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FOURIER TRANSFORM INFRARED SPECTROSCOPIC INVESTIGATION ON NIFIDIPINE

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Research Article

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ABSTRACT

The concept of supramolecular chemistry can be applied to the design of new pharmaceutical materials affording new compositions of matter with desirable composition, structure and properties. In recent years, extensive pharmaceutical research has been conducted to improve the solubility, stability and bio availability of different pharmaceutically active ingredients. Raman and infrared spectroscopy are widely used analytical methods to study pharmaceutical formulations. In the present study, Fourier Transform Infrared Spectroscopic characterization of Nifidipine, a common anti hypertension drug of the 1, 4-dihydro Pyridine family is studied.

KEYWORDS: ***Nifidipine, FTIR, Pyridine***

Introduction

Nifidipine is a drug belonging to a class of pharmacological agents known as Calcium channel blockers weighing a molecular weight of 346.33. Nifidipine is a highly photo labile, practically water insoluble drug used therapeutically as calcium channel antagonist for the treatment of various cardiac vascular disorders. Nifidipine is a yellow crystalline substance[1], practically insoluble in water but soluble in ethanol. Nifedipine has three possible hydrogen-bonding sites, the secondary amine (H-bond donor), the ester carbonyl (H-bond acceptor) and the nitro group (H-bond acceptor)[11]. Out of these three possible sites, the secondary amine is involved in hydrogen bonding. The results from [1, 2] indicate that the Nifidipine solid dispersion is physically stable over 8 weeks.

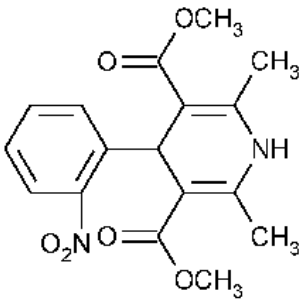
Materials and Methods

Nifidipine drug used were of analytical reagent grade and used as received. Further without any purification of the drug was grinded well with mortar and the powdered sample was subjected to FTIR characterization.

Structure of Nifidipine:

Molecular formula: $C_{17}H_{18}N_2O_6$, IUPAC Name: 3, 5-Pyridinedicarboxylic acid,1, 4-dihydro-2,6-dimethyl-4-(2-nitrophenyl)-,dimethylester.

Fig: 01



EXPERIMENTAL PROCEDURE:

FTIR spectra of Nifidipine drug was recorded in the frequency range 4000 – 450 cm-1 on a Perkin Elmer One Spectrometer at Anna University, Chennai equipped with an air cooled DTGS detector. IR transparent Thallium Bromide material without the serum was scanned as the background for each spectrum and 16 scans were co-added at a spectral resolution of 1 cm-1. To minimize problems from avoidable baseline shifts, the spectra were baseline corrected and normalized.

IR VIBRATION BAND ANALYSIS OF NIFIDIPINE

The various functional groups present in the Nifidipine drug were analyzed by using Fourier Transform Infrared Spectroscopy. The assignment of bands observed in the vibration spectra is essential step for solving structural and chemical problems. The recorded spectra are shown in **figure 2** and vibration band assignment is given in **Table 1**

The broad band at 3431 cm^{-1} corresponds to the amine and hydroxyl groups, the peak at 2922 cm^{-1} was caused by OH stretching[9]. A sharp band at 1667 cm^{-1} was assigned to C=O stretching of the secondary amide (amide II)[4,6] . The peak at 1436 cm^{-1} and 1373 cm^{-1} belong to aromatic N-O stretching [5] and ether bonds and NH stretching amide III band respectively. The peaks observed at 1079 cm^{-1} and 1025 cm^{-1} were the secondary hydroxyl group (characteristic peak of –CH-OH in cyclic alcohols, C-O stretch) and the primary hydroxyl group (characteristic peak of $–CH_2OH$ in primay alcohols C-O stretch)[9]. The bands around 1025 cm^{-1} were attributed to C-O-C stretching. Pure Nifidipine displays a peak characteristic of the N-H stretching vibration at 3431 cm^{-1} and a band with main peak at 1667 cm^{-1} indicative of the C-O stretching of the ester group[10]. The characteristic absorption band of Nifidipine which probably indicate that Nifidipine molecule was filled in the polymeric network[7,8].

Results and Discussions

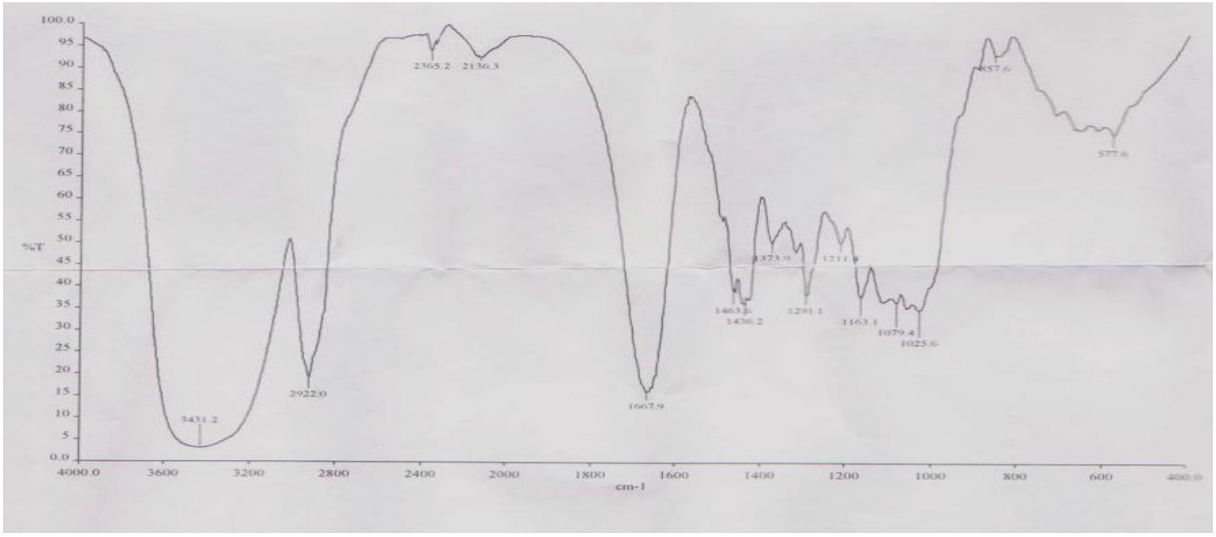
Nifidipine is a calcium ion influx inhibitor and inhibits the trans membrane influx of calcium ions into cardiac muscle and smooth muscles. Alliya etal [3] reported that nifedipine was among the most widely used of the oral agents, because it decreases blood pressure within 15 minutes.

Nifedipine is a dihydropyridine calcium channel antagonist that dilates the vascular bed and reduces peripheral vascular resistance, thus reducing the arterial blood pressure. Nifidipine may be used alone or in combination with other anti hypertensive agents. Because Nifidpine decreases peripheral vascular resistance, careful monitoring of blood pressure during the Initial administration and titration of nifidipine is suggested. Since Nifidipine is highly protein bond, dialysis is not likely to be of any benefit. Fourier Transform Infrared Spectroscopic technique has been employed to characterize the drug.

VIBRATIONAL BAND ASSIGNMENT OF NIFIDIPINE: TABLE:1

Wavenumber cm^{-1}	Assignment Description
3431	Amine and hydroxyl groups N-H stretching vibration
2922	O-H stretching
1667	C=O stretching of the secondary amide (amide II) C-O stretching of the ester group
1436	NH stretching of the amide and ether bonds
1373	NH stretching (amide III band
1079	seconday hydroxyl group (characteristic peak of –CH-OH in cyclic alcohols, C-O stretch)
1025	Primary hydroxykl group (characteristic peak of $-CH_2OH$ in primay alcohols C-O stretch). C-O-C stretching

FOURIER TRANSFORM INFRARED SPECTRUM OF NIFIDIPINE: FIGURE:2



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