DNA Interaction Studies by UV of Copper Complex based on Gallic Acid

Inamdar Poonam[1], Mutalikdesai Shreya[2] and Hegde Varun[3]
[1,2,3]Department of Pharmaceutical Chemistry, Karnataka Lingayat Education College of Pharmacy, Kaher, Belagavi, 590010, Karnataka.

[1]poonam17_oct@yahoo.co.in

Abstract: Copper, being an essential element, has been used to synthesize metal complexes. Different ligand systems have been reported to coordinate with copper ion to form biologically important metal complexes. Thus, we are reporting the synthesis and characterization of copper complex based on biologically important ligand, gallic acid. The synthesized complex later was subjected for DNA interaction studies using UV spectroscopic titration revealing as efficient interacting agent.

Keywords: Copper complex, DNA interaction, Gallic acid, UV spectroscopy

1. INTRODUCTION

In coordination chemistry, Schiff base ligands are used extensively because of their tunable steric and electronic properties, good solubility. Oxygen and nitrogen donor Schiff bases are preferred to form the complexes because of their sensitivity towards molecular environment. Copper complexes with Schiff bases are extensively used due to their enhanced antimicrobial, antiviral, anti-inflammatory, anti-tumor and enzyme inhibitory properties[1]. Schiff bases will bind to different metal ions to form a homonuclear and heteronuclear complexes of varying geometry[2,3]. In the current study, we are reporting the synthesis, characterization and DNA interaction studies of copper complexes based on gallic acid[4].

2. MATERIALS AND METHODS

Gallic acid, copper sulphate, hydrazone ligand, ethanol, DNA sodium salt, distilled water, phosphate buffer.

2.1. Synthesis of complex

The complex is synthesized using copper sulphate, gallic acid and hydrazone ligand. These are weighed in required quantities and dissolved in ethanol in a round bottom flask[5]. The contents of RBF are mixed using a magnetic stirrer with reflux condenser. The reaction is carried out for 2 hours. The formed solution is cooled and allowed to crystallize.

The formed crystals were subjected to characterization using UV and FTIR and compared with precursor ligand.

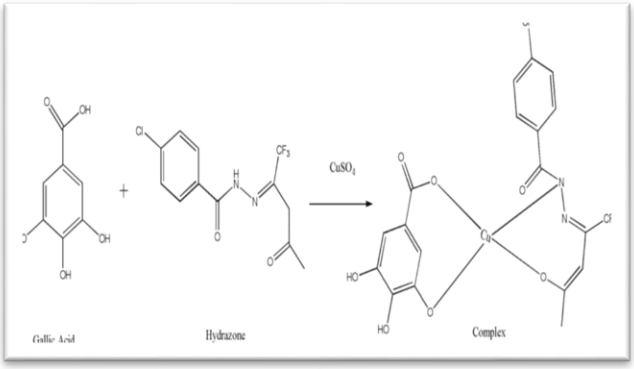

Figure 1. Synthesis of copper complex.

2.2 Preparation of gallic acid solution

Gallic Acid is very soluble in ethanol . Molecular weight of of gallic is 170.12g/mol. Concentration of gallic acid solution required is 20µM and 40µM. ml).

2.3. Preparation of complex solution

Metal complex is very soluble in ethanol. Hence the stock solution of 1mM(100ml) was prepared in ethanol by dissolving 0.05g of complex in 100ml ethanol.

2.4. Preparation of DNA solution

DNA sodium salt powder was extracted from *Salmon milt.* DNA solution was prepared in distilled water (pH= 7) of concentration 1mg/ml.

2.5. DNA binding studies by UV spectroscopy

UV absorption titration was carried out by keeping the complex concentration at 40µM. Complex solution
prepared in ethanol. Titration was carried out by monitoring ligand based transition of complex along with 10µM increments of DNA.

3. RESULTS AND DISCUSSION

3.1. Characterization of complex spectrum :

a. UV and visible of complex was recorded in ethanol

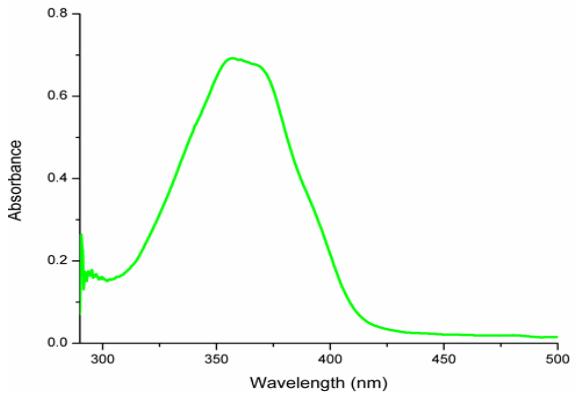

Figure 2. UV spectrum of copper complex of ligand

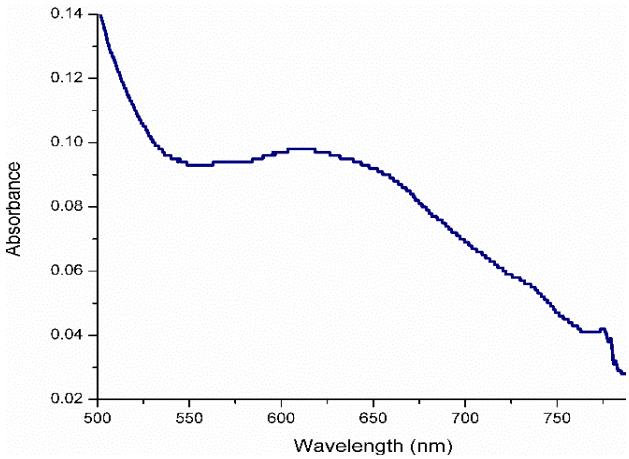

Figure 3. Visible spectrum of copper complex of ligand.

Table 1. UV and visible transition of ligand, complex, gallic acid

Compound	Region	λma
Complex	UV	360nm
	Visible	630nm

UV absorption spectroscopy is used to find out absorption maxima of the compound. The UV spectrum of the complex was recorded in UV region and visible region in the wavelength range of 300-500nm(fig.2) and 500-800nm(fig.3) respectively.

π-π* transition for the complex was observed at 365nm, where as in visible region complex showed maximum absorbance at 630nm (table 1).

3.2. DNA interaction studies

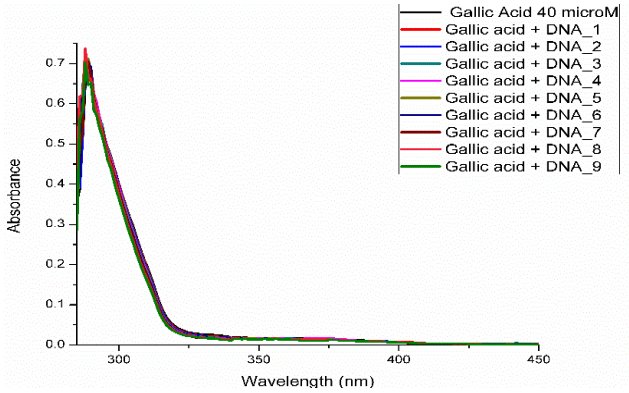

Figure 4 .DNA Binding of gallic acid

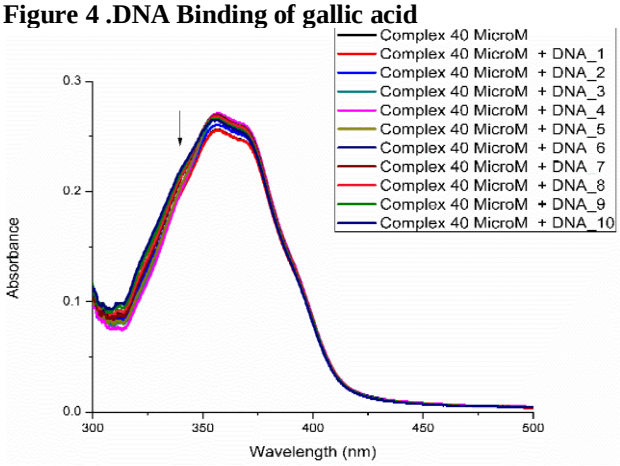

Figure 5. DNA binding of copper complex.

The complex synthesized from ligand, gallic acid and hydrazone was characterised and assessed for the DNA interaction studies. Change in the π-π* transition of the complex was focused to find out the interaction of the compound with DNA. The absorbance and λmax of complex (Fig.5) was observed after successive increments of DNA. The hypochromic effect was observed stating the effective interaction between complex and DNA.

4. CONCLUSION

Synthesis of copper complex based on gallic acid and hydrazone ligand was carried out using simple techniques. The characterization of the complex was carried out using UV and FTIR spectral analysis. Thus, the characterized compound was subjected to DNA interaction studies using UV spectroscopic titration. The complex showed the decreased absorbance in the titration stating the interaction with DNA.

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