mainly based on thiazines and their derivatives with potential antimicrobial activities that are at this time in advancement.

Keywords: Nitrogen, Sulfur heterocycles (thiazines), Antibacterial, Antifungal, Antimicrobial agents.

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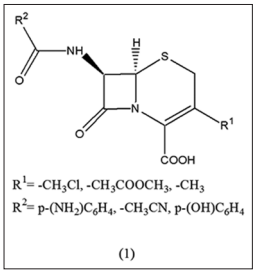
INTRODUCTION

Heterocycles participate an exceptionally significant division in present culture and a group of diverse submissions in dissimilar fields owing to which significant research efforts have been going on for the synthesise of new heterocyclic compounds incorporateing derivatization of naturally occurring materials – plant alkaloids, vitamins, nucleic acids, hormones, proteins, etc. Heterocycles, particularly be full of heteroatom N, S, have huge possibility primarily as drugs, agrochemicals, paints, etc. Substituted thiazines ring-based chemical compounds are considered as organic compounds holding four carbon atoms and one N and S atom at various place in the rings containing six members present in various structures. Further, a variety of organic compounds are synthesized by the use of 1, 3 and 1,4 thiazines [1-15].

This article is committed to the role of different thiazine ring systems in heterocycles for their behavior as antimicrobial agents .The aim of this review is to collect data on antimicrobial activities of 1,3 and 1,4-thiazines derivatives. The present survey has clearly demonstrated that 1,3 and 1,4-thiazines consider as potential antimicrobial agents. Hence, we have decided to review on different types of thiazines.

ANTIMICROBIAL ACTIVITIES OF NITROGEN AND SULFUR CONTAINING HETEROCYCLES

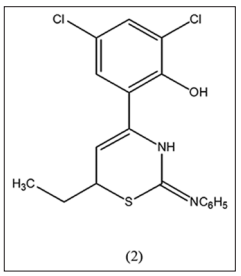
Damanjit (2013) proposed that 1,3-thiazines-based heterocycles confirmed antimicrobial activity against a range of strains of microbes [16].



R^1= -CH_3Cl, -CH_3COOCH_3, -CH_3
R^2= p-$(NH_2)C_6H_4$, -CH_3CN, p-$(OH)C_6H_4$

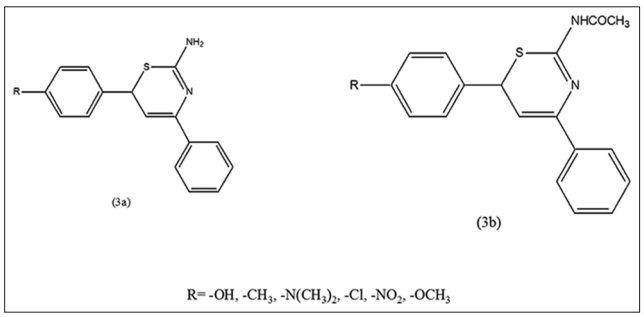
(1)

Yavari and Hossaini (2010) showed that 1,3-thiazines derived from chalcones exhibit antimicrobial activity against *Staphylococcus aureus*, *Bacillus subtilis, Escherichia coli*, and *Pseudomonas aeruginosa* [17].



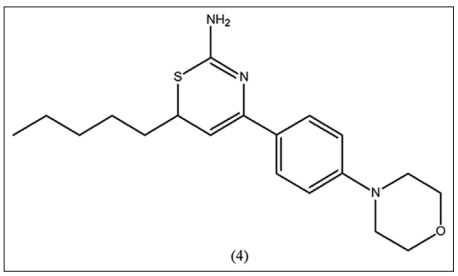
(2)

Bhangale and Wadekar (2011) found that 1,3-thiazine derivatives and their acylated products also exhibit antimicrobial activity [18].



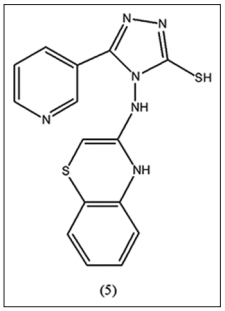
R= -OH, -CH_3, -$N(CH_3)_2$, -Cl, -NO_2, -OCH_3

Thanusu and Gopalakrishnan (2010) found that morpholine containing thiazine derivatives showed extensive antifungal and antibacterial activity against *Rhizopus* and *Vibrio cholerae*, respectively [19].



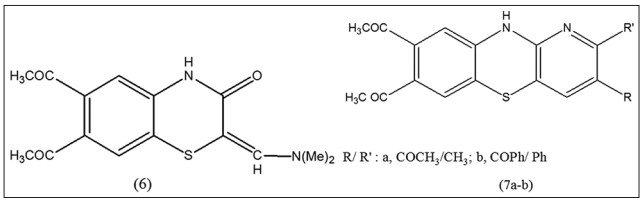
(4)

Suresh and Jayaveera (2010) showed that compound (5) was screened for its antibacterial activity against two micro organisims, i.e., *E. coli* and *S. aureus* and exhibited promising antibacterial activity [20].



(5)

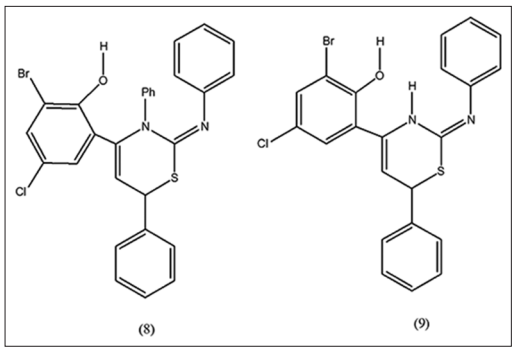
Abbas and Farghaly (2010) found that the compounds 6, 7a, 7b, confirmed for antibacterial activity and antifungal activity against *S. aureus* and (*E. coli*), in addition to the pathogenic fungi *Aspergillus flavus* and *Candida albicans* [21].



R/ R' : a, $COCH_3/CH_3$; b, COPh/ Ph

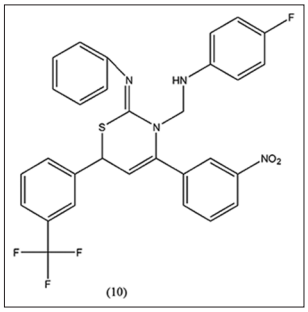
(6) (7a-b)

Jupudi and Rao (2013) tested these compounds for antibacterial activity against different bacteria such as *B. subtilus*, *S. aureus*, *E. coli*, and *P. aeruginosa* species [22].



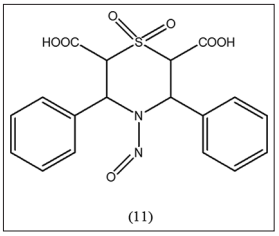
(8) (9)

Dipansu and Mander (2012) showed that thiazine derivative (10) was tested for antibacterial activity against different Gram-positive and Gram-negative bacteria and showed good result [23].



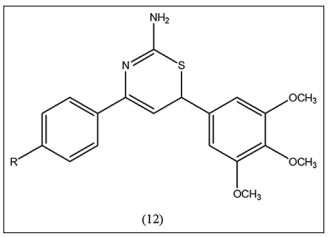
(10)

Naushad and Panugonda (2012) showed that 1,4 thiazines are tested for their antifungal and antibacterial activities [24].



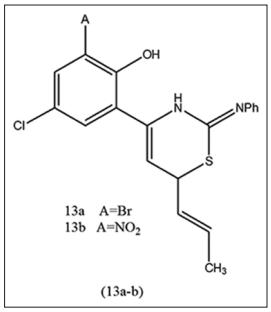
(11)

Varalakshmi Devi *et al*. (2011) found that all the synthesized thiazine derivatives screened for the antibacterial activity and exhibited excellent antibacterial activities [25].



(12)

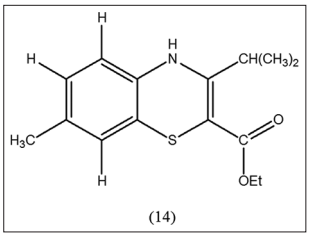
Ram and Parhate (2013) found that substituted 1,3-thiazines have been reported for antimycobacterial activity. The studies were treated for their antibacterial impact against a few common bacteria [26].



13a A=Br
13b $A=NO_2$

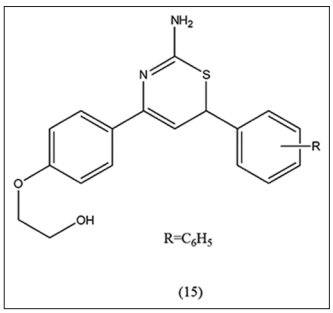
(13a-b)

Sharma and Fogla (2011) [27] and Sharma [28-30] found that substituted benzothiazines were examined for antibacterial activity against *Bacillus cereus* and *E. coli* at a concentration of 30 µg/mL using ethanol as a solvent by well-diffusion method.



(14)

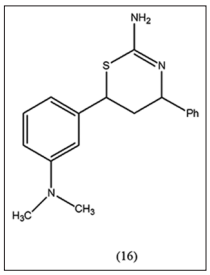
Didwagh and Piste (2013) showed that all the synthesized compounds were tested for antimicrobial activities with different methods [31].



$R=C_6H_5$

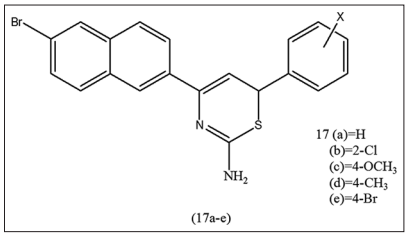
(15)

Elarfi and Al-Difa (2012) showed that chalcone-based heterocycles exhibit diverse medicinal field activities that are antiviral, anesthetic, and antimicrobial agents [32].



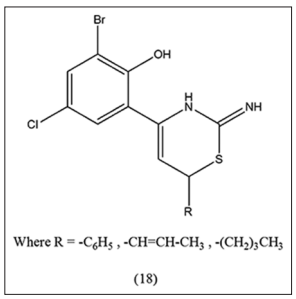
(16)

Prakash and Ingarsal (2015) found that substituted 1,3-thiazines are established as extremely strong antimicrobial agents. The compounds (17a-e) were screened for their in vitro antimicrobial activity [33].



(17a-e)

Rathore and Rajput (2013) found that substituted thiazines were examined for antimicrobial activity against different bacteria, namely, *B. subtilus, S. aureus, P. aerugiuosa*, and *E. coli* species [34].



(18)

CONCLUSION

Literature provides an attention that thiazines are principal class of heterocyclic compounds and their results are demanding in infections based on pathogens. A review of thiazine-based heterocycles exposed that the thiazine moiety has hold a huge agreement of attention to the biochemist and medicinal chemist and can be used as important molecule for designing prospective biological active medicinal compounds. Thus, a variety of substituted thiazine derivatives are potential antimicrobial agents. Besides having antimicrobial activities, thiazine-based heterocycles have also been extraordinarily identified for other agrochemical and pharmaceutical important chemical compounds.

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