

Syntheses, structural and biological studies of Mn(II), Cu(II), Zn(II), Fe(III) and MoO₂(VI) complexes of a tridentate OOS donor thiazolidin-4-one

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A new thiazolidinone, N-(2-hydroxymethylphenyl)-C-(3'-carboxy-2'-hydroxyphenyl)thiazolidin-4-one, LH₃ (**I**) has been synthesized by the cyclization of a dry benzene solution of the Schiff base, N-(2-hydroxymethylphenyl)-3'-carboxy-2'-hydroxybenzylideneimine with mercaptoacetic acid. A methanolic solution of **I** reacts with Mn(II), Cu(II), Zn(II), Fe(III) and MoO₂(VI) ions and forms the coordination compounds, [Mn(LH)(MeOH)₃], [M'(LH)(MeOH)] [here M' = Cu (II), Zn(II), MoO₂(VI)] and [FeCl(LH)(MeOH)₂]. All the coordination compounds are monomeric in nature. The coordination compounds have been characterized on the basis of elemental analyses, molar conductance, molecular weight, spectral (IR, NMR, reflectance, ESR) studies and magnetic susceptibility measurements. **I** behaves as a dibasic tridentate OOS donor ligand in these compounds. The compounds are non-electrolytes ($\Lambda_M = 6.1-13.5 \text{ mho cm}^2 \text{ mol}^{-1}$) in DMF. A square-planar structure for [Cu(LH)(MeOH)], a tetrahedral structure for [Zn(LH)(MeOH)] and an octahedral structure for the remaining compounds are suggested. The compounds were screened for antimicrobial activity.

Keywords: thiazolidin-4-one, monomeric, gram positive, magnetic susceptibility, strong field and covalent character

INTRODUCTION

Thiazolidin-4-ones are a traditionally known class of biologically active compounds. They have played an important role in medicinal chemistry. Moreover they have been studied extensively because of their ready accessibility, diverse chemical reactivity and broad spectrum of biological activity [1]. In recent years, a large number of innovative drugs containing the thiazolidinone moiety have been developed, including hypoglycemic thiazolidinediones (pioglitazone and its analogs), dual COX-2/5-LOX inhibitors (darbufelon), new generation diuretics (etozolin) etc [2].

Metal complexes play an important role in plant and animal life due to their physico-chemical and biological properties. Organosulphur compounds, in the form of their metal complexes, exhibit a wide range of biological properties. Heavy metals in traces are essential for all forms of life. Heavy metals like Cu, Fe, Mo and occasionally Mn assist oxidation-reduction equilibria while those like Zn and Mn are concerned with hydrolytic processes [3]. However, coordination metal complexes are gaining increasing importance in the design of respiratory, slow release and long acting drugs.

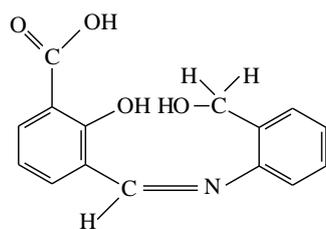
Metal ions are therefore known to accelerate drug actions. The efficacies of some therapeutic agents are known to increase upon co-ordination [4]. Some metal complexes are known to exhibit remarkable antitumour, antifungal, antiviral and special biological activities [3].

Thiazolidin-4-ones, a saturated form of thiazole with carbonyl group on fourth carbon, possess almost all type of biological activities like antitubercular [5], antibacterial [6], anticonvulsant [7], antifungal [8], amoebicidal [9], antioxidant [10], pesticidal [11], antiviral [12] and antitumour [13].

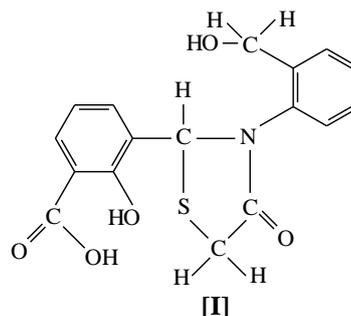
Due to this, the investigation of chemistry and biology of these compounds continue to appeal the synthetic and medicinal organic chemists. A perusal of the literature reveals that much has been reported on the syntheses and characterization [14] of a variety of thiazolidin-4-ones, relatively little is known about their coordination compounds [15, 16].

Keeping this in mind, it was worth while to synthesize and characterize a new thiazolidinone, N-(2-hydroxymethylphenyl)-C-(3'-carboxy-2'-hydroxyphenyl)thiazolidin-4-one, LH₃ (**I**) and its coordination compounds with Mn(II), Cu(II), Zn(II), Fe(III) and MoO₂(VI) ions.

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[Schiff base]



[I]

EXPERIMENTAL

Materials

o-Aminobenzylalcohol [Aldrich]; manganese(II) acetate tetrahydrate, iron(III) chloride (anhydrous) [Sarabhai]; copper(II) acetate monohydrate, zinc(II) acetate dihydrate [SD's Fine]; ammonium molybdate(VI) tetrahydrate, methanol, ethanol, mercaptoacetic acid, dry benzene, sodium bicarbonate [Ranbaxy] were used as supplied for the syntheses. 3-formylsalicylic acid and bis(acetylacetonato)dioxo-molybdenum(VI) were synthesized by following the reported procedures [17].

Analyses and physical measurements

The organic skeleton of the respective coordination compounds was decomposed by the slow heating of ~ 0.1 g of the latter, with conc. HNO₃. The residue was dissolved in minimum amount of conc. HCl and the corresponding metal ions were estimated as follows: The Mn(II) and Zn(II) contents of the respective coordination compounds were estimated by complexometric titration method against standardized EDTA solution using eriochrome black-T and xylenol orange as the indicators respectively. The Cu(II) contents was estimated iodometrically against a standard solution of sodium thiosulphate to the starch end point. The Fe(III) ions were reduced to Fe(II) ions with aqueous SnCl₂ and then estimated against standard K₂Cr₂O₇ solution using N-phenylanthranilic acid as an indicator. The molybdenum contents was estimated gravimetrically after decomposing the given MoO₂(VI) compound with a few drops of conc. HNO₃ and conc. H₂SO₄ and then igniting the residue in an electric Bunsen at 500 °C. MoO₃ obtained was dissolved in 6*N* NaOH and then molybdenum was estimated as bis(8-hydroxyquinolino)dioxo-molybdenum(VI). The C, H and N contents of LH₃ and its coordination compounds were determined by CHN Eager analyzer model-300. The S and Cl contents were

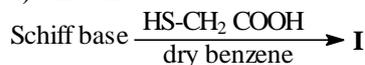
estimated gravimetrically as BaSO₄ and AgCl respectively. The molecular weight measurements were carried out by the Rast method using diphenyl as the solvent [18]. The molar conductances (Λ_M) of the coordination compounds were measured in DMF with the help of a Toshniwal conductivity bridge (CL01-02A) and a dip type cell calibrated with KCl solutions. The ESR spectrum of [Cu(LH)(MeOH)] was recorded at liquid nitrogen temperature in polycrystalline solids on a Varian V4502-12 X-band ESR spectrophotometer with 100 KHz modulation using diphenylpicrylhydrazide as a *g*-marker and monitoring the frequency with frequency meter. The IR spectra were recorded in KBr pellets (4000-400 cm⁻¹) on a Beckman-20 spectrophotometer. The reflectance spectra were recorded on a Beckmann DU spectrophotometer attached with a reflectance arrangement. The magnetic susceptibility measurements were carried out at room temperature, using Hg[Co(NCS)₄] as the standard [19]. The diamagnetic corrections were computed using Pascal's constants. The magnetic susceptibilities were corrected for temperature independent paramagnetism term (TIP) [19] using value of 60 × 10⁻⁶ cgs units for Cu(II), zero for Mn(II) and Fe(III) ions.

Synthesis of *N*-(2-hydroxymethylphenyl)-3'-carboxy-2'-hydroxybenzylideneimine (Schiff base). A MeOH solution (30 mL) of *o*-aminobenzylalcohol (1.23 g, 10 mmol) was added to a MeOH solution (30 mL) of 3-formylsalicylic acid (1.66 g, 10 mmol) and the mixture was then refluxed for 1 h. The precipitates formed were suction filtered, washed with MeOH and dried *in vacuo* at room temperature over silica gel for 24 h. Yield = 58%. The elemental analyses of the compound gave the satisfactory results.

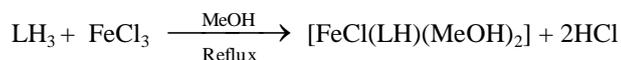
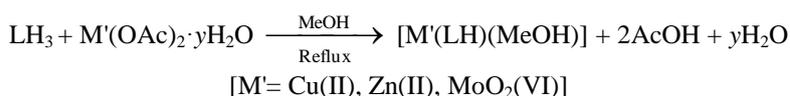
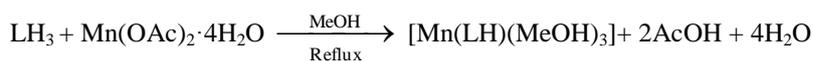
Synthesis of *N*-(2-hydroxymethylphenyl)-C-(3'-carboxy-2'-hydroxyphenyl)thiazolidin-4-one, LH₃ (I). A dry benzene solution of the Schiff base (2.71 g, 10 mmol) and mercaptoacetic acid (0.92 g, 10 mmol) were refluxed for 12 h on a water bath. The mixture was cooled to room temperature and then was washed with 10% sodium bicarbonate solution.

The benzene layer was separated using a separating funnel. The partial evaporation of the benzene layer gave a solid product, which was filtered, washed with and recrystallized from petroleum ether. The compounds were dried as mentioned above. Yield = 14%. *Anal.*: (I, C₁₇H₁₅NO₅S) (obsd: C, 58.91%; H, 4.37%; N, 4.12%; S, 9.11%. calc.: C, 59.13%; H, 4.35%; N, 4.06%; S, 9.28%); IR bands (KBr): 2860 cm⁻¹ [ν(O–H)(intramolecular H-bonding)], 1710 cm⁻¹ [ν(C=O) (thiazolidinone ring)], 1675 cm⁻¹ [ν(C=O)(carboxylic)], 1570 cm⁻¹ [ν(C–N)(thiazolidinone ring)], 1520 cm⁻¹ [ν(C–O)(phenolic)], 1225 cm⁻¹ [ν(C–O)(alcoholic)], and 830 cm⁻¹ [ν(C–S)(thiazolidinone ring)].

Syntheses of coordination compounds of I. A MeOH solution (30-50 mL) of the appropriate metal salt (10 mmol) was added to a MeOH solution (50 mL) of I (3.45 g, 10 mmol) and the



Scheme 1: Preparative scheme of LH₃ (I)



Scheme 2: Preparative scheme of coordination compounds of LH₃ (I)

The coordination compounds are air-stable at room temperature. They are insoluble in H₂O, partially soluble in MeOH, EtOH and completely soluble in DMSO and DMF. Their molar conductance measurements (Λ_M = 6.1-13.5 mho cm² mol⁻¹) in DMF indicate their non-electrolytic

mixture was then refluxed for 3-4 h. The solid products formed were suction filtered, washed with and recrystallized from MeOH and were then dried as mentioned above. Yield = 50–75%.

RESULTS AND DISCUSSION

A dry benzene solution of the Schiff base reacts with mercaptoacetic acid and forms N-(2-hydroxymethylphenyl)-C-(3'-carboxy-2'-hydroxyphenyl)thiazolidin-4-one, LH₃ (I). The reaction of I with appropriate metal salt in 1:1 molar ratio in MeOH produces the coordination compounds, [Mn(LH)(MeOH)₃], [M'(LH)(MeOH)] [where M' = Cu(II), Zn(II), MoO₂(VI)] and [FeCl(LH)(MeOH)₂]. The formations of I from the Schiff base and the coordination compounds of I take place according to the Schemes 1 and 2.

nature. The analytical data of I and its coordination compounds are presented in Table 1.

Infrared spectral studies

The infrared spectra of the Schiff base, I and the coordination compounds of the latter were recorded in KBr and the prominent peaks (in cm⁻¹) are shown in Table 2

Table 1. Analytical, molar conductance (Λ_M) and molecular weight data of I and its coordination compounds.

| Compound | Mol. formula | Λ _M (mho cm ² Mol ⁻¹) | Mol. Wt Obsd (calcd) | obsd(calcd)% | | | | |
|-------------------------------|---|---|-------------------------------|------------------|------------------|----------------|----------------|----------------|
| | | | | M | C | H | N | S |
| LH ₃ (I) | C ₁₇ H ₁₅ NO ₅ S | – | 345 ^a (345.0) | – | 58.91 (59.13) | 4.37 (4.35) | 4.12 (4.06) | 9.11 (9.28) |
| [Mn(LH)(MeOH) ₃] | MnC ₂₀ H ₂₅ NO ₈ S | 6.1 | 467.1 ^b (493.9) | 11.23 (11.12) | 48.37 (48.59) | 5.13 (5.06) | 2.74 (2.83) | 6.37 (6.48) |
| [Cu(LH)(MeOH)] | CuC ₁₈ H ₁₇ NO ₆ S | 9.6 | 417.6 438.5 ^b | 14.22 (14.48) | 49.37 (49.26) | 3.84 (3.88) | 3.08 (3.19) | 7.46 (7.30) |
| [Zn(LH)(MeOH)] | ZnC ₁₈ H ₁₇ NO ₆ S | 8.2 | 462.1 ^b (440.4) | 14.70 (14.85) | 48.90 (49.05) | 3.94 (3.86) | 3.00 (3.18) | 7.15 (7.27) |
| FeCl(LH)(MeOH) ₂ | FeC ₁₉ H ₂₁ NO ₇ SCl | 13.5 | 461.5 ^b (498.5) | 11.37 (11.23) | 45.43 (45.74) | 4.14 (4.21) | 2.84 (2.81) | 6.37 (6.42) |
| [MoO ₂ (LH)(MeOH)] | MoC ₁₈ H ₁₇ NO ₈ S | 7.1 | 487.6 ^b (502.9) | 19.36 (19.07) | 42.71 (42.95) | 3.47 (3.38) | 2.83 (2.78) | 6.22 (6.36) |

Abbreviations: ^aMass spectral data, ^bRast method data

Table 2. IR, reflectance spectral data (cm⁻¹) and magnetic moments of the coordination compounds of I

| Compound | $\nu_{as}(\text{COO})$ | $\nu_s(\text{COO})$ | $\nu(\text{C-O})$ (phenolic) | $\nu(\text{C-S})$ | $\nu(\text{C-O})$ (MeOH) | ν_{max} | Mag. moment (B. M.) |
|--------------------------------|------------------------|---------------------|---------------------------------|-------------------|-----------------------------|------------------------|------------------------|
| LH ₃ (I) | – | – | 1520 | 830 | – | – | Diamagnetic |
| [Mn(LH)(MeOH) ₃] | 1562 | 1350 | 1525 | 815 | 978 | 17460, 22380, 25280 | 5.84 |
| [Cu(LH)(MeOH)] | 1560 | 1335 | 1530 | 800 | 974 | 17240 | 1.89 |
| [Zn(LH)(MeOH)] | 1567 | 1352 | 1527 | 805 | 964 | – | Diamagnetic |
| [FeCl(LH)(MeOH) ₂] | 1572 | 1352 | 1528 | 812 | 980 | 12500, 15900, 24300 | 5.85 |
| [MoO ₂ (LH)(MeOH)] | 1577 | 1365 | 1525 | 795 | 969 | – | Diamagnetic |

The Schiff base exhibits the $\nu(\text{C=N})$ (azomethine) stretch at 1640 cm⁻¹. This band disappears in **I** and a new band appears at 1570 cm⁻¹ due to the $\nu(\text{C-N})$ (thiazolidinone ring) stretch [20] indicating the conversion of the Schiff base into **I**. The formation of **I** is further supported by the appearance of a new band at 830 cm⁻¹ due to the $\nu(\text{C-S})$ (thiazolidinone ring) stretch [21]. A negative shift of 15-35 cm⁻¹ of the $\nu(\text{C-S})$ (thiazolidinone ring) stretch in the coordination compounds indicates the involvement of the S atom of the thiazolidinone moiety towards coordination [22]. **I** shows the $\nu(\text{C=O})$ (thiazolidinone ring) stretch [23] at 1710 cm⁻¹. This band remains unchanged in the coordination compounds indicating the non-involvement of O atom towards the coordination. The $\nu(\text{C-O})$ (alcoholic) stretch [24] of **I** occurs at 1225 cm⁻¹ which remain unchanged in the complexes. **I** exhibits a strong band at 2860 cm⁻¹ due to the intramolecular H-bonded OH group of phenolic and/or carboxylic acid moieties [25]. This band disappears in the coordination compounds indicating the breakdown of H-bonding and subsequent deprotonation of the OH group followed by the involvement of phenolic and carboxylic acid O atoms towards coordination. The presence of a broad band at ~ 3400 cm⁻¹ due to $\nu(\text{O-H})$ (MeOH) and the decrease of $\nu(\text{C-O})$ (MeOH) stretch from 1034 cm⁻¹ to lower energy by 54-70 cm⁻¹ in the coordination compounds of **I** indicate the involvement of the O atom of MeOH towards coordination [26]. The appearance of two new bands between 1560-1577 cm⁻¹, $\nu_{as}(\text{COO})$ and 1335-1365 cm⁻¹, $\nu_s(\text{COO})$ stretches indicate the presence of the coordinated carboxylate group in the coordination compounds. The energy difference ($\Delta\nu = 212-225$ cm⁻¹) between these stretches is > 210 cm⁻¹ which indicates the monodentate nature of the carboxylate moiety [27]. The $\nu(\text{C-O})\phi$ stretch [26] of **I** occurs at 1520 cm⁻¹. This band shifts to higher energy by 5-10 cm⁻¹ in the coordination compounds indicating the involvement of phenolic O

atom of 3-formylsalicylic acid moiety towards coordination. The absence of a band between 820-860 cm⁻¹ in [FeCl(LH)(MeOH)₂] precludes the presence of the (Fe-O-Fe) bridged structure [28]. [MoO₂(LH)(MeOH)] exhibits the $\nu_s(\text{O=Mo=O})$ and $\nu_{as}(\text{O=Mo=O})$ stretches at 945 and 908 cm⁻¹ respectively [29]. These bands occur in the usual ranges: $\nu_s(\text{O=Mo=O})$ stretch, 892-964 cm⁻¹ and $\nu_{as}(\text{O=Mo=O})$ stretch, 842-928 cm⁻¹, reported for the majority of MoO₂(VI) compounds. The presence of two bands due to the $\nu(\text{O=Mo=O})$ stretch is indicative of a *cis*-MoO₂ configuration as the compound with *trans*-MoO₂ structure shows only $\nu_{as}(\text{O=Mo=O})$ stretch since the $\nu_s(\text{O=Mo=O})$ stretch is IR inactive [30]. The absence of a band at ~775 cm⁻¹ in the MoO₂(VI) compound indicates the absence of an oligomeric chain with $\cdots\text{Mo}\cdots\text{Mo}\cdots\text{Mo}\cdots$ interaction [31]. The new non-ligand bands in the present coordination compounds in the low frequency region are assigned to the $\nu(\text{M-O})$ (550-570 cm⁻¹) and the $\nu(\text{M-S})$ (345-375 cm⁻¹) and these bands [32] are in the expected order of increasing energy: $\nu(\text{M-S}) < \nu(\text{M-O})$.

NMR Spectral Studies

The NMR spectra of **I** and [Zn(LH)(MeOH)] were recorded in DMSO-*d*₆. The chemical shifts (δ) are expressed in ppm downfield from TMS. The prominent resonance signals of these compounds were compared with the reported peaks [33]. **I** exhibits a singlet at δ 17.5 ppm due to the carboxylic proton, a sharp singlet at δ 13.60 ppm due to phenolic proton, a singlet at δ 2.35 ppm due to alcoholic proton, multiplets due to methylene protons at δ 4.70-4.79 ppm, multiplets between δ 7.34-7.50 ppm due to the aromatic protons. The occurrence of the resonance signal at the same frequency (δ 2.35 ppm) due to alcoholic proton (CH₂OH) indicates the non-involvement of the alcoholic group towards coordination. The absence of the signal at δ 17.5 ppm due to the COOH proton in [Zn(LH)(MeOH)] indicates the

deprotonation of the COOH group, followed by the involvement of its O atom in coordination. The absence of the resonance signal at δ 13.60 ppm due to the phenolic proton in [Zn(LH)(MeOH)] indicates the deprotonation of the phenolic OH group followed by its involvement in coordination [34]. The appearance of resonance signals at 2.81-2.85 ppm due to alcoholic proton and at 3.0-3.1 ppm due to methyl protons in the coordination compound supports the presence of MeOH in it.

Reflectance spectral studies

[Mn(LH)(MeOH)₃] exhibits three bands at 17460, 22380 and 25280 cm⁻¹ due to ⁶A_{1g} → ⁴T_{1g}(G), ⁶A_{1g} → ⁴T_{2g}(G) and ⁶A_{1g} → ⁴A_{1g}(G) transitions, respectively in an octahedral environment [35]. The presence of an asymmetric broad band at 17240 cm⁻¹ due to the ²B_{1g} → ²A_{1g}, ²B_{2g} and ²E_g transitions in [Cu(LH)(MeOH)] suggests a square-planar arrangement of I around Cu(II) ion [36]. The absence of a band in the range 8000-10000 cm⁻¹ precludes the presence of a tetrahedral structure. [FeCl(LH)(MeOH)₂] exhibits three bands at 12500, 15900 and 24300 cm⁻¹ due to ⁶A_{1g} → ⁴T_{1g}(G), ⁶A_{1g} → ⁴T_{2g}(G) and ⁶A_{1g} → ⁴A_{1g}(G) transitions, respectively in an octahedral environment [37].

Magnetic measurements

The room temperature magnetic moments of the coordination compounds of I are presented in Table 2. The magnetic moments of [Mn(LH)(MeOH)₃], [Cu(LH)(MeOH)] and [FeCl(LH)(MeOH)₂] are 5.84, 1.89 and 5.85 B.M. respectively. These values are indicative of the magnetically dilute high-spin octahedral coordination compounds of Mn(II) and Fe(III) ions [38]. The coordination compounds of other ions are diamagnetic.

ESR Studies

[Cu(LH)(MeOH)] exhibits two g values ($g_{\parallel} = 2.25$, $g_{\perp} = 2.09$) and this indicates the presence of tetragonal type symmetry about the Cu(II) ions [39]. The spin Hamiltonian parameters are: $A_{\parallel} = 1.683 \times 10^{-2}$ cm⁻¹, $A_{\perp} = 4.49 \times 10^{-3}$ cm⁻¹, $G = 2.73$, $\alpha_{Cu}^2 = 0.79$, $(\alpha')^2 = 0.27$, $\kappa = 0.58$ and $P_d = 1.58 \times 10^{-2}$ cm⁻¹. The data indicate that $g_{\parallel} > g_{\perp}$ and $A_{\parallel} > A_{\perp}$ which are indicative of the presence of the unpaired electron in the $d_{x^2-y^2}$ orbital [19]. For ionic environments, g_{\parallel} is normally ≥ 2.3 and is < 2.3 for covalent environments. The g_{\parallel} value (2.25) indicates that the metal-ligand bonding in the compound is covalent. For tetragonal Cu(II) compounds, if G is less than 4.0, the ligand forming

the Cu(II) compound is regarded as a strong field ligand. G value (2.73) indicates the strong field nature of the ligand. The in-plane covalence parameter (α_{Cu}^2) has been calculated using the relation: $\alpha_{Cu}^2 = (g_{\parallel} - 2.002) + 3/7 (g_{\perp} - 2.002) - (A_{\parallel}/0.036) + 0.04$, where α is related to the overlap integral (S) according to the relation [40]: $\alpha^2 - 2\alpha\alpha'S + (\alpha')^2 = 1$. The values of α_{Cu}^2 (0.79) and α'^2 (0.35) indicate its covalent nature. The smaller the value of α_{Cu}^2 , the more covalent is the bonding; $\alpha_{Cu}^2 = 1$ indicates completely ionic bonding, while $\alpha_{Cu}^2 = 0.5$ indicates completely covalent bonding. The larger the value of α'^2 , the more covalent is the bonding; $\alpha'^2 = 0$ suggests a complete ionic bonding [19]. The symbol κP_d represents the Fermi contact contribution (A) to the coupling, where P_d is the dipolar contribution. The value of P_d and κ have been calculated using the relation [39]: $P_d = -(A_{\parallel} - A_{\perp})/0.78$ and $\kappa = -0.48 - (A_{\parallel}/P_d)$. The positive value of κ suggests that A_{\parallel} should be greater than A_{\perp} and it has also been observed by us. The lower value of P_d in comparison to that of the free ion value (3.5×10^{-2} cm⁻¹) indicates the presence of covalent character between the metal-ligand bonding. The absence of any band ~ 1500 G due to the $\Delta Ms = 2$ transition precludes the presence of M-M interaction.

Antimicrobial Activity

The antimicrobial activity of the ligand and the complexes were tested against two selected bacterias which include *E.Coli* (Gram Negative) and *S. aureus* (Gram positive) by using disc-diffusion method. Stock solution was prepared by dissolving compounds in DMSO. Under aseptic conditions, plain sterilised discs were soaked in solution of compounds for overnight. Test culture was spread over the plates containing Mueller Hinton Agar (MHA) by using sterile swab. Inoculated plates were dried for 30 minutes and discs were placed on these inoculated plates. The plates were left for 30 minutes at room temperature to allow diffusion. The plates were then incubated at 37 °C for 24-48 hours. After incubation diameter of zone of inhibition was noted on each disc.

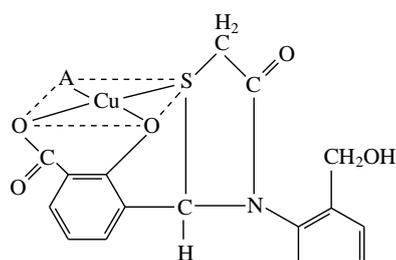
As we consider all results obtained from antibacterial tests we can say that the entire compounds tested are active towards both gram positive and gram negative bacteria. The metal complexes are more active than the parental ligand.

Table 3. Antimicrobial activity of Ligand (I) and its Coordination compounds (zone of Inhibition in mm)

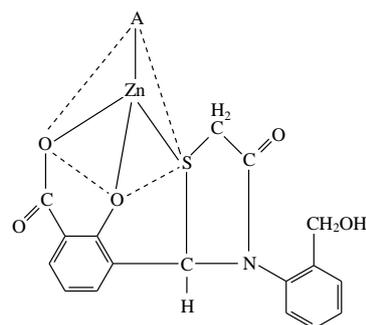
| Compound | <i>E. coli</i> (Gram negative) | <i>S. aureus</i> (Gram positive) |
|--------------------------------|--------------------------------------|--|
| LH ₃ (I) | 4 | 6 |
| [Mn(LH)(MeOH) ₃] | 8 | 9 |
| [Cu(LH)(MeOH)] | 6 | 12 |
| [Zn(LH)(MeOH)] | 10 | 10 |
| [FeCl(LH)(MeOH) ₂] | 8 | 11 |
| [MoO ₂ (LH)(MeOH)] | 12 | 14 |

CONCLUSIONS

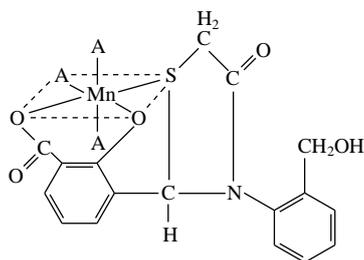
Thus, on the basis of analytical data, valence requirements, molecular weight, spectral and the magnetic studies, it is proposed that **I** behaves as a dibasic tridentate OOS donor ligand in the square-planar coordination compound, [Cu(LH)(MeOH)] (**II**), in the tetrahedral compound, [Zn(LH)(MeOH)] (**III**) and in the octahedral compounds, [Mn(LH)(MeOH)₃] (**IV**), [FeCl(LH)(MeOH)₂] (**V**) and [MoO₂(LH)(MeOH)] (**VI**).



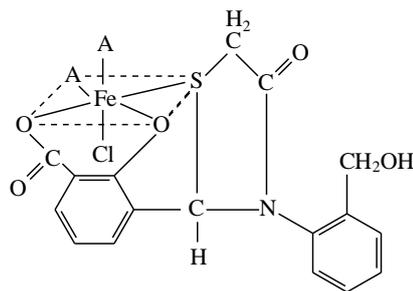
[II, A = MeOH]



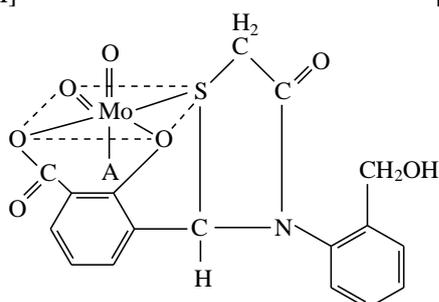
[III, A = MeOH]



[IV, A = MeOH]



[V, A = MeOH]



[VI, A = MeOH]

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СИНТЕЗИ, СТРУКТУРНИ И БИОЛОГИЧНИ ИЗСЛЕДВАНИЯ НА КОМПЛЕКСИ НА Mn(II), Cu(II), Zn(II), Fe (III) И MoO₂(VI) С ДОНОР ОТ ТРИДЕНТАТ-4-ОН

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(Резюме)

Синтезиран е нов тиазолидинон N-(2-хидроксиетилфенил)-C-(3'-карбокси-2'-хидроксиетилфенил)тиазолидин-4-он, LH₃ (I) чрез циклизирането на Шифова база (N-(2-хидроксиетилфенил)-3'-карбокси-2'-хидроксибензилиденимин) с меркапто-оцетна киселина. Метанолов разтвор на I реагира с иони Mn(II), Cu(II), Zn(II), Fe(III) и MoO₂(VI) и образува координационни съединения, [Mn(LH)(MeOH)₃], [M'(LH)(MeOH)] [тук M' = Cu (II), Zn(II), MoO₂(VI)] и [FeCl(LH)(MeOH)₂]. Всички координационни съединения са мономери. Те са охарактеризирани на базата на елементни анализи, моларна проводимост, молекулна маса, спектрални изследвания (IR, NMR, отражателни спектри, ESR) и магнитния susceptibilitet. I се отнася като дву-основен тридентатен OOS донорен лиганд в тези съединения. Съединенията са не-електролити ($\Lambda_m = 6.1-13.5 \text{ mho cm}^2 \text{ mol}^{-1}$) в DMF. Предложени са квадратно-планарна структура за [Cu(LH)(MeOH)], тетраедрична структура за [Zn(LH)(MeOH)] и октаедрична за останалите съединения. Те са изследвани за антимикуробна активност.