World Journal of Pharmaceutical Sciences
ISSN (Print): 2321-3310; ISSN (Online): 2321-3086
Published by Atom and Cell Publishers
Available online at: http://www.wjpsonline.org/
Original Article

Spectrophotometrically studied conditional stability constants and confirmation of complex formation of Cu (II), Cd (II) and Cr (III) complex with substituted thio-carbamidonaphthols

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Received: 11-06-2016 / Revised: 30-07-2016 / Accepted: 01-08-2016 / Published: 01-08-2016

ABSTRACT

Present work concern with spectrophotometrically investigation of conditional stability constant and formation constant of metal-ligand complexes of ligands 5-p-chlorophenyl thiocarbamido-1-nahthol with Cu(II), Cd(II) and Cr(III) metal ions with ethanol water systems at different proportions by Jobs method of continuous variation. The stiochiometry of complex formation found to be 1:1. This investigation helps to understand drug effect and drug activity of newly synthesized drugs.

Keywords: 5-p-chlorophenyl thiocarbamido-1-nahthol, stability constant. Spectrophotometry

INTRODUCTION

Physical and chemical properties are varied due to complexation. Composition as well as conformation of complex formation can be measured from study of various physicochemical properties by spectrophotometric method. Spectrophotometric technique has a great significance in measurement of stability constant and confirmation of complex formation in solution. Wagh [1] and Deshamukh [2] determined log K value of chalcones pyridine carboxylic acids and hydroxyl ethyl benzene. Galhan et al [3] studied (E)-2-(mercapto-phenylaminoethylene)-3-oxo-N-p-tolylbutamide with some metal ion by spectrophotometrically. Boldescu et al [4]. Spectrophotometrically studied sangurine-bcyclodextrin complex formation. Spectrophotometrically determination of phenylprine hydrochloride and salbutamol sulphate drugs in pharmaceutical preparation using diazotized metacloprine hydrochloride was carried out by Al-Abachi and Abed [5]. Alsamarrai et al [6] investigated ephedrine-hydrochloride by spectrophotometrically. Saleha et al [7] investigated sulphsalazine antibiotics drugs. Investigation of ion complex formation of anti-hypertensive drug mehtyldopal was studied [8]. Meshram [9] studied complexation by interaction of Dy(III) with lincomycine and lyrodoxin in 70% ethanol-water medium. Spectrophotometric study of diflunisal febuxostate metaxalone, fexofenadine methyl ester and linezolide pharmaceutical dosages using tetracynoethelene was carried out by Shrinivas et al [10]. Valtierra –Alvardo et al [11] investigated complex formation equilibrium of Cu(II). Solvent effect on dissociation of ammonium and pyridinium ion was studied by Ohataki [12]. Investigation of effect of dielectric constant on Cu(II) –Complexes of phthalic acid in various percentage of dioxane -water mixture was carried by Palaskar [13]. Metal-ligand stability constant and confirmation of complexes formation of 5-p-chlorophenyl -thiocarbamido-1-naphthol with Cu(II), Cd(II) and Cr(III) metal ions had been investigated respectively by Spectrophotometric technique at 0.0001 M ionic strength. This work mainly base on Jobs method of continuous variation. It is specially associated to study of effect of solvents, effect of ligands and group as well as effect of metal ions during formation of complexes.

EXPERMENTAL

5-p-chlorophenylthiocarbamido-1-naphthol has been synthesized in the laboratory by standard method. The nitrate salts of Copper Cadmium and Chromium were used & their solutions were prepared in double distilled water. The solutions of

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potassium nitrate was prepared (1M) & used for maintaining ionic strength constants. Absorption are measured by UV Spectrophotometer model 106, (Systronic make) with an accuracy = ± 0.005 was used.

RESULTS & DISCUSSION

Spectrophotometric Measurement

Job's Method: Jobs method of continuous variation method is reliable method for investigation of formation of complex [14]. Jobs method consist of equimolar solutions of metal and ligand varying proportion in such manner that total concentration of metal plus ligand is constant in resulting mixtures[15]. The compositions of metal ions solution (1 x10 $^{-4}$ M) & ligand (5x 10^{-4}M) were prepared in ten series. Ionic strength was maintained constant (0.1M) by adding an appropriate amount 0f 1M KNO3 solution in 10 ml volume (λmax) was determined using one of the compositions at which there is maximum absorption. The absorption for all the compositions were recorded at a cosnstant wave length (λmax). The data of absorption & %composition of metal ion and ligand solutions at constant pH can be used to construct the curves. It was observed that 1:1 complex formation occurs in the pH range of 3 to 6. Each solution is diluted up to 15 ml and recorded absorption at same (λ max). Conditional stability constants of metal ligand complexes were calculated for all the systems using following expression.

$$K = \frac{X}{(a1-x)\,(b1-x)} = \frac{X}{(a2-x)\,(b2-x)}$$

K = Conditional stability constants of complex.
X = Concentration of complex.
a1 & a2 = Concentration of metal ions.
b1 & b2 = Concentration of ligand.
Conditional stability constants of metal ligand complexes were calculated & presented in Table1.

Table – 1: Determination of Conditional Stability of Metal Ligand Complexes

System	Conditional stability constant	Log K
Cu(II) + L3	**5 X 10^{-3}**	**0.69897 X 10^{-3}**
Cd(II) + L3	**1.2010 X 10^{-3}**	**0.79540 X 10^{-3}**
Cr(III) + L3	**3.8610 X 10^{-3}**	**0.58669 X 10^{-3}**

CONCLUSION

From Table 1 it was conclude that resultant values obtain in both technique are fairly good. There is no appreciably change in log K values. This indicated the simultaneously complex formations. Variation in Log K values observed due to direct interfere of solvent-solvent interaction, solute-solvent interaction and solute-solute-solvent interaction. Table 1 revel that Log K value of L3 greater for Cd(II) than Cu(II) and Cr(III). Thus L3 form more stable complex with Cd(II) than Cu(III) and Cr(III). This investigation helps to study of drug activity and drug effect of newly synthesized drugs.

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