Spectroscopic study of solvent effect on the UV visible absorption spectra and on the electronic absorption of different pharmaceutical drug

Mr. Abhilash D. Waghmare*, Mr. Mangesh M. Raut, Miss. Radhika. T.Tagwale, Miss. Harshada.B. Kudale, Miss. Manisha S. Shete, Mr. Ratan M. Biradar

[1]*Department of Quality Assurance*
[1]*Anand Charitable Santha's College of Pharmaceutical Science and Research, Ashti, Beed Maharashtra 414203*

ABSTRACT :
The aim of this spectroscopic study of solvent effect on the UV / visible absorption spectra and on the electronic absorption spectra of Cetirizine, Amlodipine ,Telmisartan, Aspirin, Metformin. In this study the drugs absorptions and wavelength in different solvent such as Water, methanol, 0.1N HCL, 0.1N NaOH etc. where studded according to their solubility in particular solvent. In this study the main finding is the determination of the solvent effect on the lambda- max of given drug into the various solvent. The proposed methods were accurate, precise and selective for determination of given drug in various solvent. The proposed methods were accurate, precise and selective for determination of given drug in various solvents in pure form. Beer's law was obeyed in the concentration range of 2–10 µg/ml in all methods. Determination of all drugs is done at 200-400nm range by using 10 ug/m

Keyword of Cetirizine, Amlodipine ,Telmisartan, Aspirin, Metformin And Spectroscopic

I. INTRODUCTION

First of all we select drug that is Metformin, cetirizine, Amlodipine, Telmisartan and Aspirin.Various solvent use for Spectroscopic study of solvent effect on the UV visible absorptionspectra and on the electronic absorption of pharmaceutical drug. Solvent like 0.1N Hydrochloric acid, 0.1N Sodium Hydroxide, Water and Methanol.

Metformin.

Metformin hydrochloride Fig. 1 drug has an IUPAC name as N,N-dimethyl-imido-dicarbonimidic diamide hydrochloride. It is freely soluble in water and is practically insoluble in acetone, ether and chloroform[1]. The pKa of Metformin is 2.8 and 11.51. The melting point is 222–226 C. Metformin hydrochloride contains two imino (AC=NH) groups and the three amino groups (i.e. primary (ANH2), secondary (ANH) and tertiary (AN(CH3)2) as donating centers. Metformin is commonly prescribed agent for the treatment of type II diabetes. It induces multiple beneficial effects such as weight loss, lipid reduction and lowering blood glucose levels[2] It is an oral hypoglycemic agent, which enhances insulin sensitivity and is not effective in the absence of insulin[3]. It lowers blood glucose level in non-insulin-dependent diabetes mellitus (NIDDM) patients by suppressing hepatic glucose output and enhancing peripheral glucose uptake. Several clinical studies worldwide are using Metformin as a monotherapy or as an add-on therapy with chemotherapeutic drugs to determine prospectively its efficacy and safety in treating human cancer[4]. The use of Metformin has been shown to possibly decrease the rate of specific cancers when used in the treatment of type II diabetes.[5] Biguanide is a strong organic base of pKa0 = 12.8 and pKa00 = 3.1 at 25 C[6], and readily forms acidic salts, with HCl to produce Metformin hydrochloride. Biguanide exists in diprotonated form (H2Bg2+) in strong acid solutions, monoprotonated forms (HBg+) in weak acid solutions, and neutral (Bg) in strong alkali solution [7]
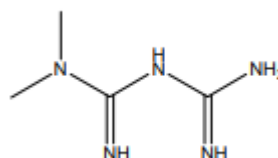

Fig. no 1 Metformin

Aspirin .

Aspirin (acetyl salicylic acid) is one of the most frequently used drugs, it is an analgesic with pain relief and anti-inflammatory properties[8]. The

long-term use of salicylic acid or NSAIDs, is known to reduce colon cancer risk by 40–50% and may be preventative for lung, esophagus, and stomach cancers [9]. NSAIDs were found to activate the mechanism of apoptosis through 15-lipoxygenase-1 (15-LOX-1) inhibition [10,11], while 15-LOX-1 has been associated with the evolution of certain cancers[11]
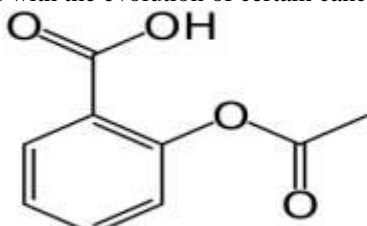

Fig .no 2 Aspirin

Telmisartan

Telmisartan is a benzimidazole antihypertensive agent that blocks angiotensin II type 1 receptors. Telmisartan is not a prodrug and has a highly lipophilic structure with good penetration of target tissues . Furthermore, telmisartan is exclusively metabolized by glucuronidation in the liver and rapidly excreted via bile[12]
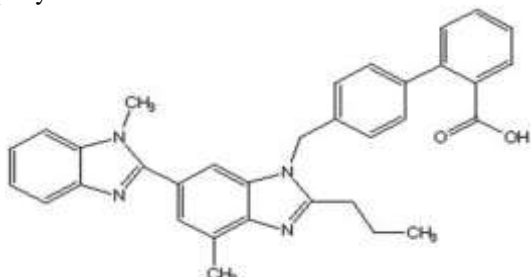

Fig.no 3 Telmisartan

Amlodipine

Amlodipine is a second-generation calcium antagonist, with pharmacodynamic properties similar to other dihydropyridines, such as the prototype nifedipine, but with distinctive pharmacokinetic profile , characterized by a high oral bioavailability, late peak plasma concentrations, slow hepatic biodegradation, and long (>30 h) elimination half-life 1The Indian Pharmacopoeia[13-16]
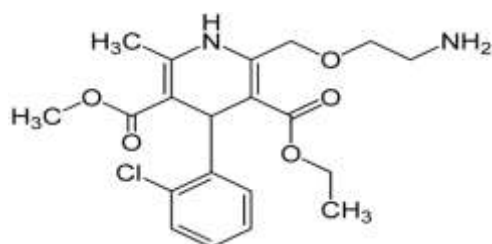

Fig.no 4 Amlodipine

Cetirizine:

Cetirizine, the active metabolite of hydroxyzine, is a potent second-generation H1 receptor antagonist.2,3 It is considered a second-generation antihistamine because, in contrast to earlier antihistamines, it does not cause sedation in people. Hydroxyzine, the parent drug of cetirizine, results in considerably more sedative effects. In dogs, practically all of an administered dose of hydroxyzine is converted to the active drug cetirizine after IV or oral administration.a In those same dogs, the pharmacodynamic effects (suppression of histamine) were attributed to cetirizine concentrations, rather than to the effects of hydroxyzine.a Even though cetirizine and [17-18]
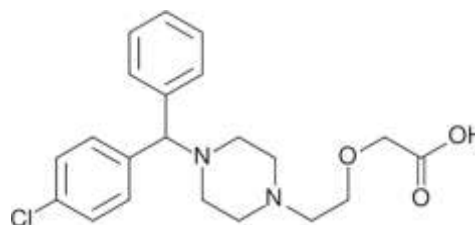

Fig.no 5 Cetirizine

II. MATERIAL AND METHODS

2.1 SHIMADZU: Deutschland GmbH UV-2550 spectrophotometer the double-beam spectrophotometer is a device that uses two rather than one beam of light to measure how light is absorbed during spectrophotometry. Unlike single beam units, the device allows for simultaneous measurement of a sample beam and a reference beam. The purpose of this instrument is to determine the amount of light of a specific wavelength absorbed by an analyte in a sample and to check the solvent effect on the drug molecule. Although samples are in solid form. Digital Balance: Shimadzu ATX224. Calibrated glassware was used for the study

2 Reagents and chemicals
Cetirizine, Amlodipine ,Telmisartan, Aspirin and Metformin was purchased form local Medical shop by prescription of register medical practicians . Analytical grade methanol was purchased from Suvidhanath laboratories Pvt Ltd. All the reagents were of analytical grade. Glass double distilled water was used throughout the experiment.
0.1N Hydrochloric acid was preparade : 1000 ml water and addition of 8.50 ml hydrochloric acid Mixed and shake well properly. Sodium hydroxide (NaOH): also preparade at Laboratory level Preparation of 0.1N NaOH: 100ml water and addition

of 4 gm flexes of NaOH Mixed and shake well properly.

3 Preparation of stock Solution
Water -
　　Water Stock solution of drug weighed an amount 100mg drug of drug. And was dissolved in 100 ml water. Then the solution transferred in 100 ml conical flask. Then conical flask placed the sonicate machine and sonicate the drug in 2 min. Then stock solution is prepared.

Methanol -
　　Stock solution of drug weighed an amount 100mg drug of drug. And was dissolved in 100 ml methanol. Then the solution transferred in 100 ml conical flask. Then conical flask placed the sonicate machine and sonicate the drug in 2 min. Then stock solution is prepared.

Hydrochloric acid -
　　Stock solution of drug weighed an amount 100mg drug of drug. And was dissolved in 100 ml 0.1N HCL. Then the solution transferred in 100 ml conical flask. Then conical flask placed the sonicate machine and sonicate the drug in 2 min.Then stock solution is prepared.

Sodium hydroxide
　　Stock solution of drug weighed an amount 100mg drug of drug. And was dissolved in 100 ml 0.1N NaOH. Then the solution transferred in 100 ml conical flask. Then conical flask placed the sonicate machine and sonicate the drug in 2 min. Then stock solution is prepared.

Determination of Solvent effect on Metformin by using Uv – visible spectroscopy :
By the using uv – visible spectrometer effect of solvent on the Lambda max is tested and compare with standard.

| Solvent	Wavelength(nm)	Abs.
Water	233	1.229
0.1N NaOH	248	1.021
0.1N HCL	232	0.998
Methanol	251	1.163

Table no. 1 showing wavelength of Metformin in various solvents

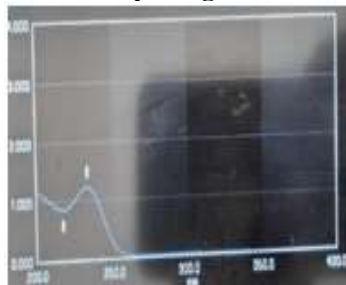**Determination of Solvent effect on Cetirizine by using Uv – visible spectroscopy**

Solvent	Wavelength(nm)	Absorbance
Water	229	1.247
0.1N HCL	231	0.306
0.1N NaOH	230	0.283
Methanol	223	1.994

Table no.2 showing wavelength of Cetirizine in various solvents

Determination of Solvent effect on Amlodipine by using uv – visible spectroscopy

Solvent	Wavelength (nm)	Absorbance
Water	322.00	0.129
0.1N NaOH	366. 00	0.037
Methanol	360. 00	0.223

Table no : 3 Table showing wavelength of Amlodipine in various solvents :

Determination of Solvent effect on Telmisartan by using uv – visible spectroscopy

Solvent	Wavelength (nm)	Absorbance
Water	365	0.031
0.1N NaOH	307	0.057
0.1N HCL	292	0.545
Methanol	296	0.279

Table no : 4 Table showing wavelength of Telmisartan in various solvents

Determination of Solvent effect on Aspirin by using uv – visible spectroscopy

Solvent	Wavelength (nm)	Absorbance
Water	295	0.017
0.1N HCL	280	0.225
0.1N NaOH	306	0.581
Methanol	276	0.130

Table no : 5 Table showing wavelength of **Aspirin** in various solvents

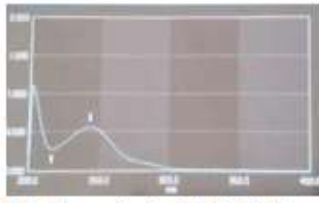**Determination of Solvent effect on Metformin by using Uv – visible spectroscopy :**
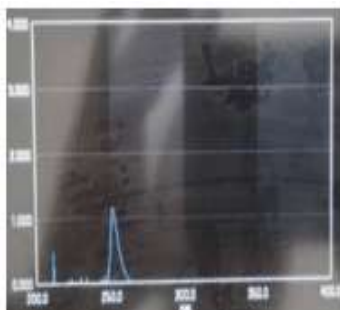
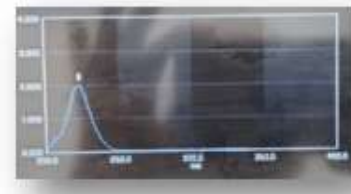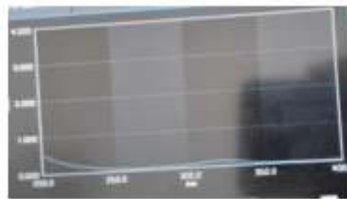**Metformin in methanol**   **Metformin in water**   **Metformin in 0.1N NaO**
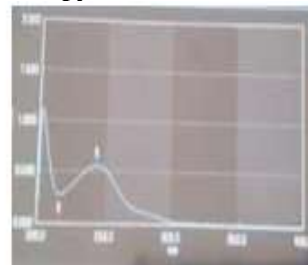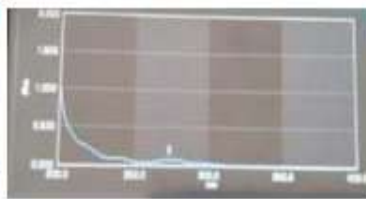
Metformin in 0.1 N Hcl

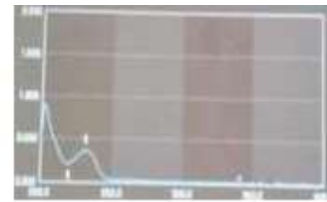**Cetirizine in methanol.**

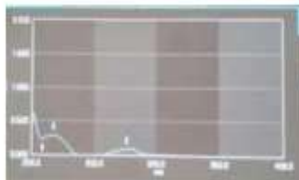**. Cetirizine in water**

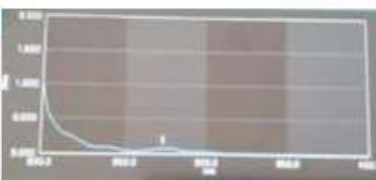Amlodipine in water.

Cetirizine in 0.1N NaOH

Cetirizine in0.1N HCL
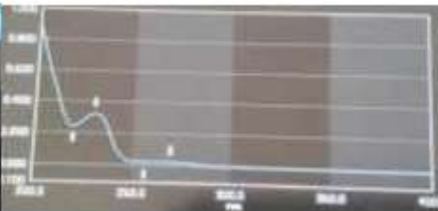

Amlodipine in 0.1N NaOH

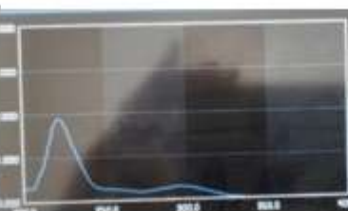Amlodipine in methanol

Telmisartan in 0.1N NaOH .

Telmisartan in water

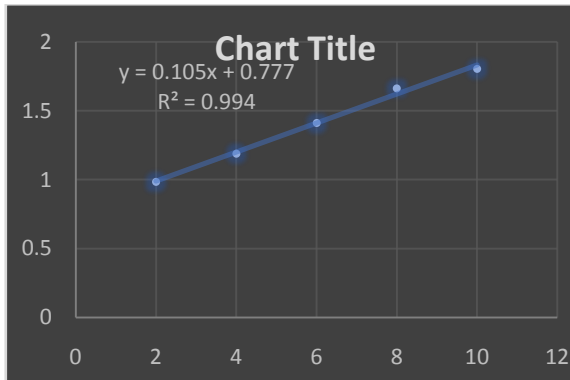**Telmisartan in 0.1N HCL**

Telmisartan in Methanol

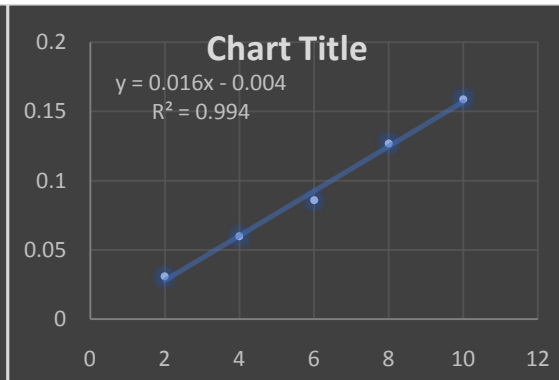**fig. Aspirin in Water**

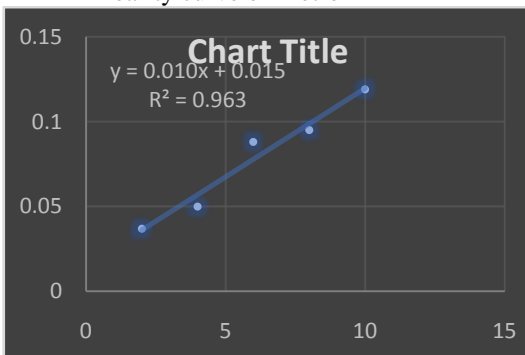**Aspirin in HCL**

Aspirin in 0.1N NaOH

. Aspirin in Methanol

Linearity curve of Metformin

Linearity curve of Telmisartan

Linearity curve of Amlodipine
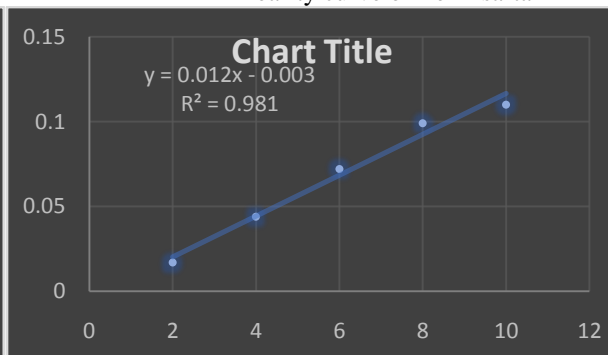
Linearity curve of Aspirin
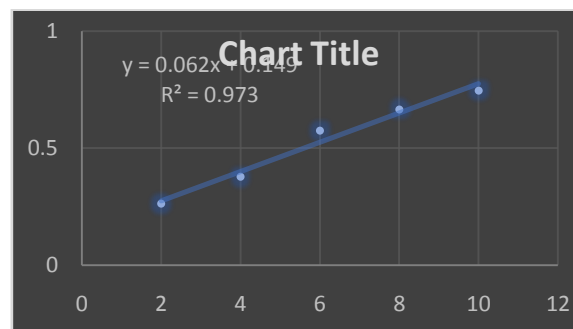
Linearity curve of Cetirizine

Table no 6Linearity and rangereport metformin, telmisartan, amlodipine, cetirizine, and aspirin

Parameters	Metformin	Telmisartan
Linearityrange	2-10ug/mL	2-10ug/mL
Regressionequation	y = 0.1056x + 0.7774	y = 0.0162x - 0.0043
Correlationcoefficient	0.9944	0.9943
Intercept	0.7774	-0.0043

Slope	0.1056	0.01615

Table no 7Linearity and rangereport metformin, telmisartan, amlodipine, cetirizine, and aspirin

Parameters	Amlodipine	Cetirizine	Aspirin
Linearityrange	2-10ug/m	2-10ug/m	2-10ug/m
Regressionequation	y = 0.0105x + 0.0151	y= 0.0627x + 0.149	y = 0.0121x - 0.0039
Correlationcoefficient	0.9632	0.9738	0.9816
Intercept	0.0151	0.149	0.0039
Slope	0.01045	0.0627	0.01205

III.   RESULT :

Spectroscopic study of solvent effect on the UV visible absorption spectra and on the electronic absorption of different pharmaceutical drug. Determination of Solvent effect on Metformin, Aspirin, Telmisartan, Amlodipine and cetirizine by using Uv – visible spectroscopy : table no1, table no2, table no 3 table no 4 table no 5. Linearity and range report met form in, telmisartan, amlodipine, cetirizine, and aspirin was given in table no 6 and table no7

IV.   DISCUSSION

In the present research work Spectroscopic study of solvent effect on the UVvisible absorption spectra and on the electronic absorption of different pharmaceutical drug like Metformin, Aspirin, Telmisartan, Amlodipine and cetirizine by using various solvent like methanol .01N HCL , sodium Hydroxide, Methanol and water and we found the various wavelengths in different solvent shown in table1 table 2 , table3, table 4 table 5. There is different in wavelength and absorbance due to the solvent effect. It may be happened due to the any attractive force or bonding between the solvent and that drug molecule takes place. Further clarification of result we need to check the IR spectroscopy for detection of change in structure due to solvent in drug molecule

REFERENCES:

[1]. Govt. of India, Delhi, 19962Physicians, Desk Reference, 57, Medical Economics Company, New Jersey, USA, 2003
[2]. The Merck Index: Published on CD by Chapman & Hall CRC. Merck & Co Inc., Whitehouse Station, NJ, USA. Monograph No. 6001 (1999).
[3]. J.E. Duque, J. Velez, I. Samudio, E. Lai, J. Exp. Clin. Med. 4 (3) (2012) 140.
[4]. M. Bodmer, C. Meier, S. Krahenbuhl, S.S. Jick, C.R. Meier, Diabetes Care 33 (2010) 1304.
[5]. B. Elpern, Chemistry of the biguanides, Ann. N. Y. Acad. Sci. 148 (3) (1968) 577–586.
[6]. P. Ray, Chem. Rev. 61 (1961) 313
[7]. Albert, J.S. in 'Lead Generation Approaches in Drug Discovery' Z Rancovic, R Morphy (Eds), J Wiley & Sons, Wiley, New Jersey, 2010
[8]. M. O'Connor, A. Kellett, M. McCann, G. Rosair, M. McNamara, O. Howe, B.S. Creaven, S. McClean, A. Foltyn-Arfa Kia, D. O'Shea, M. Devereux, J. Med. Chem. 55 (2012) 1957–1968
[9]. M.J. Thun, S.J. Henley, C. Patrono, J. Natl. Cancer Inst. 94 (2002) 252–266.
[10]. A.J. Dannenberg, K. Subbaramaiah, Cancer Cell 4 (2003) 431.
[11]. Yamada A, Maeda K, Ishiguro N, Tsuda Y, Igarashi T, Ebner T, et al. The impact of pharmacogenetics of metabolic enzymes and transporters on the pharmacokinetics of telmisartan in healthy volunteers. PharmacogenetGenom. 2011;21(9):523–30. https://doi.org/10.1097/FPC.0b013e3283482502
[12]. Murdoch D, Reel RC (1991) Amlodipine: a review of its pharmacodynamic and pharmacokinetic properties, and therapeutic use in cardiovascular disease. Drugs 41: 478±505
[13]. Meredith PA, Elliot HL (1992) Clinical pharmacokinetics of amlodipine. Clin Pharmacokinet 22: 22±31

[14].   Abernethy DR (1994) An overview of the pharmacokinetics and pharmacodynamics of amlodipine in eldery persons with systemic hypertension. Am J Cardiol 73: 10A±17A

[15].   Van Zwieten PA (1994) An overview of its pharmacodynamic and pharmacokinetic properties. Clin Cardiol 17[suppl III]: III3±III6

[16].   Spangler DL, Brunton S. Efficacy and central nervous system impairment of new-generation prescription antihistamines in seasonal allergic rhinitis. South Med J 2006;99:593–599.

[17].   Polli JW, Baughman TM, Humphreys JE, et al. P-glycoprotein influences the brain concentrations of cetirizine (Zyrtec), a second-generation non-sedating antihistamine. J Pharm Sci 2003;92:2082–2089.