



Short Communication

Synthesis of Newly Thiocarbamides using Substituted Isothiocyanates

Shelke M.E.

H.V.P.M.'s College of Engineering and Technology, Amravati-444605, MS, INDIA

Available online at: www.isca.in

Received 3rd August 2012, revised 14th September 2012, accepted 28th October 2012

Abstract

A series of 1,3-bis (2- substitutedamino-6-substituted-imino-1,3,5-thiadiazin- 4- yl)-thiocarbamides [3a(i) to 3f (iii)] have been obtained by basification of their hydrochlorides [2a(i) to 2f (iii)]. The latter were synthesized by the interaction of 1,3-bis (N-substitutedamidinothiocarbamido)- thiourea (1) and N-aryl/alkylisocyanodichlorides in 1:2 molar ratio. The compound (1) was prepared initially by the condensation of aryl/alkylisothiocyanate and 1, 3-diformamidinothiourea in 1:2 molar ratios. The structure of all these compounds was established on the basis of IR and NMR spectral data.

Keywords: Thiocarbamides, 1, 3, 5-thiadiazine, synthesis.

Introduction

The literature survey reveals that the thiourea and its derivatives having 1,3,5-thiadiazine nucleus enhanced pharmaceutical, agricultural and industrial values¹. So, the medicines containing thiadiazines nucleus are now used extensively in medical, biomedical and biotechnological faculties. It has been shown to possess industrial²⁻³, fungicidal⁴⁻⁵, insecticidal⁴⁻⁵, medicinal⁶ values. The synthetic applications of N-aryl/alkylisocyanodichlorides⁷ have been investigated and shown to have enough potential in the synthesis of nitrogen and sulphur containing heterocyclic compounds, thus with an aim to synthesize 1,3,5-thiadiazine, reaction of N-aryl/alkylisocyanodichlorides⁷ have been carried out with different 1,3-bis (N-substitutedamidinothiocarbamido) thiourea (1) in 1:2 molar ratios.

Material and Methods

All chemicals used were of analar grade. N-aryl/alkylisocyanodichlorides were prepared according to literature method⁷. Melting point of all synthesized compounds was determined in open capillary and uncorrected; IR spectra were recorded on Perkin-Elmer spectrometer in the range 4000-400 cm⁻¹ in KBr pellets. PMR spectra were recorded with TMS as internal standard using CDCl₃ and DMSO-*d*₆. TLC checked the purity of the compounds on silica gel-G plates with layer thickness of 0.3mm.

The parent compound 1,3-bis (N-substitutedamidinothiocarbamido) thiourea (1a-f) was prepared by refluxing the mixture of 1,3-diformamidinothiourea⁸⁻⁹ with aryl/alkylisothiocyanate in 1:2 molar ratio in acetone ethanol medium for 12 h. on water bath.

Synthesis of 1-3-Bis (N-phenylamidinothiocarbamido) thiourea (1a): Mixtures of 1,3-diformamidinothiourea (0.01

mol), phenylisothiocyanate (0.02 mol) and acetone ethanol (50ml) were refluxed on water bath for 12 h. in 1:2 molar ratios. The mixture was filtered and the filtrate on concentration yielded the crystals of 3a. Yield 72 %; m.p. 270-72 °C; IR spectra of compound shows ν (N-H) 3471.3cm⁻¹, ν (C-H)(Ar) 3150.0cm⁻¹, ν (C=N) 1642.2cm⁻¹, ν (C-N) 1253.7cm⁻¹, ν (C=S) grouping 1087.6cm⁻¹, ν (C-S) 721.7cm⁻¹, ν (C=NH) grouping 1571.7cm⁻¹. The PMR spectra of compounds showed signals due to N-H protons at δ 3.9-4.3 ppm, Ar-NH protons at δ 5.1-5.9 ppm, Ar-H protons at δ 6.3 ppm.

Synthesis 1,3-Bis (2- phenylamino-6-phenylimino-1,3,5-thiadiazin- 4- yl)-Thiocarbamides [3a(i)]: 1-3-Bis (N-phenylamidinothiocarbamido) thiourea (0.01mol)(1a) was suspended in acetone ethanol medium (25ml). To this a solution of N-phenylisocyanodichlorides (0.02 mol) was added. The reaction mixture was refluxed on water bath for 12 h. During heating the evolution of hydrogen chloride gas was observed and tested with moist blue litmus paper. After cooling the reaction mixture distilled off excess solvent, the solid crystals were separated out. And crystallized from aqueous Ethanol. Yield 72 %; m.p. 265 °C; and identified as 1,3-Bis (2-phenylamino-6-phenylimino-1,3,5-thiadiazin- 4- yl)-thiourea hydrochloride [2a(i)]. On basification of [2a(i)] with ammonium hydroxide solution afforded free base [3a(i)]. It was recrystallized from aqueous ethanol m.p. 254 °C.

Similarly other compounds [2a(ii)] to [2f(iii)] were synthesized from (1a-1f). And which on basification yielded [3a(ii)] to [3f(iii)] by above mention method and enlisted in table I.

Properties of Compound [3a(i)]: It is ivory crystalline solid having m.p. 254 °C. From analytical data; molecular formula is

C₃₁H₂₄N₁₀S₃; IR spectra of compound shows ν (N-H) 333.8cm⁻¹, (C-H)(Ar) 3149.6cm⁻¹, ν (C=N) 1688.4 cm⁻¹, ν (C-N) 1295.2cm⁻¹, ν (C=S) grouping 1198.2cm⁻¹, ν (C-S) 777.6cm⁻¹, ν (C=NH) grouping 1634.3cm⁻¹. The PMR spectra of compounds showed signals due to Ar-NH protons at δ 8.63 ppm, Ar-H protons at δ 7.14-7.85. From these spectral and chemical data the compound [3a(i)] is 1,3-Bis (2- phenylamino-6-phenylimino-1,3,5-thiadiazin- 4- yl)-thiocarbamides.

Results and Discussion

Various thiocarbamides derivatives [3a(i) to 3f(iii)] were prepared using 1,3-bis (N-substitutedamidinothiocarbamido)-thiourea and N-aryl/alkylisocyanodichlorides. All the compounds synthesized were adequately characterized by their elemental analyses and spectral IR,UV and H-NMR.

Conclusion

As outline in synthesis process, important novel thiocarbamides have been synthesized. All the structure of the above compounds was in good agreement with Spectral and Analytical data.

References

1. Aboul-Fadi T., Hussein M.A., ElShorbaji A.N., Kallil A.R., Arch. Pharm (Weinbeim), **335**, 438 (2002)
2. Alfred K. and Tantaway A., Arch. Pharm. (Weinbeim), **311**, 935 (1978)
3. Helmut B., Willi K., Wolfgang K., Edger M., Peter R., Ger, Offen, 2, 1978, 630/849; Chem. Abstr, **88**, 152669 (1978)
4. Tayade D.T., Synthesis of 1,3,5-thiadiazines from formamidino-thiocarbamide, Proc. 83rd Ind. Sci. Cong. (1996)
5. Shelke M.E. and Tayade D.T., Synthesis of 1-substituted-2-thio- (1H)-4-[(2-imino-4- thiobiureto-5-yl) guanyl]-6-substitutedamino-1,2-dihydro-s-triazines AJC, **18(3)**, (2006)
6. Shelke M.E., Antimicrobial activity of 1-Substituted-2-thio-(1H)-4-(3- phenylthiocarbamido-1-yl)-6-(1-substitutedguanidino-3-yl)-1,2- dihydro-S-triazine, JPAM, **1(1)**, 123-125 (2007)
7. Cavanaugh F., Analytical Microbiology, Academic Press, New York, 126 (1963)
8. Barry A.L., The Antimicrobial Susceptibility Test; Principle and Practices, edited by Illus Lea and Fibiger, Philadelphia, Pa, U.S.A., 180 (1976)
9. Vogel A.I., Text book of practical organic chemistry including qualitative organic analysis, ELBS and Longman Greek and Co. Ltd., 615 (1954)

Table-1
Physical Data and Antimicrobial Activity of the Compounds [3a(i) to 3f(iii)]

Compd.	R	R ₁	Yield	m.p. (°C)
[3a(i)]	Phenyl	Phenyl	60	254
[3a(ii)]	Phenyl	<i>p</i> -Chloro-phenyl	58	257
[3a(iii)]	Phenyl	Ethyl	64	242
[3b(i)]	<i>p</i> -Chlorophenyl	Phenyl	71	252
[3b(ii)]	<i>p</i> -Chlorophenyl	<i>p</i> -Chloro-phenyl	69	264
[3b(iii)]	<i>p</i> -Chlorophenyl	Ethyl	73	272
[3c(i)]	<i>p</i> -Tolyl	Phenyl	62	268
[3c(ii)]	<i>p</i> -Tolyl	<i>p</i> -Chloro-phenyl	58	257
[3c(iii)]	<i>p</i> -Tolyl	Ethyl	63	256
[3d(i)]	Ethyl	Phenyl	67	261
[3d(ii)]	Ethyl	<i>p</i> -Chloro-phenyl	72	272
[3d(iii)]	Ethyl	Ethyl	58	242
[3e(i)]	Methyl	Phenyl	62	232
[3e(ii)]	Methyl	<i>p</i> -Chloro-phenyl	59	227
[3e(iii)]	Methyl	Ethyl	61	231
[3f(i)]	<i>t</i> -Butyl	Phenyl	67	242
[3f(ii)]	<i>t</i> -Butyl	<i>p</i> -Chloro-phenyl	69	251
[3f(iii)]	<i>t</i> -Butyl	Ethyl	73	237

* All Compounds gave satisfactory C, H, N, and S analysis.