



SYNTHESIS AND BACTERICIDAL STUDIES OF SOME COPPER (II) CARBOXYLATES WITH UREA

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ABSTRACT

New coordination compounds of copper (II) carboxylates with urea and thiourea have been synthesized tested with *Pseudomonas aeruginosa*, *Bacillus subtilis*, *Klebsiella pneumoniae*, *Proteus vulgaris*, *E.coli* and *Staphylococcus sp.* The compounds exhibited promising antimicrobial activity when compared with the five antibiotics (Amoxicillin Cotrimoxazole Ciprofloxacin Gentamycin and Tetracyclin) used as standard positive control.

Keywords: carboxylates, urea, thiourea, bactericidal studies.

INTRODUCTION

There has been a lot of interest in synthesis structure and properties of nitrogen donor ligands particularly urea, thiourea and its derivatives due to their wide application as pharmaceuticals [1] and in wood protection [2-5].

The synthesis and characterization of urea and thiourea based complexes have been studied and reported [6]. We report here the bactericidal activity of some selected copper (II) complexes of carboxylates with urea and thiourea. The biological activities of fatty acid copper (II) carboxylates with urea have already been reported.

MATERIALS AND METHODS

Microorganisms

The bacteria that were used for the bactericidal studies were *Pseudomonas aeruginosa*, *Bacillus subtilis*, *Klebsiella pneumoniae*, *Proteus vulgaris*, *E.coli* and *Staphylococcus sp.* They were from the stock cultures of the Microbiology Laboratory of the Department of Pure and Applied Biology, Ladoko Akintola University of Technology, Ogbomoso, Nigeria.

Activity testing

The antibacterial activity of the synthesized complexes was determined by disc diffusion method (Cruickshank 1968). The bacteria were cultured in nutrient agar medium and used as inoculum for the study. Bacterial cells were swabbed onto nutrient agar medium (prepared from NaCl 5.0g peptone 5.0g beef extracted powder 3.0g gargar 20.0g in 1000ml distilled water; pH = 7.5± 0.2) in Petri dishes. The test solutions were prepared in distilled water and then applied to filter paper discs (Whatmann No

4, 5 mm diameter). These discs were placed on the already seeded plates and incubated at 37°C for 24h. Amoxicillin Cotrimoxazole Ciprofloxacin Gentamycin and Tetracyclin were used as positive control.

Copper (II) carboxylates with urea and thiourea complexes

The compound was prepared using the following general method:

Preparation of [Cu (C₆H₅COO⁻) NH₂CONH₂] SO₄

Benzoic acid (5g, 0.0206moles) was dissolved in 50ml of 2M NaOH and stirred with a magnetic stirrer. CuSO₄·5H₂O (1.6g, 0.0100moles) dissolved in 10ml of water was added dropwise to the solution and stirred for 30minutes. The resulting solution was filtered through a buchner funnel using a suction pump and washed with ethanol. The precipitate was light blue in colour (0.32g).

30ml of water was added to the precipitate formed (0.32g) and it was stirred using a magnetic stirrer. Urea (0.0628g, 0.0010moles) was diluted with 10ml of water and added to the solution being stirred dropwisely. The resulting solution was stirred for 30 minutes and filtered to dryness through suction. The precipitate (complex) was weighed and dried over KOH. The colour of the complex is light blue.

RESULTS

The antibacterial activity of the metal complexes is presented in Table-1 and the minimum inhibitory concentration of the complexes is reported in Table-2. The complexes showed considerable activities against the test organism. They were able to compete favourably with the five organisms used as positive control.

**Table-1.** Antibacterial activity of the complexes.

Complexes	Diameter of zone of inhibition (mm)					
	<i>Pseudomonas aeuriginosa</i>	<i>Bacillus subtilis</i>	<i>Klebsiella pneumoniae</i>	<i>Proteus vulgaris</i>	<i>E.coli</i>	<i>Staphylococcus sp</i>
[Cu(C ₆ H ₅ COO ⁻)NH ₂ CONH ₂] ₂ SO ₄	12.0	11.0	0.90	-	8.3	11.2
Cu(C ₆ H ₅ COO ⁻)NH ₂ CONH ₂]Cl	21.5	11.0	9.5	11.0	9.5	11.0
Cu(C ₆ H ₅ COO ⁻)NH ₂ SCONH ₂]Cl	15.5	-	9.7	9.5	9.5	9.3
Cu(C ₆ H ₅ COO ⁻)NH ₂ SCONH ₂]SO ₄	-	10.0	13.0	11.0	9.0	9.5
Amoxicillin 25µg	-	-	-	-	-	-
Cotrimoxazole 25µg	-	-	-	-	-	-
Ciprofloxacin 10µg	21.0	31.5	16.5	25.5	25.5	21.0
Gentamycin 10µg	-	13.5	-	-	14.0	13.5
Tetracyclin	-	-	-	-	-	13

Table-2. Minimum inhibitory concentration of the metal complexes against test organisms.

Complexes	Minimum inhibitory concentrations (g/ml)					
	<i>Pseudomonas aeuriginosa</i>	<i>Bacillus subtilis</i>	<i>Klebsiella pneumoniae</i>	<i>Proteus vulgaris</i>	<i>E.coli</i>	<i>Staphylococcus sp</i>
[Cu(C ₆ H ₅ COO ⁻)NH ₂ CONH ₂] ₂ SO ₄	>0.02	>0.02	>0.02	>0.02	>0.02	0.02
Cu(C ₆ H ₅ COO ⁻)NH ₂ CONH ₂]Cl	>0.02	>0.02	0.00002	>0.02	>0.02	0.02
Cu(C ₆ H ₅ COO ⁻)NH ₂ SCONH ₂]Cl	>0.02	>0.02	>0.02	0.02	0.002	>0.02
Cu(C ₆ H ₅ COO ⁻)NH ₂ SCONH ₂]SO ₄	>0.02	>0.02	>0.02	0.02	>0.002	0.02

CONCLUSION

Even though copper (II) complexes of carboxylates with urea and thiourea have been noted as potential fungicides their bactericidal activity is also worth noting for further investigations.

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