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3-SUBSTITUTED BENZOTHIAZOLYL-1-PHENYL AMINO METHENAMIDES AS ANTIMICROBIAL COMPOUNDS

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ABSTRACT

Phenyl isocyanate on condensation with substituted benzothiazoles produces several 3-substituted benzothiazolyl-1-phenyl amino methenamides, which show strong antibacterial and antifungal activity. The identities of these new compounds have been established on the basis of usual chemical transformations and IR, NMR and mass spectral studies and all the compounds are screened for their antimicrobial activity.

Key words: Phenyl isocyanate, Benzothiazoles, Antimicrobial activity.

INTRODUCTION

Benzothiazoles have been known from long ago to be biologically active their varied biological features are still of great scientific interest[1-4]. They are bicyclic ring system with multiple applications. Some derivatives of benzothiazoles possess antituberculosis, anticancer, antitumor, antipyretic activities[5,6].

In view of applications of benzothiazoles and its derivatives in medicinal chemistry and in many other ways, we herein report the antimicrobial activity of several 3-substituted benzothiazolyl 1-phenyl amino methenamides **(3 a-g)**, which were prepared by the condensation of phenyl isocyanate **1** with 2-aminobenzothiazole/ substituted benzothiazloles **(2 a-g)**. Required 2-amino benzothiazoles / substituted benzothiazoles were prepared by the already known method of oxidative cyclization of 1-aryl thiocarbamides with the help of molecular bromine and 1-aryl thiocarbamides was prepared by reaction of aryl amine hydrochlorides with ammonium thiocyanate[7-9].

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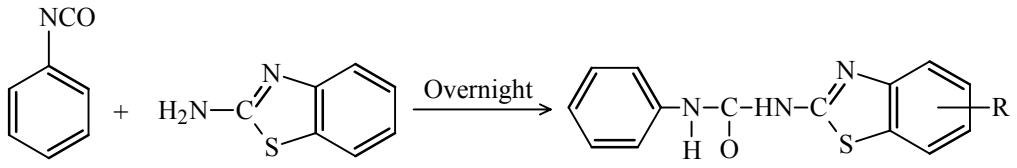

1 **2 (a-g)** **3 (a-g)**

Scheme 1

Where, R = (a) phenyl, (b) 4-methyl, (c) 5- methyl, (d) 6- methyl, (e) 4-Cl, (f) 5-Cl, (g) 6-Cl

RESULTS AND DISCUSSION

3-substituted benzothiazolyl 1-phenyl amino methenamides **(3 a-g)** were prepared by the condensation of phenyl isocyanate **1** with 2-aminobenzothiazole/substituted benzothiazloles **(2 a-g)** was added to benzeneand kept overnight. The sticky residue obtained was triturated with petroleum ether (60-80^{o}C) to afford a white solid **(3 a-g)**. The structure of the products were confirmed on the basis of IR, NMR and Mass spectral analysis[10]. The specific rotation of the products were also recorded[11-13].

EXPERIMENTAL

Specific rotations were measured on Equip-Tronics Digital Polarimeter at 28^{o}C in $CHCl_3$. IR spectra were recorded on Perkin-Elmer spectrum RXI FTIR spectrophotometer (4000-450 cm^{-1}). ^{1}H NMR was recorded in $CDCl_3$ on Bruker DRX-300 spectrometer operating at 300 MHz. The mass spectra were recorded on Jeol-SX-102(FAB) instrument.

Preparation of aryl thiocarbamides

Aryl thiocarbamide was obtained by interaction of aromatic amine and concentrated HCl. Mixture was heated in 500 mL round bottle flask. When hydrochloric salt was obtained. It was dissolved in water (500 mL) and ammonium thiocyante was added to it (40 g in 150 mL and water). It became turbid upon boiling. It was pouned in to 200 mL of ice-cold water, thiocarbamides were separated.

Synthesis of substituted benzothiazoles

To a chloroformic paste of thiocarbamide (10 g in 40 mL) 20% bromine solution was added with constant stirring. Mix was allowed to stand for six hours. Resultant

hydrobromide was treated with 30 mL of cold cold ethyl alchol, when it dissolved. It gave substituted benzthiazole upon basification with cold ammonium hydroxide solution (30 mL). To 2-amino/substituted benzothiazoles **(2 a-g)**.

Synthesis of 3-substituted benzothiazolyl-1-phenyl amino methenamides (3 a-g) (Scheme 1)

A mixture of phenyl isocyanate 1 (.02 M, 2.3 g) and (2 M, 2 g) 2-aminobenzothiazole/ substituted benzothiazoles **(2 a-g)** in 30 mL of benzene was added to it in a conical flask. The mixture was allowed to stand overnight. The solvent was triturated with petroleum ether (60-80^{o}C) to afford a white solid (**3 a-g)**. The products were purified from acetone-petroleum ether.

Antimicrobial activities

All the compounds have been screened for both antibacterial and antifungal activity using cup plate agar diffusion method[11] by measuring the inhibition zone in mm. The compounds were taken at a concentration of 1 mg/mL using dimethyl sulphoxide as solvent. Amikacin (100 μg/mL) was used as a standard for antibacterial and *fluconazole* (100 μg/mL) as a standard for antifungal activity. The compounds were screened for antibacterial activity against *Escherichia coli, Staphylococcus aureus, Proteus vulgaris, and Salmonella typhi* in nutrient agar medium and for antifungal activity against *Candida guilliermondii* and *Microsporum* in potato dextrose agar medium.

It has been observed that these compounds exhibited interesting microbial activities. 3c and 3d exhibited most significant activity against *Salmonella* and *E.coli*, while **3a** inhibited *S.aureus* and *P.vulgaris*. All other compounds exhibited low to moderate activity.

Amongst the compounds tested for antifungal activity,compounds **3a**, **3e** and **3f** are active against *A. niger* and C. *guilliermondii*. All other compouns, show low to moderate activity.

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REFERENCES

1. K. Kmzer, Org. Synthesis, **35**, 69 (1955).
2. M. Lacova, J. Chovancova, O. Hyblova and S. Varkonda, Chem. Pap., **44**, 131 (1990).
3. C. H. Cao, C. J. Zhou, H. Y. Gao and Y. T. Liu, J. Chin. Chem. Soc., **48**, 207 (2001).
4. T. Papenfnws, Ger. Offen. De., **3**, 528 (1987).
5. M. S. Shingare and D. B. Ngale, J. Ind. Chem. Soc., **53**, 1036 (1976).
6. B. Dash and M. Patra, Indian J. Chem., **19B**, 894 (1980).
7. R. Hunter, J. Chem. Soc., **127**, 2023 (1928).
8. H. Kaufman, Arch. Pharm., 266 (1925).
9. N. Krall and R. D. Gupta, J. Indian Chem. Soc., **12**, 629 (1935).
10. R. M. Silverstein, G. C. Bassler and T. C. Morril, Spectrometric Identification of Organic Compounds, 5th Ed., John Wiley and Sons, INC, New York (2003) pp. 108-123.
11. N. B. Colthup, L. H. Daly and S. E. Wiberley, Introduction to Infrared and Raman Spectroscopy, Academic Press, New York (2003) p. 279.
12. D. H. Williams and I. Flemming, Spectroscopic Methods in Organic Chemistry, 4th Ed., Tata McGraw-Hill Publication, New Delhi (2003) p. 40, 41, 47, 53.
13. Arnold Weissberger, Physical Methods of Organic Chemistry, Part II, 2nd Ed., Interscience Publisher, INC New York (1949).

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