

# Synthesis, antibacterial and antifungal studies of Cobalt(II) complexes of (*E*)-2-(2-hydroxy-3-methoxybenzalidene)hydrazinecarbo(thio)amides

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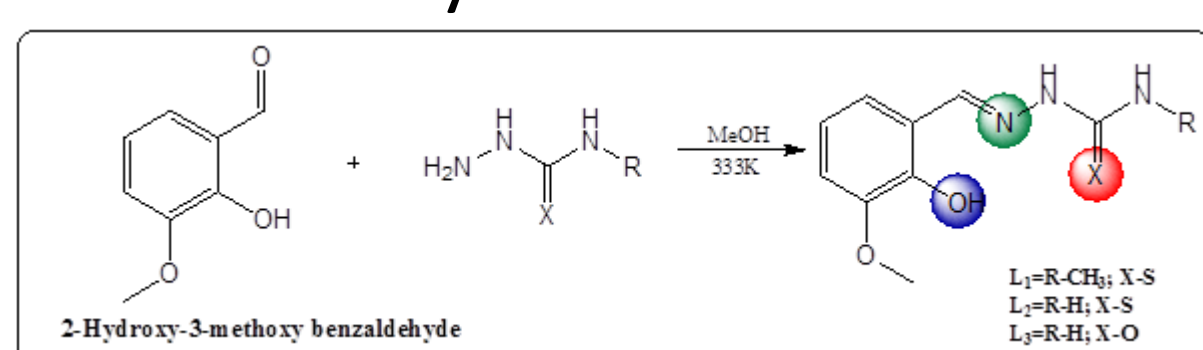
## Aim:

- To synthesize and characterization of six new Cobalt(II) complexes of (*E*)-2-(2-hydroxy-3-methoxybenzalidene)hydrazinecarbo(thio)amides.
- To screen their antibacterial and antifungal activity

## Experimental:

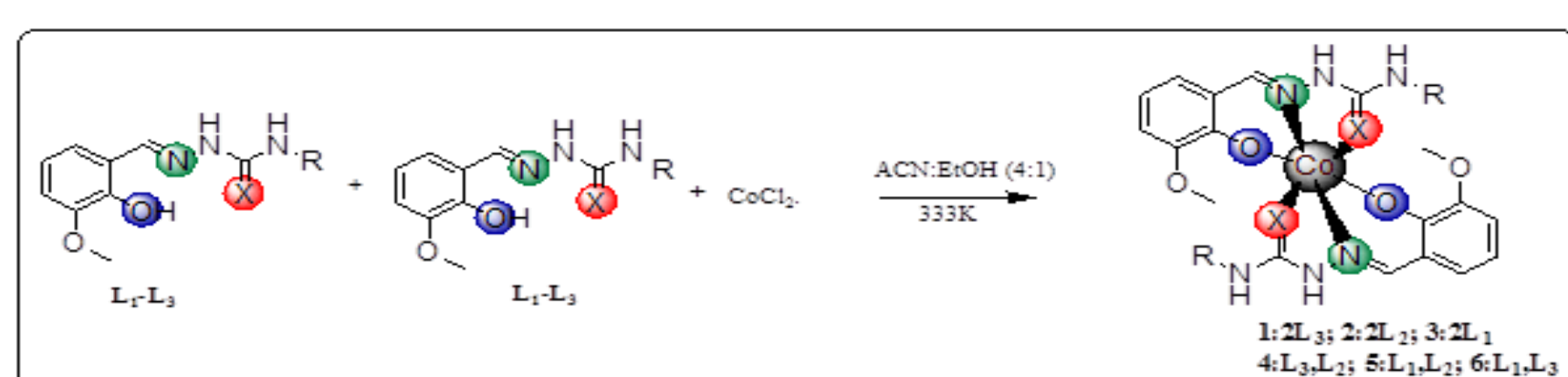
### Synthesis of Schiff base ligands

- In our previous work, the three Schiff base ligands namely as (*E*)-2-(2-hydroxy-3-methoxybenzalidene)-*N*<sup>4</sup>-methylhydrazinecarbothioamide (**HL<sub>1</sub>**), (*E*)-2-(2-hydroxy-3-methoxybenzalidene)-hydrazinecarbothioamide (**HL<sub>2</sub>**) and (*E*)-2-(2-hydroxy-3-methoxybenzalidene)-hydrazinecarboamide (**HL<sub>3</sub>**) have been synthesized and successfully confirmed their structures.<sup>[1-3]</sup>



Scheme - 1: Synthesis of Schiff base L<sub>1</sub>, L<sub>2</sub> & L<sub>3</sub>

- 15ml of the ethanol-acetonitrile (2:3) mixture of 0.0011 mole of ligands and 10 ml of the mixture of the ethanol acetonitrile of 0.0005 mole (0.0649g) CoCl<sub>2</sub> were mixed. The reaction mixture was continuously refluxed for 5 hours at 100°C. A coloured precipitate of the complex **1-6** were appeared. It was filtered, washed with ethanol and air dried. It was then washed with diethyl ether and recrystallized with dimethyl sulfoxide (Scheme 1). The light green powder of the complex formed was then weighed.



Scheme - 1: Synthesis of Cobalt(II) complexes (1-6)

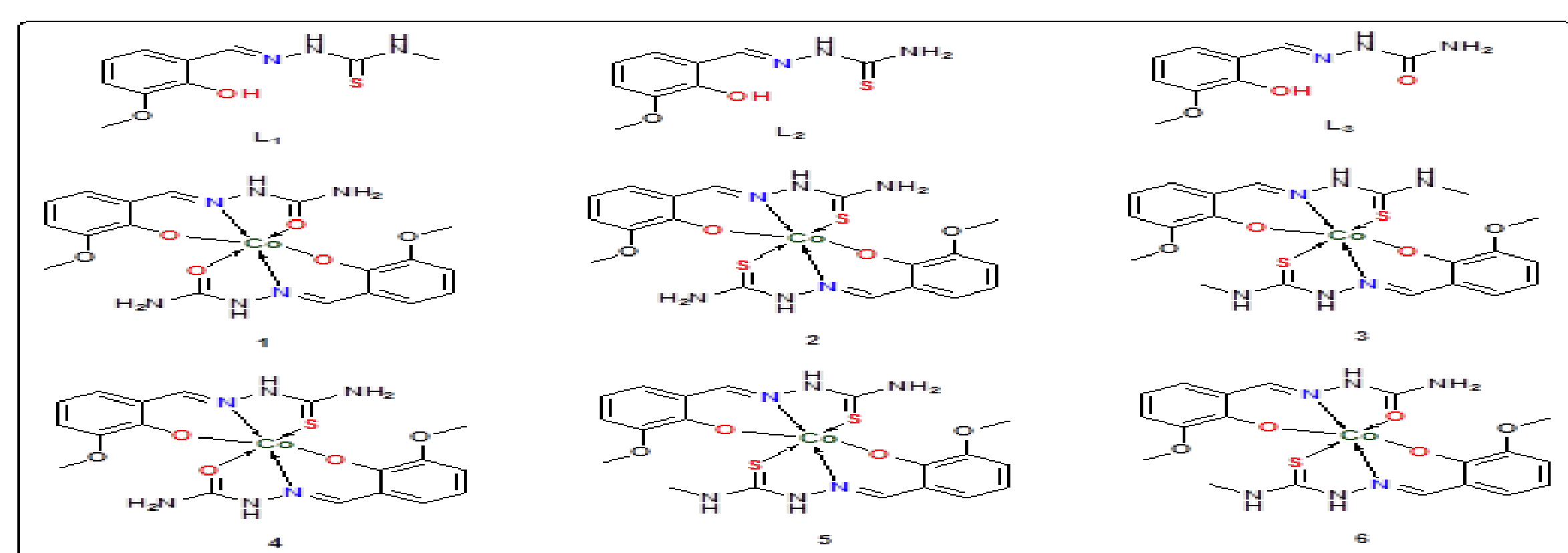
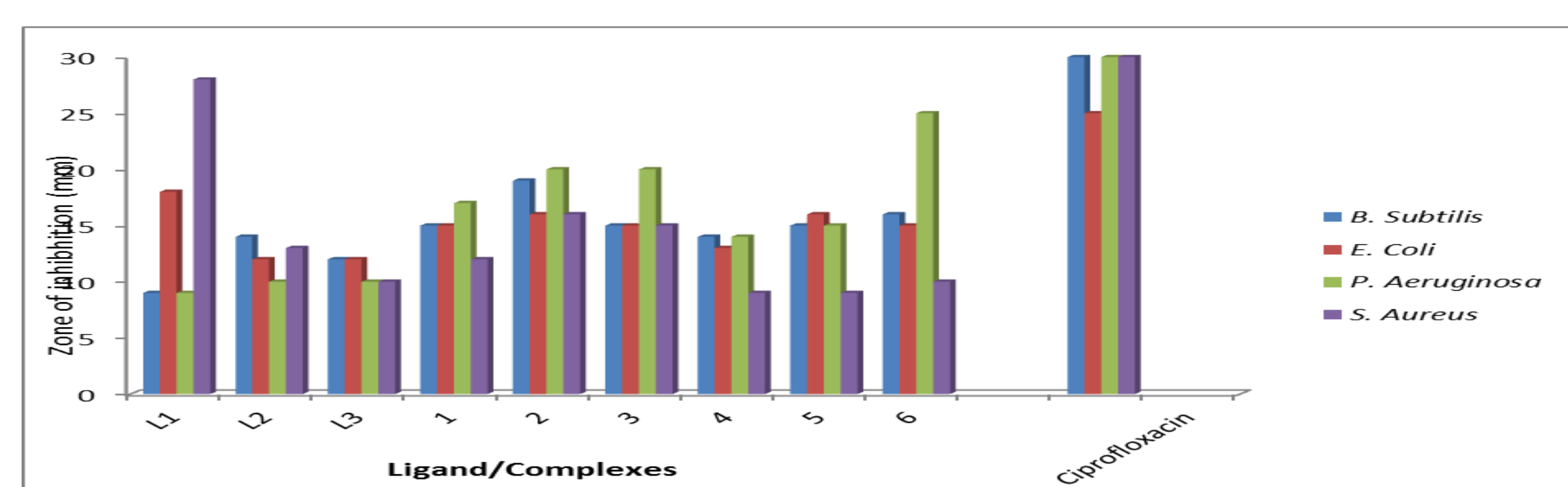


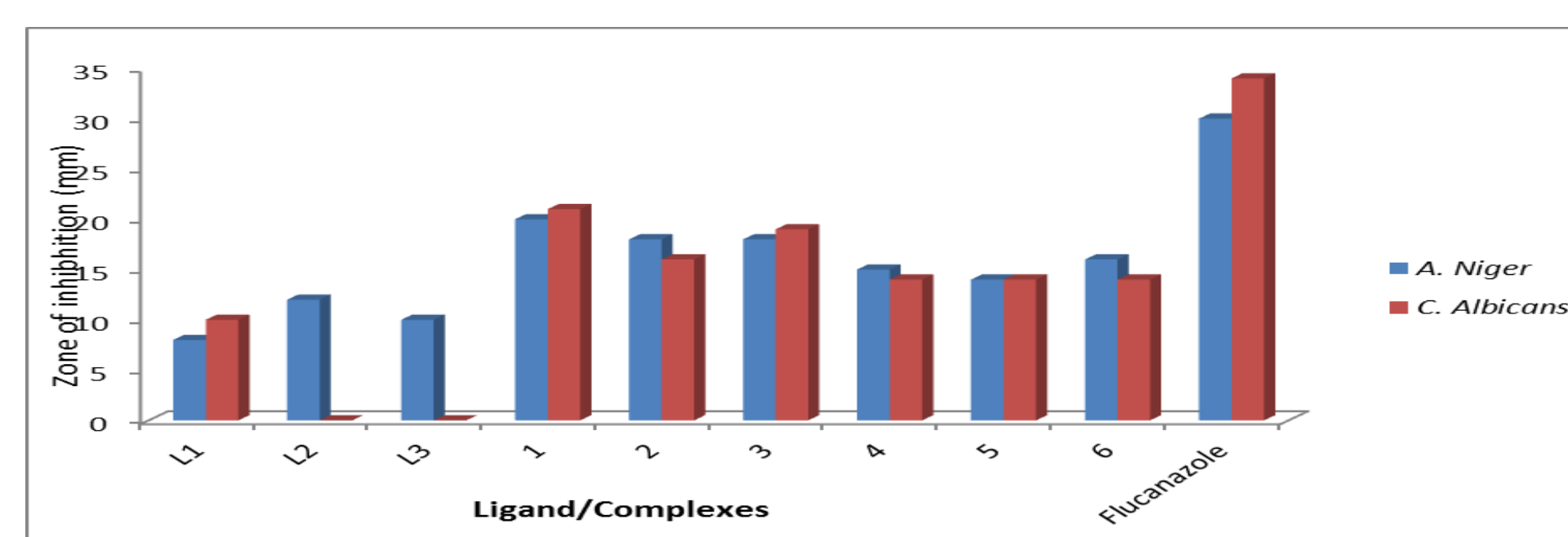
Figure 1: structure of Schiff base ligands and their Co(II) complexes

## Biology

All the new complexes showed a remarkable biological activity against bacteria and fungus. From the results it is clear that the metal complexes are found to have biological activity than the parent ligands (Graph 1 and Graph 2). Antimicrobial activity of Schiff base ligands L<sub>1</sub>- L<sub>3</sub> were reported in our previous work.<sup>[1-3]</sup>



Graph 1: Antibacterial activity of Co(II) complexes



Graph 2: Antifungal activity of Co(II) complexes

## Chemistry

Complex Code	Mol. Formula	Mol. Wt.	Color	Melting Point (°C)	Yield% (Weight)
1	C <sub>17</sub> H <sub>17</sub> CoN <sub>2</sub> O <sub>6</sub>	475.07	Light Green	250-252	92% (0.2185g)
2	C <sub>17</sub> H <sub>17</sub> CoN <sub>2</sub> O <sub>6</sub> S <sub>2</sub>	507.03	Dark Green	259-261	90% (0.2281g)
3	C <sub>19</sub> H <sub>19</sub> CoN <sub>2</sub> O <sub>6</sub> S <sub>2</sub>	535.06	Olive Green	268-270	54% (0.1445g)
4	C <sub>17</sub> H <sub>17</sub> CoN <sub>2</sub> O <sub>6</sub> S	491.05	Dark Green	254-256	91% (0.2234g)
5	C <sub>17</sub> H <sub>17</sub> CoN <sub>2</sub> O <sub>6</sub> S <sub>2</sub>	521.04	Dark olive Green	263-265	71% (0.1843g)
6	C <sub>17</sub> H <sub>17</sub> CoN <sub>2</sub> O <sub>6</sub> S	505.07	Light olive Green	253-255	75% (0.1902g)

Ligand / Complex	FT-IR frequencies (ν <sub>max</sub> , cm <sup>-1</sup> )						
	C=N	C=S	C=O	OH	N-H	Co-N	Co-O
L <sub>1</sub>	1556, 1526	831	-	3308	3341	-	-
L <sub>2</sub>	1554	842	-	3170	3351	-	-
L <sub>3</sub>	1588	-	1666	3329	3425	-	-
1	1556	-	1603	-	3420	502	531
2	1538, 1531	1538, 1531	-	-	3354	514	555
3	1556, 1538	1556, 1538	-	-	3371, 3221	473	555
4	1555	1555	1665	-	3340	479	537
5	1561	1561	1695	-	3276	485	523
6	1575	1575	1681	-	3283	492	605

## Conclusion

- This work shows that complexes formed between thiosemicarbazone Schiff bases and Co<sup>2+</sup> ion were evaluated for the anti-bacterial and anti-fungal activities. The results generated in this study lead to the following conclusions. (a) Tested **complex 2 and 6** were found to possess moderate anti-bacterial activity against *Bacillus subtilis*. While that **complex 2 and 5** were found to possess moderate anti-bacterial activity against *Escherichia coli*.
- (b) The **complex 2** was found to possess moderate activity against *Staphylococcus aureus* and **complex 2, 3 and 6** very good against *Staphylococcus aureus*.
- (c) Test **complex 1, 2, 3 and 6** were found to possess very good anti-fungal activity against *Aspergillus niger* and **complex 1, 2 and 3** were found very good activity against *Candida albicans*.

## Acknowledgement

- We would like also to thank Department of Physics, **Alagappa University, Karaikudi**, for providing **FT-IR facilities** for this project studies.
- Dr. S. SUNDHARA MOORTHY**, Assistant Professor of Pharmacy, KMCH College of Pharmacy, Coimbatore for providing antimicrobial activity.
- I would like to thank **SAIC, Tezpur University, Tezpur, Assam** for providing necessary facilities.

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