

Review Synthesis and Characterization of N-benzylidene-2-hydroxybenzohydrazine

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Abstract

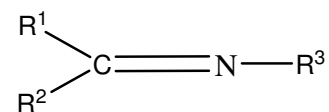
The Schiff base ligand was synthesized from 2-hydroxybenzohydrazide and benzaldehyde. The imines, very well known and popular as Schiff Bases. Recent developments on their “metallo-imines” variants have been described. The applications of Schiff bases in organic synthesis is recognizable Schiff bases are aldehyde or ketone like compounds in which the carbonyl group is replaced by an imine or azomethine group. They are widely used for industrial purposes and also exhibit a broad range of biological activities. The IR spectral data reveal that the ligand behaves as bidentate with ON donor atom sequence towards central metal ion.

Keywords: Bidentate Schiff base, Antibacterial activity, IR spectral data

1. INTRODUCTION

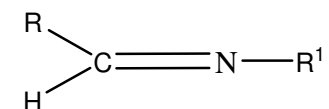
Metal complex play an essential role in agriculture pharmaceutical an industrial chemistry ligand, a metal surrounded by classier of ions or molecule, is used for preparation of complex compound named as Schiff bases, which are condensation products of primary amines and aldehydes or ketones ($RCH=NR^1$) where, R and R^1 represents alkyl or aryl substituents.[1,2] Schiff bases named after Hugo Schiff, is a compound with a functional group that contains a carbon –nitrogen double bond with the nitrogen atom connected to an aryl or alkyl group, not hydrogen. Schiff bases in a broad sense have the general formula $R^2R^1C=NR^3$, where R is an organic side chain. In this definition Schiff base synonymous with azo methine. Azo methane where the carbon connected to a hydrogen atom, those with the general formula $RCH=NR^1$. The chain on the nitrogen makes the Schiff base a stable imine. A Schiff base derived from aniline, where R^3 a phenyl or a substituted phenyl, can be called an anil.

General structure of an azo methine



Where R^2, R^1, R^3 aryl or alkyl

General structure of Schiff base



There has been growing interest in the study of hydrazones because of their physiological activity, coordinative capability, and applications in analytical chemistry [3, 4]. This introduces a wider range of properties for these substances. The study of ligands involving such hydrazones is interesting as they demonstrate versatility in coordination, a tendency to yield stereochemistry of higher coordination number, an ability to behave as neutral or deprotonated ligands, and flexibility in assuming different conformations. Recently, several metal complexes of Schiff bases containing N, S and N, O donors have been synthesized and studied. This may be due to the reported ant carcinogenic and antiviral activity of these donor ligands and the complexes obtained from them. A number of hydrazone derivatives have interesting bioactivity towards *anti-bacterial*, *anti-fungal* [5], *anti-inflammatory* anti-malarial analgesic, *anti-platelets* *anti-tuberculosis* and *anti-cancer* activities. Hydrazones also act as herbicides, insecticides, nematocides, rodenticides, and plant growth regulators and are used as plasticizers, stabilizers and antioxidant initiators for polymerization. Hydrazone derivatives are used in analytical chemistry as selective metal extracting agents as well as in the spectroscopy for the determination of certain transition metals. It was thought worthwhile that the metal complexes formed by the combination of transition metal ion with a potent hydrazone Schiff base ligand should be more biologically active than the metal salts or the ligand individually. Therefore, it was reported that the synthesis and characterization of Cu (II), Co (II), complexes with 1-(2-hydroxybenzamido)-2-(2-methylphenyl)-azomethine. The *anti-fungal* and *anti-bacterial* properties of the ligand and its metal complexes were also tested. [5]

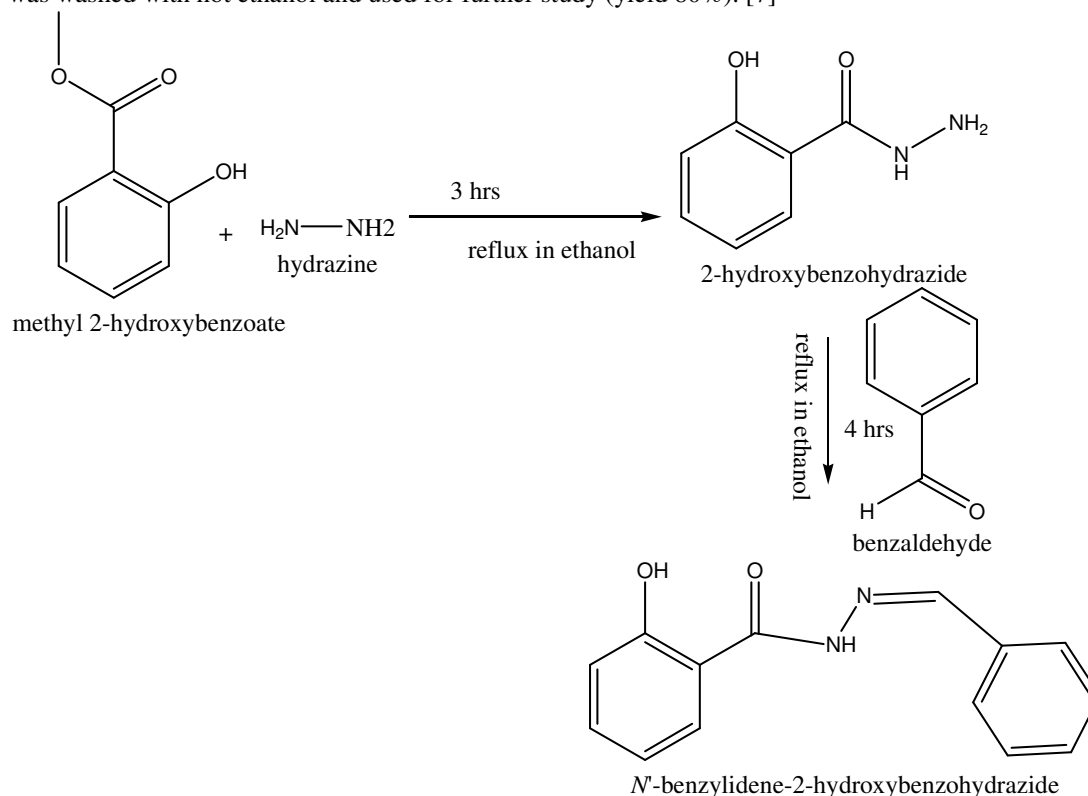
The synthesis, characterization and antibacterial activity of Cu (II) and Co (II) metal complexes N-benzylidene-2 hydroxybenzohydrazide has been reported by different researchers at different times. Bu they are not reviewed yet together. Therefore the aim of this work is to review the combined idea of these different researchers.

1. Objective

The object of this paper is to provide a review of results reported by most of researchers concerned with traditional medicinal plants used in the management of sexual transmits disease, to give awareness on advantage of using medicinal plants to fight sexual transmitted diseases, recommended areas that need future attention by researcher specially in Ethiopia, which may expected to fill the gap in future.

2. Synthesis and characterization of N-benzylidene-2-hydroxybenzohydrazide

For the synthesis of N-benzylidene-2-hydroxybenzohydrazide in ethanol solution of methyl salicylate was taken in round bottomed flask and to this hydrazine in ethanol was added slowly under stirring. The resulting mixture was refluxed for about 3-4 h. It was naturally cooled to room temperature after cooling; the solid residue was washed with hot ethanol and used for further study (yield 80%). [7]



¹H-NMR spectra of synthesized N-benzylidene-2-hydroxybenzohydrazide was recorded in CDCl₃. It shows following signals at 1H, -C-N-H at chemical shift 4.8 ppm, 9 hydrogen of aromatic ring at chemical shift 7.03-7.55 ppm, one hydrogen N=C-H at chemical shift 7.87 ppm singlet on hydrogen of OH (Ar-OH) at chemical shift 10.23 ppm singlet. The ¹H NMR spectral data of the compounds conform of proposed structure of ligand. The IR spectrum of the free ligand shows four characteristic bands at 3260-3300, 3450, 1655 and 1610 cm⁻¹ assignable to (-N-H), free (-O-H) stretching phenolic moiety, amide carbonyl (-C=O) and azomethine (-C=N), stretching modes, respectively in functional group region. The IR spectral data of the compounds conform of proposed structure ligand due to C=N, C=O, N-H and O-H bond stretching. From ¹³C NMR spectra of N-benzylidene-2-hydroxybenzohydrazide was recorded in CDCl₃ and It shows following signals C=O of amide at chemical shift of 163 ppm. Imine carbon C=N at chemical shift of 143 ppm and aromatic carbons at 121-135 ppm. The ¹³C NMR spectral data of the compounds also conform of proposed structure. From IR, ¹H NMR and ¹³C NMR clearly show the formation of C=N bond from 2-hydroxybenzohydrazide and benzaldehyde. IR ¹H NMR and ¹³C NMR spectral assignments of these compounds were in good agreement with those reported in literature [8]

3. Uses of N-benzylidene-2-hydroxybenzohydrazide

N-benzylidene-2 hydroxybenzohydrazide are considered “privileged ligands” because they are easily prepared by the condensation between aldehydes and imines. Stereogenic centers or other elements of chirality (planes, axes) can be introduced in the synthetic design. Schiff base ligands are able to coordinate with many different metals [9], and to stabilize them in various oxidation states. The Schiff base complexes have been used in catalytic reactions and as models for biological systems. Chiral Schiff bases derived from the condensation of salicylaldehydes with 2-amino alcohols have found widespread use as ligands in asymmetric synthesis. These

compounds act as tridentate ONO ligands, and a great number of metallic complexes derived from them have been described in the literature [10, 16]. Depending upon the nature of the metal centre, these chiral complexes are able to promote a variety of enantioselective transformations. It has been reported that the structure of the substituent bonded to the imino nitrogen affects the coordination geometry of the complex [11, 17]. During the past two decades, considerable attention has been paid to the chemistry of the metal complexes of Schiff bases containing nitrogen and other donors. This may be attributed to their stability, biological activity and potential applications in many fields such as oxidation catalysis, electrochemistry [12]. The complexes make these compounds effective and stereospecific catalysts for oxidation, reduction and hydrolysis and they show biological activity, and other transformations of organic and inorganic chemistry.

Among the variety of organic ligands Schiff's bases have acquired highest popularity owing to their preparative accessibility and multifarious roles, viz. in analytical chemistry as gravimetric reagents and metallic indicators in organic chemistry as starting materials or intermediates, in industry as dyes and sequestering agents of metal impurities of oils in coordination chemistry as versatile ligands in forming stable complexes of unusual coordination number and in isomeric structures,[13,20] in biological science as anti-tuberculosis anti-inflammatory, anesthetic antibacterial, antifungal, analgesic agents etc. In view of mentioned distinguished features of Schiff's bases including unique ligation properties and urgent need of designing new metal-based drugs to address the alarming problem of multidrug resistance of gram-positive bacteria we report herein synthesis, structure and bactericidal and fungicidal properties of the ligand and its 3 dimensional metal complexes.[13,14]

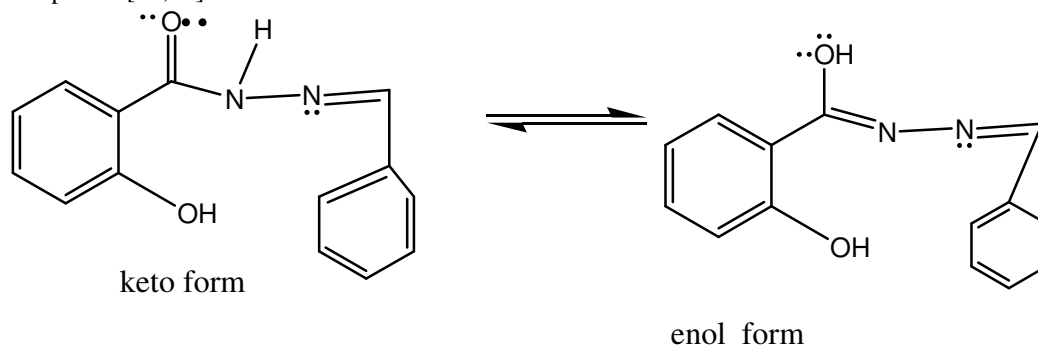


Figure1. keto and enol form of ligand.

N-benzylidene-2 hydroxybenzohydrazide. complexes were synthesized in powder form with high melting points they are not soluble in ethanol, diethyl ester, or chloroform, but are partially soluble in DMSO and DMF. The molar conductance of the Co(II), and Cu(II) Schiff base complexes in DMSO are 138, 105, 98, 121 and 127 μ s indicating there are electrolytic nature, these meaning that anions occurred out of the coordination sphere.[14,19] Schiff base ligands are considered "privileged ligands" because they are easily prepared by the condensation between benzaldehyde and methyl Salicylate and hydrazine in ethanol solvent can be introduced in the synthetic design. Schiff base ligands are able to coordinate with many different metals [13], and to stabilize them in various oxidation states. The Schiff base complexes have been used in catalytic reactions and as models for biological systems. During the past two decades, considerable attention has been paid to the chemistry of the metal complexes of Schiff bases containing nitrogen and other donors [15, 18].

4. CONCLUSIONS

This paper was reviewed that the synthesis, isolation of solid products and new bidentate Schiff base derived (N'-benzylidene-2-hydroxybenzohydrazide) from 2-hydroxybenzohydrazide and benzaldehyde. On the basis of the physico-chemical data one can assume that the ligand behave, bidentate, coordinating via amide oxygen and azomethine nitrogen. The ligand has biologically active and are having enhanced antimicrobial activities. In any chemistry database a countless number of records appear as proof of the importance of such derivatives in chemistry. They are present as reactants in umpteen synthetic organic processes, as important scaffolds in organometallic chemistry, as backbones of precious catalysts and as pharmaceutical presidiums against a series of different diseases and pathological states.

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