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Biomolecular Companionship, Antioxidant, Anti-cancer and Anti- inflammatory properties of Cobalt (II) Schiff Base complex

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ABSTRACT

The spectrum properties of cobalt (III) complexes make them interesting anticancer drugs among other metallodrugs. We want to test the anticancer effects of the ligand and the Co (III) complex by assuming that they are appropriately created from a new Schiff base ligand. Curcumin and thiosemicarbazide hydrochloride were combined to produce a hexadentate ligand (L). Macromolecular complexation with cobalt acetate salt in a 2:1 molar ratio yielded its deformed Co (III) complex. H1 NMR spectroscopy, infrared (IR), thermogravimetric analysis (TGA), molar conductivity, and CHN elemental analysis were all used to provide light on the complex. The complexation with the Co (III) ion caused the ν (C=N), ν (C-N) phenolic, and ν (C-O) methoxy peaks to move to a higher wave number. At 672-693 and 442 - 456 cm-1, respectively, new peaks were seen that could be attributed to ν (Co-N) and ν (Co-S), suggesting that the ligand coordinated to the center of the Co3+ ion through its azomethine nitrogen, thio sulfur, and methoxy O groups. The Co(L)2 compound exhibited paramagnetic properties with a μeff value of 7.93. At temperatures of around 100 and 350 degrees Celsius, the thermal breakdown of the Co (III) complex occurred in two stages. Compared to its Co (III) complex, the parent ligand has lesser activity in an anticancer study conducted on breast cancer cell lines (MCF-7). When compared to ligand, the anticancer activity of the Co(L)2 complex is superior. This study's Co (III) complex is an intriguing dual-acting drug with the potential to be turned into chemotherapeutics for many malignancies, including breast cancer, according to the current inquiry.

KEYWORDS: Biomolecular interaction, Schiff base ligand, anti-oxidant, anti –inflammatory activity and cytotoxic activity.

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INTRODUCTION

The recent surprising discovery of cis platin has made metal-based treatments a promising field of study in medicinal chemistry. Lately, platinum-based drugs have been used to treat roughly half of all cancer patients**.** [1,2] but platinum based metallodrug are associated with several side effects like

1) Adverse effects on organs
2) Lack of selectivity
3) Intrinsic or acquired resistance which prompted search for effective non- platinum drug.
4) Develops organs toxicity
5) Poor absorption of drug

Complexes of Ru, Ir, Cu, Ni, Zn, Co, etc., have been shown to have superior anti-cancer properties compared to cis platin in recent decades. [3,6]. Cobalt is a trace element that every living thing needs. Important biological processes that it plays a role in include hematopoiesis, fatty acid and amino acid metabolism, and, via vitamin B12, DNA synthesis. A single anti-viral drug molecule using a cobalt complex with the doxorubin Schiff base ligand has just completed phase II clinical trials. [7]. The anti-cancer effects of cobalt complexes have been indicated by a number of in vitro investigations[8]. When tested against cancer cells including MCF-7, A-431, and HeLa, cobalt complexes containing Schiff base ligands shown more potent anti-cancer action compared to Cis-Platin. [9,11]. Schiff base ligand-cobalt complexes were more effective than Cis-Platin in inhibiting the growth of cancer cells in vitro, including MCF-7, A-431, and HeLa. [12,15]. The salicylaldehyde aromatic ring of these Schiff bases may be substituted with different moieties to modify their anticancer activity. When tested against colon HT-29 and OVCAR-I cancer cells, Tshuva et al. found that a titanium (IV) complex of salen with two aromatic rings that have been replaced showed 30-fold more anti-cancer activity than cis-platin. [9]. It has been discovered that some complexes including fluoine and iron (III) salophen are very hazardous to HT-29, MCF-7, and MDA-MB-231 cells. [16]. Complexes comprising salophen and iron(III) are very effective against cis-platin in terms of their anti-proliferation characteristics. [18]. Experiments on the ethylene diamine bridge shown that the cytotoxic activity of these salen complexes is not reliant on the aromatic ring location but rather the type of the substitutent. While compounds with a hydroxy substituent exhibited strong cytotoxic action against cancer cells, those with a methoxy substituent were equipotent to cis-platin. The oxidative DNA damage that these metal complexes cause is the mechanism by which they destroy cancer cells.. Research on the ethylene diamine bridge shown that the kind of the substitutent, rather than the position of the aromatic ring, determines the cytotoxic action of these salen complexes. Chemicals with a hydroxyl group were very hazardous to cancer cells, but those having a methoxy group were inert to cis-platin. In order to kill cancer cells, these metal complexes produce oxidative DNA damage. [19,20] Lippard et al] have reported that the ligands directly atter the binding and cytotoxic properties of metal complexes.

Tumor development is influenced by angiogenesis, which is the production of new blood vessels. The research indicates that tumor growth beyond 2 to 3 mm is impossible in the absence of angiogenesis. [22]. The tumor microenvironment receives oxygen and vital nutrients via the newly established blood vessels. Metastatic cells often migrate to other parts of the body via these blood arteries. Therefore, one of the potential techniques to restrict the proliferation and spread of cancer cells is inhibiting angiogenesis. There have been reports in recent years suggesting that metal complexes including Cu, Pt, Ru, and Ir have the ability to inhibit angiogenesis. [23-26]. Angiogenesis progression is influenced by even cobalt [27]. We are unaware of any prior research on the anti-angiogenesis effects of Cobalt complexes of Schiff base ligands. Furthermore, prior research has failed to provide any coherent theoretical and experimental data about the interaction between DNA and serum proteins and base metal complexes of Salen and salophen. In light of the above, we synthesized Co(III) Schiff base complexes having short alkyl chains from aromatic aldehyde and primary amine, and we investigated the biomolecular interaction between these complexes using experimental and theoretical methods. This research also probed the antioxidant, anti-inflammatory, and anti-cancer properties of the Co(III) Complex.

EXPERIMENTAL SECTION:

2.1.Materials & Instrumentation:

All chemicals and reagents were of analytical quality, bought from a business, and used exactly as given. The thiosemicarbazide and cobalt chloride hexahydrate were procured from Merck in India. Merck in India supplied the curcumin, ethanol, methanol, and DMSO. Throughout the trials, double-distilled water was used. The compounds' carbon, hydrogen, and nitrogen contents were ascertained using a Perkin Elmer C, H N 2400 analyzer from CIF, CDRI Lucknow (U.P.) in India. The compounds were synthesized as KBr pallets and their infrared spectra were recorded on an FT-IR Perkin Elmer spectrophotometer. The H1 NMR spectra were captured using CDCl3 as the solvent on a BRUKER 400 MH2. At the PC ray Research Centre at ITM University Gwalior (M.P.), a Parkin Elmer UV- Vis spectrophotometer was used to capture the absorption spectra. A Systonics type 302 conductivity bridge was used to determine the molar conductance of the Co(III) complexe. The bridge was equilibrated at 25± 0.01°c using a 1 milli-molar solution in dimethyl sulphoxide solvent. Volumetric and gravimetric analyses determined the concentrations of cobalt and anions. For the purpose of thermal analysis, a Shimadzu thermal analyzer was used. The experiment was conducted in an inert nitrogen environment using alumina powder as the reference component. At room temperature, a D8 advance BRVKER diffractometer equipped with Cu Kα (1.54 Aº) as the incident radiations was used to characterize the structure of the ligand and Cobalt complex using the powered XRD (X-ray diffraction) method.

a) Synthesis of Schiff base ligand

The ligand was prepared by condensation of thiosemicarbazide hydrochloride with curcumin extract in the 1: 2 molar ratio in methanol and the crude product was recrystallized in methanol. [7,8]

Yield-74%, colour - light yellow, Anal. for $C_{22}H_{23}O_5N_3S$(%) C,62.02; H, 5. 29, N, 9.76 S, 14.16 Found C;62.10, H;5.32,N;9.80,S,14.18.

FT-IR (KBr, cm^{-1}): 3173 cm^{-1}, ν(O-H),1647 cm^{-1} ,ν (C=N), 1316 cm^{-1}, (ν (C-O)1285 cm^{-1}.

UV-- Vis ʎ(max) (nm) (DMSO); 356, 371 nm: Solubility : DMSO, DMF : Melting point: 98± 2°c ,Molecular weight: 863. 96 grams per mole.

H^1 NMR (400 mH_2, $CDCl_3$, δppm): 0.86-0.89(t,6H, CH_3), 0.88-1.20(23H, CH_2),1.82(4H, CH_2), 2.48(2H, CH_2),6.8 (2H, aromatic), 7.23(2H, aromatic), 7.46(4H, aromatic), 8,2 (2H, aromatic), 8.18(2H, amine).

b) Synthesis of Cobalt (III) complex:

Cobalt salt (0.26 gram, 1 mmol) was added to a reflective solution of synthesized ligand (1 mmol) in methanol (10mi). For six hours at 70°c, the reaction mixture was refluxed. After forming a cobalt (III) complex, the solution was oxidized by adding air for 1 hour before filtering. This filtrate was supplemented with the correct amount of sodium per chlorate (NaClo4). Following 72 hours of aging, crystals of the Co (III) Complex, which had a brownish hue, were precipitated out of the solution. Silica gel chromatography with hexane/eth
yl acetate as the elutent was used to purify the crude product.

Yield – 72%, colour – Black, m.pt. -104±2°c, molecular weight: 922.89 g/mole: solubility- DMSO, DMF, Uv- vis (ʎ max) = 263nm Anal for [Co (C_{22} H_{23} O_5 $N_3S)_2$] :(%) C,63.68; H,8.20; N, 6.86, S, 14.20. Found (%) C, 63.70, H, 8.22, N ,6.96, S, 14.26. FT-IR (KBr, cm^{-1})

H^1NMR (400 MH_2, $CDCl_3$, δppm): 0.86 – 0.90 (t,6H, CH_3), 0.90- 1.28 (6H, CH_2), 1.82 (4H, CH_2), 2.50(2H, CH_2),6.8(2H, aromatic),7.24(2H, aromatic),7.46(4H, aromatic),8.2(2H, aromatic), 8.18(2H, imine).

C) Anti-cancer studies:

A reflecting solution of synthesized ligand (1 mmol) in methanol (10mi) was supplemented with 0.26 gram of cobalt salt (1 mmol). Refluxing the reaction mixture for six hours at 70°C was the procedure used. To filter out impurities, the solution was oxidized for 1 hour after a cobalt (III) complex had formed. The appropriate concentration of sodium per chlorate (NaClo4) was added to this filtrate. The brownish-colored Co(III) Complex crystals were precipitated from the solution after 72 hours of age. To refine the raw material, we used silica gel chromatography with a hexane/ethyl acetate eluate.

The solvent control utilized in the assessment of the IC50 value was 0.02% DMSO. Careful aspiration of the media was followed by replacement with fresh medium after the completion of the incubation period (24 hours). Each well was treated with 100µl of 100% DMSO to dissolve the formazan that had been produced. A 96-well plate reader (Bio-Rad, Hercules, California, USA) was used to detect the absorbance at 570 nm. Every experiment was conducted at least three times, with two replicates for each. The percentage inhibition was calculated, from these data using the formula.

= Mean OD of untreated cells (control) – Mean OD of treated cells/ Mean OD of untreated cells (control)

d) In-vitro Antioxidant activity:

The Hataro's approach was used to conduct the RAS activity of the ligand and its cobalt (III) complex at doses of 20, 40, 60, 80, and 100 µg/ml using a solution of stable DPPH (2,2- diphenyle-1-picrylhydrazyl) (0.04% W/V). Ascorbic acid is used as a reference material in this procedure. The examined compounds were combined with 1 milliliter of DPPH in methanol (0.3 millimoles) in a 50-milliliter beaker. At the same time, the examined compounds were mixed with 1 milliliter of methanol to make the blank solution. A 1 milliliter solution of DPPH and 3 milliliters of DMSO solvent were used as the negative controls in this experiment. After 30 minutes of room temperature treatment, we measured absorbance at 517 nm for all of the solutions. Percentage scavenging ability of investigated compounds was calculated by following formula.

= Percentage (RAS) Scavenging ability of compounds = $[(Abs_{control} - Abs_{sample})/Abs_{control}] X100$

$Abs_{control}$ = Absorbance of control

Abs_{sample} =Absorbance of investigated compounds

e) In-vitro Anti-Inflammatory activity:

Using a solution of stable DPPH (2,2- diphenyle-1-picrylhydrazyl) (0.04% W/V), the RAS activity of the ligand and its cobalt (III) complex was tested using Hataro's technique at dosages of 20, 40, 60, 80, and 100 µg/ml. This process makes use of ascorbic acid as a standard. The chemicals that were tested were mixed in a 50 mL beaker with 1 mL of DPPH in methanol (0.3 millimoles). Concurrently, the compounds under investigation were combined with 1 milliliter of methanol to create the blank solution. The experiment's negative controls consisted of a 1 mL DPPH solution and a 3 mL DMSO solvent. The absorbance at 517 nm was measured for each solution after 30 minutes of treatment at room temperature.

Percentage inhibition of Protein = $[(Abs_{control} - Abs_{sample})/Abs_{control}] X100$

$Abs_{control}$ = Absorbance of control

Abs_{sample} =Absorbance of investigated compounds.

RESULT AND DISCUSSION:

3.1 Synthesis and Characterization:

A strategy for the synthesis of the schiff base cobalt (III) complex is shown below. Figure 1

Cucumin and thiosemicarbazide hydrochloride form a ligand for Schiff bases.

In both DMF and DMSO, the Ligand and its Co (III) complex were fully soluble and stable at room temperature. With the help of the XRD pattern, we were able to determine the crystalline nature and surface morphology of the cobalt (III) complex using standard methods and procedures. We then used the DPPH method, the protein denaturation assay, and the MTT assay to evaluate the compound's antioxidant, anti-inflammatory, and anti-cancer activities. Their molecular makeup was used to confirm the ligand and its Co (III) complex elemental analysis.

Table 1: Physico-chemical Properties of ligand and Co (III) Complex:

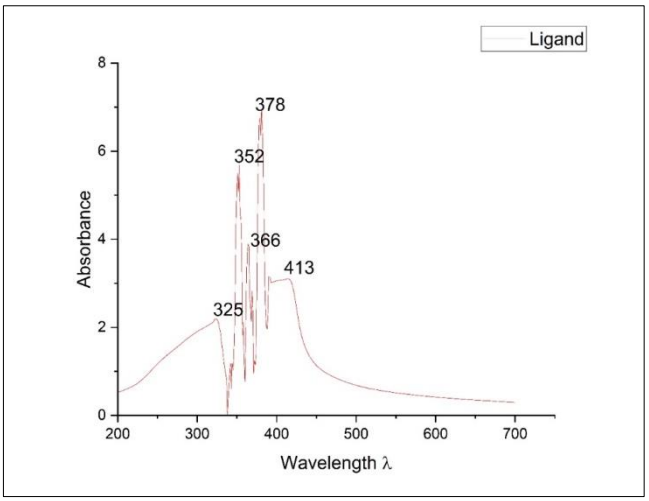
S. N.	Compound	Colour	Melting point	Molecular weight	Molar Conductance	Analysis(%) Found				ʎ Max
						C%	H%	N%	Cal. Co%	
1.	$[C_{24}H_{31}O_5N_3S]$ Schiff base ligand	Yellow	149±2° c	863.96	18.5	62.10 (62.20)	5.29 (4.40)	9.78 (9.80)	-	320nm
2	$Co[C_{45}H_{22}O_{10}N_6S_2]$ Co(III) Complex	Dark Brown	156±2ºc	916.887	0.8	56.78 (56.81)	5.0 (4.84)	9.12 (9.05)	7.46%	264 nm

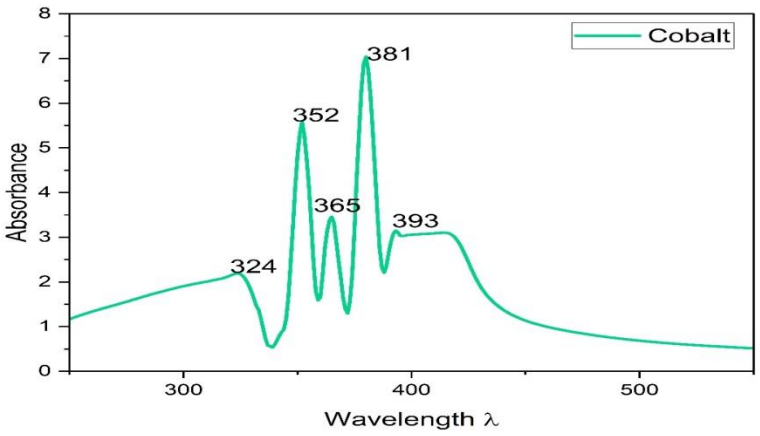
The ligand and its Co (III) complex infrared spectra are shown in figure. For the free ν (C=N) group, the ligand's infrared spectra reveal a band at around 1636 cm-1. In the complex, this band moves to a lower wave number of 1605 cm-1, which means that the nitrogen and oxygen atoms of the ligand are coordinated to the center of the cobalt metal [28]. The resonance at 1282 cm-1 in the infrared spectrum is caused by the ring stretching frequency of the free phenolic ν (C-O) bond, which moves to a higher frequency at 1312 cm-1 in the co complex. Sulfur atoms are shown to be the other coordination sites [29]. The ring starching frequencies ν(C=N) and ν (C-S) of the schiff base ligand, which have values of 1634cm-1 and 1275cm-1, respectively, in the free state, manifest in the infrared spectrum of the cobalt (III) complex as bands at around 1610 cm-1 and 1328 cm-1, respectively. The ligand's nitrogen and oxygen atoms coordinating with the core cobalt (III) ion causes the IR frequency changes. Within the Co (III) complex, the CH2 groups of short chain aliphatic amines exhibited symmetrical stretching vibrations around 2922–2930 cm-1 and carbon hydrogen asymmetrical stretching vibrations at 2852–2860 cm-1. An additional band in the 3420–3435 cm-1 range is likely the N–H bond of the main alkyl amine group.

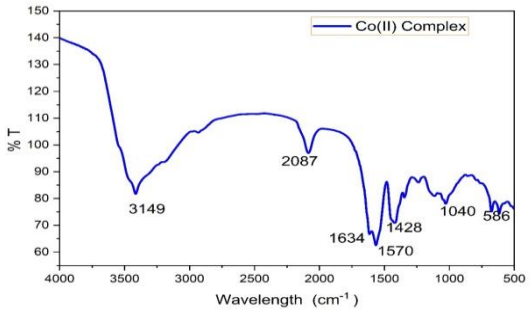
The graphic displays the hydrogen 1NMR spectra of the cobalt complex. Multiple -CH2 protons in the 0.8-0.9 ppm region were

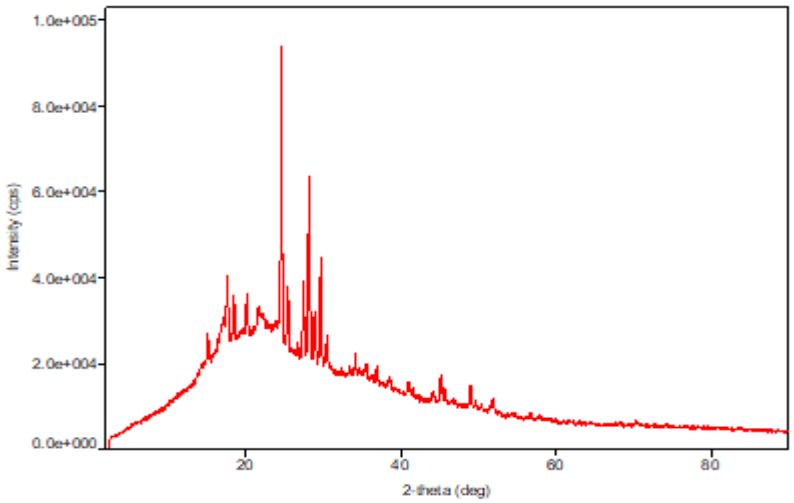
seen in the 1H NMR spectra of the aliphatic amine. The observed protons of CH2 were 2.26 and 1.9 ppm, correspondingly. The methylene groups of the principal amine were matched by the cobalt (III) complex's doublet at around 0.7 ppm. The cobalt (III) complex is thought to include two imine protons, at 7.9 and 8.7 ppm, respectively. The cobalt (III) complex in DMSO was studied by recording its abortion spectra at ambient temperature. Bands at 250-263 nm, corresponding to the aromatic ring's л→л* transition, and 366-386 nm, representing the n→л* transition, are seen in these spectra. In addition to the ligand, the cobalt (III) complex exhibited a shoulder peak at around 470-490 nm, which is a result of the LMCT transition.

A non-electrolyte complex was suggested by the very low molar conductance (0.8Ω-1 cm2 mho) observed at room temperature and various dilutions of 1X10-3 mol/L in DMSO solvent for the produced Co(III) complex. An iodometric study was performed to determine the cobalt metal percentage in the Co(III) complex using potassium iodide and standard sodium thio sulphate solutions. The proportion of nitrogen in the ligand and the Co(III) complex was determined using Kjeldalh's technique. The hexadenatated ligand, which was created by combining curcumin and thiosemicarbazide hydrochloride, was utilized as a complexing agent in this study. This particular ligand is thought to be a promising hetero ligand because of its exceptional ability to enclose cobalt ions when synthesizing cobalt complexes using the refluxing method.





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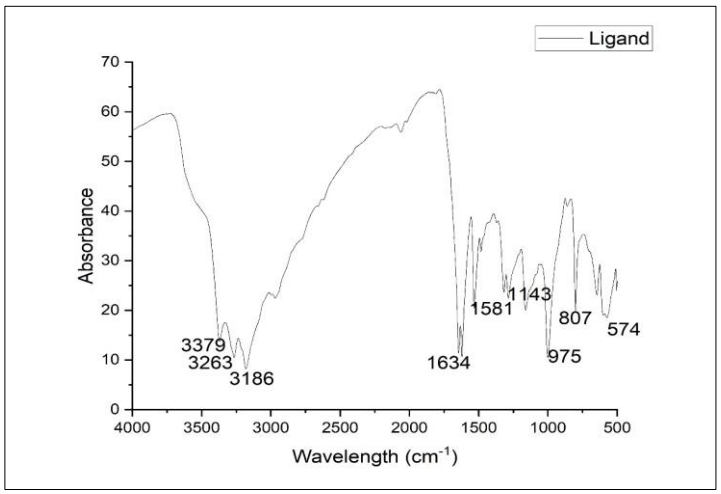
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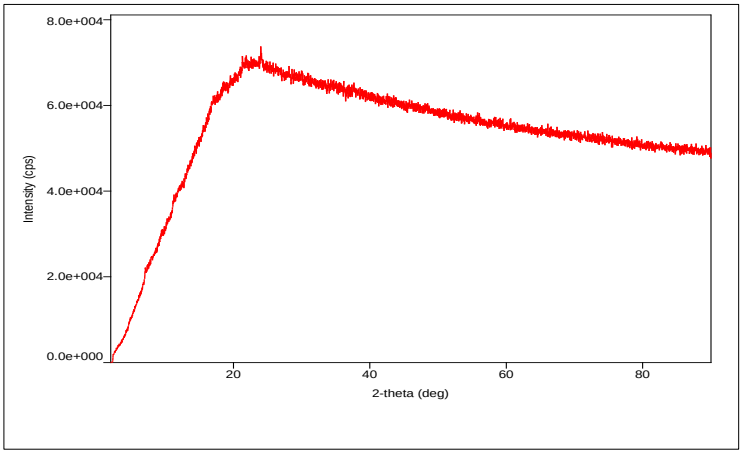
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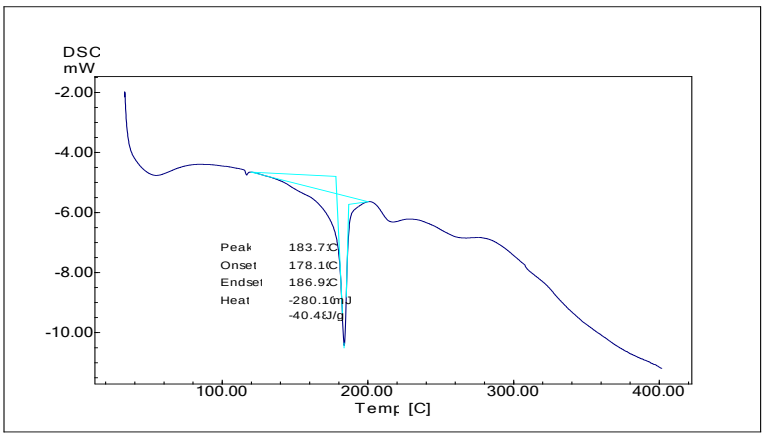
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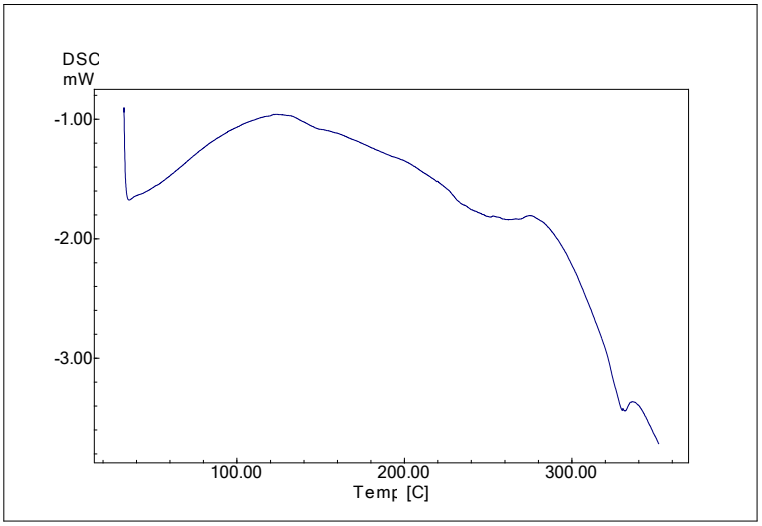


3.2Stability of Cobalt (III) complex:

The cytotoxic action of metal complexes against tumour cells can be influenced by their stability.An ultraviolet- visible spectrophotometer was used to measure the hydrolytic stability of metal complex. The absorption spectra of Co(III) complex was measured in 1% DMSO solvent (TBS, P^H 7.4) at different time intervals (0,24 and 48 hors). Over the course of 48 hours, The UV-Vis spectra did not exhibit any notable alterations, suggesting that the synthesized Co (III) complex remained stable over a long period of time.

3.3 Powder XRD Spectral analysis of compounds:

The powdered XRD technique is a very important crystallographic technique that has been used for the identification of different peaks in the powdered Schiff base ligand and is coordinated cobalt (III) complex.

Figure showed the XRD spectra of ligand and Co complex. The XRD diffraction lines are indexed for ligand and complex as 101,102,103 and 110 phases JCPDS Card No.(100754-44128). From the full width at half maximum of diffraction peaks of x-rays are employed to calculate the average crystalline particle size using Debye- Scherer's equation i.e.

$D=0.9 \text{ X } \lambda / \beta \text{ X } Cos\theta$

Where D =Crystalline average particle size

λ = Wavelength of X-rays used

β= Full width at half maximum of the diffraction peak

θ= Bragg's angle

The particle size of ligand and its cobalt complex were below 100 -200 nm (calculated by using Debye- Scherer's equation) and the width of x-rays were almost similar to the crystalline size of the particle size of ligand and its cobalt complex.

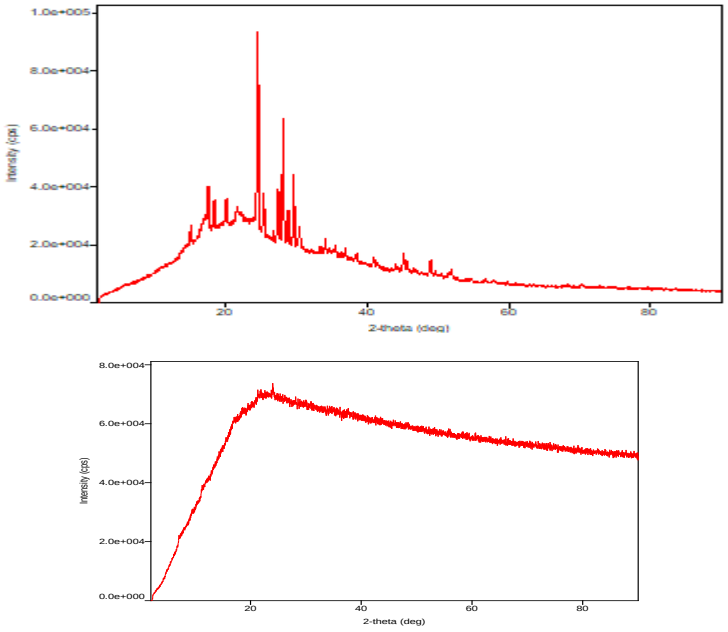
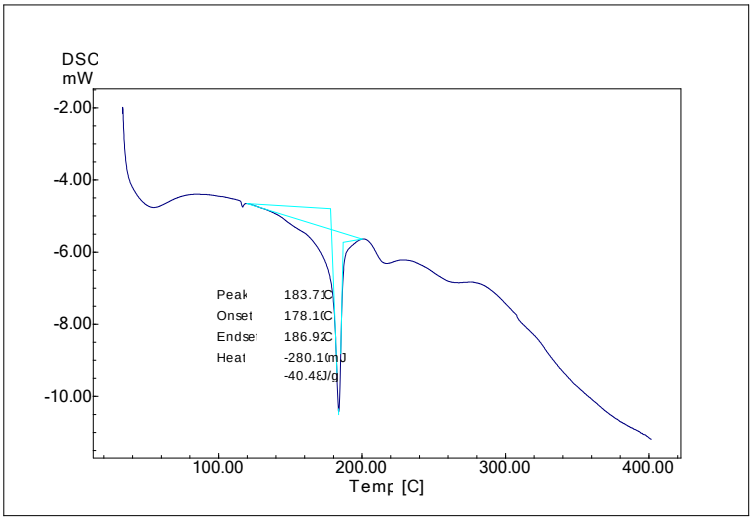
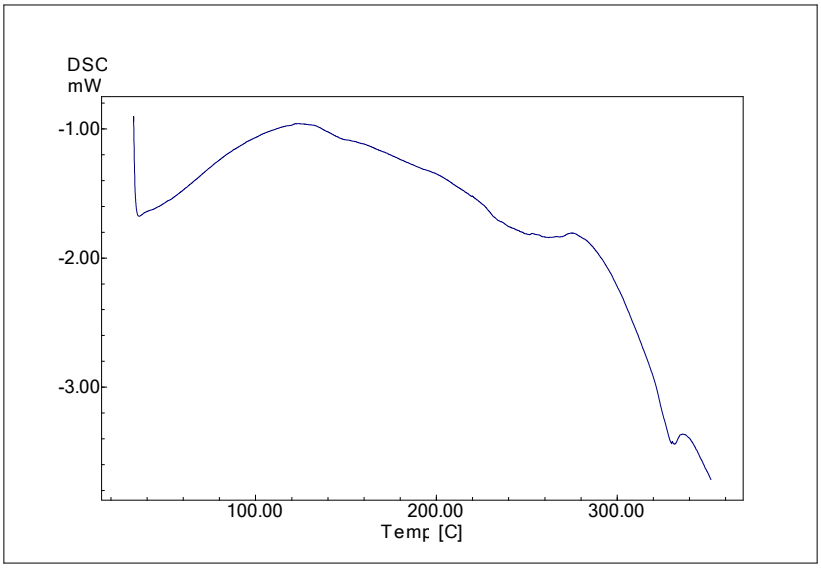


Figure – Powdered XRD spectra of ligand and its Cobalt(III) complex

3.4 TGA analysis of synthesised compounds

The TGA figure indicates that the graph of the cobalt complex begins to decompose at 95^{0}C, 150^{0}C and 285^{0}C respectively comparison of the decomposition temperature of the compounds showed that complex decompose at a higher temperature than its ligand. The TGA curve for the cobalt complex displays 2.85 mg weight loss within temperature range of 150-285 ^{0}C and exhibit a maximum loss of 17.2%.





3.5 In vitro antioxidant activity of compounds:

The antioxidant activity of compounds were evaluated by DPPH method using ascorbic acid as standard substance. The DPPH (stable free radical compound) is used to easily access the radical scavenging ability of compounds. The Co(III) complex demonstrated more antioxidant activity than schiff base ligand, according to the findings of a related investigation.

Ascorbic acid served as a positive control in this investigation to evaluate the synthesized compounds antioxidant activity. Interestingly Schiff base ligand and its Co(III) complex showed excellent antioxidant activity performed by DPPH scavenging efficacy method. The results of antioxidant activities of synthesised compounds are consistent with the theoretical ideas that hydroxyl groups (-OH) and their number, as well as the degree of conjugation within the molecules, affect a compound's antioxidant capabilities. The greater the number of hydroxyl groups on the benzene ring of natural flavonoids, greater their capacity to scavenge radicals. This study highlights the superior antioxidant activity of synthesised Co(III) complex, which is attributed to the structure aspects of its molecular composition, particularly the enhanced presence of hydroxyl groups. The free radical scavenging activities of compounds depends upon the structural features, geometries of complexes and the presence of different electron with - drawing or electron - releasing functional groups in synthesised compounds

Antioxidant of ligand:

S.N.	Concentration	Control	% inhibition AgNo3
1	0	0	0
2	20	53.76	27.90%
3	40	58.07	32.34%
4	60	61.32	50.70%

5	80	67.47	57.86%
6	100	74.02	55.59%
			Avg.- 37.39%

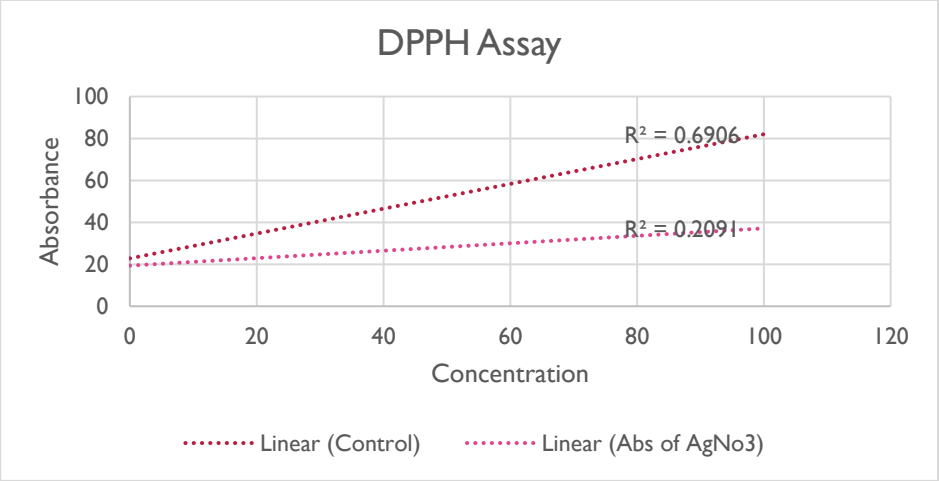


Table-2: In vitro antioxidant activity of synthesised compounds:

S.N.	Compound	IC50 µg/ml
1.	[C_{22} H_{23} O_5 N_3 S] Schiff base ligand	37.39
2.	[Co (C_{22} H_{23} O_5 N_3 S)$_2$]	69.114
3.	Ascorbic Acid (Standard substance)	70.16

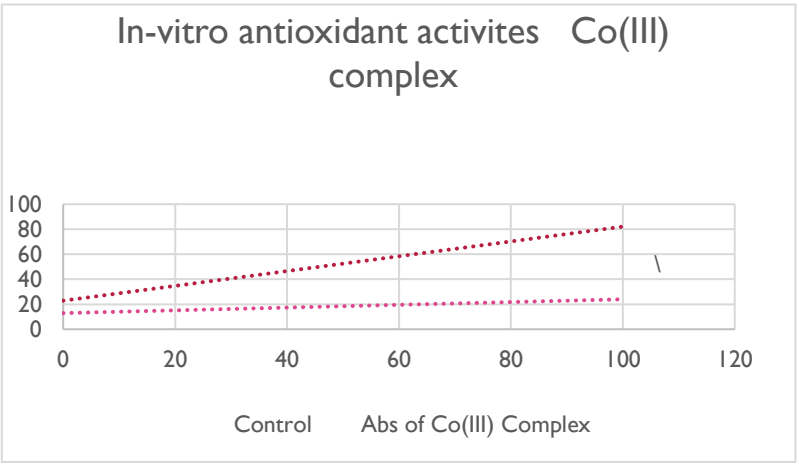


Fig-1:Graphical representation of In -vitro antioxidant activities of synthesised compounds

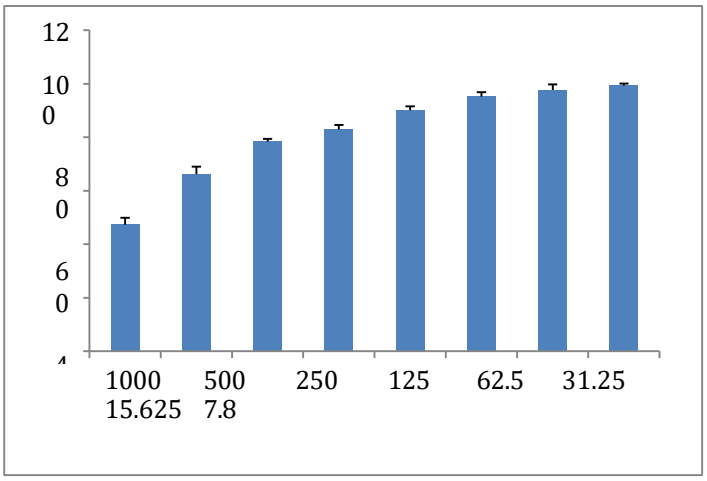
3.6 In- vitro anti-cancer activity of Synthesis compounds:

The anti-cancer potency of Co (III) complex of schiff base ligand derived from curcumin and thiosemicarbazide hydrochloride was assessed against MCF-7 breast carcinoma cell lines using MTT assay. The NCCS (National Centre for cell sciences) located in Pune, provided the cell lines.Cobalt (III) complexes are well known for being nontoxic in nature and chemically inert, and because of these properties they have been attracted a lot of attention for their possible use as diagnostic and therapeutic instruments as well as for the treatment of cancer [43, s-6]

Doxorubicin was employed as a reference anticancer medication in this study at the following different concentrations: 7.8,15.62,31.25,62.5,125,250, 500 and 1000µg/ml. The ligand and its Co(III) complexes were tested for cytotoxic activity against MCF-7 breast cancer carcinoma cell lines using MTT assay. Their cytotoxicity potential as are anticancer drugs was evaluated by comparing their activity to the well-known anticancer drug Doxorubicin.

Table-3: Anticancer activity of synthesized Schiff base ligand and its Co(III) complex:

S.N.	Compound	IC_{50} µg/ml
1.	[C_{22} H_{23} O_5 N_3 S] Schiff base ligand	853.98
2.	[Co (C_{22} H_{23} O_5 N_3 S)$_2$]	556.86
3.	Doxorubicin (standard anticancer drug)	7.38



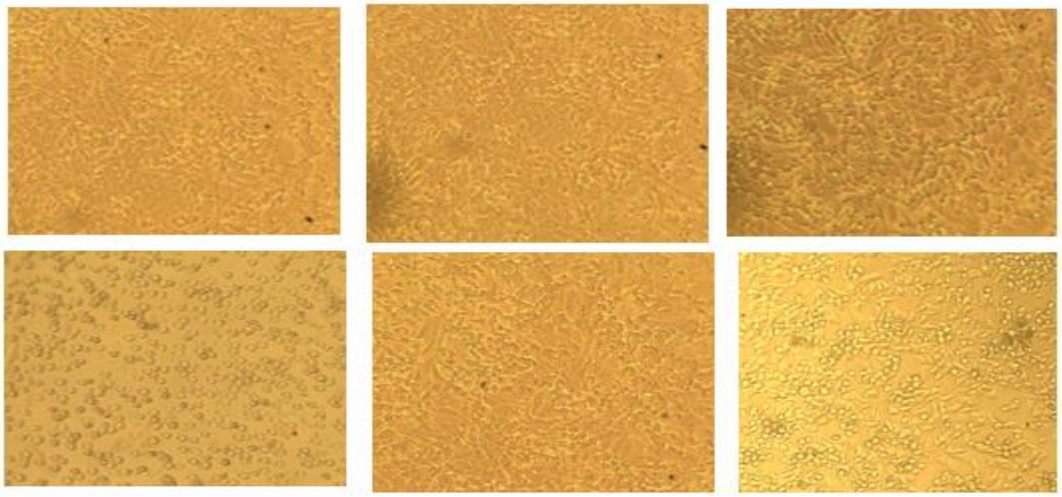


Fig -3: Anticancer activity of synthesized Schiff base ligand and Co(III) complex:

In –Vitro anti- inflammatory activity of synthesized compounds

One known element causing inflammation is protein denaturation .Our investigation evaluated the anti-inflammatory properties of synthesized ligand and its Co(III) complex by the use of the inhibition of albumin denaturation approach, utilizing a slight

modified version of the specific method. [41 s6] The major goal of this study was to comprehend the mechanism underlying these chemical's anticancer- inflammatory actions.

In our study, we have synthesized Schiff base ligand, which was derived from curcumin and thiosemicarbazide hydrochloride and its Co(III) complex using refluxing process. The capacity of these compounds to prevent heat- induced albumin denaturation at different doses was used to assess their anti- inflammatory properties. The finding, which are displayed in Table demonstrated that protein denaturation was successful and concentration- dependent, prevented by both ligand its Co(III) complex. When compared the anti- inflammatory activity of both synthesized compound, we analysed that Co(III) complex showed moderate inhibition effect as compared to schiff base ligand. The moderate activity can be explained by the easy oxidation and reduction of cobalt, which helps to lower hydrogen peroxide and free radicals generated during inflammation process [42 s6]. Furthermore, compared to the regular aspirin medication, the Co(III) complex had much stronger anti-inflammatory effect. This is probably because the synthesized Co(III) complex contains C=N (imino linkages) as well as various with drawing and electron releasing functional groups like-OH, -CH_3, C=S groups etc.

Table-4: Anti- inflammatory activity of Schiff base ligand and its Co (III) complex:

S.N	Concentration	control	Absorbance of Sample	% of Inhibition
1	0	0	0	
2	10	0.159	0.142	
3	20	0.162	0.139	14.568
4	30	0.166	0.138	
5	40	0.172	0.137	
6	50	0.166	0.124	

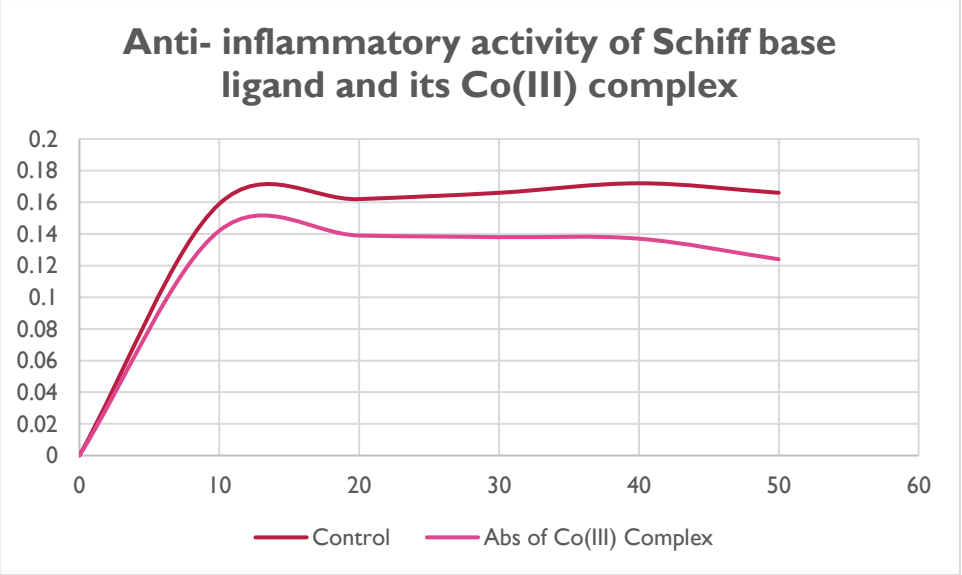


Fig-4 : Anti- inflammatory activity of Schiff base ligand and its Co(III) complex:

CONCLUSION

In the present study, we reported the Biomolecular Companionship, Antioxidant, Anti-cancer and Anti- inflammatory properties of Cobalt (II) Schiff Base complex are in agreement with the elemental analysis,FT-IR,NMR,XRD and electronic absorption studies. Results of various spectroscopic characterizations of synthesized ligand and cobalt complex revealed that both compounds were stable at room temperature and completely soluble in non -polar solvents like DMF ,DMSO etc. and synthesized ligand was effectively coordinated with Co^{3+} ion via the azomethine nitrogen ,oxygen and sulfur atoms of ligand and developed into a coloured stable cobalt complex. The results of in-vitro anti-inflammatory and anti-oxidant activities of ligand and is Co(III) complex revealed that cobalt complex showed good anti -inflammatory as well as anti-oxidant activity as compared to ligand against standard drug like Aspirin and DPPH compound. The cytotoxic activity of ligand and its cobalt (III) complex were investigated against MCF-7 breast cancer cell lines and results revealed that coordinated cobalt complex in +3 oxidation state prove to be more efficient than ligand. Thus, the present investigation clearly indicates that the cobalt (III) Schiff base complex in this study will be promising dual acting agent that could b developed into chemotherapeutics for cancers in general,and especially in the treatment of breast cancer.

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