



# REVIEW ON SYNTHESIS AND ANTIMICROBIAL ACTIVITY PHENYLTHIOUREA

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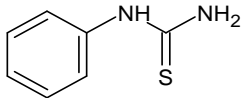
**ABSTRACT:** An efficient method for the synthesis of symmetrical and unsymmetrical substituted thiourea derivatives by means of simple condensation between available building blocks such as amines and carbon disulfide in aqueous medium is presented. The present method is also useful in substituted 2-mercapto imidazole heterocycles. The products were purified through precipitation, which involves changing the pH value, followed by recrystallization. The products were identified by melting point and infrared spectroscopy. The geometry of the proposed structures of the chelates based on their electronic spectra, electron spin resonance (ESR) and magnetic susceptibility. The stability of complexes was studied by TGA analysis (Thermal studies). The practical two-step synthesis of 1-phenylthiourea is reported here as an undergraduate experiment for the organic synthesis laboratory. The products were purified through precipitation, which involves changing the pH value, followed by recrystallization. The products were identified by melting point and infrared and NMR spectroscopy. <sup>[1]</sup> Phenylthiourea and its derivatives have attracted interest due to their excellent combination of properties such as high corrosion resistance, anti-viral activity, strong hydrogen bonding and inhibition of bacterial adhesion to the submersible surface within the aqueous system <sup>[2,3]</sup> In present work we have synthesized substituted phenylthiourea. The structures of the synthesized compounds were confirmed by their analytical and spectroscopic data. All the synthesized compounds were screened for their antimicrobial activities. These compounds were found to have antimicrobial activities comparable to and in some cases greater than those of equimolar quantities of standard drug. <sup>[4]</sup>

**Keywords :** Thiourea, NMR Spectroscopy, Organosulfur Compounds, Transition metals complexes; Microwave irradiation.

## INTRODUCTION

A review of the literature reveals that number of references is available for the synthesis and antimicrobial activity of substituted phenylthiourea <sup>[5,14]</sup>. Substituted phenylthioureas are considered to be most active in case of antimicrobial activity <sup>[13-15]</sup>. In view of the structural changes with the presence of sulphur–nitrogen and the relationship of structures with the biological/pharmacological activities, we have synthesized phenylthiourea of biological and pharmacological importance incorporating diverse structural feature due to diversity in substituent, organic systems and appended pharmacologically active functional groups for making them available for biological evaluation and SAR studies. Due to high importance of thiourea and their derivatives they have been quantitatively synthesized by using different catalyst, conditions, strategies <sup>[16-22]</sup>. The sulphur–nitrogen containing compounds constitute an interesting class of organic compounds and attracting the attention of the synthetic and medicinal chemists due to their structural diversity and biological activities. The pathogenic bacteria *Staphylococcus aureus* (SA), Methicillin-resistant *Staphylococcus aureus* (MRSA) and *Escherichia coli* (EC) have a great impact on human health. Microorganisms with extensive resistance to antimicrobial agents cause serious health concerns in the global fight against infectious diseases <sup>[23,25]</sup>.

## drug profile

Phenylthiourea	
Synonym	N-Phenylthiourea, 1-Phenylthiourea, 1-PHENYL-2-THIOUREA
Structure	 N-phenylthiourea
Molecular Formula	$C_7H_8N_2S$
Molecular weight	152.218 g/mol
Colour	Brown
Melting Point	154°C
Solubility	Soluble in boiling Water
Use	It is used in medical genetics, as a repellent for rats, rabbits and weasels, and in the production of rodenticides. [29]

**MECHANISM**

Phenylthiourea has been discovered as a non-competitive inhibitor with a unique mechanism of inhibition. The structure of the copper-enzyme establishes the role of this metal as a cofactor. Inhibition of PvdP interferes with the production of pyoverdine thus impairing the iron uptake ability in *Pseudomonas aeruginosa*. [29]

**EXPERIMENTAL SECTION**

**Synthesis of substituted phenylthiourea has been prepared from aniline. Preparation of phenylthiourea:-** Take 0.1 mole of aniline add 9ml of HCl and 25 ml of water heat the solution for about 1 hr at about 60-70 °C in a round bottom flask. Cool the mixture for about 1 hr and add slowly 0.1 mole ammonium thiocyanate to the solution. Now reflux the solution for about 4 hrs. Add 20ml of water to the solution by continuous stirring the crystals form powered solution. Filter the solution and dry it. Finally a powered phenylthiourea is formed. Percentage yield comes out to be 86.3%. Structural characterization of the compounds was reported in literature [26,27].

**Synthesis of N-(p-chlorophenyl)-N'-Benzoyl thiourea (PBCT):-**

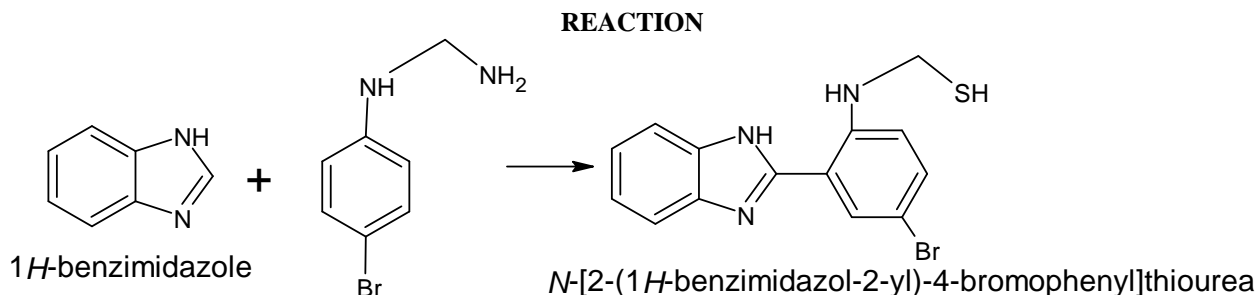
1.0.1m of ammonium thiocyanate (7.6 gm) dissolved in 50 ml of acetone then added drop by drop to 0.1 m of benzoyl chloride (14.06 gm) (11.62 ml) taken in 3 neck flask with continuous stirring.

1. The mixture is refluxed for 1 hour with continuous stirring. After 45 minutes white ppt (ammonium chloride) appeared and then disappeared at 1 hr. The mixture left in room temp until the precipitate appears again completely.
2. Filtration done and precipitate washed by acetone to get all the filtrate (Benzoyl thiocyanate).
3. The added drop by drop in a 3-neck flask contains 0.1 m (12.75 gm) of para chloro aniline dissolved in 25 ml acetone with continuous stirring.
4. The mixture refluxed for 2 hrs with continuous stirring.

- The mixture transferred to a baker and covered for two days for complete precipitation.

#### Preparation of Thiourea by microwave assisted synthesis:-

- Take 0.1 mole of aniline add 9ml of HCl And 25 ml of water heat the solution for about 1 hr at about 60-70 0 C in a Round bottom flask.
- Cool the mixture for about 1 hr and add slowly 0.1 mole Ammonium thiocyanate to the solution.
- Now add the above solution in conical flask and keep in microwave assembly for 15 min .
- Add 20ml of water to the solution by continuous stirring the crystals form Powered solution.
- Filter the solution and dry it. Finally a powered Phenylthiourea is formed. Percentage yield comes out to be 86.3%.



#### ANTIMICROBIAL ACTIVITIES

All the synthesized compound was screened for their antimicrobial activities (Fig:-1-8). In the present work I have used the Agar disc method [35-37]. This may yield in zone of inhibition in mm results for the amount of antimicrobial chemicals that is needed to inhibit the growth of microorganism. It is carried out in Petri-plates. Medium for microorganisms consists of

- Agar agar 13 g
- LB agar 5 g
- Distilled water 300 g

The above constituents are dissolved and sterilized in an autoclave at 15 lbs and 1210C for 15 minutes. The sterilized medium was poured into different sterilized Petra-plates in laminar, allowing them to solidify. Following common standard strains used for screening of antibacterial and anti fungal activities: 1. *Samonella typhimurium*, 2. *E. coli* 3. *Nitrobacter* 4. *Aspergillus fumigatus*, 5. *Penicillium chrysogenum* 6. *Fusarium graminearium*<sup>4</sup>

#### CONCLUSION

It has been observed that all the compounds (Sample 1-4) show activity against microbes. Thus from the results, it has been found that substituted phenylthiourea shows wide variety of antimicrobial activity in comparison to unsubstituted phenylthiourea.

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