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"METHOD DEVELOPMENT, VALIDATION AND STABILITY STUDY OF AMLODIPINE IN MARKETED FORMULATION BY UV SPECTROPHOTOMETRIC METHOD"

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Abstract: A simple, precise, accurate and economical spectrophotometric method has been developed for the estimation of Amlodipine besylate using methanol as a solvent. Amlodipine besylate is an anti-hypertensive and an antianginal agent. Amlodipine besylate has shown maximum absorption at 360nm.The calibration. The calibration was found to be linear in the concentration range 6-80µg/ml, with regression value of 0.9979. Recovery studies were carried out using a standard addition method by adding specific drug amount (80%, 100%, and 120%) and show recovery studies in the range (99.58-100.06) %. Thus the method was found to be accurate. Precesion study was carried and expressed in terms of %RSD, which was found to be less than 2%. So the method was precise. Validation experiments were performed to demonstrate system suitability, precision, linearity, accuracy, ruggedness, LOD, LOQ as per International Conference on Harmonization guidelines. Furthermore stability studies of Amlodipine besylate were carried out. The drug was subjected to oxidation, hydrolysis, heat and photolysis to apply stress conditions. Degradation products resulting from stress studies did not interfere with the detection of amlodipine besylate.

Keywords: Amlodipine besylate, UV Spectrophotometry, validation, Beers law, Methanol, 0.1 N HCl, 0.1 N NaOH, 3% H_2O_2, stability study.

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INTRODUCTION

Cardiovascular disease is the leading cause of death in developed countries but is quickly becoming an epidemic. Amlodipine besylate is a calcium antagonist used in management of hypertension. Amlodipine besylate is a dihydropyridine calcium channel blocker. Amlodipine besylate is a calcium antagonist that inhibits the transmembrane influx of calcium ions into vascular smooth muscles and cardiac muscles, which in turn affects their contractile process and results in reduced blood pressure.

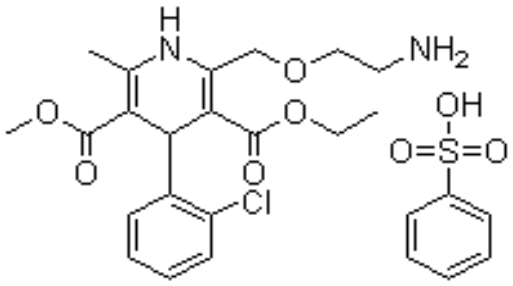


Fig.1. Amlodipine besylate

Chemical Name - [3-ethyl-5-methyl (4RS)-2-[(2-aminoethoxy) methyl] -4- (2-chlorophenyl)-methyl-1-dihydropyridine-3, 5- dicarboxylate benzene sulfonate.

Color and Nature - white crystalline powder

Molecular weight - 567.1g/mol

Molecular Formula - $C_{26}H_{31}C_1N_2O_8S$

Melting Point-195 °C

Solubility – It is freely Soluble in methanol, sparingly soluble in ethanol and slightly soluble in water. [1]

Amlodipine besylate tablets are formulated as white tablets equivalent to 2.5, 5 and 10 mg of amlodipine for oral administration. In addition to the active ingredient, amlodipine besylate, each tablet contains the following inactive ingredients: microcrystalline cellulose, dibasic calcium phosphate anhydrous, sodium starch glycolate, and magnesium stearate.

The UV spectrophotometric method are developed and validated as per International Conference on Harmonization (ICH) guidelines. The method of analysis is based on measuring

the absorption of a monochromatic light by colorless compounds in the near ultraviolet path of spectrum (200–380nm).

A stability study is a routine procedure which ensures the maintenance of pharmaceutical product safety, quality and efficacy throughout the shelf life. Stability studies at a developmental stage provides a data base that may be of value in selection of adequate formulation to determine shelf life, container closure system and storage conditions for development of new product. In a stability study, the effects of variation in temperature, time, humidity, light intensity and partial vapor pressure on the pharmaceutical product are investigated. These pharmaceutical products are followed by the guidelines issued by International Conference on Harmonization (ICH), World Health Organization (WHO) or other agencies. An important point in conducting stability studies are storage conditions which are derived from real climatic conditions. As stability study is tool in cGMP, indirectly to attribute quality product which will increase reputability of company in global market. [2]

There are developed methods including UV, visible spectrophotometric, HPTLC, HPLC, and UPLC methods for estimation of Amlodipine, with many drugs combined other than the single drug with stability study. However, no method has been reported till date for the method validation and stability study of Amlodipine using the UV spectrophotometric method. This work deals with the method development, validation, and stability study of Amlodipine by various UV spectrophotometric methods.

MATERIAL AND METHODS

Instrumentation

UV-Visible spectrophotometer UV- Agilent Technologies Carry 60, spectral band width of 1nm, wavelength accuracy ± 0.5nm and a pair of 1cm matched quartz cells was used to measure absorbance of the resulting solution.

Material

Standard sample of Amlodipine besylate were taken manufactured by Lupin Research Park, Aurangabad as a gift sample with 98.70% (w/w) assay value and was used without further purification.

Solvents

Methanol selected as solvent for developing spectral characteristics of the drug. The selection was made after assessing the solubility of drug in different solvents.

Solubility of drug

10mg of Amlodipine besylate was weighed and solubility of this sample was checked in water, methanol, ethanol and 2-propanol. The drug was found to be soluble in methanol.

METHOD A- METHOD DEVELOPMENT AND VALIDATION

Identification of λmax of Amlodipine besylate

10mg of drug was weighed and was dissolved in 10ml of methanol (1mg/ml). 1ml of this solution was withdrawn and volume was made up to 10ml. Appropriate dilutions were made with methanol to give concentration of 10µg/ml scanned in UV range from 200-400nm, which could be utilized for analysis and spectrum was recorded (Fig. 2).

Preparation of standard stock solution

10mg of pure Amlodipine besylate was accurately weighed and transferred to 10ml of volumetric flask. Drug was dissolved in methanol and volume was made up to 10ml. The concentration of drug was 1mg/ml. 1ml of this solution was taken in a 10ml volumetric flask and volume was made up to the mark with methanol. Thus Amlodipine besylate of strength 100µg/ml was obtained.

Procedure for plotting calibration curve of pure drug

From the standard stock solution 0.9ml, 1ml,2ml, 3ml, 4ml, 5ml, 6ml, 7ml and 8ml dilutions were made in 10ml volumetric flask and volume was made up to the mark with methanol to obtain concentration in range of 9-80µg/ml. The spectra were recorded, absorbance were measured at 360nm (Table 1.) and calibration curve was plotted (Fig.3).

Analysis of pharmaceutical formulations

20 Tablets were procured from local market and average weight was determined. The powder equivalent to 10mg of Amlodipine besylate was weighed accurately and dissolved in 10ml of methanol, shaken for ten minutes and filtered. 1ml of this solution was taken in a 10ml volumetric flask and volume was made up to the mark with methanol. Thus Amodipine besylate of strength 100µg/ml was obtained. The solution was diluted in 10 ml volumetric flask with methanol to get a solution of 10µg/ml. Absorbance was measured at 360nm. Results are shown in the Table 7.

VALIDATION OF METHOD

Method validation was performed in terms of linearity, precision and accuracy, Limit of Detection, Limit of Quantitation, Ruggedness as per ICH Guidelines Q2B (R1).

Linearity

For the method, linearity was repeated 3 times for validation. The calibration curve was constructed by plotting the response y-axis versus the theoretical concentrations of standards x-axis, by using linear regression analysis. Linearity was expressed as a correlation coefficient; r^2 the value must be > 0.999. The results are shown in table 1.

Precision

The precision of the method was achieved by replicate (*n* = 6) analysis of tablet preparations. The precision was also studied in terms of intra-day changes in absorbance of drug solution on the same day and inter-day changes on three different days over a period of 1 week. The intra-day and inter-day variations were calculated in terms of percentage relative standard deviation and the results are given in table 2.

Procedure for recovery studies

20 Tablets were procured from local market and average weight was determined. The powder equivalent to 10mg of Amlodipine besylate was weighed accurately and taken in 3 separate 10ml volumetric flask. To this 8mg, 10mg, 12mg pure drug was added (for 80%, 100% and 120% recovery). 10ml of methanol was added to make up the volume, shaken for ten minutes and filtered. 1ml of this solution was taken in a 10ml volumetric flask and volume was made up to the mark with methanol. Thus Amlodipine besylate of strength 100µg/ml was obtained.1ml of this solution was diluted in 10ml volumetric flask up to the mark with methanol and absorbance was measured at 360nm. This procedure was carried out for 3 times. Results are shown in the table 3.

Limit of detection

It is the lowest amount of analyte in a sample that can be detected but not necessarily quantitated under the stated experimental conditions. Limit of detection can be calculated using following equation as per ICH guidelines.

LOD = 3.3×N/S **--- (1)**

Where,

N = Standard deviation of the response and

S = Slope of the corresponding calibration curve.

Results are shown in the table 4.

Limit of quantification

It is the lowest concentration of analyte in a sample that can be determined with the acceptable precision and accuracy under stated experimental conditions. Limit of quantification can be calculated using following equation as per ICH guidelines.

$$LOQ = 10 \times N/S \quad \text{--- (2)}$$

Where,

N = Standard deviation of the response and

S = Slope of the corresponding calibration curve.

Results are shown in the table 4.

Ruggedness

The ruggedness of the proposed method was evaluated by applying the developed procedures to assay of 10µg/ml of Amlodipine Besylate using the same instrument by two different analysts under the same optimized conditions at different days. The obtained results were found to be reproducible, since there was no significant difference between two analysts. Thus, the proposed methods could be considered rugged. The results are shown in table 5.

METHOD B: FORCED DEGRADATION STUDY

Preparation of 0.1 N NaOH

Weigh accurately 4gm of sodium hydroxide and dissolve in a small quantity of water taken in 1liter volumetric flask, make up the volume upto the mark with distilled water.

Preparation of 0.1 N HCl

Add 8.37 ml of conc. HCl in a 1liter volumetric flask and make up the volume upto the mark with distilled water.

Acid Degradation

Accurately weighed 10mg bulk drug was taken in 10ml volumetric flask. To make the drug soluble, few drops of methanol were added and then the volume is made by 0.1 N HCl. Then, this solution was refluxed for 5 hrs at 70 ºC in water bath. Initially at 0 h take 0.1 ml of this solution and the volume was made up to 10 ml with methanol and then withdrawing the specific amount of solution in every hour. After this the absorbance was measured by scanning

the prepared solution of required concentration in a UV spectrophotometer. Results are shown in the table 8.

Alkali Degradation

Accurately weighed 10mg bulk drug was taken in 10 ml volumetric flask. To make the drug soluble, few drops of methanol were added and then the volume is made by 0.1 N NaOH. Then, this solution was refluxed for 5 hrs at 70 ºC in water bath. Initially at 0 h take 0.1 ml of this solution and the volume was made up to 10 ml with methanol. The absorbance was measured in every hour by withdrawing the specific amount of solution. Then, scanning was performed with a UV spectrophotometer. Results are shown in the table 9.

Neutral Degradation

Accurately weighed 10mg bulk drug was taken in 10 ml volumetric flask. To make the drug soluble, few drops of methanol were added and then the volume is made by double distilled water. Then, this solution was refluxed for 5 hrs at 70 ºC in water bath. Initially at 0 h take 0.1 ml of this solution and the volume was made up to 10 ml with methanol. The absorbance was measured in every hour by withdrawing the specific amount of solution. Then, scanning was performed with a UV spectrophotometer. Results are shown in the table no. 10.

Photolytic Degradation

Accurately weighed 10mg bulk drug was taken in 10 ml volumetric flask. The volume was adjusted up to the mark with methanol. Then that solution was placed into the photostability chamber for 5 h. Initially at 0 h take 0.1 ml of this solution and the volume was made up to 10 ml with methanol. The absorbance was measured at one-hour interval by withdrawing the required amount of sample solution. Then, scanning was performed with a UV spectrophotometer. Results are shown in the table no. 11.

Oxidation with H_2O_2

Accurately weighed 10mg bulk drug was taken in 10 ml volumetric flask. To make the drug soluble, few drops of methanol were added and then the volume is made by 3% H_2O_2 and placed it in a cupboard for 5 h. At one-hour interval specified amount of sample was taken and the required concentration was prepared. It was scanned in a UV spectrophotometer. Results are shown in the table no. 12.

Thermal Degradation

A specific amount of bulk drug was taken in a cleaned Petri dish and dried, then the petri dish along with bulk was placed into the oven at 70 ºC for 5 h, at every hour 10 mg of bulk drug was

taken from the petri dish, and 1000 ppm solution with methanol was prepared. After this, the required concentration was made and the absorbance measured in the UV spectrophotometer and percentage of degradation was calculated .Results are shown in the table no. 13.

RESULT AND DISCUSSION

IDENTIFICATION OF λ MAX OF AMLODIPINE BESYLATE–

The absorption spectrum of Amlodipine Besylate in methanol (10µg/ml) was measured in the range of 200-400 nm against the blank solution. The zero order spectrum of Amlodipine Besylate shown maximum drug absorption wavelength at 360 nm (Fig.2).

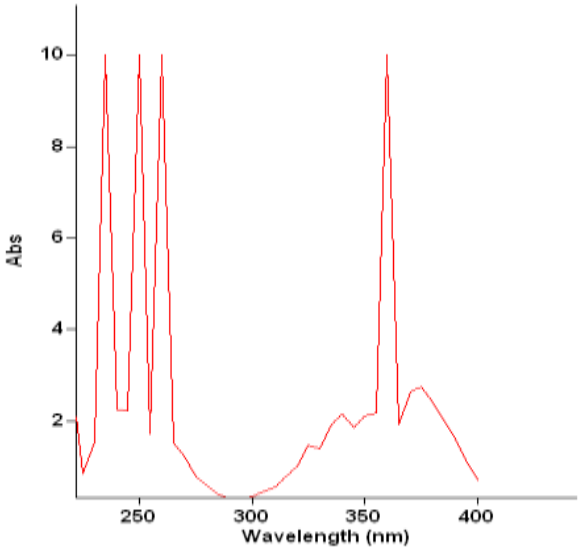


Fig. 2: Identification of λ max of Amlodipine besylate

VALIDATION PARAMETERS

Standard calibration curve for Amlodipine besylate, covering the range 6-80µg/ml, prepared by serial dilution with methanol for pure drug and tablet formulation were developed and validated. The procedure was adopted as per desired protocol, based on ICH Q2B guidelines. The calibration curve was obtained by plotting absorbance Vs analyte concentration. The slope and intercept of the calibration line was determined by linear regression.

Linearity

Standard calibration curve for Amlodipine besylate, covering the range 6-80µg/ml, prepared by serial dilution with methanol for pure drug. The procedure was adopted as per desired protocol, based on ICH Q2B guidelines. The calibration curve was obtained by plotting

absorbance Vs analyte concentration. The slope and intercept of the calibration line was determined by linear regression (Fig. 3, Table 1)

Table 1: Linearity table of Amlodipine besylate

Sr. No.	Concentration (µg/ml)	Absorbance
1.	6	0.099
2.	7	0.1289
3.	8	0.1367
4.	9	0.1537
5.	10	0.1708
6.	20	0.3401
7.	30	0.5126
8.	40	0.6804
9.	50	0.7944
10.	60	0.9462
11.	70	1.0961
12.	80	1.224

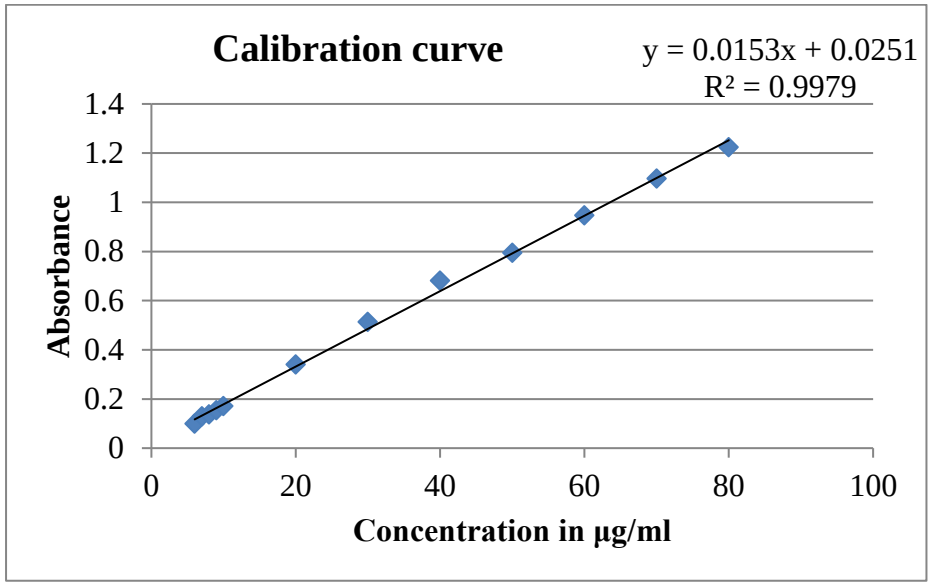


Fig 3: Linearity curve of Amlodipine besylate

Precision-

Precision evaluated through inter day and intraday of the pure drug from solvent are presented in Table 2.

Table 2: Precision Data for proposed method

Concentration (µg/ml)	Abs. at 360nm	Calculated Amount	Statistical analysis
10	0.1762	9.88	
10	0.1768	9.92	Mean=9.928
10	0.1773	9.95	
10	0.1765	9.9	S.D.=0.036
10	0.1777	9.98	
10	0.1771	9.94	RSD=0.362

a) Intra-day Precision

Concentration (µg/ml)	Abs. at 360nm	Calculated Amount	Statistical analysis
10	0.1759	9.86	
10	0.1771	9.94	Mean=9.905
10	0.1762	9.88	
10	0.1768	9.92	S.D.=0.0333
10	0.1771	9.94	
10	0.1764	9.89	RSD=0.336

b) Inter Day Precision

Concentration (µg/ml)	Day -1	Day -2	Day -3	Statistical analysis
10	0.1777	0.1768	0.1771	
10	0.1771	0.1762	0.1768	Mean=9.89
10	0.1759	0.1764	0.1764	
10	0.1773	0.1762	0.1768	S.D.=0.030
10	0.1771	0.1759	0.1762	
10	0.1758	0.1752	0.1763	RSD=0.303
Mean	0.1768	0.1761	0.1766	
Amount Found	9.92	9.86	9.90	

Accuracy –

As shown in Table 3, excellent recoveries were made at each added concentration.

Table 3: Excellent recovery at each added concentration

Sr. No.	Level of percent Recovery	Initial Amount Present in µg/ml	Amount of Standard added in µg/ml	Total Amount Present in µg/ml	Total Amount Recovered	% Recovery	Mean	Statistical Analysis	
								S.D.	RSD
1.	80	10	8	18	18.02	100.11	99.58	0.4566	0.4585
	80	10	8	18	17.87	99.27			
	80	10	8	18	17.89	99.38			
2.	100	10	10	20	20.17	100.85	100.06	0.7320	0.7315
	100	10	10	20	19.99	99.95			
	100	10	10	20	19.88	99.4			
3.	120	10	12	22	22.10	100.45	99.90	0.8081	0.8089
	120	10	12	22	21.99	99.95			
	120	10	12	22	21.85	99.31			

Limit of detection (LOD) limit of quantification (LOQ) -

The LOD determined as the amount of drug and LOQ was determined as the lowest concentration for drug shown in Table 4.

Table 4: LOD and LOQ for drug in solvent

Sr. No.	Concentration (µg/ml)	Absorbance	S.D.	Slope	LOD (µg/ml)	LOQ (µg/ml)
1.	Amlodipine besylate (10 µg/ml)	0.1720	0.0033	0.0153	0.7117	2.15
2.		0.1782				
3.		0.1794				
4.		0.1728				
5.		0.1715				

6.		0.1740				

Ruggedness

The ruggedness of the proposed method was evaluated by applying the developed procedures to assay of 10µg/ml of Amlodipine besylate using the same instrument by two different analysts by under the same optimized conditions at different days. No significant difference could be observed. The results are shown in table 5.

Table 5: Ruggedness data at 10µg/ml by two analysts at different days

Test concentration µg/ml	**Analyst 1**	**Analyst 2**
10	0.1772	0.1768
10	0.1708	0.1762
10	0.1764	0.1712
10	0.1762	0.1771
10	0.1768	0.1756
Mean	0.1754	0.1753
S.D.	0.0026	0.0024
RSD	1.4823	1.3690

Statistical data of the regression equation for determination of Amlodipine besylate are shown in table 6.

Table 6: Linearity regression data for Amlodipine besylate

Sr. No.	**Parameters**	**Results**
1.	Absorption maxima (nm)	360
2.	Linearity range (µg/ml)	6-80

3.	Standard regression equation	y = 0.0153x + 0.0251
4.	Correlation coefficient (r2)	0.9979
5.	Accuracy (% recovery)	99.58 – 100.06
6.	Precision	9.905to 9.89
7.	LOD & LOQ	0.7117, 2.15

ANALYSIS OF PHARMACEUTICAL FORMULATION

The applicability of the developed method was checked by analyzing commercially available pharmaceutical formulation. The formulation selected was Amlodep 5mg tablet. Results are shown in table 7.

Table 7: Analysis of Pharmaceutical Formulation

Formulation	**Labeled amount (mg)**	**Amount recovered (mg)**	**% drug recovered**	**Mean**	**Standard deviation**	**% RSD**
Amlodep 5 mg	5 mg	4.98	99.6	100.46	1.3317	1.3256
	5 mg	5.1	102			
	5 mg	4.99	99.8			

STABILITY INDICATING STUDY-

Acidic Degradation-

The effect of acidic condition onthe drug degradation of Amlodipine besylate was studied by treating with 0.1N HCl. The absorbances in acidic condition were decreased for repeated times and percent degradation of Amlodipine besylate was found to be in between 1.1-28.2%.

Table 8: Acidic Degradation

Name	Absorbance	Concentration	% Degradation
Analyte at 0 h	0.1801	10	0
Analyte at 1 h	0.1782	9.89	1.1
Analyte at 2 h	0.1664	9.24	7.6
Analyte at 3 h	0.1516	8.42	15.8
Analyte at 4 h	0.1374	7.63	23.7
Analyte at 5 h	0.1293	7.18	28.2

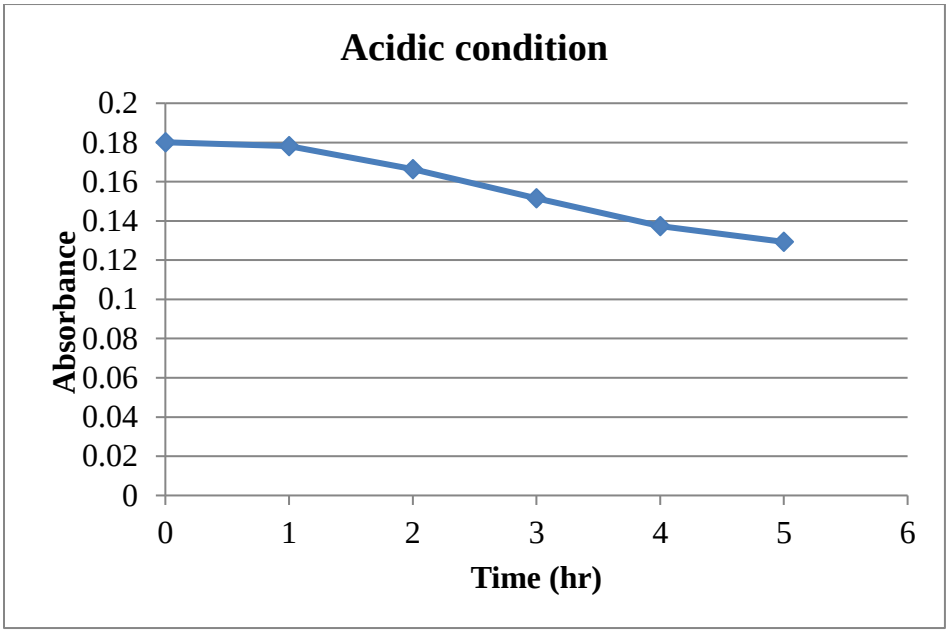


Fig. 4: Acidic Degradation

Basic Degradation-

The effect of basic condition on the drug degradation of Amlodipine besylate was studied by treating with 0.1N NaOH. The absorbances in basic condition were decreased for repeated times and percent degradation of Amlodipine besylate was found to be in between 8.9-43.5%. Amlodipine besylate gives more absorbance in basic medium as compare to other medium.

Table 9: Basic Degradation

Name	Absorbance	Concentration	% Degradation
Analyte at 0 h	0.1812	10	0
Analyte at 1 h	0.1651	9.11	8.9
Analyte at 2 h	0.1609	8.88	11.2
Analyte at 3 h	0.1426	7.86	21.4
Analyte at 4 h	0.1223	6.76	32.4
Analyte at 5 h	0.1025	5.65	43.5

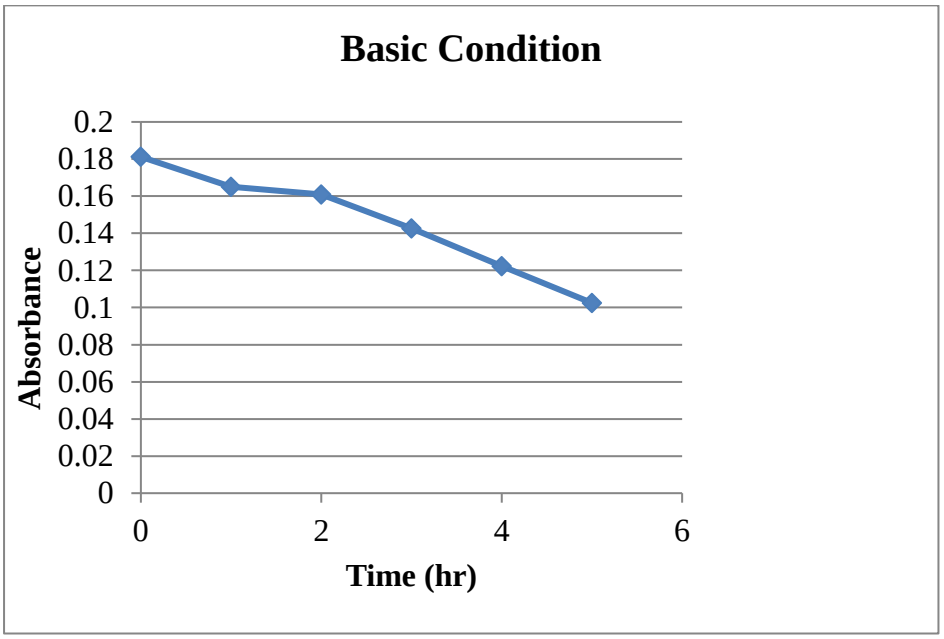


Fig. 5: Basic Degradation

Neutral Degradation-

The effect of neutral condition on the drug degradation of Amlodipine besylate was studied by treating with double distilled water. The absorbances in neutral condition were decreased for repeated times and percent degradation of Amlodipine besylate was found to be in between 1.1-10%.

Table 10: Neutral Degradation

Name	Absorbance	Concentration	% Degradation
Analyte at 0 h	0.1765	10	0
Analyte at 1 h	0.1745	9.89	1.1
Analyte at 2 h	0.1719	9.74	2.6
Analyte at 3 h	0.168	9.52	4.8
Analyte at 4 h	0.1599	9.06	9.4
Analyte at 5 h	0.1588	9.00	10

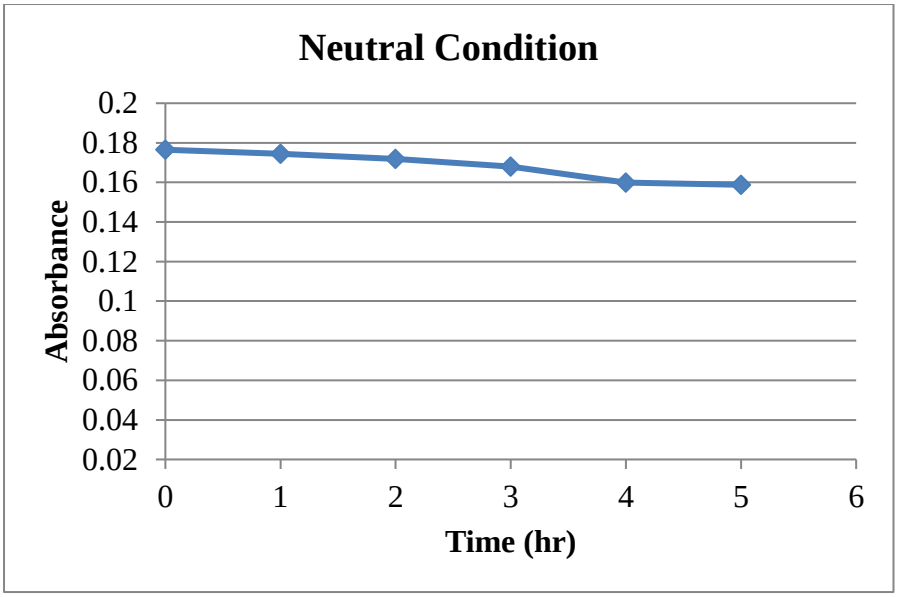


Fig. 6: Neutral Degradation

Photolytic Degradation-

Under photolytic condition degradation of Amlodipine besylate were found to be in between 6.6-21.9%.

Table 11: Photolytic Degradation

Name	Absorbance	Concentration	% Degradation
Analyte at 0 h	0.1779	10	0
Analyte at 1 h	0.1661	9.34	6.6
Analyte at 2 h	0.1634	9.19	8.1
Analyte at 3 h	0.1581	8.89	11.1
Analyte at 4 h	0.1445	8.12	18.8
Analyte at 5 h	0.1391	7.81	21.9

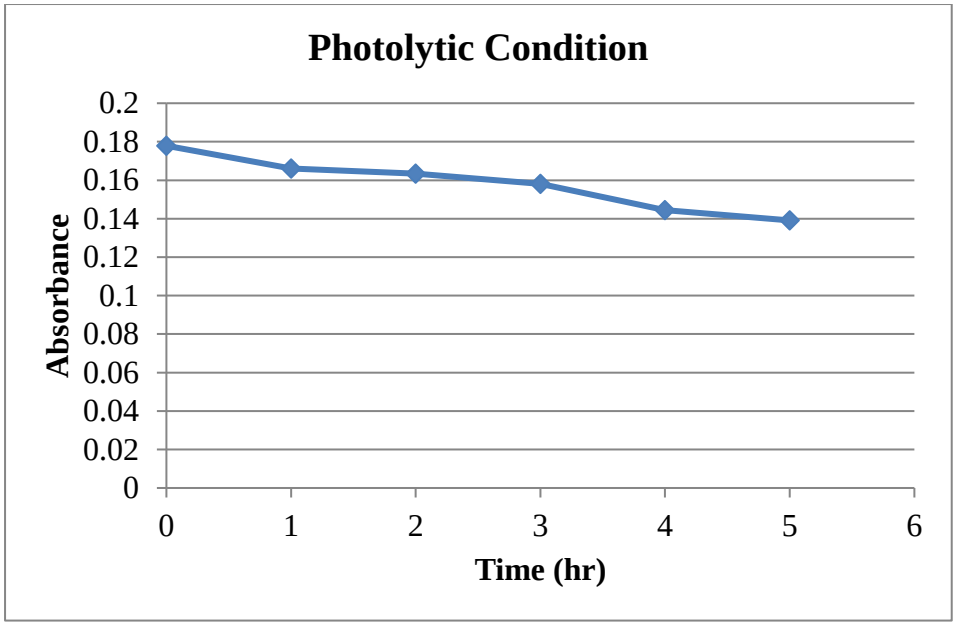


Fig. 7: Photolytic Degradation

Oxidative Degradation-

The effect of oxidative condition on the drug degradation of Amlodipine besylate was studied by treating with 3% H_2O_2. The absorbances in oxidative condition were decreased for repeated times and percent degradation of Amlodipine besylate was found to be in between 3.5-37.9%.

Table 12: Oxidative Degradation

Name	Absorbance	Concentration	% Degradation
Analyte at 0 h	0.1755	10	0
Analyte at 1 h	0.1693	9.65	3.5
Analyte at 2 h	0.1547	8.82	11.8
Analyte at 3 h	0.1386	7.90	21
Analyte at 4 h	0.1217	6.94	30.6
Analyte at 5 h	0.1089	6.21	37.9

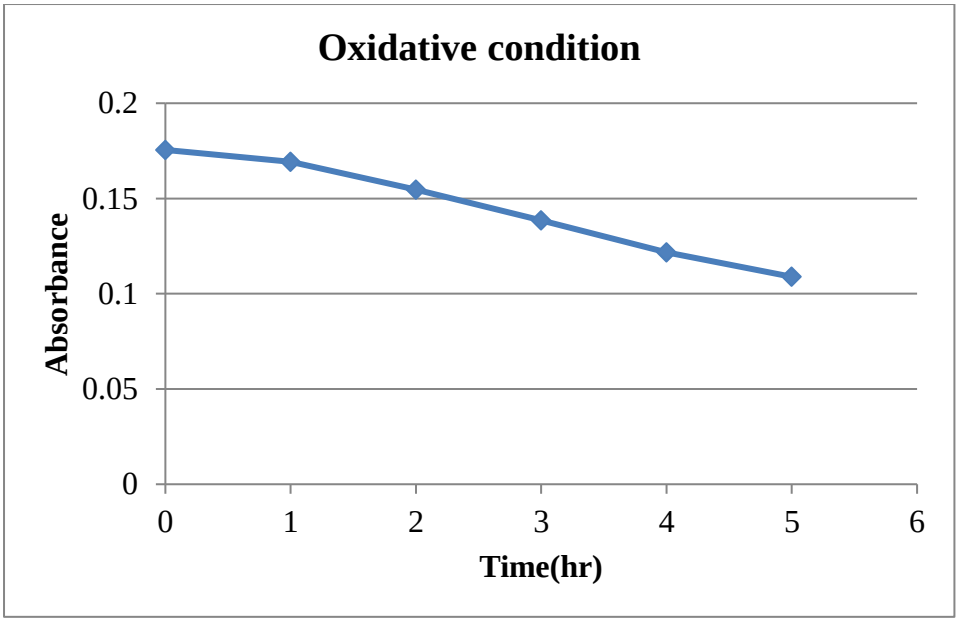


Fig. 8: Oxidative Degradation

Thermal Degradation-

The effect of thermal condition on the drug degradation of Amlodipine besylate was studied at 65°C in different time interval. The absorbances in thermal condition were decreased by increasing time interval for repeated times and percent degradation of Amlodipine besylate was found to be in between 3.2-14.8%.

Table 13: Thermal Degradation

Name	Absorbance	Concentration	% Degradation
Analyte at 0 h	0.176	10	0
Analyte at 1 h	0.1703	9.68	3.2
Analyte at 2 h	0.1659	9.43	5.7
Analyte at 3 h	0.1606	9.13	8.7
Analyte at 4 h	0.1545	8.78	12.2
Analyte at 5 h	0.1499	8.52	14.8

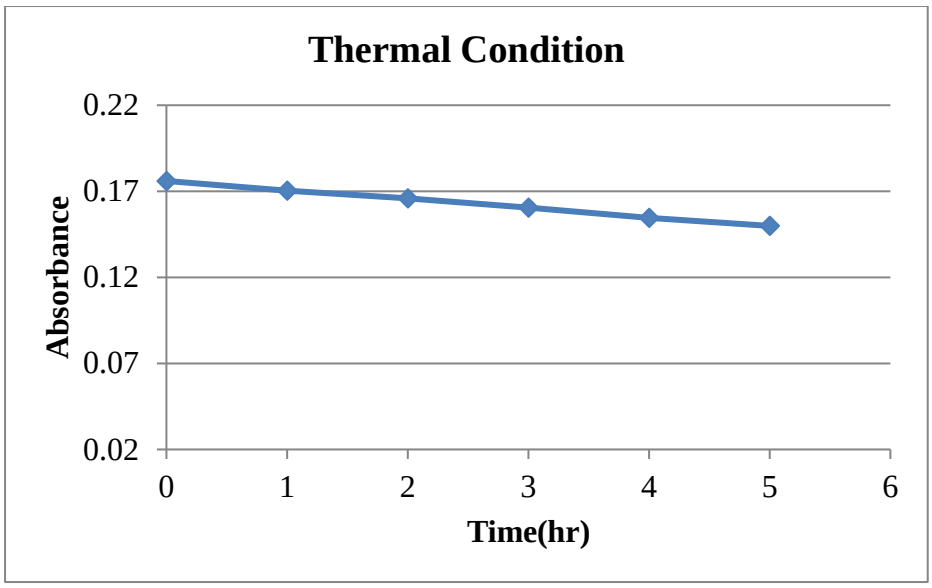
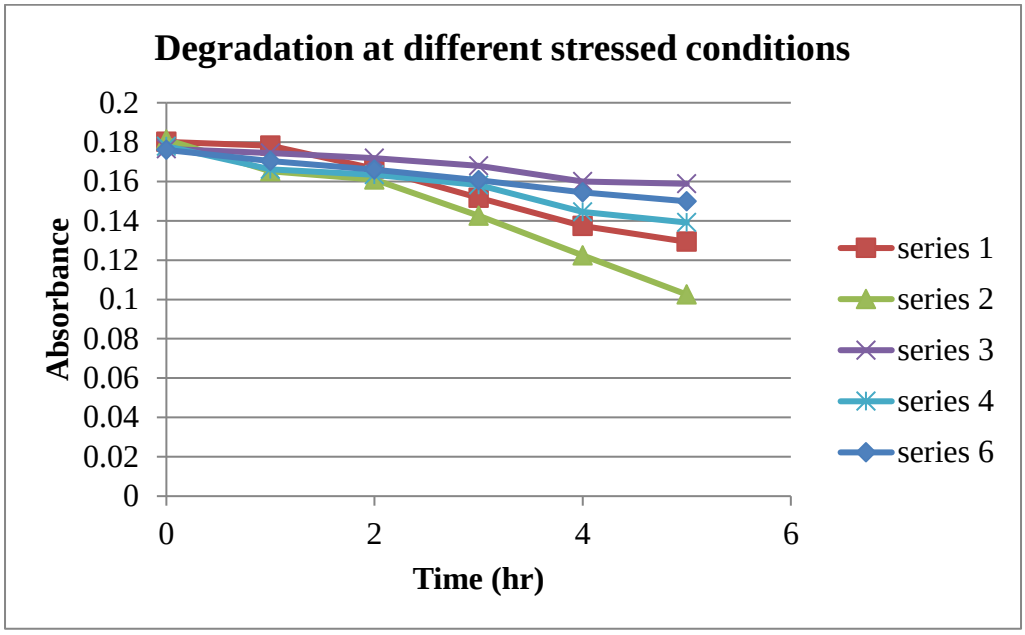


Fig. 9: Thermal Degradation

Degradation at different stressed conditions-

For forced degradation studies, the absorbances in all stressed condition were decreased for repeated times and percent degradation was found out. The drug Amlodipine besylate undergoes degradation in all stressed condition.



Series 1 - Acidic, series 2- Basic, series 3- Neutral

Series 4 - Photolytic, series 5- Oxidative, series 6- Thermal

Fig. 10: Degradation at different stressed conditions

The work has been performed to develop and validate the stability indicating a UV method for Amlodipine besylate in the pharmaceutical dosage form. The absorbance maxima of Amlodipine besylate was found at 360 nm and linearity were observed in the concentration range of 6–80 µg/ml for all validated methods. A percent assay for Amlodipine besylate by above validated methods was found in the range of 99.6–102%. Standard deviation was found to be less than ±2.0 and the coefficient of variance was found to be less than ±1.0 indicating the precision of the methods. Accuracy of proposed methods was ascertained by recovery studies, and the results were expressed as % recovery. Percent recovery for Amlodipine besylate was found in the range of 99.58 – 100.06%. Values of standard deviation and coefficient of variation were satisfactorily low indicating the accuracy of all the methods.

The Parameters chosen for the degradation of the drug were acidic condition (0.1 N HCl), basic condition (0.1 N NaOH), Neutral condition, photolytic condition, oxidative condition, thermal condition (65ºC). For forced degradation studies, the absorbance in all stressed conditions were decreased for repeated times and percent degradation was found out. The drug Amlodipine besylate undergoes degradation in all stressed conditions. The Amlodipine besylate degraded more in the alkali condition. Amlodipine besylate gives more absorbance with alkali medium as compared to other medium, alkali degradation, and chances of generating degradation with 0.1 N sodium hydroxide solution drug is degraded in specific time interval as compared to original

drug. Based on the results obtained, it is found that the proposed methods are accurate, precise, reproducible, and economical and can be employed for routine quality control of Amlodipine besylate in its pharmaceutical dosage form.

CONCLUSION-

The proposed method was simple, sensitive and reliable with good precision and accuracy. The proposed method is specific in estimating the commercial formulation without interference of excipients and the other additives. Hence, this method can be used for routine analysis of Amlodipine besylate in the bulk sample and pharmaceutical formulation. The proposed method for stability study shows that there is appreciable degradation of Amlodipine besylate found in stress conditions. A new simple analytical method has been developed to be applied for the evaluation of the stability of Amlodipine besylate to quantify Amlodipine besylate and its degradation products in a solid premix dosage forms. In addition to demonstrate specificity, forced degradation study can be used to determine the degradation pathways and degradation product of the APIs that could form during storage and facilitate formulation, development, manufacturing and packaging.

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