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Synthesis, Characterization and Antimicrobial Studies of Some Aryltellurium (IV) Complexes of 5-Chlorosalicylhydroxamate.

Sonu Chauhan, Sapana Garg, and KK Verma*

Department of Chemistry, Maharshi Dayanand University, Rohtak-124001, India.

ABSTRACT

A new series of 5-chlorosalicylhydroxamate complexes with aryltellurium(IV) and diaryltellurium(IV) of the type $RTeCl_2.L$, $RTeCl.L_2$, $R_2TeCl.L$ and $R_2Te.L_2$ (where R = 4-methoxyphenyl, 4-hydroxyphenyl, 3-methyl-4-hydroxyphenyl and L = 5-chlorosalicylhydroxamate) have been synthesized by reactions of $RTeCl_3$ and R_2TeCl_2 with potassium 5-chlorosalicylhydroxamate. They have been characterized by elemental analyses, molar conductance and spectral techniques such as FT-IR and ^1H NMR. The spectral studies predict the bonding of ligand through hydroxylamine and carbonyl oxygens (O, O coordination). A square pyramidal and distorted octahedral geometry around tellurium has tentatively been proposed for 1:1 and 1:2 complexes, respectively. The complexes also have been observed to possess appreciable antimicrobial activity against bacteria and fungi.

Keywords: 5-Chlorosalicylhydroxamate, Aryltellurium(IV), Diaryltellurium(IV), Antimicrobial activity.

Corresponding author

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INTRODUCTION

Hydroxamic acids, containing –C(O)NHOH functionality, are potent metal complexing agents and form coordination compounds with a wide range of metal ions [1-3]. Principally known as strong polyfunctional iron chelators, they also display antibacterial, anti- inflammatory and anti- asthmatic behaviour and hence have been used in the design of therapeutic targets for cancer [4,5], Alzheimer's disease [6], malaria [7] and haemochromatosis [8, 9]. Anion derived from hydroxamic acids i.e. hydroxamates are known to chelate to a number of metal ions [10-15] to form stable complexes. Literature contains reports that some chlorohydroxamic acid have been found to be most effective antitumor agent [16, 17].

Salicylhydroxamtes including chlorosalicylhydroxamates can chelate to the metal ions via a number of coordination modes, not only the O, O' mode but also N, O– modes, most common being the chelation through O, O– mode [17-24]. Also, aryltellurium(IV) trichlorides are known [25-38] to behave as lewis acids and form complexes with N- , O- and S- donor bases. diaryltellurium(IV) dichlorides also form such complexes but only with strong chelating ligands [39-41].

In view of biological relevance of hydroxamates and acceptor properties of aryltellurium(IV) trichlorides and dichlorides, we report herein the synthesis, characterization and antimicrobial studies on some new hydroxamate complexes of the type $RTeCl_2.L$, $RTeCl.L_2$, $R_2TeCl.L$ and $R_2Te.L_2$; where R = 4-methoxyphenyl, 4-hydroxyphenyl and 3-methyl-4-hydroxyphenyl and L = 5-chlorosalicylhydroxamate.

MATERIALS AND METHODS

All preparations were carried out under an atmosphere of dry nitrogen and the solvents used were purified by standard method [42, 43] before use. The purity of compounds was checked by TLC using Silica gel-G (Merck). Melting points were determined in open capillary tube and are uncorrected.

Carbon, hydrogen and nitrogen analyses were obtained microanalytically from SAIF, Panjab University Chandigarh on a ThermoFinnigan CHNS analyser. Conductivity was measured in DMSO at 25±2 ˚C with a dip type conductivity cell on microprocessor based conductivity bridge type MICROSIL.

Infrared spectra were recorded in KBr pellets at Department of Pharmaceutical Sciences, M. D. University, Rohtak on Bruker FT-IR spectrometer. Proton Magnetic Resonance spectra were recorded in DMSO-d_6 using TMS as an internal reference on BRUKER AVANCE II 400 NMR spectrometer at Sophisticated Analytical Instrumentation Facility, Panjab University Chandigarh. The antimicrobial screening was carried out by Double Dilution Method.

Preparation of Aryltellurium(IV) Trichlorides and Diaryltellurium(IV) Dichlorides

4-Methoxyphenyltellurium(IV) trichloride [44,45], bis(4-methoxyphenyl)tellurium(IV) dichloride [45,46], 4-hydroxyphenyltellurium(IV) trichloride [47], bis(4-hydroxyphenyl)tellurium(IV) dichloride [47],_3-methyl-4-hydroxyphenyltellurium(IV) trichloride [48] and bis(3-methyl-4-hydroxyphenyl)tellurium(IV) dichloride [48] were prepared by the reactions of $TeCl_4$ with anisole/ phenol/ o-cresol as reported in the literature [44-48].

Preparation of Potassium 5- chlorosalicylhydroxamate (KL)

The potassium salt of 5-chlorosalicylhydroxamic acid has been obtained in two steps.

Preparation of ethyl ester of 5-chlorosalicylic acid [42]

To 0.2 mole of 5-chlorosalicylic acid, was added an excess (upto 2 moles) of ethyl alcohol and 1 mL of conc. H_2SO_4 in a reaction flask. The contents were then refluxed for about 3- 6 hrs till whole of the acid dissolved in ethanol. The reaction mixture was cooled and transferred to 60 mL of water in a separating funnel. The lower layer of ester was removed and was washed with saturated sodium bicarbonate till no effervescence. Finally ester layer was washed with water and dried over anhydrous Na_2SO_4.

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Preparation of potassium salt of 5- chlorosalicylhydroxamic acid

The potassium salt was obtained by the method reported by Houser and Renfrow [49]. Cooled solution of KOH (28.05 g in 70 mL methanol) was added to methanolic solution of hydroxylamine hydrochloride (23.27g in 120 mL) with constant shaking and cooling. The mixture was allowed to cool for about 24 hours in an ice bath to ensure complete precipitation of KCl, which was removed by filteration. To this filtrate was added 25 mL of ethyl ester of 5- chlorosalicylhydroxamic acid prepared above. The reaction mixture was kept in air tight flask at room temperature for 2-3 days to yield the fine crystals of potassium 5-chlorosalicylhydroxamate. This was filtered and dried in air. Yield 80%, m. pt. >**270**˚C (dec.).

Preparation of Aryltellurium(IV) complexes of 5- chlorosalicylhydroxamate

Aryltellurium(IV) trichlorides, $RTeCl_3$ (R = 4-methoxyphenyl, 4-hydroxyphenyl, 3-methyl-4-hydroxyphenyl), when reacted with potassium 5-chlorosalicylhydroxamate in different molar ratios, yield $RTeCl_2.L$ and $RTeCl.L_2$ type complexes.

$RTeCl_2.L$

A warm saturated methanolic solution of potassium 5- chlorosalicylhydroxamate (0.45 g, 2 mmol) was added dropwise to a solution of aryltellurium(IV) trichloride (2 mmol) in chloroform/methanol. An immediate precipitation of KCl resulted which was removed by filteration. The filterate was refluxed for 3-**4 hours to** precipitate out any KCl and clear solution was then concentrated to about one third of the original volume and kept overnight to yield crystalline product. This was filtered, washed with chloroform and dried in a vacuum desiccator over P_4O_{10}.

$RTeCl.L_2$

The saturated solution of aryltellurium(IV) trichloride (2 mmol) in chloroform/ methanol was added dropwise with constant stirring to a saturated methanolic solution of potassium 5- chlorosalicylhydroxamate (0.9 g, 4 mmol). An immediate change in colour with precipitation of KCl took place, which was removed by filteration. The contents were then refluxed for about **3**-4 hours. The clear solution thus obtained was concentrated to about one third of original volume and left overnight to get coloured crystalline product, which was filtered, washed with chloroform and dried in a vacuum desiccator over P_4O_{10}.

Preparation of Diaryltellurium(IV) complexes 5- chlorosalicylhydroxamate

Diaryltellurium(IV) dichlorides, R_2TeCl_2 (R = 4-methoxyphenyl, 4-hydroxyphenyl and 3-methyl-4-hydroxyphenyl), when treated with potassium 5- chlorosalicylhydroxamate yield both 1:1 and 1:2 complexes of the type $R_2TeCl.L$ and $R_2Te.L_2$. These have been synthesized by the same procedure as for 5-chlorosalicylydroxamate of aryltellurium(IV) described above. The 1:1 and 1:2 complexes of bis(3-methyl-4-hydroxyphenyl)tellurium(IV) are extremely hygroscopic and are sticky in nature and hence could not be characterized further.

RESULTS AND DISCUSSION

$TeCl_4$ when heated with anisole [44-46], phenol [47], o-cresol [48] (R-H) appears to undergo Friedel-Crafts type condensation reaction whereby $TeCl_3^+$ unit attacks a position para to the -OH/ $-OCH_3$ groups in the aromatic rings, thus resulting in the formation of aryltellurium(IV) trichlorides and diaryltellurium(IV) dichlorides.

$$\mathbf{R\text{-}H} + TeCl_4 \longrightarrow \mathbf{RTeCl_3} + HCl$$
$$\mathbf{2\ R\text{-}H} + TeCl_4 \longrightarrow \mathbf{R_2TeCl_2} + \mathbf{2}\ HCl$$

Preparation of potassium 5- chlorosalicylhydroxamate involves two steps: (i) the preparation of ethyl ester of 5-chlorosalicylic acid and (ii) preparation of potassium salt, which can be represented by following equations.

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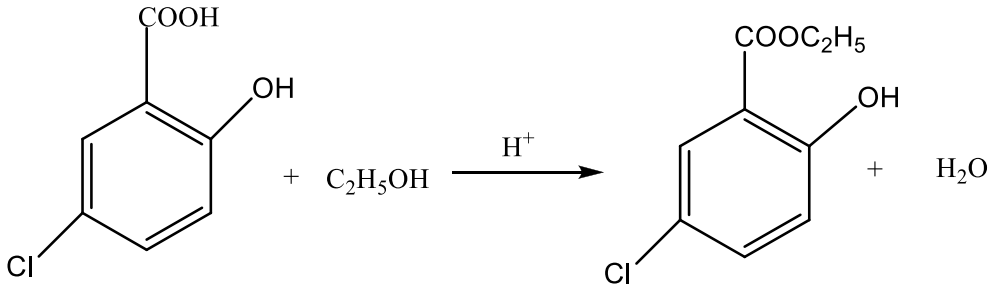

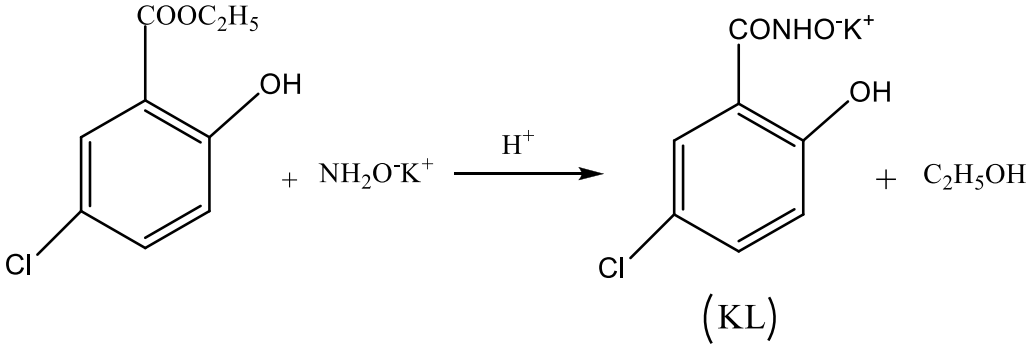

Aryltellurium(IV) trichlorides and diaryltellurium (IV) dichlorides reacts with potassium 5-chlorosalicylhydroxamate (KL) in 1:1 and 1:2 molar ratios to give the corresponding aryltellurium (IV) hydroxamates.

$$\mathbf{RTeCl_3} + \mathbf{KL} \longrightarrow \mathbf{RTeCl_2.L} + \mathrm{KCl}$$
$$\mathbf{RTeCl_3} + \mathbf{2\ L} \longrightarrow \mathbf{RTeCl.L_2} + \mathbf{2}\ \mathrm{KCl}$$
$$\mathbf{R_2TeCl_2} + \mathbf{KL} \longrightarrow \mathbf{R_2TeCl.L} + \mathrm{KCl}$$
$$\mathbf{R_2TeCl_2} + \mathbf{2\ L} \longrightarrow \mathbf{R_2Te.L_2} + \mathbf{2}\ \mathrm{KCl}$$

The analytical data, physical properties and yields for these aryltellurium(IV) 5-chlorosalicylhydroxamates are complied in Table 1.

Conductance Studies

Molar conductance, Λ_M data at ca. 10^{-3} M for aryltellurium(IV) hydroxamates in DMSO lie in the range 3.96- 68.34 ohm^{-1} cm^2 mol^{-1} which predict the weak to 1:1 electrolyte [50,51] type behaviour of these hydroxamates in DMSO, probably due to ionization into $RTeCl.L^+$/ $RTe.L_2^+$/ $R_2Te.L^+$ and Cl^- in DMSO. The higher Λ_M values for $R_2Te.L_2$ may be due to steric factors and donor behaviour of DMSO to result in probable dissociation into $R_2Te.L.DMSO^+$ and L^- ions. The RTeCl.L (R = 4- methoxyphenyl), however appears to be non-electrolyte in DMSO.

Infrared Spectra

The infrared spectra of the aryltellurium(IV) 5- chlorosalicylhydroxamates are quite complexes and an attempt has therefore been made to identify the donor sites of hydroxamate ligand by comparing with those of parent aryltellurium(IV) chlorides and potassium 5- chlorosalicylhydroxamate, which illustrated clear differences.

ISSN: 0975-8585

Table 1: Analytical Data, Molar Conductance and Physical Properties of Aryltellurium(IV) 5- Chlorosalicylhydroxamates

Compound No.	Complex (R)	Empirical Formula (Formula Wt.)	Colour (Yield, %)	M. Pt. (°C) dec.	Analyses % Found (Calculated)					Λ_M at *ca.* 10^{-3}M ohm^{-1} cm^2mol^{-1} in DMSO
					C	H	N	Te	Cl	
I	R***TeCl$_2$.L*** (*p*-methoxyphenyl)	$C_{14}H_{12}Cl_3NO_4Te$ (492.12)	Light brown(70)	184-186	34.01 (34.16)	2.96 (2.46)	2.70 (2.85)	25.80 (25.92)	21.50 (21.64)	3.96
II	R***TeCl.***L_2 (*p*-methoxyphenyl)	$C_{21}H_{17}Cl_3N_2O_7Te$ (643.19)	Grey (80)	194-196	39.00 (39.21)	2.48 (2.66)	4.26 (4.35)	19.70 (19.83)	16.40 (16.55)	43.62
III	R***TeCl$_2$.L*** (*p*-hydroxyphenyl)	$C_{13}H_{10}Cl_3NO_4Te$ (478.11)	Dull white (82)	112-114	32.41 (32.65)	1.95 (2.11)	2.86 (2.93)	26.50 (26.68)	21.74 (22.27)	61.73
IV	R***TeCl.***L_2 (*p*-hydroxyphenyl)	$C_{20}H_{15}Cl_3N_2O_7Te$ (629.18)	Cream (84)	126-128	38.10 (38.17)	2.53 (2.40)	4.20 (4.45)	20.21 (20.28)	16.82 (16.92)	51.66
V	R***TeCl$_2$.L*** (3-methyl-4-hydroxyphenyl)	$C_{14}H_{12}Cl_3NO_4Te$ (492.12)	Dark yellow (75)	136-138	34.06 (34.16)	2.66 (2.46)	2.70 (2.85)	25.90 (25.92)	21.55 (21.64)	68.34
VI	R***TeCl.***L_2 (3-methyl-4-hydroxyphenyl)	$C_{21}H_{17}Cl_3N_2O_7Te$ (643.19)	Pale yellow (85)	154-156	39.10 (39.21)	2.76 (2.66)	4.23 (4.35)	19.70 (19.83)	16.40 (16.55)	40.58
VII	R$_2$***TeCl.L*** (4-methoxyphenyl)	$C_{21}H_{19}Cl_2NO_5Te$ (563.74)	Yellow (85)	140-142	44.65 (44.73)	3.66 (3.40)	2.35 (2.48)	22.50 (22.63)	12.47 (12.59)	65.59
VIII	R$_2$***Te.***L_2 (4-methoxyphenyl)	$C_{28}H_{24}Cl_2N_2O_8Te$ (714.82)	Light yellow (88)	128-130	46.84 (47.03)	3.40 (3.38)	3.80 (3.92)	17.71 (17.85)	9.85 (9.93)	39.35
IX	R$_2$***TeCl.L*** (4-hydroxyphenyl)	$C_{19}H_{15}Cl_2NO_5Te$ (535.78)	Pink (84)	156-158	42.35 (42.59)	2.99 (2.82)	2.52 (2.61)	23.70 (23.81)	13.18 (13.25)	31.73
X	R$_2$***Te.L$_2$*** (4-hydroxyphenyl)	$C_{26}H_{20}Cl_2N_2O_8Te$ (686.80)	Light pink (88)	134-136	45.20 (45.46)	3.12/* (2.93)	3.97 (4.08)	18.45 (18.57)	10.28 (10.33)	33.73
XI	R$_2$***TeCl.L*** (3-methyl-4-hydroxyphenyl)	$C_{21}H_{19}Cl_2NO_5Te$ (563.74)	Cream (70)	*	(44.73)	(3.40)	(2.48)	22.09 (22.63)	12.20 (12.59)	*
XII	R$_2$***Te.***L_2 (3-methyl-4-hydroxyphenyl)	$C_{28}H_{24}Cl_2N_2O_8Te$ (714.82)	Light cream (65)	*	(47.03)	(3.38)	(3.92)	17.36 (17.85)	9.44 (9.93)	*

Values of Λ_M reported [50, 51] for 1:1 electrolytes in DMSO = 50 – 70 ohm^{-1} cm^2 mol^{-1} * Could not be determined due to hygroscopic nature.

ISSN: 0975-8585

The principal infrared absorption bands of KL are those due to $\nu_{(C=O)}$, $\nu_{(C-N)}$, $\nu_{(N-O)}$ and $\nu_{(N-H)}$ stretching vibrations of the hydroxamate group observed in the spectrum at 1603 cm^{-1}, 1390 cm^{-1}, 986 cm^{-1} and 3283 cm^{-1} respectively.

The absorption band occurring at 1603 cm^{-1} in KL attributes to $\nu_{(C=O)}$ mode, shifted to lower wave numbers and appeared at 1576-1599 cm^{-1} in aryltellurium(IV) 5- chlorosalicylhydroxamates. The absorption band due to $\nu_{(C-N)}$ mode occurring at 1390 cm^{-1} in free KL has been found to shift towards higher region at 1410-1442 cm^{-1} in the complexes. The band at around 3283 cm^{-1} due to $\nu_{(N-H)}$ mode in KL did not undergo any change, however could not be ascertained due to phenolic OH group in the aryltellurium moiety. This rules out the involvement of coordination through nitrogen atom. The sharp band occurring at 986 cm^{-1} in KL ascribed to $\nu_{(N-O)}$ mode has been observed to move towards higher wave number and appeared at 1020-1050 cm^{-1} in aryltellurium(IV) 5- chlorosalicylhydroxamates.

Table 2: Important IR Data (cm^{-1}) of Potassium 5 – Chlorosalicylhydroxamate and Aryltellurium(IV) 5-Chlorosalicylhydroxamates

Compound	$\nu_{(C=O)}$	$\nu_{(C-N)}$	$\nu_{(N-O)}$
KL	1603 s	1390 s	986 s
I	1584 vs	1442 s	1020 m
II	1595 s	1411 s	1020 m
III	1576 s	1414 s	1047 m, 1020 w
IV	1577 s	1413 s	1049 m, 1020 w
V	1592 s	1414 s	1025 m
VI	1581 s	1412 s	1048 m
VII	1584 s	1410 m	1050 m, 1023 m
VIII	1586 s	1410 m	1050 m, 1024 m
IX	1580 s	1417 m	1050 m
X	1599 s	1414 m	1049 m

s = strong, vs = very strong, m = medium, w = weak

A shift in $\nu_{(C=O)}$ mode to lower wave number and $\nu_{(N-O)}$ mode to higher wave numbers are suggestive of bonding of 5- chlorosalicylhydroxamate ion via oxygen atoms of carbonyl and hydroxylamine group [17,52-56]. The formation of Te–O bond however, could not be confirmed due to non availability of far IR data. Also, independent assignment of ν_{O-H} (phenolic) could not be made due to presence of this group in hydroxyaryltellurium(IV) moiety i.e. RTe or R_2Te.

^{1}H NMR Spectra

Proton magnetic resonance spectra of aryltellurium(IV) 5- chlorosalicylhydroxamates are very complex and a lot of mixing of aryl proton singals of the 5- chlorosalicylhydroxamate and aryltellurium(IV) moiety takes place, thus making the independent assignment almost impossible. The chemical shift data for the complexes are complied in the Table 3.

All the complexes show singlets at around 11.45 δ ppm and 12.25 δ ppm, which may be assigned to –NH and phenolic –OH of salicylhyroxamate group [57]. This rules out the linkage of 5-chlorosalicylhydroxamate group through nitrogen and phenolic oxygen atoms.

Further, the aryl protons of aryltellurium(IV), diaryltellurium(IV) and 5- chlorosalicylhydroxamate groups exhibit a lot of overlapping of signals and are observed as complex multiplet in the region 6.76 - 8.40 δ ppm, as observed in ^{1}H NMR Spectra of organotin(IV) complexes of hydroxamic acids [52]. Also, a careful examination of ^{1}H NMR Spectra of 5- chlorosalicylhydroxamate complexes reveal the shielding of aryl protons of RTe/R_2Te compared to $RTeCl_3$/R_2TeCl_2 [47, 48, 58, 59] due to flow of electron density from the ligand to the aryltellurium moiety as a result of complexation.

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Table 3: ^{1}H NMR Spectral Data of Aryltellurium(IV) 5- Chlorosalicylhydroxamates in DMSO-d_6.

Compound	Chemical Shift, δ ppm
I	3.83(s, 3H, –OCH_3), 6.90-8.39(cm, 7H, aryl protons of R and L), 11.43(s, 1H, –NH), 12.42(bs, 1H, phenolic OH of L).
II	3.82(s, 3H, –OCH_3), 6.89-8.40(cm, 10H, aryl protons of R and L), 11.44(s, 2H, –NH), 12.26(s, 2H, phenolic OH of L).
III	6.82-7.79(cm, 7H, aryl proton of R and L), 8.27(s, 1H, phenolic OH of R), 11.44(s, 1H, –NH), 12.24(s, 1H, phenolic OH of L).
IV	6.83-7.98(cm, 10H, aryl protons of R and L), 8.27(s, 1H, phenolic OH of R), 11.44(s, 2H, –NH), 10.12, 12.24(s, 2H, phenolic OH of L).
V	2.18(s, 3H, –CH_3), 6.83-7.76(cm, 6H, aryl protons of R and L), 8.13(s, 1H, phenolic OH of R), 10.15(phenolic OH of L), 11.47(s, 1H, –NH).
VI	2.17(s, 3H, –CH_3), 6.89-7.76(cm, 9H, aryl protons of R and L), 8.14(s, 1H, phenolic OH of R), 11.44(s, 2H, –NH), 10.08, 12.26(s, 2H, phenolic OH of L).
VII	3.83(s, 6H, –OCH_3), 6.91-8.19(cm, 11H, aryl protons of R and L), 11.45(s, 1H, –NH), 12.26(s, 1H, phenolic OH of L).
VIII	3.83(s, 6H, –OCH_3), 6.83-8.15(cm, 14H, aryl protons of R and L), 11.44(s, 2H, –NH), 12.27(s, 2H, phenolic OH of L).
IX	6.77-7.88(cm, 11H, aryl protons of R and L), 9.39(s, 2H, phenolic OH of R), 11.45(s, 1H, –NH), 12.26(s, 1H, phenolic OH of L).
X	6.76-7.84(cm, 14H, aryl protons of R and L), 8.19, 9.40(s, 2H, phenolic OH of R), 11.50(s, 2H, –NH), 12.30(bs, 2H, phenolic OH of L).

s = singlet, d = doublet, cm = complex multiplet, bs = broad singlet.

Table 4: Minimum Inhibitory Concentration, MIC (µg/mL); (-) Resistant.

Compound	Bacteria species						Fungal strains		
	S. aureus (ATCC 11632)	***S. typhi*** (ATCC 15499)	***P. aeruginosa*** (ATCC 23564)	***E.coli*** (ATCC 35218)	***B. cereus*** (MTCC 7350)	***P. rettgeri*** (DRDE strain)	***A. niger***	***A. fumigates***	***A. flavus***
KL	1.25	2.5	1.25	2.0	0.625	1.25	-	-	1.25
R*TeCl$_2$.L* (*p*-methoxyphenyl)	-	20	10	5	1.25	-	5	12	5
R*TeCl$_2$.L* (*p*-hydroxyphenyl)	20	20	10	-	5	5	-	-	-
R*TeCl*.L$_2$ (*p*-hydroxyphenyl)	20	-	20	-	10	20	-	-	-
R*TeCl$_2$.L* (3-methyl-4-hydroxy phenyl)	-	10	5	20	-	0.625	20	5	1.25
R$_2$*TeCl.L* (4-methoxyphenyl)	1.25	-	5	1.25	0.625	-	1.25	10	12
R$_2$*TeCl.L* (4-hydroxyphenyl)	1.25	2.5	1.25	5	-	-	-	12	-
R$_2$*Te.L*$_2$ (4-hydroxyphenyl)	5.0	-	-	-	1.25	2.5	17	-	-

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Thus, on the basis of infrared and proton magnetic resonance spectral studies it may be concluded that 5- chlorosalicylhydroxamate acts as a bidentate (O, O) ligand involving the hydroxamate (–NHO) and carbonyl oxygens, giving rise to penta coordinated tellurium complexes in $RTeCl_2.L$ and $R_2TeCl.L$ and hexa coordinated in $RTeCl.L_2$ and $R_2Te.L_2$. The proposed structures are shown in figure 1.

Antimicrobial Activity

The 5- chlorosalicylhydroxamate and newly synthesized aryltellurium(IV) hydroxamate complexes were screened for their in vitro antimicrobial potential against Gram positive bacteria: S. aureus ATCC 11632 and B. cereus MTCC 7350, Gram negative bacteria E. coli ATCC 35218, P. aeruginosa ATCC 23564 and S. typhi ATCC 15499; fungal strains A. niger, A. fumigates and A. flavus by tube dilution method [60]. Dilution of test and standard compounds were prepared Double strength nutrient broth- I.P (Antibacterial) and Sabouraud Dextrose Broth –I.P (Antifungal) [61]. The samples were incubated at 37±1ºC for 24h (bacteria), 25±1ºC for 7 days (A. niger), 30 ±1ºC for 15 days (A. flavus), 35±1ºC for 72hrs (A. fumigates) respectively and results were recorded in terms of MIC (The lowest concentration of test substances which inhibited values are presented in the Table 4.

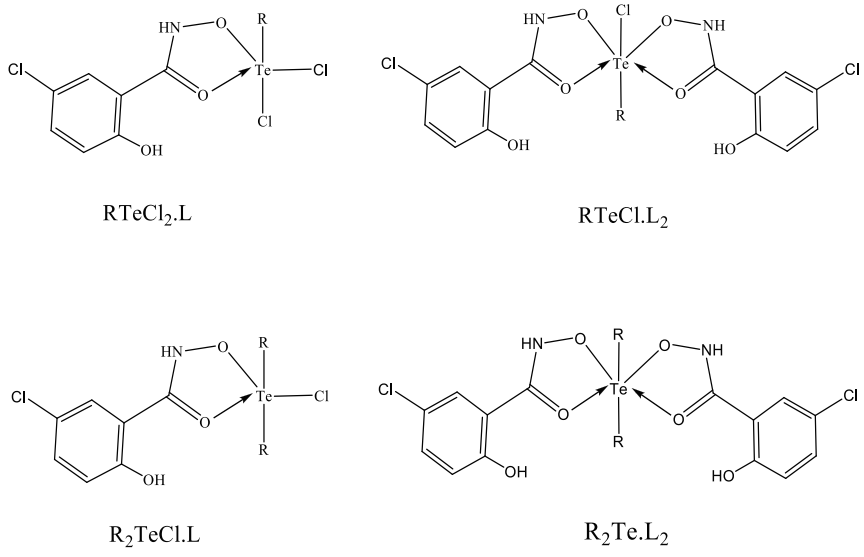

Figure 1: Proposed Structures of Complexes

The 5- chlorosalicylhydroxamate complexes of aryltellurium(IV) and diaryltellurium(IV) have been observed to possess substantial biocidal activity especially against the bacteria species.

CONCLUSION

Aryltellurium(IV) and diaryltellurium(IV) 5- chlorosalicylhydroxamates have been synthesized by the reaction of aryltellurium(IV) chlorides with 5- chlorosalicylhyroxamate in 1:1 and 1:2 molar ratios. The hydroxamate group is bonded to tellurium atom via carbonyl and hydroxylamine oxygen atoms thus forming five membered chelate complexes as predicated by spectral studies. Some of the complexes have also been screened for their antimicrobial activity against pathogenic bacteria and fungi.

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