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Title Key: Synthesis and Evaluation of 2-Aminothiazole

Synthesis and Evaluation of 2-Aminothiazole Derivative

A. S. Tekale , B.N. Muthal, S. A. L. Shaikh, V.K. Jadhav
tananta@rediffmail.com,
shaikhsalman676@gmail.com.
Department of Chemistry.
Shivaji Mahavidyalaya, Udgir. -413517, Dist. Latur (M S).
Vai. Dhunda Maharaj Degloorkar college, Degloor. Dist Nanded.

Abstract

Substituted amino thiazole was synthesized by a facile synthetic procedure. starting with substituted aromatic ketones and thiourea in presence of iodine to produce the amino thiazole derivatives. The synthesized compound was characterized for structural conformation by IR, ^{1}H NMR, ^{13}C NMR and Mass Spectroscopic techniques.

Keywords: 2-Amino Thiazole, Characterization: IR, ^{1}H NMR , ^{13}C NMR, Mass. Thiourea, 4-Bromo acetophenone and Biological Activity.

1. Introduction

Heterocyclic compound are highly attractive compound in the research and development of materials for organic chemistry. The first synthesis of the thiazolic ring at the end of the nineteenth century by Rudolf Hantzch in 1887.[1] The term thiazole refer to a large family of derivatives. They are isomeric with the 1, 2-azoles, the nitrogen and sulphur compound being called isothiazole .The numbering system was shown below Fig. 1, for naming derivatives of thiazole.[2,3]

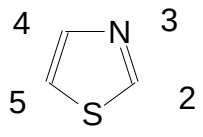

fig 1. Numbering system of thiazole

Heterocyclic compound containing thiazole and its derivatives are playing a vital role in nature. For example, the thaizolunim ring present in vitamin B1 [Thiamine] Serves as an electron sink and its coenzyme form was important for the decarboxylation of α-keto acids. This heterocyclic system has found broad applications in drug development for the treatment allergies, inflammation, hypertension, schizophrenia, bacterial and HIV infections.

Thiazole is a heterocyclic compound featuring both a nitrogen atom and sulfur atom as part of the aromatic five-membered ring. Thiazole are related compound are called 1,3-azoles (nitrogen and one other hetero atom in a five membered ring). Thiazoles obtained from microbial and marine origins exhibit antitumor and antiviral activities.[4,5]

The heterocycles containing nitrogen and

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sulfur atoms are an important class of compound in drug chemistry as well as agricultural chemistry. Thiazole being a key part of many potent biologically active commercial molecules such as sulfathiazole, Fanetizole.

Thiazole and its derivatives have been found to be a biological significance. 2-amino substituted thiazole is biologically active compound with broad range of activity and intermediate in the synthesis of Schiff base. Thiazoles are important class of natural and synthetic compound. thiazole derivatives display a wide range of activities such as antibacterial, antifungal and anti-inflammatory, anti cancer.[10,11,12]

The synthesis of thiazole derivatives is important for their wide range of biological and pharmaceutical properties. One classical and widely used method is the condensation of 4-Bromo acetophenone with thiourea. thiazole ring are usually introduced into target molecules by use of monohalo aromatic ketone with thiourea.[9,10,11,12] Thiazole rings appear in many compounds that exhibit important biological and pharmacological activities. Thiazole rings are usually introduced into target molecules by use of a monohalothiazole. In the present research work, the synthesis, structure, physical properties and spectral characterization i.e. UV, IR, ^{1}H NMR, ^{13}C NMR and Mass spectra and biological activities has been reported.

2. Materials and methods:

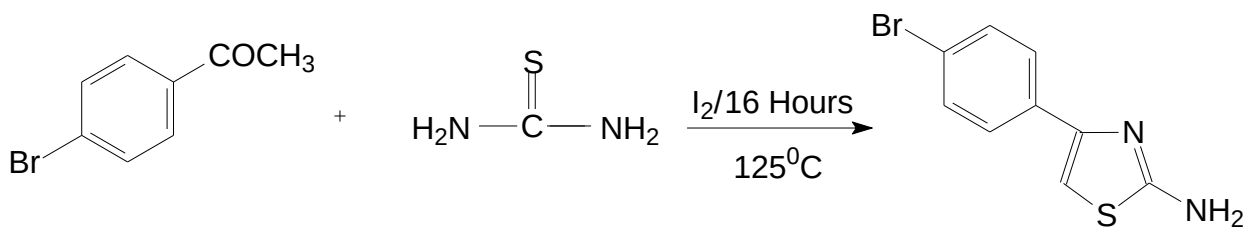
All the chemicals and solvents used in studies were of (AR) grade and were dried and purified before use. The purification of synthesized compound was performed by recrystallization with appropriate solvents.[13] Purity of all the synthesized compound was checked by TLC. Melting points of the synthesized compound were determined by open capillary method and are corrected.[14]

IR spectra were recorded using Nujol with FT-IR Perkin-Elmer model Spectrum One Spectrophotometer, ^{1}H NMR spectra were recorded using $CDCl_3$ with Varian-300 spectrometer NMR instrument using TMS as an internal standard. Mass spectra were recorded in NCMS ES+ spectrometer.

Synthesis of 2-amino-4-(4bromophenyl) thiazole :

The 2-amino-4-(4-bromophenyl)thiazole is prepared by[15] the standard methods scheme-1, 1 mmol of 4-bromoacetophenone was added to an 1 mmol alcoholic solution of thiourea in presence of 2 mmol of iodine and reaction mixture was refluxed on water bath for 16 hours at 125°C, after the reaction time duration the reaction mixture was cooled for few minutes a solid white precipitated will generate.

After the product was filtered and recrystallized from 70 % ethanol. Yield is 72.91 and melting point is 183°C-187°C.



Scheme-1: Synthesis of 2-amino-4-(4-bromophenyl)thiazole

Physical properties of thiazole derivative :

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Sr. No.	Molecular formula of Compound	M.P. °C	% Yield	Colour And Solubility	Rf	Molecular Weight.	Elemental analysis in %				
							C	H	N	S	Br
1	$C_9H_7N_2SBr$	183-187	72.91	White $CHCI_3$	0.83	255.13	42.36	2.76	10.97	12.56	31.31

3. Results and discussion

A substituted amino thiazole compound were synthesized by reaction of substituted acetophenone with thiourea and iodine. This reaction were monitored by TLC. Following spectroscopic methods and their values confirms the formation of desire product. The compound amino thiazole is coloured solid and stable in air. It is insoluble in water but soluble in coordinating solvents like DMF and DMSO.

The Purification of thiazole compound was tested first by thin layer chromatography [TLC] using different eluents. The best separation was obtained in mixture of [hexane: ethyl acetate] having ratio [7:3] respectively as eluent. Then, the product was purified by absolute ethanol. Spectroscopic characterization of thiazole derivative The structure of the prepared thiazole derivative was refined on the basis of their IR spectra. The IR abssorption bands were assigned withaccount taken of the data given in.[16]

In IR spectra, the thiazole derivatives show absorption bands in the range 3353 cm^{-1} assigned for N-H group, The absorption bands of the C=N group were observed in the range 1515 cm^{-1} and that for C=C group in the region 1455 cm^{1}. The absorptions for the C-S- C group were observed in between 1091 cm^{1}.

In ^{1}H NMR spectra, the protons of the $–NH_2$ group appeared as singlet in the region of 4.9 ppm. The heteroaromatic (thiazole) protons appeared in the region of 6.7 ppm. Whole aromatic protons appeared in the range 6.39-7.65 ppm respectively.

The ^{13}C NMR spectra provide further support for the structural characterization of the Schiff bases. ^{13}C NMR spectral data of compound have been listed in Table. The number of signals found corresponds with the presence of magnetically nonequivalent carbon atoms, which were assigned by comparison with literature values. The aromatic carbon present in the structures of 2-amino Thiazole derivatives were assigned by comparing the experimental chemical shifts with those calculated from the incremental method.The ^{13}C-NMR spectral data of the 2-amino Thiazole derivatives are in accord with the proposed structures.

In the Mass spectra,

The composition of the resulting amino thiazole derivative was determined by Mass and Elemental analysis. The molecular ion peak for the amino thiazole derivative was observed at 255 m/z .

Sr. No	Mass	IR in cm^{-1}	^{1}H NMR in ppm	^{13}C NMR in ppm
1	255 MW	3353 (N-H), 1515 (C=N), 1455 (C=C),1091 (C-S-C).	4.9 (s 2H NH_2), 6.7 (s 1H Hetero aromatic thiazole)7.49 -7.65 (m 4H Aromatic).	168,134, 132,122, 104,77.

Table : Spectroscopic characterization of thiazole derivative

Biological Activity :

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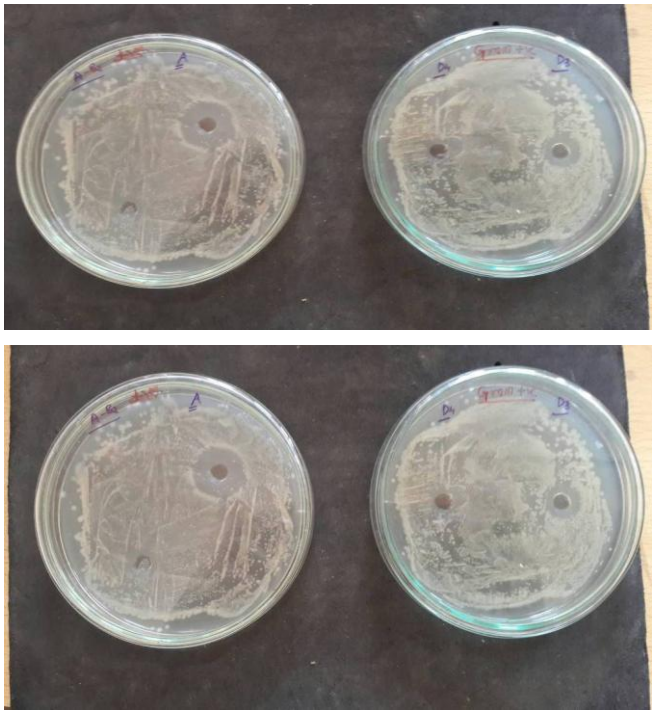
Health and welfare of human being are closely associated with microorganism.Microbiology is a very important branch among all the biological sciences and now a day's microbiology has become very important to our society. They play essential role in the ecology of life on the earth, some bacteria are very useful on the other hand some are harmful to mankind or animal. For example some microorganisms are important commercially through their used in the production of antibiotic i.e. Amphicillin; microorganisms are used in the production of certain foods, like cheese, yoghurt and fermented drinks. Microorganisms are also major tools in the basic research in the biological science; microbial activity is also used to produce the energy such as methane gas for rural consumption. Thus there is no field of human Endeavour, whether it is in the industry, agriculture, food preparation[17-20].

Anti-Bacterial Activity :

The newly synthesized thiazoles were screened for their antibacterial activity against bacterial strains by disc diffusion method. The discs measuring 6.25mm in diameter were punched from Whatman No. 1 filter paper. Batches of 100 discs were dispensed to each screw capped bottles and sterilized by dry heat at 140 °C for an hour. The test compounds were prepared with different concentrations using dimethyl formamide. One millilitre containing 100 times the amount of chemical required in each disc was added to each bottle which contains 100 discs. The discs of each concentration were placed in triplicate in nutrient agar medium seeded with fresh bacteria separately. The incubation was carried out at 37.8 °C for 24 h. Nitrofurazone was used as a standard drug. Solvent and growth controls were kept. The zone of inhibition and minimum inhibitory concentrations [MIC] was noted.



Figures : Antibacterial Activity of Thiazole Compound.

Anti-Fungal Activity :

Antifungal activity for newly prepared compound was screened by serial plate dilution method. Sabourands agar media was prepared by dissolving peptone (1 g), D-glucose (4 g) and agar (2 g) in distilled water (100 ml) and adjusting the pH to 5.7. Normal saline was used to make a suspension of spores of fungal strain for lawning. A loopful of particular fungal strain was transferred to 3ml saline toget a suspension of corresponding species. A 20ml of agar media was poured in to each of the petridishes. Excess of suspension was decanted and the plates were dried by placing in an incubator at 37 °C for 1 h. Using an agar punch wells were made on these seeded agar plates and 10 mg/ml of the test compounds in DMSO were added into each well labeled. A control was also prepared for the plates in the same way using solvent DMSO. The petridishes were prepared in triplicate and maintained at 37 °C for 3e4 days. Antifungal activity was determined by

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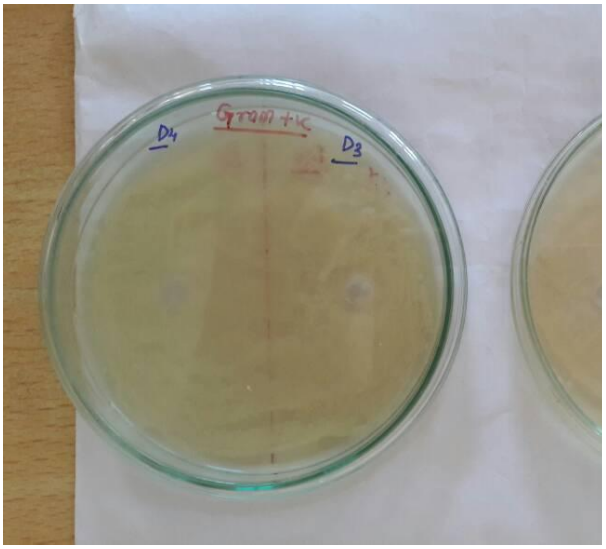
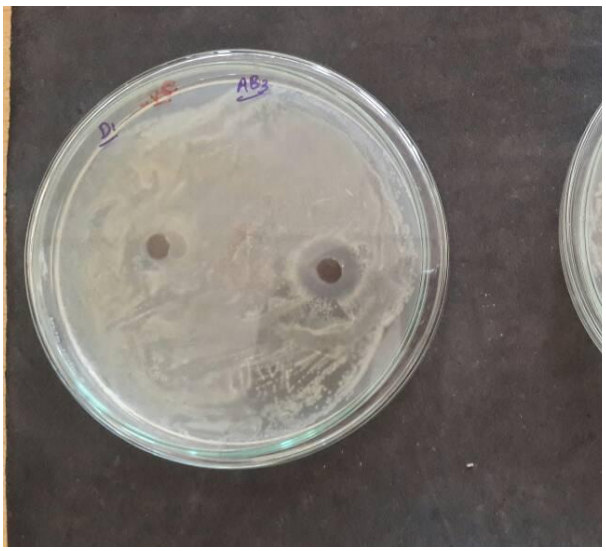
measuring the diameter of the inhibition zone.

Activity of each compound was compared with Amphotericin B as standard. The minimum inhibitory concentration (MIC) for the Amphotericin B in DMSO was more than 1 mg/ml against the tested species.





Figures: Antifungal Activity of Thiazole Compound.

The compound was tested for antimicrobial activity against some pathogens. The compound was found to be active against the bacteria *E. coli, B. Subtilis* and fungus *A. niger, C. Albicans, staphylococcus aureus, pseudomonas aeroginosa, klebsiella pneumoniae.*

the synthesized compound showed significant activity and showed enhanced antimicrobial activity than those of other compound from which they are synthesized.

Spectral data was recorded at IICT Hyderabad, The biological data was recorded at school of life science S.R.T.M.University Nanded, and synthesis was carried out at research laboratory department of chemistry shivaji mahavidyalaya , udgir.

4. Conclusion

The synthesis of substituted amino thiazole compound showed high different yields because the acetophenones compound contained electron donating or electron withdrawing groups on their structures. The electron-donating groups led to increasing the electron density at the carbon atom of carbonyl group so, their electrophilic properties were enhanced, while the electron withdrawing groups decrease the electron density at the carbon atom of carbonyl group, therefore, the yield was of product increased and decrease the reaction time.

In the present study, preparation of thiazole derivative has been attempted by reacting aromatic ketone with thiourea in presence of iodine. Evidences for their structures by means of IR, ^{1}H, ^{13}C NMR and Mass spectrum confirmed the formation of the desired products. From the results we conclude that, the synthesis is superior as far as the yield and purity are considered, as saves solvent and time.

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6. References

1. R. Hantzch and H. J. Weber, Brachiate, 1887; 20, 3118.
2. T. Eicher and S. Hauptmann, "The chemistry of heterocyclic, reactions, syntheses, and
3. application" Welly, New York, 2003
4. Zeki A Naser Al-Shamkhani and Hanan A Al-Hazam Research Journal of Pharmaceutical, Biological and Chemical Sciences
5. SN Pandeya; D Sriram; G Nath and E. De. Clercq, *Eur. J. Pharma. Soc.*, 1999, 9, 25.
6. PG More; RB Bhalvankar and SC Patter, *J. Ind. Chem. Soc.*, 2001, 78, 474.
7. I R siddiqui, Pravin K singh, Jaya singh, Jagdamba singh. Synthesis and fungicidal activity of 4,4' bis [2"-(5"'-substituted rhodanin-3"'-yl)thiazole-4"-yl]bibenzyls. Indian J of chem 2005; 44B:2102-06.
8. Gindher T, Reddy RB, Prasanna B, Chandra Mouli GVP. Synthesis and pharmacological evaluation of thiazoles. *Ind J Chem* 2001;40B:1279.
9. Chandrasekhar S, Narsimulu Ch, Sultana SS, Reddy NRK.Synthesis of thiazoles under solvent free condition. *Org Lett* 2002;4:4399.
10. BS Furniss, AJ Hannaford, PWG Smith and AR Tatchell, Vogel's practical organic chem. 5thEd. (Logman Scientific Technical, John Wiley and Sons), 1989.AI Vogel, A Text book of quantitative inorganic chemistry 3rd Ed., (ELBS,London),1961.
11. MR Maurya and C Gopinathan, *Indian J. Chem*., 1996, 35A, 701.
12. M Jayaramadu and KH Reddy, *Indian J. Chem*., 1999, 38A, 1173.
13. RP Sharma; AK Kothari and NK Sharma , *Indian J. Derm. Vener. Lepr*., 1995, 61, 26.
14. CJ Ballchausen and HB Gray, *Inorg. Chem*., 1962, 1, 11.
15. Furniss BS, Hannaford AJ, Smith PWG and Tatchell AR,Vogel's practical organic chem.5thEd.(Logman Scientific Technical, John Wiley and Sons),1989.
16. A.D.Cross, An Introduction to Practical Infra-red Spectroscopy, London: Butterworths,,1960. Translated under the Title Vvedenie v prakticheskuyu infrakrasnuyu spektroskopiyu, Moscow: Inostrannaya Literatura, 1961, pp.110.
17. Pelezar M.J., Jr. Chan E.C.S. and R. Noelkrieg., Microbiology, McGraw Hill, International Edition, 5th Ed. 19- 30, 66, 101,(1986).
18. Satpathy, K.C., H.P. Mlshra H .P. and B.N. Patel B.N. J.Ind. Chem. Soc,59, 49 (1982).
19. Cavallito, C.J., Ann. Rev. Pharmacol, 8, 39(1968).
20. Bloom, B. M. and Laubach, G.D., Ann. Rev. Pharmacol, 67, (1962).