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**EXTENDED ABSTRACTS BOOK**



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## HIGHLY POTENTIAL CHEMOTHERAPEUTIC AGENT DERIVED FROM SCHIFF BASE COMPLEXES

Siti Solihah Khaidir<sup>1</sup>, Shahrul Nizam Ahmad<sup>1</sup>, Karimah Kassim<sup>1</sup>, Nurul Huda Abd Karim<sup>2</sup>

<sup>1</sup>Faculty of Applied Sciences, Universiti Teknologi MARA Shah Alam

<sup>2</sup>Department of Chemical Sciences, Faculty of Science & Technology,  
Universiti Kebangsaan Malaysia

Email: s.solihah92@gmail.com

### ABSTRACT

The synthesis, characterization, and cytotoxicity studies of Schiff base with copper (II), nickel (II), cobalt (II) and zinc (II) metal salts are reported here. The ligands were synthesized by condensation reaction of appropriate carbonyl and amine compounds. The reactions were carried out in the presence of ethanol and some of the reactions were carried out in the mixture of ethanol and chloroform. Schiff base ligands and complexes were synthesized via microwave-assisted synthesis. The complexes were characterized by means of elemental analysis (EA), magnetic susceptibility (MSB), molar conductance, fourier transform infrared (FT-IR) spectroscopy, nuclear magnetic resonance (<sup>1</sup>H NMR and <sup>13</sup>C NMR) spectroscopy, UV-Visible spectroscopy, and thermogravimetric analysis (TGA). IR spectra of the complexes show a shifting of  $\nu(\text{C}=\text{N})$  and  $\nu(\text{C}-\text{O})$  peaks to a lower frequency as well as the appearance of new M-N and M-O peaks indicating the metal ion was bonded to ONNO donor atoms. The binding mode and interaction of ligand and complexes with porcine and Calf DNA were determined by UV-Vis DNA titration technique. The investigation revealed that all complexes showed a higher binding constant,  $K_b$ . The metal complexes and their corresponding ligands were tested against colon cancer cell lines (HCT116). It was found that the tetranuclear copper complex is the most potent chemotherapeutic agent.

**Keyword:** Schiff base complexes, green synthesis, DNA binding studies, chemotherapeutic agent

### 1. INTRODUCTION

Schiff bases are widely used as ligands due to their ability to stabilize metals in various oxidation states (Al-Shaalan, 2011; Bader, 2010). Microwave-assisted synthesis is one of the components of green chemistry that has become increasingly popular among coordination chemists particularly for the formation of high nuclearity complexes that conventionally involves long refluxing hours. (Kassim & Hamali, 2017; Bahron et al., 2017). Certain Schiff bases and their complexes display interesting biological properties because their structures allow them to interact beneficially with biological systems (Dave & Bansal, 2014). For example, the ability to interact with DNA (Ray et al., 2009) of cancerous cells could inhibit cell proliferation. The synthesis, characterization, and cytotoxicity studies of Schiff base with copper(II), nickel(II), cobalt(II) and zinc(II) metal salts are reported here.

## 2. METHODOLOGY

The ligands were synthesized by condensation reaction of appropriate carbonyl and amine compounds. The reactions were carried out in the presence of ethanol and some of the reactions were carried out in the mixture of ethanol and chloroform. Schiff base ligands and complexes were synthesized via microwave-assisted synthesis. The complexes were characterized by means of elemental analysis (EA), magnetic susceptibility (MSB), molar conductance, fourier transform infrared (FT-IR) spectroscopy, nuclear magnetic resonance ( $^1\text{H}$  NMR and  $^{13}\text{C}$  NMR) spectroscopy, UV-Visible spectroscopy, and thermogravimetric analysis (TGA). The binding mode and interaction of ligand and complexes with porcine and Calf DNA was determined by UV-Vis DNA titration technique. The metal complexes and their corresponding ligands were tested against colon cancer cell lines (HCT116).

## 3. FINDINGS

From CHNS analysis, it is found that the ligand acts as polydentate ligand coordinating metal ions with 1:1 metal ligand ratio for dinuclear and 1:2 metal ligand ratio for tetranuclear complexes. IR spectra of the complexes show a shifting of  $\nu(\text{C}=\text{N})$  and  $\nu(\text{C}-\text{O})$  peaks to a lower frequency as well as the appearance of new M-N and M-O peaks indicating the metal ion was bonded to ONNO donor atoms. The  $^1\text{H}$  NMR and  $^{13}\text{C}$  spectrum of the ligand shows a peak representing the proton and carbon present in the compound. The investigation revealed complexes showed a higher binding constant,  $K_b$ , which verified a strong binding of the compound towards DNA helix.

## 4. CONCLUSION

The new dinuclear and tetranuclear Schiff base complexes were successfully synthesized via green synthesis technique. There was a significant reduction in reaction time, amount of solvent needed, electrical power and cooling water. The DNA binding studies revealed the high binding of the compound to the DNA helix. It was found that all compounds show a potential as chemotherapeutic agent with tetranuclear copper complex showing the highest activity.

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