SYNTHESIS OF SCHIFF BASE USING NATURAL CATALYST UNDER MICROWAVE CONDITION

SHANKAR DUTT PANDEY*, RAHUL GUPTA*, KHAN RESHMA HASNAIN, NASIRA SURVE, SAIN NAILA, SATU T CHAVHAN, R P CHAVAN.

Department of Chemistry, Dnyanasadhana College ,Thane , India.

ABSTRACT

The role of naturally available fruit juice in organic synthesis has attracted the interest of chemists, particularly from the view of green chemistry.The reaction of primary aromatic amines with aryl aldehydes is found to be catalyzed by tamarind extract as natural acid under solvent-free conditions to give the corresponding Schiff bases. This eco-friendly reaction has many advantages like economical, environmental, mild reaction conditions and simple work-up.

Key Words: Schiff base, Imines, Tamarind , Natural acid, Microwave.

INTRODUCTION

Development of non-hazardous synthetic Methodologies for organic synthesis is one of the latest challenges to organic chemists. The growing concern for the environment demands the development of eco-friendly and economic processes wherein even less hazardous byproducts are not desirable. Organic reactions under solvent-free conditions have gained in popularity in recent years. Since the majority of solvents are either toxic or flammable and add considerably to the cost of an overall synthesis. These solvent-free reactions usually need shorter reaction times, simpler reactors, resulting simpler and more efficient work up procedures, more improved selectivity and easier separations and purifications than conventional solvents.

Recently, Microwave heating has emerged as a powerful technique to promote a variety of chemical reactions . Microwave reactions under solvent-free conditions are attractive in offering reduced pollution, low cost and offer high yields together with simplicity in processing

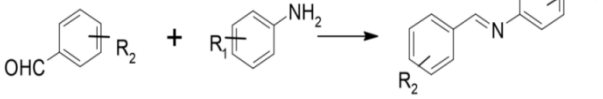
and handling. Schiff- base compounds are widely applicable as fine chemicals and in medical substrates.

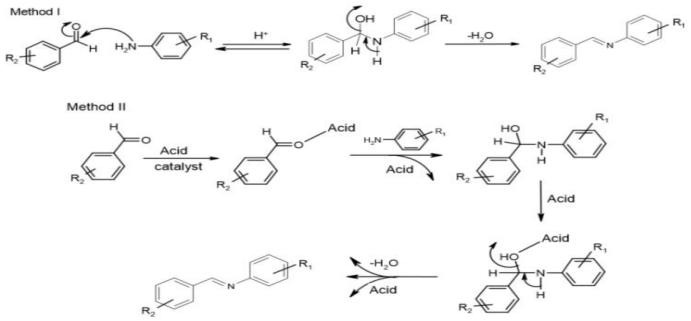
If we focus on the mechanism of transformation of aldehydes and amines in to Schiff bases, two synthetic methods are possible which are mechanized in Scheme-II. In method I, there is nucleophilic attack of primary amine on carbonyl carbon affords hydroxyl compound which on dehydration gives Schiff bases. The formation of Schiff bases in the second step largely depends upon the rate of removal of water from reaction mixture.

Originally, the classical synthetic route for synthesis of Schiff bases was reported by Schiff which involves condensation of primary amines with carbonyl compounds under azeotropic distillation with the removal of water.

The removal of water during this condensation also conventionally facilitated by using molecular sieves or a Dean-Stark apparatus. In the literature, for removal of water in situ dehydration method has been employed by using dehydrating solvents

Scheme I : Schiff bases synthesis Scheme II: Mechanism for acid catalyzed Schiff base synthesis





MATERIAL AND METHODS

All the materials chemicals used as starting materials to the synthesis of the Schiff's base were of A.R grade.

Sr. No	Aldehyde	Amine
1.	Anisaldehyde	m-chloroaniline
2.	Vanilline	

Fruit Juice of Tamarin : Tamarind (Tamarind indica) is a leguminous tree in the family Fabaceae indigenous to tropical Africa. The tamarind tree produces edible, pod-like fruit which are used extensively in cuisines around the world. It has long been one of the most popular non-citrus tropical and sub-tropical fruit, largely because of its attractive flavor and refreshing sugar-acid balance. The fruit juice is also used as traditional medicine and metal polises.

Photograph of Fruit and Tamarind Juice of Tamarindus Indica :

Composition of Tamarind Fruit Juice :The main ingredient of 100 g of pulp of Tamarind fruit contain water (15-30%),protein (2-9%), fat (0.5-3%), total carbohydrate (56-82%), edible fiber (2.2-18.3%), ash (2.1-3.3%), calcium (81-466mg), phosphorous (86-190 mg), iron (1.3-10.9 mg), sodium (23-28 mg), potassium (62-570 mg). It also contains 41-58% sugar of which 25-45% is in the form of reducing sugars and 16% is in the form of non-reducing sugars and tartaric acid is (8-18%) and ascorbic acid is (3-9 mg). The composition of the tamarind fruit juice varies with geographical, cultural and seasonal harvesting and processing. An aqueous extract of tamarind fruit juice is acidic having pH 3 and acidity percentage is 50.3% and hence it will be worked as an acid catalyst in acid catalyzed reac- tions.

General Procedure for Extraction of TamarindusIndica Fruit Juice.

The upper shell and inner grain of unripe tamarind fruit were removed with the help of a knife. The hard green material (pulp, 10 g) was boiled with water (50 mL), cooled and it was centrifuged. The clear portion of the aqueous extract (pH 3) of tamarind fruit was used as catalyst for the reaction.

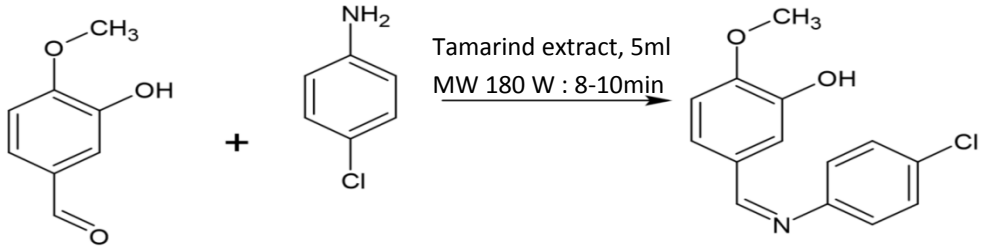
Preparationof4-chloro-N-(4-methoxybenzylidene)aniline:

A mixture of anisaldehyde and m-chloroaniline(1:1 ratio) in conical flask was introduced into the domestic microwave oven and irradiated at an interval of 30sec at 180 W for about 8min-10min progress of the reaction was monitored by TLC. After the completion of the reaction the mixture was poured in cold water. After cooling, the solid was recrystallized from ethyl acetate. Yellow colored crystal's were formed. melting point of compound: 107^0C.

Preparation of 4-chloro-N-(4-methoxy-3-hydroxybenzylidene)aniline:

A mixture of vanillin and m-chloroaniline(1:1 ratio) in conical flask was introduced into the microwave oven and irradiated at an interval of 30sec at 180 W for about 8min-10min progress of the reaction was monitored by TLC. After the completion of the reaction the mixture was poured in cold water. After cooling, the solid was recrystallized from ethyl acetate. Yellow colored crystal's were formed.M.P= 90^0C

FTIR : 1245 cm^{-1} (C-OH), 1680 (C=N) cm^{-1}

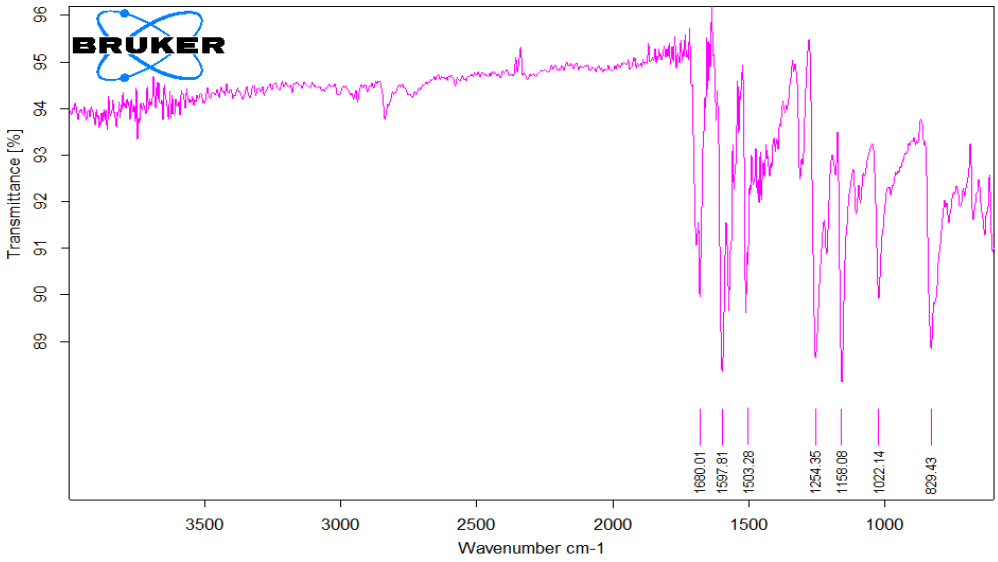


RESULT AND DISCUSSION:

In this chapter, Schiff base is synthesized by different aldehydes and different aromatic amines by using natural tamarind extract by microwave method. The synthesized Schiff base is subjected to spectroscopic analysis. On analysis following result is obtained.

The spectra of synthesized molecule is as follows:

FTIR : 1245 cm^{-1} (C-OH), 1680 (C=N) cm^{-1}



Conclusion

The role of naturally available fruit juice in organic synthesis has attracted the interest of chemists, particularly from the view of green chemistry. This review summarizes the versatile synthetic applications of fruit juice as a biocatalyst in chemical transformation. In some literature we came across synthesis of Schiff base which is carried out using lemon juice. We have used tamarind juice for the synthesis of Schiff base which act as an acid catalyst using aromatic amine with strong electron donating group and aryl aldehyde. Conventional synthesis of Schiff base is carried out with or without using acid catalyst and sometimes refluxing the mixture of aldehydes and amine in organic medium.

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