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REVIEW ARTICLE

A Review on Schiff Bases Compounds: Synthesis, Application, and a Versatile Pharmacophore

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ABSTRACT

Hugo Schiff named Schiff bases, which are highly reactive chemical compounds widely employed Pigments and dyes, catalysts, organic synthesis intermediates, and polymer stabilizers are only some of the applications. Antimalarial, antibacterial, antifungal, anti-inflammatory, and antiviral actions of Schiff bases have been reported in the literature. Schiff bases are also known for forming complexes with a large selection of metals. Schiff base complexes containing metals, as well as Schiff bases alone, have been discovered. Have frequently shown anticancer action. We will focus on the most notable examples of compounds in this class described in the literature.

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INTRODUCTION

It was mentioned in Schiff bases ($-C=N-$) are compounds with the functional group imine or azomethine ($-C=N-$)¹. When a carbonyl molecule is condensed with a primary amine, they are generated.²⁻⁴ Hugo Schiff, a German scientist, was the first to synthesize this sort of molecule in 1864, and it is thus known as Schiff base.⁵⁻⁷ Schiff bases have the basic structure $CR'R''=RN$, where $R \neq H$.⁸ Aromatic Schiff bases are more stable than aliphatic Schiff bases, which are unstable and polymerizable⁹, and their general structure is $R-CH=N-R$.

Schiff bases are key in producing a wide range of bioactive compounds. Furthermore, antibacterial, antifungal, anticancer, and herbicidal activities have been observed.¹⁰⁻¹⁴ They are, on the other hand, an important part of the synthesis of a number

of in asymmetric synthesis, Schiff base ligands are used as chiral auxiliaries. In oxidation, metal complex Schiff bases have also been employed. processes.¹⁵

We can deduct from these facts that Schiff bases are important in organic synthesis chemistry as well as medical chemistry Schiff bases can be created in a number of different ways. In this paper, we'll look at three different approaches to discover which one is the most straightforward. To compare the results, we used a simple material to create a Schiff base (3, 4, 5-trimethoxybenzaldehyde and p-toluidine) figure (1).

They have a wide range of pharmacokinetic characteristics. Schiff base derivatives are a vast group of compounds that have found various applications in medicinal chemistry and their importance in pharmaceutical industry development programs.¹⁶

The Schiff bases 2,2'(N-(aryl) diimino)-3,3'-bithiophene and 4,4'(N-(aryl)diimino)-3,3'-bithiophene and 4,4'-(N-(aryl) diimino)-3,3'-bithiophene and 4,4'-(N-(aryl)diimino)-3,3'-bithioph (2).¹⁷

As indicated in equation, Mohammed & coworkers¹⁸ synthesized Schiff base by reacting 5-bromo-2-hydroxy benzaldehyde with aniline figure (3).

General Procedure for Schiff Bases:

Refluxing a mixture of a carbonyl compound (aldehyde or

ketone, aromatic and aliphatic derivatives) and a primary amine (aromatic or aliphatic) when there are a few drips of acid such as glacial acetic acid or base such as piperidine in a suitable solvent and eliminating one water molecule is how Schiff's bases are usually carried out.¹⁹⁻²⁰

Pharmaceutical Activity of Schiff Base:

Schiff base has Anticancer, antiviral, antifungal, and antibacterial properties are just a few of the biological effects.²¹ They are also useful in the treatment of diabetic mellitus. The

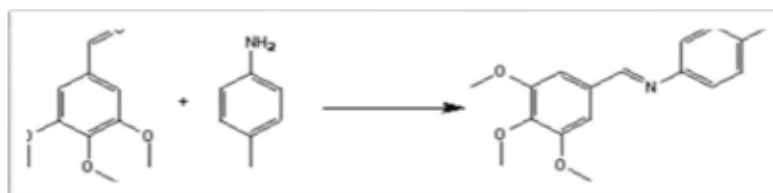


Figure: 1 Synthesis of Schiff base

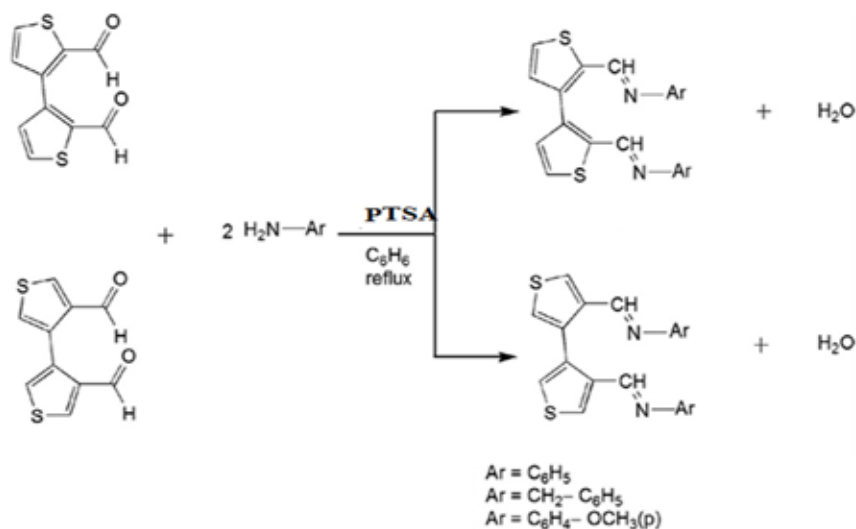


Figure: 2 Synthesis of Schiff base



Figure: 3 Schiff base synthesis



Figure: 4 Antimicrobial properties of Schiff base derivatives

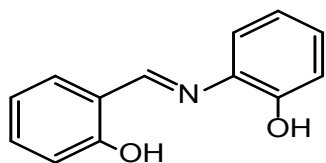


Figure: 5 Schiff base derivatives have antimicrobial characteristics

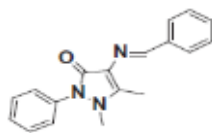


Figure: 6 Antioxidant characteristics of Schiff base compounds

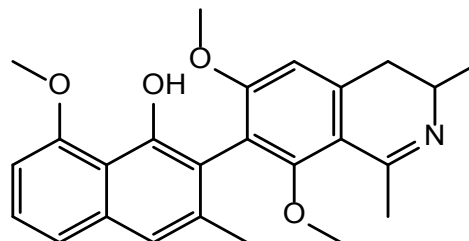


Figure: 7 Schiff base compounds with anticancer properties

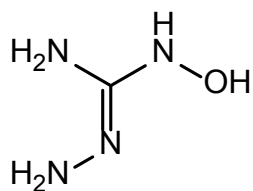


Figure: 8 Schiff base compounds with anticancer properties

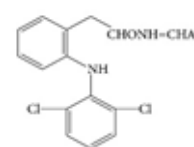


Figure (9) Schiff base compounds with nonulcerogenic activities

Schiff bases help us understand the structure of biomolecules and biological processes in living creatures. They aid in the treatment of cancer and are frequently studied as antimalarial.²²⁻²³

Because the Schiff rules incorporate the azomethane group (N=C), which alters enzyme activity within the biological system, they have a biological and pharmacological effect. As illustrated in figures (4), Schiff base derivatives have antibacterial properties.²⁴⁻²⁵

The locations of Schiff bases have been discovered. As prospective antibacterial drugs, such as Figure (5) shows N-(Salicylidene)-2-hydroxyaniline, which is efficient against the tuberculosis bacteria *Mycobacterium tuberculosis*.²⁶ As demonstrated in figure (6), the Schiff base compounds below have antioxidant properties.²⁷ Schiff bases, such as quinazolinones imine derivatives, are considered promising antifungal agents with antifungal activity against a variety of fungus species.²⁸ Antifungal activity evaluation and development is an essential objective for researchers to investigate, and Schiff bases revealed some promising antifungal medicines.²⁹

Antimalarial action is also demonstrated by Schiff bases, such as Ancistrocladidine figure (7). Figure (8) illustrates that Imine derivatives of various Schiff bases, such as N-hydroxy-N'-aminoguanidine, block ribonucleotide reductase and have significant anticancer activities in malignant cells, making it effective in the treatment of leukemia.³⁰

The analgesic, anti-inflammatory, and nonulcerogenic properties of a series of S-substituted phenacyl 1,3,4-oxadiazoles and Schiff bases (Figure 9) generated from 2-[(2,6-dichloroanilino) phenyl] acetic acid (diclofenac acid) were investigated. The acetic acid-induced writhing test and the carrageenan-induced rat paw edema method were used for analgesic and anti-inflammatory properties, respectively. It was concluded from the experiments that produced chemicals had no gastrointestinal toxicity. N-(4-bromo-benzylidene)-[2-(2,6-dichloroaniline) benzyl carbazide] was determined to be the most powerful anti-inflammatory agent among all the produced compounds.³¹

CONCLUSION

Schiff bases have been extensively investigated for industrial purposes. However, more research into the biological action of this class of compounds is required. This becomes noticeable when plant pathogens are present. Although research in this area is still in its early stages, the number of studies revealing the effect of Schiff bases on pathogenic bacteria therapeutic interest has lately increased. Schiff base compounds have been identified as intriguing candidates for developing novel antibiotics. This field has advanced. Research on the structure-activity relationship correlations and the Schiff basis of their method of action will be required.

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