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A Review: An Overview on Synthesis of Some Schiff bases and there Metal Complexes with Anti-Microbial Activity

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ABSTRACT: Azomethine linkage of Schiff base play an important role in medical field with so many pharmacological activities such as antimicrobial, antiviral, ant tubercular and anticancer activity. The potency of these pharmaceutically useful drugs in treatment of microbial infections and other activities encouraged the development of some more potent and significant compounds and metal complexes.
Schiff bases and there metal complexes are remarkably effective compounds, extensive biochemical and medicinal studies have confirmed that these molecules are effective against various strains of microorganisms. This review is summarized to know about the chemistry of different derivatives of substituted Schiff bases and there metal complexes with various metals along with their anti-microbial activities.
Key words: Substituted Schiff bases, Metal complexes, Anti-microbial activities.

INTRODUCTION: Azomethine group (–C=N–) containing compounds typically known as Schiff bases have been synthesized by the condensation of primary amines with active carbonyls. Schiff bases form a significant class of compounds in medicinal and pharmaceutical chemistry with several biological applications that include antibacterial,[1-6] antifungal,[3-6] anticancer,[7-8] anti-oxidant,[9] neurological disorders[10] and diuretic[11] activities.
They are the important compounds owing to their wide range of industrial application in food industry, dye industry, analytical chemistry, catalysis, Agrochemicals.[12-13]. An interesting property of Schiff bases is their use as an effective corrosion inhibitor[14]. They have been studied extensively as a class of ligands[15-17] and are known to coordinate with metal ions through the azomethine nitrogen atom. The lignation nature of Schiff base shows a great potentiometric sensor as they have shown excellent selectivity, sensitivity, and stability for specific metal ions such as Ag(II), Al(III), Co(II), Cu(II), Gd(III), Hg(II), Ni(II), Pb(II), Y(III), and Zn(II), Fe(III), Cd(II),[5,18-19]. Lignation behavior of Schiff base in their metal complex is due to the donor nature of neutral N of azomethine linkage. [13,19-21,]

Literature Review:

Synthesis of Schiff bases and its metal complexes with anti-microbial activity: Santosh Kumar and coworker synthesized Schiff base from 4-amino benzene sulphonamide and substituted aromatic aldehydes.[13] Muhammad Aqeel Ashraf and co-worker, reported a series of Schiff bases from 2-amino-Benzthiazole, 4-amino-Salicylic acid and 4-aminophenol.[22] Muhammad Aslam, *et al* [23] synthesized Schiff base by mixing of Aminophenol with 4-chloroacetophenon or 4-hydroxyacetophenone and the reaction mixture was refluxed for 3 h with stirring at 70^{o}C after adding 3-4drops of conc.H_2SO4. 4-Chloro-2-oxo-2H-chromene-3-carbaldehyde was made to react with different anilines in rectified spirit to yield a series of Schiff bases of the type 4-chloro-3-(substituted-phenylimino)methyl)-2H-chromen-2-one reported by S. Bairagi *et al.*[24] Bag *et al* have synthesized a series of Schiff bases of benzidene with series of substituted aromatic aldehydes and examined the mercuration reaction.[25]

K. Mounika, B. Anupama and co-worker, prepared some Schiff basses by treating of 3-ethoxy salicylaldehyde and 2-amino benzoic in ethanol. [26]

Vatsala Pawar, Sunil Joshi & V. Uma, synthesized macrocyclic ligands by taking equimolar ratios of Acetyl acetone in ethanol with the solutions of Semicarbazide hydrochloride in hot water (dil.NaoH) and Thiosemicarbazide in ethanol respectively and then both were added drop wise in 25 ml of Ethanol under constant stirring for at least 3 hours.[27]

Vivek Tiwari, Rashmi Singhai and A.P. Mishra, Synthesized some Schiff bases metal complexes of Ni(II) and Cu(II) with Schiff bases '4- dimethylaminobenzylidene-4-chloroaniline'.[28]
B. K. Rai, synthesized a series of metal complexes with 2-methyl-3-phenyl quinazolin-4 (3H) one semicarbazone and its thiosemicarbazone analogue. [29] N. Raman and co-workers [30], prepared a series of Schiff bases with 4-

aminoantipyrine and 3-hydroxy-4-nitrobenzaldehyde derivatives and its metal complexes with Cu(II), Ni(II), Co(II), Mn(II), Zn(II), Cd(II), Hg(II) and VO(IV) and studied its chemotherapeutic use as DNA cleavage and antimicrobial activity.[30]

Synthesis and pharmacological studies of novel Schiff bases of 4-Hydroxy -6-carboxyhydrazino benzofuran and their metal complexes were reported by Gopal Krishna Rao *et al.* [31]

Vijay Aanandhi *et al* have reported the synthesis of a series of 1-(5-substituted-2-oxoindolin-3-ylidene)-4-(substituted-pyridin-2yl)thiosemicarbazide derivatives. These compounds were screened for *in vitro* antibacterial and antifungal activity against *B.subtilis ,S. aureus, E.coli, P. aeruginosa, C. albicans,* and *A. niger.* All the compounds were reported to exhibit moderate to good antibacterial and antifungal activity. [32]

Metal complexes of Schiff bases derived from 2-furancarboxaldehyde and *o*-phenylenediamine and 2-thiopheneacarboxaldehyde and 2-aminothiophenol was reported by Gehad Geindy *et al*, These authors have reported the ligand dissociation as well as the metal-ligand stability constants for these complexes. The synthesized ligands, in comparison to their metal complexes were also screened for their antibacterial activity against bacterial species, *Escherichia coli, Pseudomonas aeruginosa and Staphylococcus Pyogones as well as fungi (Candida).* The activity data reveal that the metal complexes are found to be more potent antibacterial than the parent Schiff base ligand against one or more bacterial species.

Z.H. Chohan and S. Mushtaq synthesized A series of biologically active pyrazine derived Schiff base ligands have been synthesized by the condensation reaction of 2-aminopyrazine with salicylaldehyde and acetamidobenzylaldehyde.

Then their Co(II), Ni(II) & Zn (II) complexes have been prepared. The biological evaluation of the simple uncomplexed ligand in comparison to their complexes have been determined against bacterial strains namely *Escherichia coli, Staphylococcus aureous* and *Pseudomonas aeruginosa*. [31]

The authors have also studied the antibacterial and antifungal activities of the compounds.

Daniel Thangadurai and Son-Ki Ihm[32] have reported the synthesis, characterization, catalytic and antibacterial studies of chiral Schiff base Ruthenium (III) complexes. These authors have tentatively proposed an octahedral structure for all the new complexes. The catalytic and antibacterial activities of these compounds have also been reported.

Synthesis, characterization and electrochemical behavior of Cu(II), Co(II), Ni(II) and Zn(II) complexes derived from acetylacetone and p-anisidine was reported by Raman and coworkers.[33] These authors have observed that the complexes synthesized by them show fairly good antimicrobial activity.

Racanska and coworkers[34] have studied the antidiabetic activity of some Copper(II) Schiff base complexes on Aluoxan in diabat

Rajendran and Karvembu [35] have reported the synthesis of Schiff bases derived from 3-amino-2*H*pyrano[2,3-*b*]quinolin-2-ones. The synthesized Schiff base compounds were screened against the fungal strains, such as *Aspergillus niger* and *Fusarium sp.*

Natarajan Raman *et al* [36] have reported the synthesis of a novel 14-membered macrocyclic Schiff base derived from 3-cinnamalideneacetanalide and *o*-phenylenediamine which acts as a tetradentate and strongly conjugated ligand to form a cationic solid complex with Cu(II)/Ni(II)/Co(II) and /Zn(II). The ligand and the complexes were characterized by the usual spectral and analytical techniques. The antimicrobial tests were also recorded and gave good results in the presence of metal ions in the ligand system.

S. Bawa and coworker synthesized A series of 4-substituted-emoni methyltetrazolo[1,5-a]quinoline with appropriate aromatic amine by refluxing in dioxane. They have been evaluated for their anti-inflammatory and antimicrobial activities. [37]

Mukesh Kumar Biyala *et al*[38] have studied the synthesis of mono basic bidendate Schiff base complexes of palladium (II) and platinum (II) from 1H-indol-2,3-dione thiosemicarbazone. These complexes were characterized on the basis of elemental analysis, molecular weight determination, 1H NMR and UV spectral studies. Antimicrobial effects of both the ligands and their complexes on different species of pathogenic fungi and bacteria have been recorded and these are found to possess significant fungicidal and bactericidal properties.

M. Tofazzal H Tarafder *et al* [39] have reported the synthesis of complexes of a tridentate Schiff base from the condensation of S-benzyldithiocarbazate with salicylaldehyde. These complexes have been characterized by elemental analysis and spectral analysis. Square planar structures are proposed for the Ni(II) and Cu(II) complexes. These authors have also studied the antimicrobial tests which indicate that Schiff base and five of the metal complexes of Cu(II), Ni(II), U(IV), Zr(II) and Sb(II) are strongly active against bacteria.

CONCLUSION

The chemistry of Schiff bases is a field that is being noticed. Schiff base ligands are considered privileged ligands because they are easily prepared by a simple condensation of an aldehyde derivatives and primary amines. These compounds and their metal complexes had a variety of applications including clinical, analytical, agrochemical industrial they also play important roles in catalysts and corrosion inhibitor.

In this review, synthesis of the Schiff and its complexes and the biological activities have been summarized from 1995-2013.

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