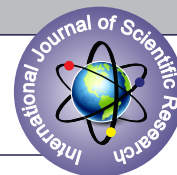


**BIOLOGICAL STUDIES OF NEWLY SYNTHESIS OF (1Z, 1'Z)-N, N'-(ETHANE-1, 2-DIYLBIS(OXY))BIS(5-METHOXY-2,1-PHENYLENE)BIS(1-(2-BROMO-4-FLUOROPHENYL)METHANIMINE AND ITS TRANSITION METAL COMPLEXES.**



**Chemical Science**

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**ABSTRACT**

This work involved the synthesis of narrative new Schiff base or azomethine group and its metal complexes of [Ru (III), Cu (II), Co (II) and Mn (II)]. The azomethine functional group formed with the coupling of 2, 5- Dimethoxy Aniline and 2-bromo-4-fluoro benzaldehyde (L). The molar ratio of Ligand-metal is 1:1. The structure and geometrical elucidation using <sup>1</sup>H-NMR, <sup>13</sup>C-NMR, electronic absorbance spectroscopy, FT-IR spectroscopy, Spectrofluorometer. The molecular weight of ligand and metal complexes is confirmed by mass spectrum. The ligand gets dimerized nature. Investigation of the biological activity of anti-microbial and antioxidant studies of metal complexes is more active than free ligand. The interaction of metal complexes with calf thymus DNA (CT-DNA) was carried out by absorption technique.

**KEYWORDS**

Schiff base, metal complexes, Antimicrobial, Antioxidant and DNA binding

**1. INTRODUCTION**

Schiff base is the primary amines condensation with carbonyl compounds (aldehyde Or ketone) have been reported by Hugo Schiff [1-4]. Organo-metallic compounds have been worn in medicine for current centuries. Metal complexes play indispensable role in pharmaceutical industries and in agriculture. The metallo elements present in trace quantities play imperative roles at the molecular level in living system [5]. A wide range of Schiff bases with their reactive azomethine or imine (-CH=N- or -C=N-) linkage show motivating inhibitory activity against tumor cells and herbicidal activities. Studies show that the metal complexes by Schiff base ligands have better anti microbial and anti cancer tricks as compared to bases. DNA plays an important role in the life progression since it contains all the genetic information for the cellular function. Further study can be revealed that free radicals can damage proteins, lipids and DNA of bio- tissues, foremost to increased rates of cancer and providentially antioxidants can prevent this damage due to their free radical scavenging activity. Therefore a lot of attention has been given to metal complexes that can bind to DNA and also with antioxidant properties [6]. Schiff base metal complexes have been widely used for metal biosite modeling, models of reaction centers of metallo enzymes, non-linear optical materials, catalysis for many organic reactions and luminescence materials [7,8 and 9]. In view of diversity roles of Schiff base metal complexes, it was thought imperative to design new Schiff base metal complexes and study of their role in biological applications of anti microbial, anti cancer, anti-oxidant and also study how the complexes associate to their reactions with DNA. For example, the coordination geometry of a Cu(II) complex bound to DNA affects the Cu(II)/Cu(I) redox behavior and a alteration in the coordination geometry has been found to primarily determine the properties of Cu(II) rather than Cu(I) complex species [10,11]. Some Schiff bases have a high antitumor activity. Imine derivatives are blocking ribonucleotide reductase in tumor cells, so that they are used in the treatment of leukemia [12].

Here we report the uniqueness synthesized Schiff base transition metal complexes and characterization, the study of DNA binding, antimicrobial and antioxidant properties.

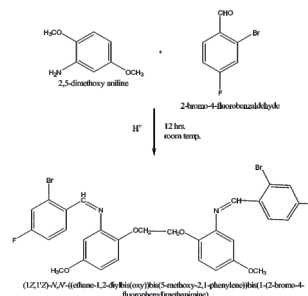
**2. Experimental and Physical measurements**

The chemicals and solvents are purchased from AR grade of Sigma Aldrich. In used to the solvent and chemicals for further purification. The metal complexes are solid in nature, soluble in DMSO, DMF and slightly soluble in ethanol. The molar conductance of the complexes in DMSO (10<sup>-3</sup>) solution as measured at 27±3°C with an Elico model conductivity meter. The electronic absorption spectra of free Schiff base ligand and its Metal complexes were recorded in DMSO solution (10<sup>-3</sup>M) in the range 200-800 nm at room temperature using Shimadazu UV-Visible Spectrometer (1800). The mass spectra of free Schiff base ligands and its Metal complexes were recorded in DMSO solution at room temperature using MS-EI spectrometer at IIT Madras. Thus the <sup>1</sup>H-NMR spectral observations supported the assigned structure of ligands by using 300MHz instrument at Madurai

Kamaraj University, Madurai. The physical properties of ligand and its metal complexes shown in the Table-1.

**2.1. Synthesis of (1Z, 1'Z)-N, N'-(ethane-1, 2-diybis(oxy))bis(5-methoxy-2,1-phenylene)bis(1-(2-bromo-4-fluorophenyl) methanimine. (L)**

Schiff base (L) has been synthesized by adding the ethanolic solution of 2-bromo-4-fluoro benzaldehyde (20mmol) with 2, 5- dimethoxy aniline (20mmol) in 1:1 equimolar ratio. The reaction mixture was then refluxed on 6-8 hours. The volume of solvent was reduced until precipitation began, and the blend was allowed to stand overnight, after which the colored solid was obtained. It was filtered off, recrystallized thrice with ethanol, finally washed with ether, and dried. The purity of the synthesized compounds was monitored by TLC using silica gel-G. The ligand has bi-tentative nature is shown in the Fig-1. Schiff base in 90% yield as black in color and melting point is 110°C. FT-IR (cm<sup>-1</sup>): 3421(Ph-OH), 1630(CH=N), UV-vis. (λ<sub>max</sub>): 220 and 252 nm.



**Fig-1. Synthesis of (1Z, 1'Z)-N, N'-(ethane-1, 2-diybis(oxy))bis(5-methoxy-2,1-phenylene)bis(1-(2-bromo-4-fluorophenyl) methanimine. (L)**

**2.2. Synthesis of metal complexes form Synthesis of (1Z, 1'Z)-N, N'-(ethane-1, 2-diybis(oxy))bis(5-methoxy-2,1-phenylene)bis(1-(2-bromo-4-fluorophenyl) methanimine (L)**

The metal complexes (ML) have been prepared by using metal chlorides dissolved in distilled water (0.005/0.003m.mol) [where M= Cu(II), Co (II), Mn(II) and Ru (III)] with the ethanolic solution of Schiff base (L) and metal solution in 1:1 molar ratio. The resulting mixture was refluxed on water bath for 8-9 hours. The volume of solvent was reduced until precipitation began, and the mixture was allowed to stand overnight, after which the colored solid was obtained. The solid compound structure is shown in the fig-2. It was filtered off, recrystallized thrice with ethanol, finally washed with ether, and dried. The purity of the synthesized compounds was monitored by TLC using silica gel-G.

**2.3. CONDUCTIVITY MEASUREMENTS**

The molar conductivities of the complexes were measured by using

DMSO as a solvent. The present coordination moieties cannot be replaced by the solvent molecules. The values of this conductance are in the range of 3-12  $\text{Ohm}^{-1}\text{cm}^2\text{mol}^{-1}$  in DMSO shown in table-1 and are in accordance with those reported for non-electrolytes in this solvent. This investigative those complexes dissociate very slightly in this solvent. Molar conductance ( $\Lambda_m$ ) value is depends on the solvent, the number of ions present in the solution, degree of dissociation, mobility of ions and temperature of complexes. The molar conductance calculated by the following equation.

Molar conductance ( $\Lambda_m$ ) = (1000 x cell constant x conductance) / concentration

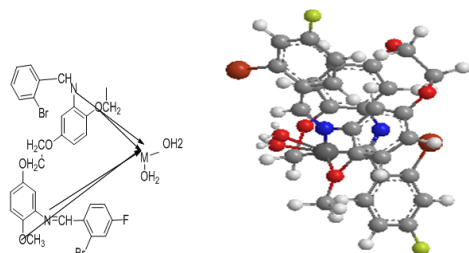


Fig-2 octahedral geometry of ML Complexes [Where M= Cu(II), Co (II), Mn (II) and Ru (III) metal ions.

Table-1 Physical properties and molar conductance values of L<sub>4</sub> and its complexes

S.No	Compound (Empirical formula)	$\Delta m$	M.Pt (°C)	Color	M.Wt Found	Elemental analysis cal. (exp)			
						C	H	N	O
1.	$\text{C}_{30}\text{H}_{26}\text{N}_2\text{O}_4$ $\text{Br}_2\text{F}_2$	--	96	Black	677.33	53.25 (52.55)	3.88 (4.99)	4.14 (5.10)	9.46 (8.89)
2.	Cu (I I I) $\text{C}_{30}\text{H}_{30}\text{N}_2\text{O}_6$ $\text{Br}_2\text{F}_2$	3.5	98	Green	775.12	46.42 (46.95)	3.90 (4.52)	3.61 (3.70)	12.37 (12.54)
3.	Co (I I I) $\text{C}_{30}\text{H}_{30}\text{N}_2\text{O}_6$ $\text{Br}_2\text{F}_2$	6.5	99	Dark green	771.47	46.70 (47.90)	3.92 (4.20)	3.63 (3.78)	12.45 (12.18)
4.	Mn (I I I) $\text{C}_{30}\text{H}_{30}\text{N}_2\text{O}_6$ $\text{Br}_2\text{F}_2$	10.9	97	Brown	767.31	46.94 (47.48)	3.94 (4.38)	3.65 (3.70)	12.51 (12.20)
5.	Ru (I I I) $\text{C}_{30}\text{H}_{30}\text{N}_2\text{O}_6$ $\text{Br}_2\text{F}_2$	8.3	144	Brown	813.34	44.28 (47.30)	3.72 (3.90)	3.44 (3.80)	11.80 (12.20)

### 3. RESULT AND DISCUSSION

#### 3.1. FT-Infrared spectral data

The FT-IR spectra of the complexes were compared with the ligand in order to ascertain the changes that might have taken place. The spectra of free ligands shows a band in the region  $1618\text{ cm}^{-1}$  characteristics of the  $\nu(\text{C}=\text{N})$  stretching mode [13] indicating the formation of the Schiff base products. This band is shifted towards lower frequency by  $25\text{ cm}^{-1}$  on complexation compared to free ligands indicating the involvement of the azomethine nitrogen in chelating with the metal ion, the coordination of the nitrogen to the metal ion would be expected to reduce the electron density of the azomethine link and thus causes a shift in the  $\nu(\text{C}=\text{N})$  group. Coupled with this, the absence of a band around  $1641\text{--}1730\text{ cm}^{-1}$ , characteristic of  $\nu(-\text{HC}=\text{O})$  in 2-Bromo-4-Fluro benzaldehyde suggests that the condensation of the aldehyde groups is complete. Conclusive evidence of the bonding is also shown by the observation that new bands appear in the spectra of all metal complexes in the low frequency regions at  $640\text{--}783$  and  $455\text{--}575\text{ cm}^{-1}$  characteristic for  $\nu(\text{M}-\text{N})$  and  $\nu(\text{M}-\text{O})$  vibrations respectively [14], the N atom for azomethine group and Oxygen atom for water molecules respectively, which are not observed in the spectra of free ligands. The water molecules presented is confirmed by the broad band spectra of the region of  $3354\text{--}3383\text{ cm}^{-1}$ . So the ligand was confirmed the octahedral geometry. The FT-IR spectra of the ligand and its metal complexes shows in the figure-3.

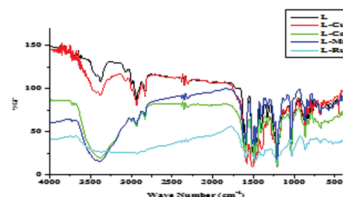


Fig-3 FT-IR spectra of L<sub>4</sub> and their metal complexes

#### 3.2. Electronic spectral data

Direct substantiation of orbital energy levels can be obtained from electronic spectra. This spectrum is a consequence of transitions between states of different energies and provides valuable information about the structure and bonding of molecules. The electronic absorption spectra of the ligand and its metal complexes were recorded in DMSO solution at room temperature. The UV-Vis spectrum of L<sub>4</sub> shows a band at  $36,101\text{ cm}^{-1}$  ( $277\text{ nm}$ ), which is assigned to the  $n-\pi^*$  transition of the  $\text{C}=\text{N}$  chromophore. The second band shows at  $45,146\text{ cm}^{-1}$  ( $221\text{ nm}$ ) which is assigned to  $\pi-\pi^*$  transition of the aromatic ring of the benzene. On complexation, this band is shifted to lower wavelength in the complexes, indicating coordination of azomethine nitrogen to the metal ion. The Cu(II) complex shows three peaks at  $359\text{ nm}$  ( $27855\text{ cm}^{-1}$ ),  $599\text{ nm}$  ( $16,694\text{ cm}^{-1}$ ) and  $642\text{ nm}$  ( $15,576\text{ cm}^{-1}$ ) for d-d transition. The three spin allowed transitions are estimated in the visible region, these bands are assigned to  ${}^2\text{B}_{1g} \rightarrow {}^2\text{A}_{1g}$  ( $d_{xy}^2-d_{xz}^2$ ),  ${}^2\text{B}_{1g} \rightarrow {}^2\text{B}_{2g}$  ( $d_{xy}^2-d_{yz}^2$ ) for  $v_1$  and  ${}^2\text{B}_{1g} \rightarrow {}^2\text{E}_g$  ( $d_{xz}^2-d_{yz}^2$ ) for  $v_2$ , this order to increasing energy. This transition suggests that these complexes have Octahedral geometry. This Cu (II) complexes having LMCT transition are available. The intensities of absorption bands are experimentally measured in terms of the molar absorption co-efficient. The term  $\epsilon$  (molar co-efficient) is calculated by Beer-Lambert's law. The Mn(II) complex band at  $16680\text{ cm}^{-1}$  ( $598\text{ nm}$ )  ${}^6\text{A}_{1g} \rightarrow {}^4\text{T}_{1g}$ . The bands are extremely weak. There are more bands available. The electronic d-d transition from a high spin  $d^5$  configuration must necessarily involved the pairing of some electron spins; such transition are both spin forbidden and orbitally forbidden therefore the bands are weak octahedral complexes.

The Ru (III) complexes have same  $d^5$  configuration but the vibration frequency and its transition occurs at the band ( $625\text{ nm}$ )  $15987\text{ cm}^{-1}$ . The electronic transition occur the orbital of  ${}^6\text{A}_{1g} \rightarrow {}^4\text{T}_{1g}$ . The molar co-efficient is  $10^2$  spin allowed symmetry forbidden in octahedral complex is confirmed. The position of d-d transitions in the electronic spectrum of a metal complex gives valuable information about the geometry of the complex. For Octahedral complexes, the molecular orbitals can be described as resulting from a combination of central metal atom accepting a pair of electrons from sigma donor's ligand. The  $d_{xy}^2$  and  $d_{z^2}$  orbital was contributing the bonding orbitals with ligand orbitals. But the  $d_{xy}$ ,  $d_{xz}$  and  $d_{yz}$  orbitals cannot form bonding with ligand. The absorption spectrum shown in figure-4.

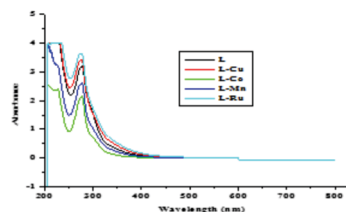


Fig-4 Electronic spectra of L<sub>4</sub> and their metal complexes

#### 3.3. <sup>1</sup>H-<sup>13</sup>CNMR Spectral data

The <sup>1</sup>H-NMR spectra of the Schiff base and its metal complexes were recorded at room temperature in  $\text{CDCl}_3$ . The <sup>1</sup>H-NMR spectra of the ligand did not show a signal corresponding to the primary amine, supporting the complete formation of the Schiff base is confirmed the data. The ligand shows four types of signals are present and four types of protons are present here. The aromatic benzene ring present is confirmed multiplet at  $\delta = 7.0\text{--}7.37$  [18, 19],  $-\text{CH}=\text{N}$  at  $\delta = 8.87$ ,  $-\text{OCH}_3$  proton present at  $\delta = 2.27$ ,  $-\text{O}-\text{CH}_2$  at  $\delta = 1.43$ . The azomethine proton ( $-\text{CH}=\text{N}$ ) in the deshielding of proton present at the signal. These signals provide support the formation of Schiff base ligand [20] shown in the figure-5. and the spectral data shown in figure-6.

The <sup>13</sup>C-NMR spectrum of the ligand had a bunch of peaks at δ 77 ppm may be attributed to CH=N. Peaks in the region of δ 111.05–137.5 ppm were due to aromatic carbons shown in the signal on figure-5.

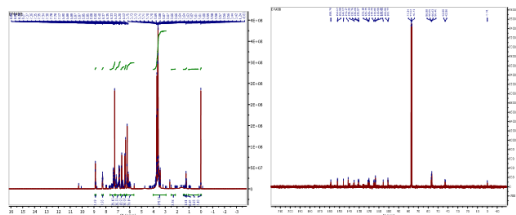


Fig-5 The <sup>1</sup>H and <sup>13</sup>C NMR Spectrum of L<sub>4</sub>

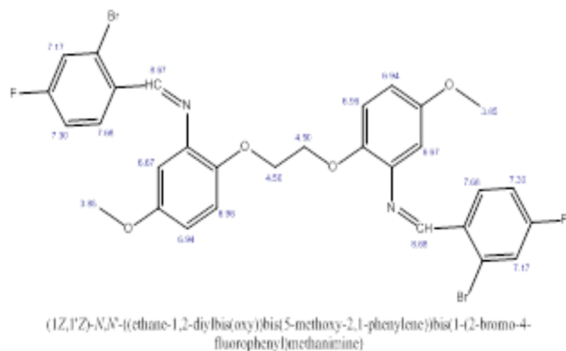


Fig-6 <sup>1</sup>H-NMR Spectral data of L<sub>4</sub>

**3.4 Mass Spectra**

The mass spectra of ligand and its metal complexes were recorded DMSO in ESI-mass Spectroscopy. The mass spectrum of ligand shows M+1 peak at M/Z value 338 (85%) corresponding to [C<sub>15</sub>H<sub>12</sub>BrFNO<sub>2</sub>]<sup>+</sup> ion. Also the spectrum exhibits the fragments at m/z 491 and 493 corresponding to [M+C<sub>6</sub>H<sub>4</sub>Br]<sup>+</sup> and [M+C<sub>8</sub>H<sub>10</sub>NO<sub>2</sub>]<sup>+</sup> respectively. The mass spectrum of Complexes shows peak at m/z 913, 828, 679 and 1068 corresponding to [ML<sub>2</sub>]. The strongest peaks (base peaks) at m/z 338 represent the stable species C<sub>15</sub>H<sub>12</sub>BrFNO<sub>2</sub><sup>+</sup>. The m/z of all the fragments of ligands and their complexes confirm the stoichiometry of the complexes. The observed peaks are in good agreement with their formulae which match well with the corresponding calculated mass

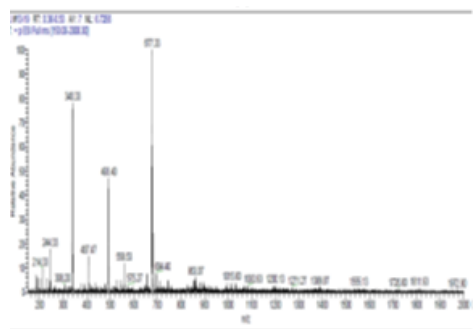


Fig-7 The mass spectra of L<sub>4</sub>

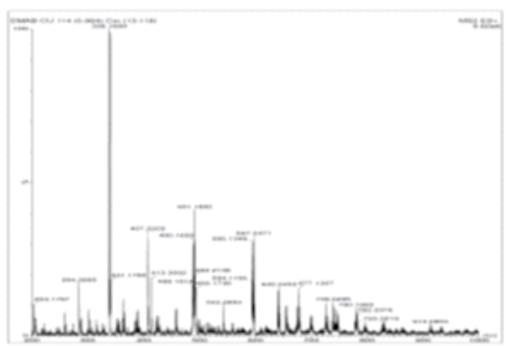


Fig-8 The mass spectra of Cu (II) Complex

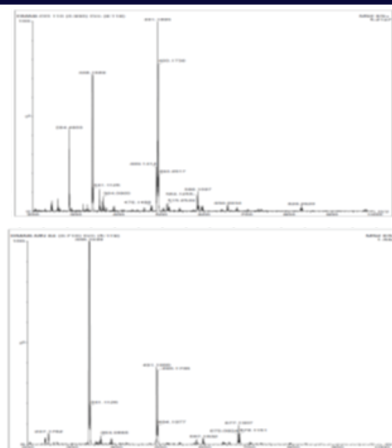


Fig-9 The mass spectra of Co(II) and Mn(II) Complexes

**3.5. Spectro fluorophotometer**

A Spectro-fluorophotometer is an instrument which takes advantage of fluorescent properties of some compounds in order to provide in sequence regarding their concentration an chemical environment in a sample. A persuaded excitation wavelength is preferred, and the emission is observed either at a single wave length, a scan is performed to record the intensity Vs Wave length, also called emission spectra. The excitation wavelength of the ligand (L<sub>4</sub>) 480 (nm), the metal complexes also emitted the fluorescent radiation at the wavelength of 527 nm, 411 nm, 560 nm and 566 nm for Cu(II), Co(II), Mn (II) and Ru (II) respectively.

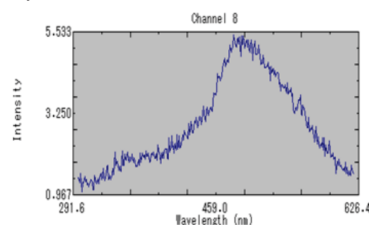


Fig-10 The emission spectrum for L<sub>4</sub>

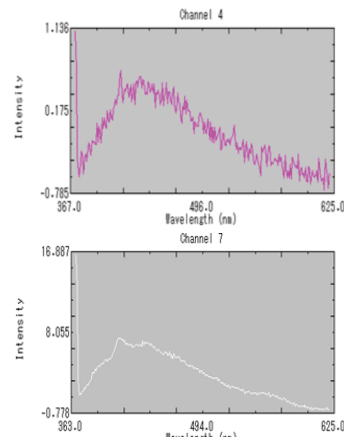


Fig-11 The emission spectrum of r Cu(II) and Co (II) complexes

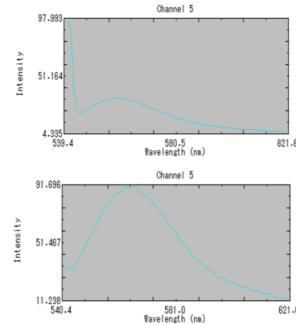


Fig-12 The emission spectrum of Mn (II) and Ru (III) complexes

## 4. Biological Studies

### 4.1. Anti microbial activity

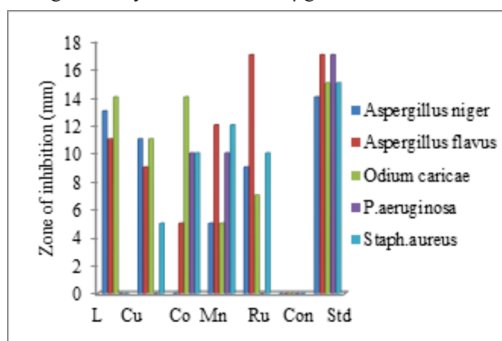
The biological proceedings of the Schiff base ligand and their metal complexes were experienced against the bacterial and fungal can achieve resistance to antibiotics through biochemical and morphological modification [21]. The organisms used in the present study are *Aspergillus niger*, *Aspergillus flavus* and *Odium Carciae* for fungals and *P.aeruginosa* (Gram - ve) and *Staph.aureus* (Gram +ve) bacteria. The well-diffusion agar method used to evaluate the antibacterial activity of the synthesized metal complexes. The results of the bactericidal and fungicidal screening of the synthesized compounds are given in table-2.

**Table-2. Antimicrobial activity of the compounds against fungal and bacterial pathogens**

Test pathogens	Zone of inhibition area in diameter (mm)						Standard (25 µg)
	L	Co	Cu	Mn	Ru	Solvent (or) con	
<i>Aspergillus niger</i>	11	11	NZ	5	9	NZ	14
<i>Aspergillus flavus</i>	14	9	5	12	17	NZ	17
<i>Odium caricae</i>	15	11	14	5	7	NZ	15
<i>P.aeruginosa</i>	NZ	NZ	10	10	NZ	NZ	17
<i>Staph.aureu</i>	NZ	5	10	12	10	NZ	15

#### Solvent used:

DMSO (Dimethyl Sulphoxide) **Standard used:** Cotrimoxazole 25 µg for antifungal activity and Amikacin 30 µg for antibacterial activity.



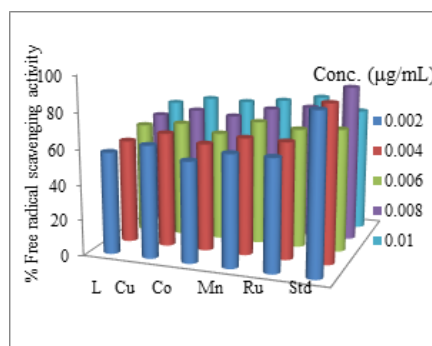
**Fig-13 Antimicrobial activity of L<sub>1</sub> and its complexes**

The ligand does not show any moderate activity against bacterial. The obtained results indicate that the complexes have higher activity than the ligand against same microorganisms under indistinguishable experimental conditions. This suggests that the chelation could facilitate the ability of a complex to cross a cell membrane and can be explained by Tweedy's Chelation theory [22]. Chelation significantly reduces the polarity of the metal ion because of partial sharing of its positive charge with donor groups and possible electron delocalization over the whole of chelate ring. Such chelation (or ring formation) could enhance the lipophilic nature of the central metal atom, which consequently positive discrimination its permeation through the lipid layer of the cell membrane. The variation in the effectiveness of unlike compounds against different organisms either on the impermeability of the cells of the microbes or on difference in ribosome of microbial cell. The metal complexes are much higher activity than that of ligand.

### 4.2. Anti Oxidant activity

The model of scavenging the stable DPPH<sup>•</sup> radical is extensively used method to estimate antioxidant activities in a relatively short time compared with other methods. The maximum absorption of a stable DPPH<sup>•</sup> in ethanol was at 517nm. When the reaction between antioxidant molecules and DPPH<sup>•</sup> radical, which results in the scavenging of the radical by hydrogen donation, the antioxidants origin to decrease the absorbance of a DPPH<sup>•</sup> radical. This is identically perceptible as a discoloration from purple to yellow. Hence, DPPH<sup>•</sup> is usually used as a substrate to evaluate antioxidant activity of antioxidants [23]. The consequence of antioxidants on DPPH<sup>•</sup> radical scavenging was thought to be due to their hydrogen donating ability. DPPH<sup>•</sup> is a stable free radical and accepts an electron or hydrogen radical to become a stable diamagnetic molecule [24]. Fig-14 Illustrates a significant increase the concentration of DPPH<sup>•</sup> radical due to the scavenging ability of the sterically hindered Schiff base ligand showed DPPH<sup>•</sup> scavenging activity. Free radical scavenging aptitude of the sterically hindered Schiff base ligand also increased

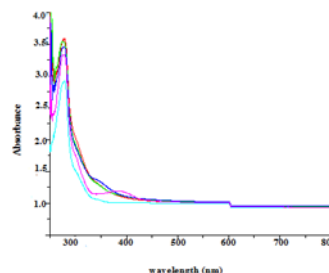
with increasing concentration. Based on the data obtained from the study, sterically hindered ligand is free radical inhibitors as well as primary antioxidant that react with free radical, which limit free radical may injure happening in the human body.



**Fig-14 Free radical scavenging activity of L<sub>1</sub> and its metal complexes**

### 4.3. DNA binding activity

Electronic absorption spectroscopy is a helpful performance in DNA binding studies of molecules. If metal complex acts as DNA investigate, its spectroscopic properties are supposed to revolutionize upon binding with DNA. These variations in spectroscopic properties endow with an outstanding statistics about DNA conformation as well as structure. A broad spectrum in the assortment 250-362 nm is shown in the UV-Visible spectrum of the complex. The privileged energy band in the spectrum is indicative of d-d transition occur. After addition of DNA to the solution of metal complexes in tris-buffer, it is clearly observed that the absorption peak at 364 nm. It undergoes significant increase in molecular absorption (hyperchromic effect) with no detectable shift in the absorption wavelength.



**Fig-15 Absorption spectra of Cu(II) Complex in buffer pH=7.2 at 25°C in presence of increasing amount of DNA.**

In the case of intercalation of the complex undergoes bathochromism as the  $\pi^*$  orbital of the intercalated ligand couple with the  $\pi$ -orbital of the DNA base pairs, thus the lowering the  $\pi$ - $\pi^*$  transition energy [25]. Therefore, change in absorption upon addition of DNA had been indicative of the binding of the complexes with DNA. The changes of energy of the ligand field bands of the complex were observed, ruling out the opportunity of binding these complexes with DNA bases [26, 27]. DNA usually exhibited hypochromism as a consequence of the intercalation mode, which involved a strong interaction between an aromatic chromophore and the base pairs of DNA. This strong stacking interaction was due to the contraction of calf thymus (CT-DNA) in the helix axis and its conformational changes. On the other hand, hyperchromism resulted from the secondary damage of DNA double helix structure, in which the extent of hyperchromism was indicative of partial or non-intercalative binding modes [28].

**Table-3 The electronic absorption data for the interaction of DNA with synthesized metal complexes**

Complexes	$\lambda_{\max}$ (nm)		$\Delta\lambda$ (nm)	$^{\circ}\text{H}\%$	$K_b \times 10^3$ ( $\text{M}^{-1}$ )
	Free	bound			
Cu(II)- complex	280	282	2	3.74	3.18
Co(II)-complex	320	318	2	4.40	1.64
Mn(III)-complex	285	290	5	3.70	1.68
Ru(III)- complex	304	307	3	7.80	10.5

$$^{\circ}\text{H}\% = [(A_{\text{free}} - A_{\text{bound}}) / A_{\text{free}}] \times 100\%$$

#### 4.4. DNA Cleavage efficacy

The ability of the complexes to cleave CT-DNA has been studied by using gel electrophoresis technique. DNA cleavage is controlled by relaxation of super coiled circular form of CT-DNA into nicked circular form and linear form. In Continution, it is also reporting here the cleavage of CT- DNA with complexes (Cu, Co, Mn and Ru). Their cleavage efficacy can be identified by using the gel electrophoresis diagram as shown in fig-16. The aptitude of the complexes in affecting DNA cleavage has been investigated by gel electrophoresis using CT-DNA in 5mM Tris HCl/ 50mM NaCl buffer solution (adjusted pH-7.2). When the DNA is conducted by electrophoresis, the fastest migration will be observed for the super coiled form (Form-I). However, all the metal complexes reveal some good DNA cleaving properties. In feature Cu (II) and Ru (III) complexes have shown complete DNA cleavage as evidenced by retreating of lanes intensity while other metal complexes (Co (II) and Mn (II)) may also depend on the intercalative binding mode of the DNA molecules to the metal (II) complexes. The consequence of this DNA cleavage indicates the important role in the isolation of metal ions from the complexes. It may also be concluded that compound which cleaves the DNA may also inhibit the enlargement of the pathogenic organism by cleaving the genome.

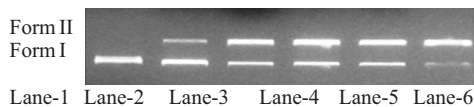


Fig-16 Gel electrophoresis assay for the cleavage of calf thymus DNA (200 µg) by Cu- complex in the presence of activators – reactive oxygen species after 45 min incubation time at different concentration. Lane 1 - DNA control (Calf thymus DNA); Lane 2- DNA + Cu (10µM); Lane 3- DNA + Cu (20µM); Lane 4- DNA + Cu (30µM); Lane 5- DNA + Cu (40µM); Lane 6- DNA + H<sub>2</sub>O<sub>2</sub>.

#### 5. CONCLUSION

In summary we have accomplished the facile synthesis of (Z)-N-(3-bromo-5-fluorobenzylidene)-2, 4-dimethoxyaniline (L<sub>1</sub>) schiff base ligand by conventional method and its metal complexes synthesized by using Ru (III), Cu (II), Co(II) and Mn (II) ions by reflux process. The ligand and its metal complexes was confirmed by the characterization techniques of conductivity studies, FT-IR, UV-Visible, EPR, <sup>1</sup>H-NMR, Spectrofluorophotometer and Mass spectroscopy. The ligand acts as tetra dentative nature because it's get dimerized form two azomethine linkage and two methoxy group can donate the electron. The physico-chemical and spectral data revealed an octahedral geometry for the all metal complexes. Anti-fungal activity of Ru (III) complex is highly active against for *Aspergillus Flavus* and Co (II) complex is highly active against as *Odicium carciae*. Anti bacterial activity of Cu (II) complex is highly activity against pathogens for *P.aeruginosa* and Mn (II) complex activity against *Staph.aureus*. The free radical scavenging activity of ligand and its metal complexes shows increase the activity is increasing attentiveness of the compounds.

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