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Bioactivity of Formerly Synthesized Imino Phenol Ligand and its Organometallic Complexes

EMAN TURKY SHAMKHY, VEAN SABAH ALI, HEBA FADHIL HASSAN, SUHA TALAL ABD, GHADA IBRAHEEM AL_DUBONI and RASHA ABBAS AZEEZ

Department of Basic Science, College of Dentistry, University of Baghdad, Baghdad-Iraq.
*Correspondent author E-mail: dr.alkarkhi@gmail.com

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ABSTRACT

The biological actions of ligand 2-{(*E*)-[2-hydroxyphenyl)imino] methyl}phenol [LF] and its metallic complexes of Cu (II), Co (II) and Rh (III) ions were examined against isolated bacteria include: Escherichia coli (EC),Staphylococcus aureus (SA), Candida albicans (CA), Acintobacterbaumani (AB), Enterobacter spp.(ES), Pseudo fluresence (PF). The organometallic complexes showed diverse properties reliant on the concentration and the cellular kind, cobalt complex demonstrated extra action against CA, ES. PF and SA, while rhodium metal complex display additional activity towards EC only.

Keywords: Ligand, Organometallic, Bioactivity.

INTRODUCTION

Cyclic compounds and theirderivatives possess remarkable capacity for coordination withtransition metals giving rise to coordination compounds with variable structural geometry, presently, there is a rising attention in the ligand chemistry of structurally modified bio-ligands. Organometallic complexes with possible biological activity are the spotlight of wide investigations[1-3].

A formerly synthesized 2-{(*E*)-[2-hydroxyphenyl)imino] methyl}phenol [LF] was prepared according to the below equation[4]:

Cu(II), Co(II), and Rh(III) metal complexes were prepared and characterized with the ligand (L_F) using IR, UV-Vis spectroscopy, metal investigation spectrophotometer, magnetic susceptibility and conductivity measurements[5-9]. Scheme 2 shows the predictable geometry of the organometallic complexes:

Specifically, ligands composed of salicyaldehydes are very hopeful in the exploration of new efficient materials. They shows a diversity of biological activities[10] as well as show important photochromism where light absorption lead to interconversion between enol- imine and keto-amine tautomers via intramolecular hydrogen transfer[6].

As part of our efforts in this study is to inspect the antimicrobial action of ligand and its organometallic complexes towards Escherichia coli (EC),Staphylococcus aureus (SA), Candida albicans (CA), Acintobacterbaumani (AB), Enterobacter spp.(ES), Pseudo fluresence (PF). The complexes shows diverse action reliant to the concentration and the cellular type, cobalt complex demonstrate extra activity toward CA, ES. PF and SA, while rhodium metal complex exhibit more activity against EC only.

MATERIALS AND METHODS

Dilution for the chemical compounds (ligands)

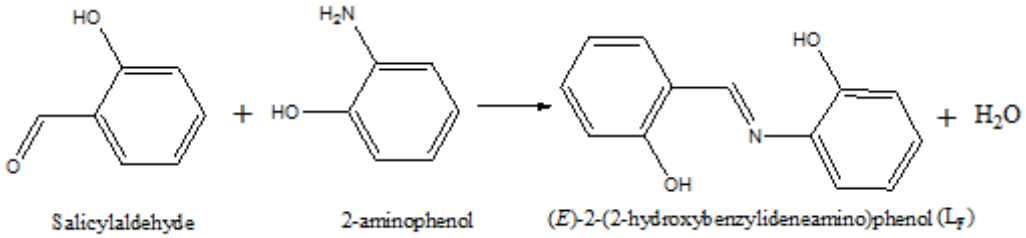
From Stock solution of Schiff organic ligand in concentration 0.1M, make the dilution of concentration 0.01M by using the dilution rule ($M_1V_1 = M_2V_2$), and use DMSO as a solvent or dilute for the stock solution

Test organisms

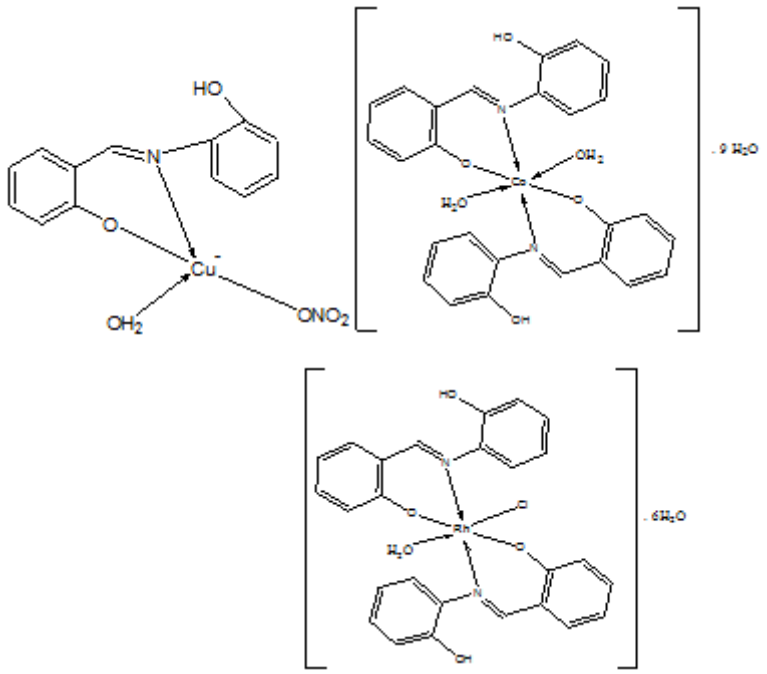
Tested bacterial and fungal were isolated from diverse scientific specimens, samples were isolated and identify according to typical laboratory methods[11]. Isolated bacteria include: *Escherichiacoli, Staphylococcus aureus*, *Candida albican*s, *Acintobacterb-aumani, Enterobacter spp., Pseudo fluresence.*

Bacterial and fungal media (Agar Media)

Muller Hinton Agar set according to manufacturer's regulations which involved dissolving 38 grams in one liter of de-ionized water with boiling, it was sterilized by autoclave at 15 lb pressure for 15 minutes. , then left to cool at 45-50°C, poured and left to harden then put them in incubator at 37°C for 24 hours then kept in fridge till being used.



Scheme 1: Synthesis equation of the 2-{(*E*)-[2-hydroxyphenyl)imino]methyl}phenol



Scheme 2: Predictable arrangements of the synthesized complexes

Antimicrobial screening (*in vitro*)

The antimicrobial activity of the ligand compounds L_F, RhL_F, CuL_F, COL_F and DMSO were measured by well diffusion technique[12, 13]. The prepared culture plates were immunized with different selected strains of bacteria and fungi using dispersal method. Wells were made on the agar surface with 6 mm cork borer. The location of the

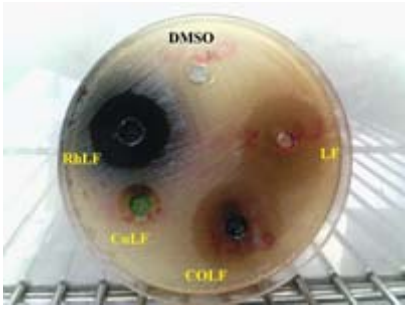


Fig. 1: Inhibition zone diameter of ligand; and its metal complexes in concentration 0.1 for Staphylococcus aurous bacteria

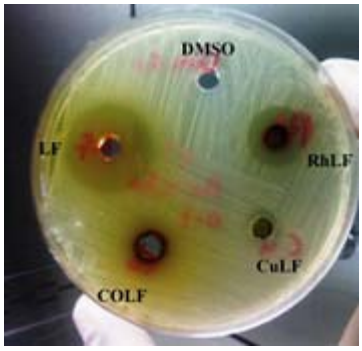


Fig. 2: Inhibition zone diameter of ligand; and its metal complexes in concentration 0.1 for Acintobacterbaumani bacteria

Table 1: Antimicrobial activity of Ligand; and its metal complexes in concentration 0.1M

Agents	Inhibition zone diameter (mm)					
	Acintobacter baumani Mean±SD	Candida albicans Mean ±SD	E.Coli Mean±SD	Enterobacter sp. Mean±SD	Pseudo Fluresence Mean±SD	Staphylococcus aurous Mean±SD
DMSO	0	0	0	0	0	0
LF (0.1)	25.4 ± 1.07	30.5 ± 0.71	39.0 ± 0.82	36.0 ± 1.41	32.8 ± 2.15	35.9 ± 0.99
RhLF(0.1)	16.3 ± 0.95	24.9 ± 0.74	37.7 ± 0.95	28.0 ± 1.25	33.0 ± 1.57	22.5 ± 0.70
CuLF(0.1)	7.2 ± 0.79	15.7 ± 0.95	20.6 ± 0.70	18.0 ± 1.15	13.2 ± 1.03	13.0 ± 0.66
COLF(0.1)	24.9 ± 0.99	33.9 ± 0.74	30.0 ± 0.82	34.0 ± 1.42	35.5 ± 1.57	37.6 ± 1.17

Weak - < 10 mm in diameter, Moderately active - 10 - 15 mm in diameter,Strongly active - >15 mm in diameter

Table 2: Antimicrobial activity of Ligand; and its metal complexes in concentration 0.01M

Agents	Inhibition zone diameter (mm)					
	Acintobacter baumani Mean±SD	Candida albicans Mean ±SD	E.Coli Mean±SD	Enterobacter sp. Mean±SD	Pseudo Fluresence Mean±SD	Staphylococcus aurous Mean±SD
DMSO	0	0	0	0	0	0
L_F (0.01)	23.9 ± 0 74	27.6 ± 0.83	34.2 ± 0.79	22.7 ± 0.95	24.8 ± 1.32	28.0 ± 0.66
RhL_F(0.01)	14.8 ± 0.79	20.8 ± 0.79	25.0 ± 0.82	18.5 ± 0.85	18.2 ± 1.03	15.4 ± 0.84
CuL_F(0.01)	7.3 ± 0.48	12.3 ± 0.48	19.5 ± 1.08	14.7 ± 0.67	12.4 ± 1.07	11.3 ± 0.94
COL_F(0.01)	10.7 ± 0.82	22.6 ± 0.84	25.1± 0.74	20.4 ± 1.07	12.5 ± 1 08	17.6 ± 1.3

Weak - < 10 mm in diameter, Moderately active - 10 - 15 mm in diameter,Strongly active - >15 mm in diameter

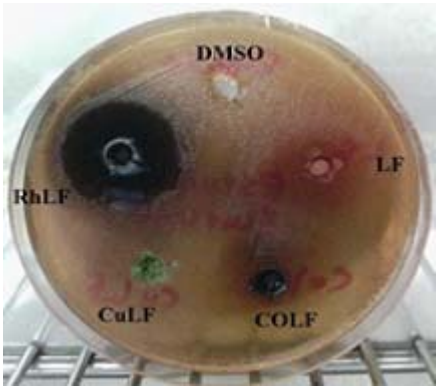


Fig. 3: Inhibition zone diameter of ligand; and its metal complexes in concentration 0.1 for Pseudo Fluresence bacteria

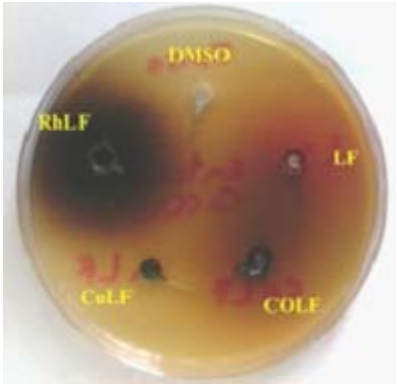


Fig. 4: Inhibition zone diameter of ligand; and its metal complexes in concentration 0.1 for Enterobacter spp. Bacteria

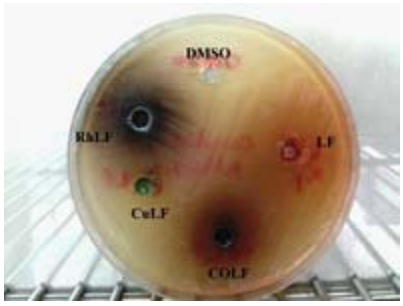


Fig. 5: Inhibition zone diameter of ligand; and its metal complexes in concentration 0.1 for Candida Albicans

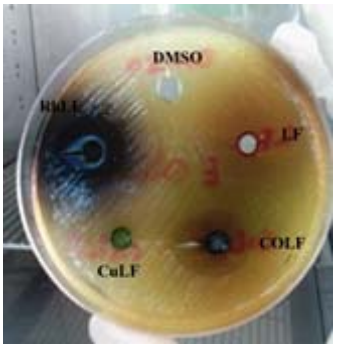


Fig. 6: Inhibition zone diameter of ligand and its metal complexes in concentration 0.1 for E.Coli bacteria

wells for each extract was marked at the external walls of plates before addition of chemical complexes and DMSO. The agents were discharged into the well. Each well was filled with 100µl with corresponding agents with the assistance of a micropipette. The plates were incubated at37±2 ºC for 24 hours for bacterial and 25±2 ºC for 48 hours for fungal action. The plates were observed for the zone clearances around the wells.The resulting zones of inhibition were uniformly circular. The widths of the zones of complete inhibition were measured, with the diameter of the disc. Regions are measured to the nearest whole millimeter, using sliding calipers or a ruler, which is held on the back of the reversed petri plate.

RESULTS AND DISCUSSION

The main purpose of the production and preparation of any antimicrobial complex is to prevent the causal microbe without any side effects on the patients. Furthermore, it is well-intentioned to stress here on the basic idea of applying any chemotherapeutic agent which hinge on basically on the specific control of only one biological function and not multiple ones. The antibacterial activity of the parental ligand and its metal complexes against Escherichia coli (EC),Staphylococcus aureus (SA), Candida albicans (CA), Acintobacterbaumani (AB), Enterobacter spp.(ES), Pseudo fluresence (PF)[14].

Two concentrations were used to the bioactivity test 0.01 and 0.1. The data that was collected are recorded in Table 1 and Table 2 sequentially.

As it appears clearly from the tables above using concentration of 0.1 M is more active against 0.01 M concentration. COL_F is the strongest compound against AB, CA,EC, ES, PF and SA while RHLF shows more activity against EC only.

Figures 1, 2, 3, 4, 5 and 6 shows the inhibition zones of the DMSO and the complexes using the 0.1 M concentration on different microbs cell lines.

CONCLUSION

Bioactivity was measured to the formerly prepared coordination compounds L_F, CoL_F, CuL_F and RhL_F, against Escherichia coli (EC), *Staphylococcus aureus* (SA), Candida albicans (CA), Acintobacterbaumani (AB), Enterobacter spp.(ES), Pseudo fluresence (PF), the research conluded to the following points:

1. The concentration of 0.1 M is shows extra activity in 0.01M concentration.
2. CoL_F shows additional activity than other complexes.

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