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Simultaneously Estimation of Multicomponent Containing Formulation by using UV-Spectroscopy [Aspirin-Atorvastatin]

[1]Dr.Sunil S Jaybhaye (Guide); [2]Dake Divya Shivaji; [3]Darade Jyoti Sambhaji; [4]Jaiswal Komal Bhagwan

Abstract:- The market is currently offering a wide range of combination dose forms, and the quantity is growing daily. Due to their improved potency, various actions, speedier relief, fewer side effects, and higher patient acceptability, these multicomponent formulations are becoming more and more popular. It is therefore intended that these formulations satisfy all requirements for their efficacy, safety, and quality. This is only feasible if many analytical methods are available to determine them. When doing a simultaneous multicomponent analysis, various UV spectrophotometric techniques are applied.These techniques rely on logging and processing absorption spectra computationally. The various techniques covered in this review include the use of simultaneous equations, derivative spectrophotometry, mean centring of the ratio spectra, absorption factor method, double divisor ratio spectra derivative method, successive ratio derivative spectra, Q-absorbance ratio method, isosbestic point method, absorpitivity factor method, dual wavelength method, mean centring of the ratio spectra, and multivariate methods. A synopsis of the theories and a few uses for these techniques are given.

Keywords:- *Spectrophotometric Methods, Multicomponent Analysis, Double Divisor, Successive Ratio-Derivative, Dual Wavelength, Ratio Subtraction, Multivariate Methods.*

I. INTRODUCTION

Combination medication products have a significant and well-established place in medicine. Reasonably designed fixed combination medications can offer increased cost savings, increased convenience, and occasionally improved safety and efficacy.

In current analysis, analysing samples with several components is a significant challenge. In the past few years, multicomponent analysis has grown in popularity among analytical chemists working in areas such as clinical chemistry, drug analysis, pollution management, etc.

For multicomponent analysis, several analytical techniques can be used, such as electrophoresis, chemotherapy, and spectrometry. The review highlights the UV-spectrometric approach for simultaneous drug determination.

The majority of target analytes have other compounds absorbing in the same spectral region accompanied in their dosage forms, so traditional UV spectral measurements cannot be used to determine their concentration. Using traditional methods such as extraction is also challenging because these methods require large solvent consumptions with associated risks of analyte loss or contamination as well as incomplete separation possibilities. It could be a costly and time-consuming treatment.

The primary use of UV spectrophotometric techniques is multicomponent analysis, which minimises the laborious process of removing interferents and permits the determination of an increasing number of analytes, hence lowering the cost and duration of the analysis.

A. Articles:-

Concurrent systematic analysis provides both assurance and specificity for the identification of chemical components found in pharmaceutical formulations. The eight oral iron chelators that are being offered are the main expansion.

This work aims to develop and validate two basic spectrophotometric techniques.

For the tablet's simultaneous determination.

The inventive experimental design that aided in the development of the chromatographic process is described in this article.

To strive for concentration identification in combination.

➢ *Research and Purpose:*

- UV-spectroscopy is used in physical and analytical chemistry.
- To detect determine or quantify the molecular / structural composition of sample.
- Each types of molecules and atom will reflect, absorb or emits electromagnetic radiation in its own characteristics way.
- Both physical and analytical chemistry use UV spectroscopy.
- To identify, ascertain, or measure the sample's molecular or structural makeup.
- Every kind of atom and molecule has a unique way of emitting, absorbing, and reflecting electromagnetic radiation.

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(A) (B)

Fig 1: Aspirin Tablets

➢ *Aspirin:*

- Aspirin belongs to the salicylate class of medications.
- It functions by preventing the synthesis of a specific natural chemical.
- It results in blood clots, discomfort, edoema, and fever.
- Aspirin can also be purchased in combination with cough medicine, antacids, and pain relievers.

B. Aspirin Side Effect

- Severe vomiting, nausea, or abdominal pain.
- A fever that lasts more than three days.
- Discomfort or swelling that lasts more than ten days.

(A) (B)

Fig 2: Atorvastatin Tablets

➢ *Atorvastatin*

A statins drug called atorvastatin is used to treat abnormal cholesterol levels and prevent cardiovascular disease in people who are at high risk. Taken orally, strains are a first-line treatment.

C. Uses

- A healthy diet and atorvastatin help reduce harmful cholesterol and lipids.
- It is a member of the statin drug class.
- It functions by lowering the quantity of cholesterol the liver produces.
- Giving up smoking and losing weight if you are overweight.

D. Statement:

The rate at which a monochromatic light beam's intensity decreases when it incidentally strikes a solution containing a material that absorbs the light.

The concentration of the absorbing material is directly correlated with the thickness of the solution.

➢ *Objective:*

- Accurate and economical approach.
- ✓ Economic validation in compliance with ICH regulations.
- To create a quick, sensitive, and focused approach.
- Radiation that is electromagnetic.
- An element influencing absorption.
- UV-visible spectrophotometry theory.

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E. Problem and Hypothesis:

The purposed method development of UV-visible spectroscopy was found to least rapid, precise, accurate and sensitive in comparison to other.

It was concluded that developed method is sample almost accurate precise and reliable.

F. Requirement:

➢ *Apparatus:*

- Double beam UV-visible spectrophotometer.
- Quartz cuvettes beaker.
- volumetric flask.
- Pipette.
- Electric balance.

➢ *Chemical:*

- Aspirin powder.
- Atorvastatin powder.
- Methanol.

(A) Atorvastatin (B) Aspirin

Fig 3: Powder

G. Procedure:

➢ *Preparation of the Standard Stock Solution:*

- A stock solution of aspirin and Atorvastatin (100ug/ml)was prepared by accurately.
- Weighting 5 mg of each drug (Active pharmaceutical ingredients).
- Dissolving in separate to 50 ml volumetric flask's.
- They were dissolved first in 10 ml of methanol sonicated.
- Then the volume was mocking up to the mark to get 100ug/ml)0.1mg/ml.

➢ *Preparation of Dilution:*

- For each APT appropriate aliquot's were pipetted out from the standard stock solution.
- Into series a 10 ml volumetric flask the volume was made up the with methanol to get set up of solution for each drug.
- Having concentration 2,4,6,8,10ug/ml of Atrovastatin and aspirin.
- The absorbance of each solution were measure at selected wavelength and plotted against concentration.
- The range's were found to be 2-10ug/ml for Atrovastatin and Aspirin respectively.

➢ *Tablet Analysis:*

- Three tablet of aspirin and Atrovastatin in combination were weight.
- Their average weight was determine and finally crushed to powder.
- sample from the triturate tablet powder equivalence to 10 mg of Atrovastatin.
- 75 mg as ASP was weight and transfer to 100 ml volumetric flask and content.
- was kept in ultrasonicator for 30 min finally the volume was made up to the mark.
- With tablet solution was further diluted to obtain 14ug/ml of aspirin.
- The mixed sample was analyzed to obtained spectra.
- Absorbance value at 243nm and 257nm (-1max)of Aspirin.
- Atrovastatin respectively aspirin and atrovastatin were calculated from the equation.

H. Application of UV-Visible Spectroscopy:-

- Detection of impurities.
- Structure elucidation of organic compounds.
- Quantitative analysis.
- Molecular weight determination.
- Distinguish between cis-trans isomerism.
- Effect of conjugation.

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Fig 4: UV-Visible Spectrometry

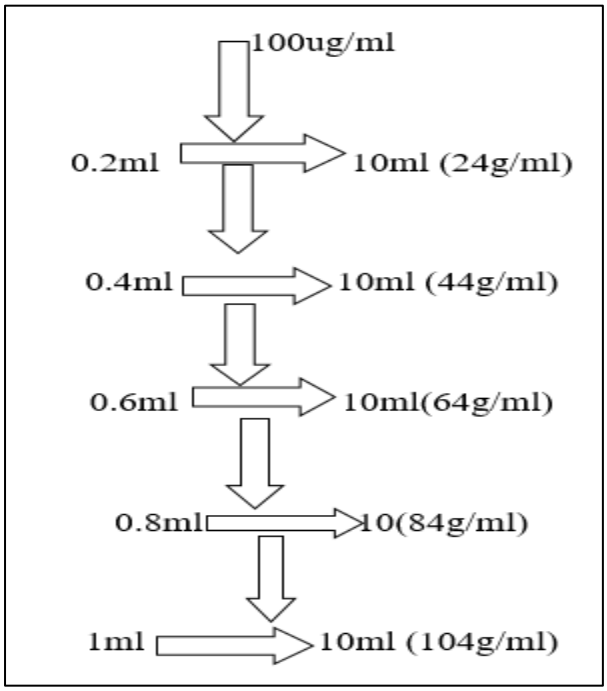

Fig 5: Stock Solution:

➢ *Principle:*

The UV-Visible Principle The basis of spectroscopy is the way that chemical compounds absorb ultraviolet or visible light, producing unique spectra in the process. Spectroscopy relies on the way light and matter interact. A spectrum is created when the substance absorbs light and goes through excitation and de-excitation

I. Observations Table:

Table 1: Aspirin

SR/NO.	Concentration(ug/ml)	Lambda Max(nm)	Absorbance
1.	2ug	228.01	1.380
2.	4ug	227.22	2.447
3.	6ug	284.02	0.476
4.	8ug	300.59	1.448
5.	10ug	302.45	1.448

Table 2: Atorvastatin

SR/NO.	Concentration(ug/ml)	Lambda Max (nm)	Absorbance
1.	2ug	229.39	0.784
2.	4ug	231.02	0.823
3.	6ug	231.02	0.943
4.	8ug	231.84	0.970
5.	10ug	237.651	1.103

Table 3: Drug Mixture

Drug Mixture	Lambda Max	Absorbance
1ml solution	228.57	3.744
7.5ml solution	270.20	4.000

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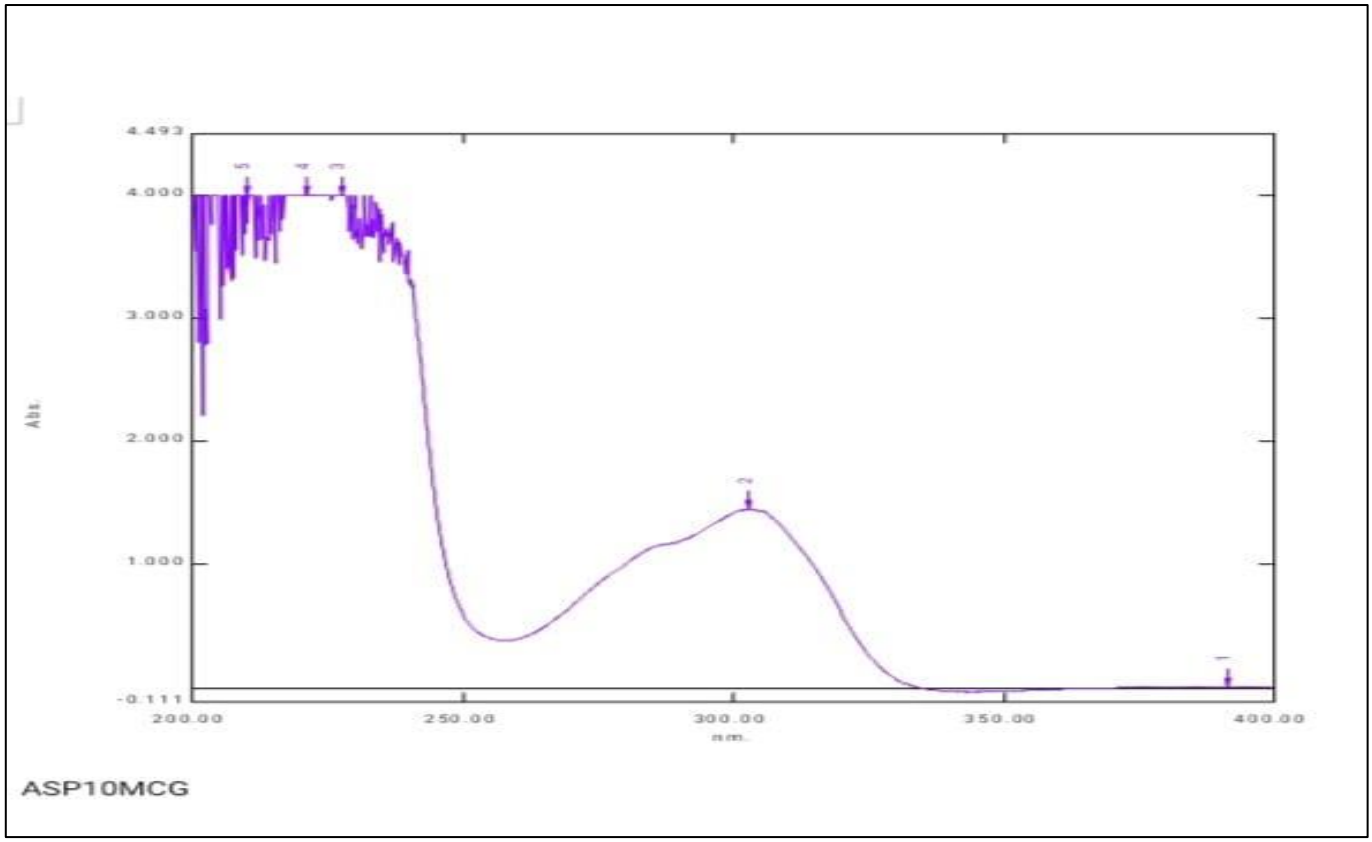
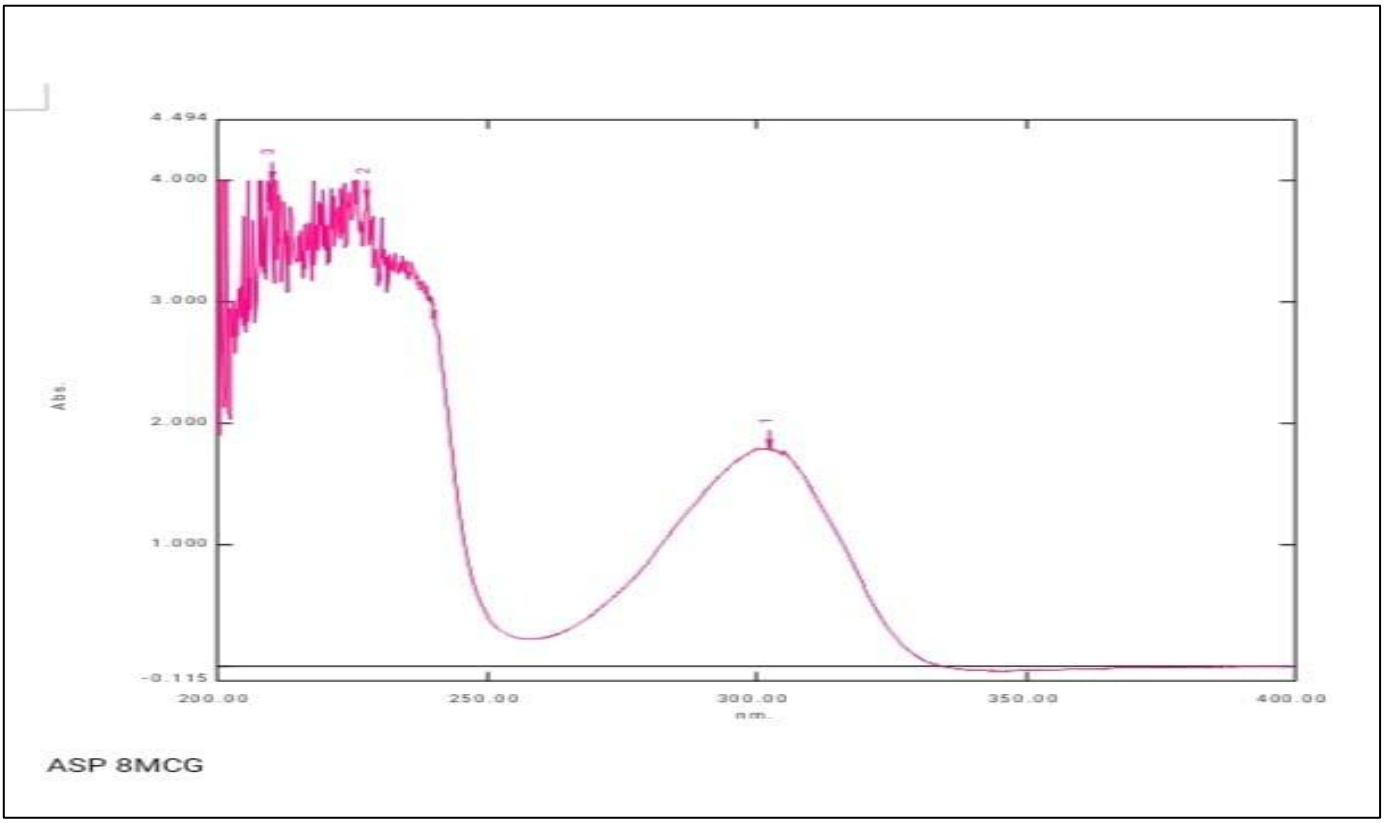
J. Graphical Representation



Graph 1: Aspirin.(10 Microgram)



Graph 2: Aspirin.(8.Microgram)

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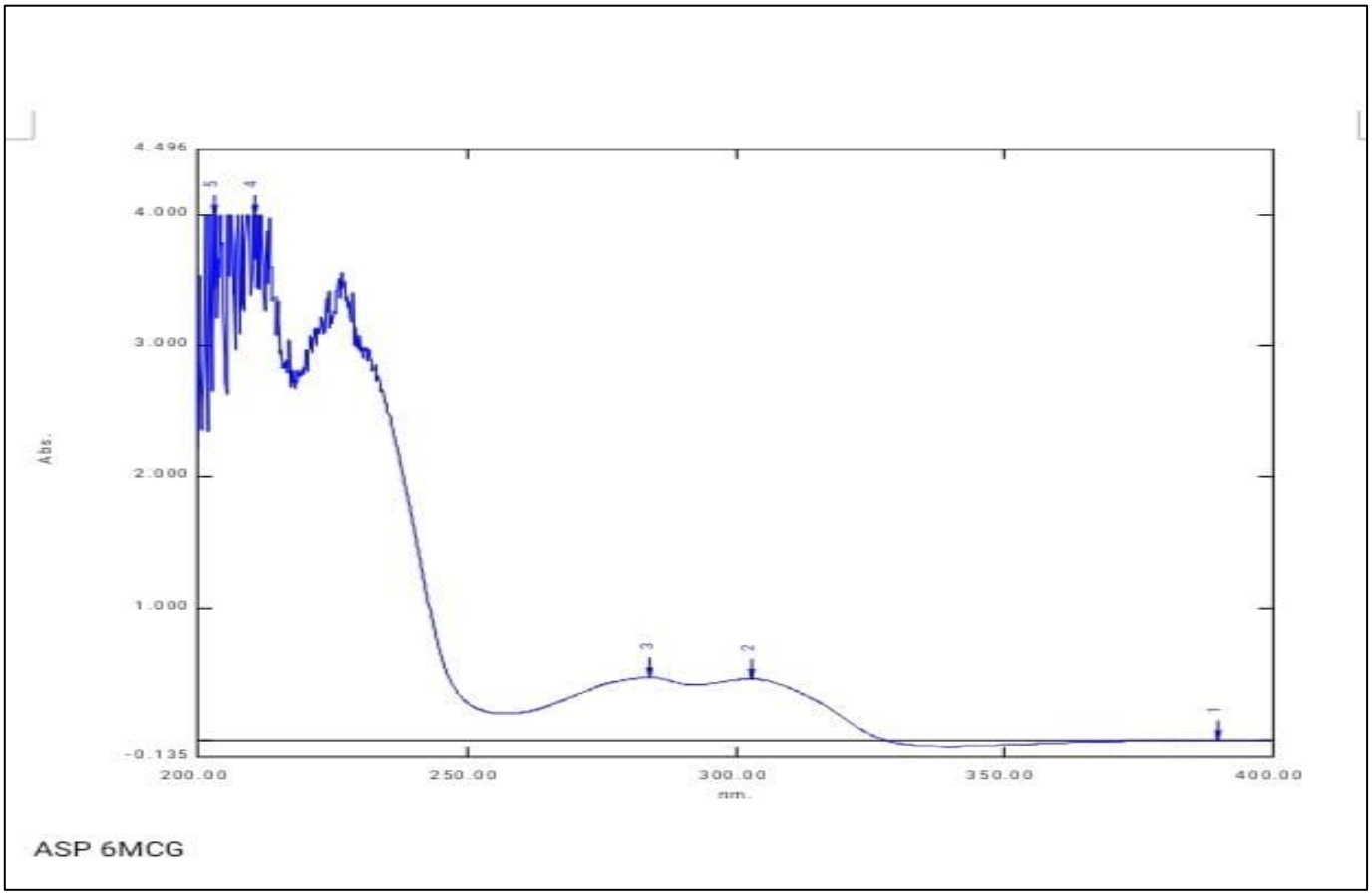
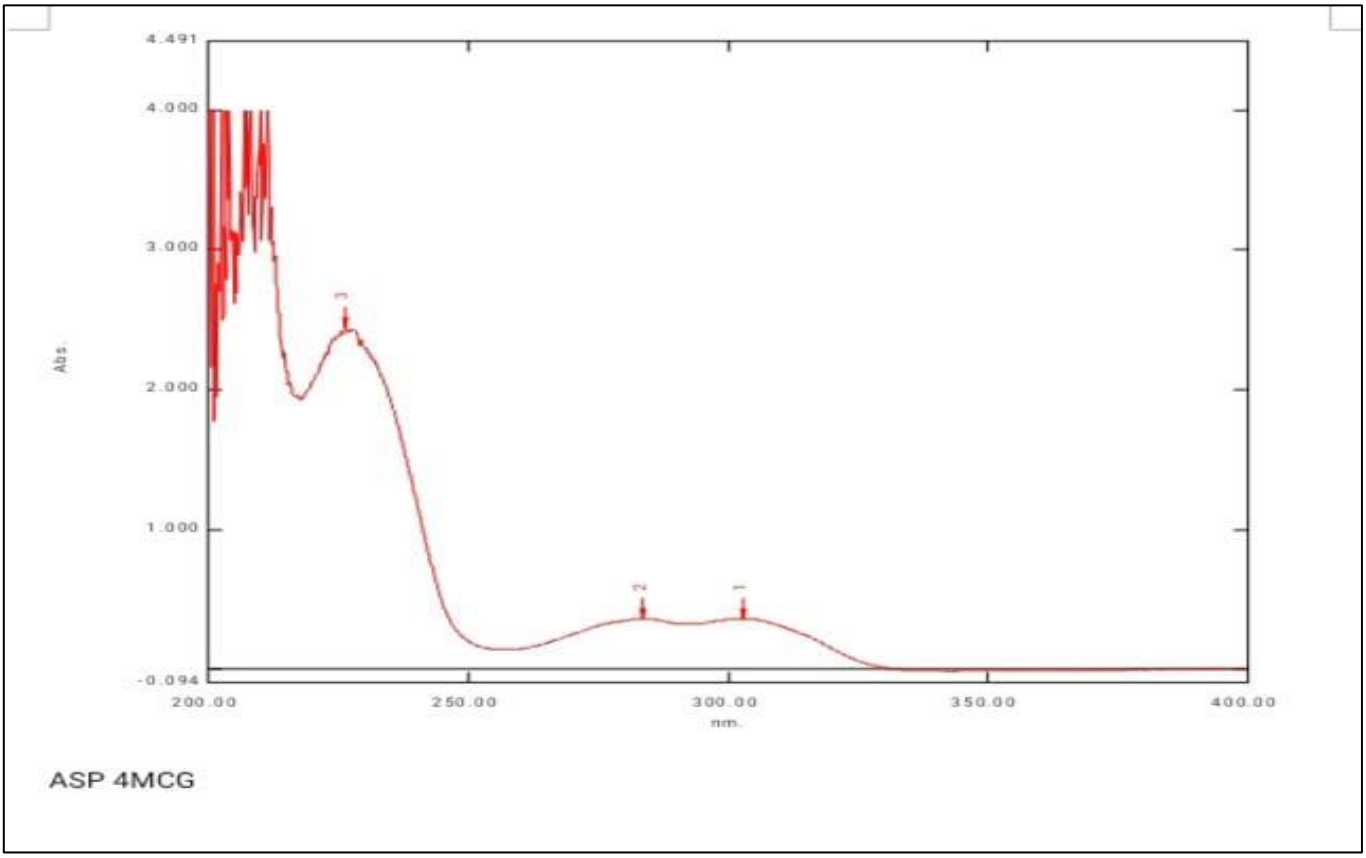


Graph 3: Aspirin (6 Microgram)



Graph 4: Aspirin (4 Microgram)

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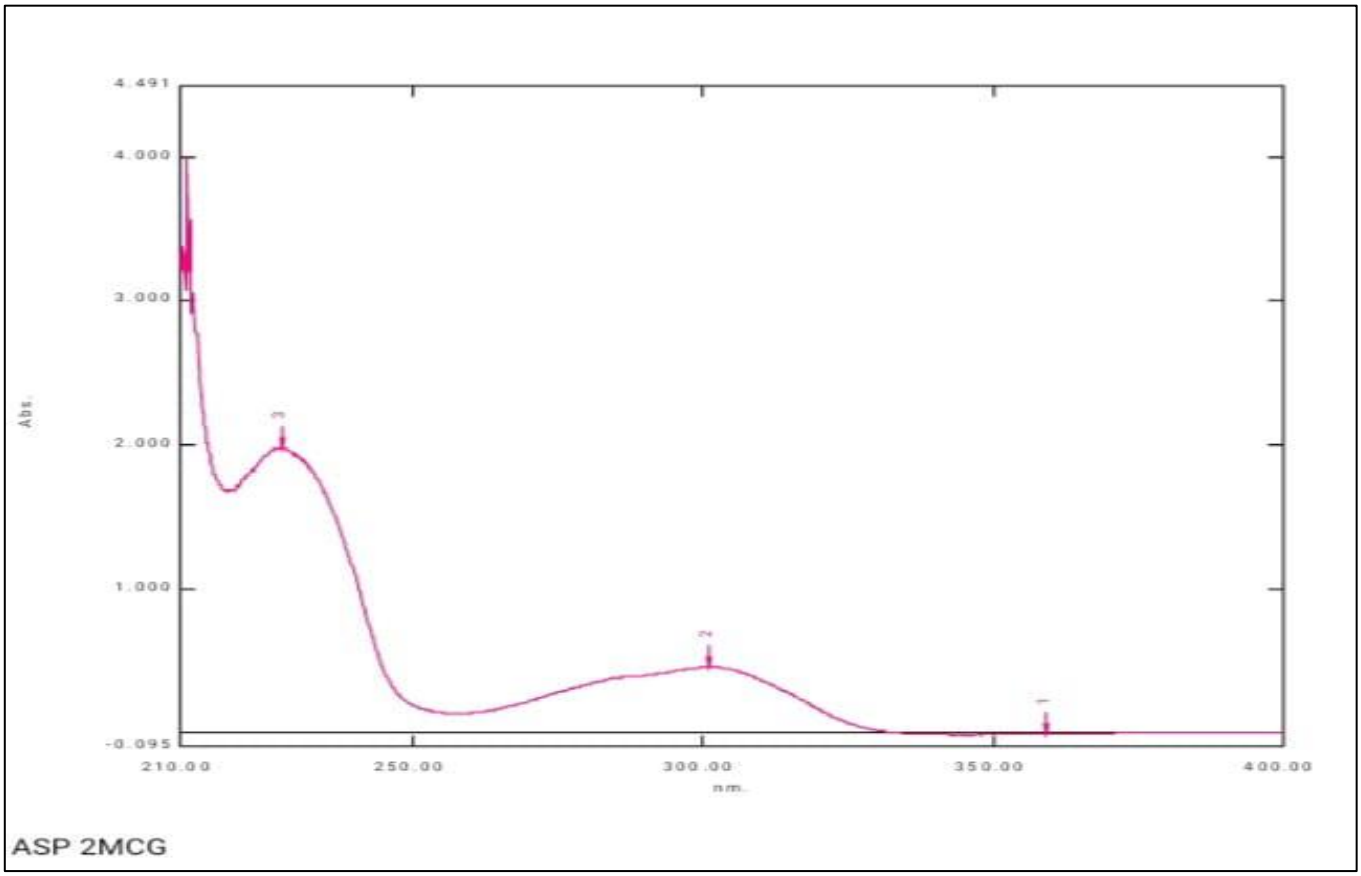
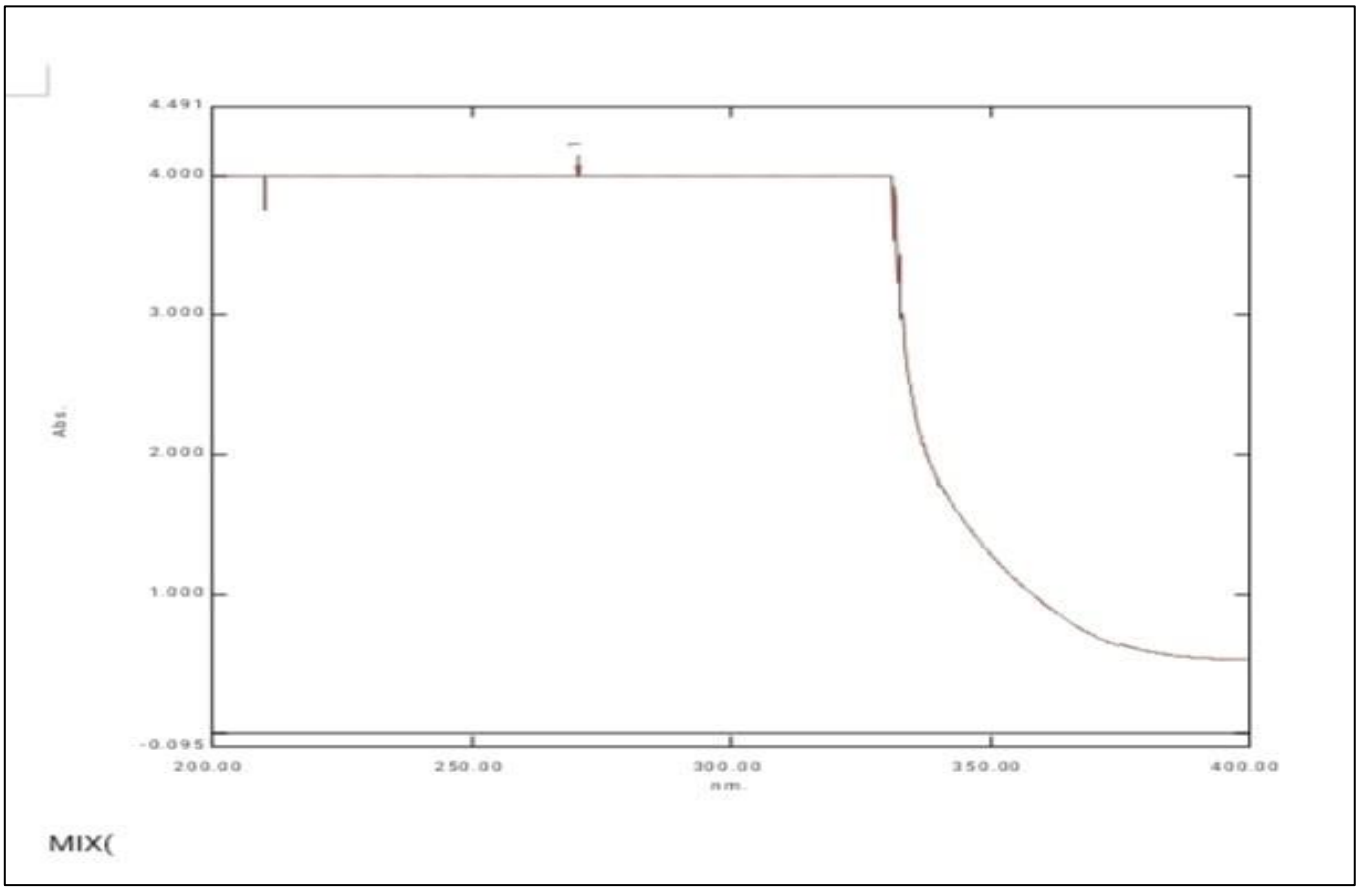


Graph 5: Aspirin (2 Microgram)



Graph 6: Drugs Mixture

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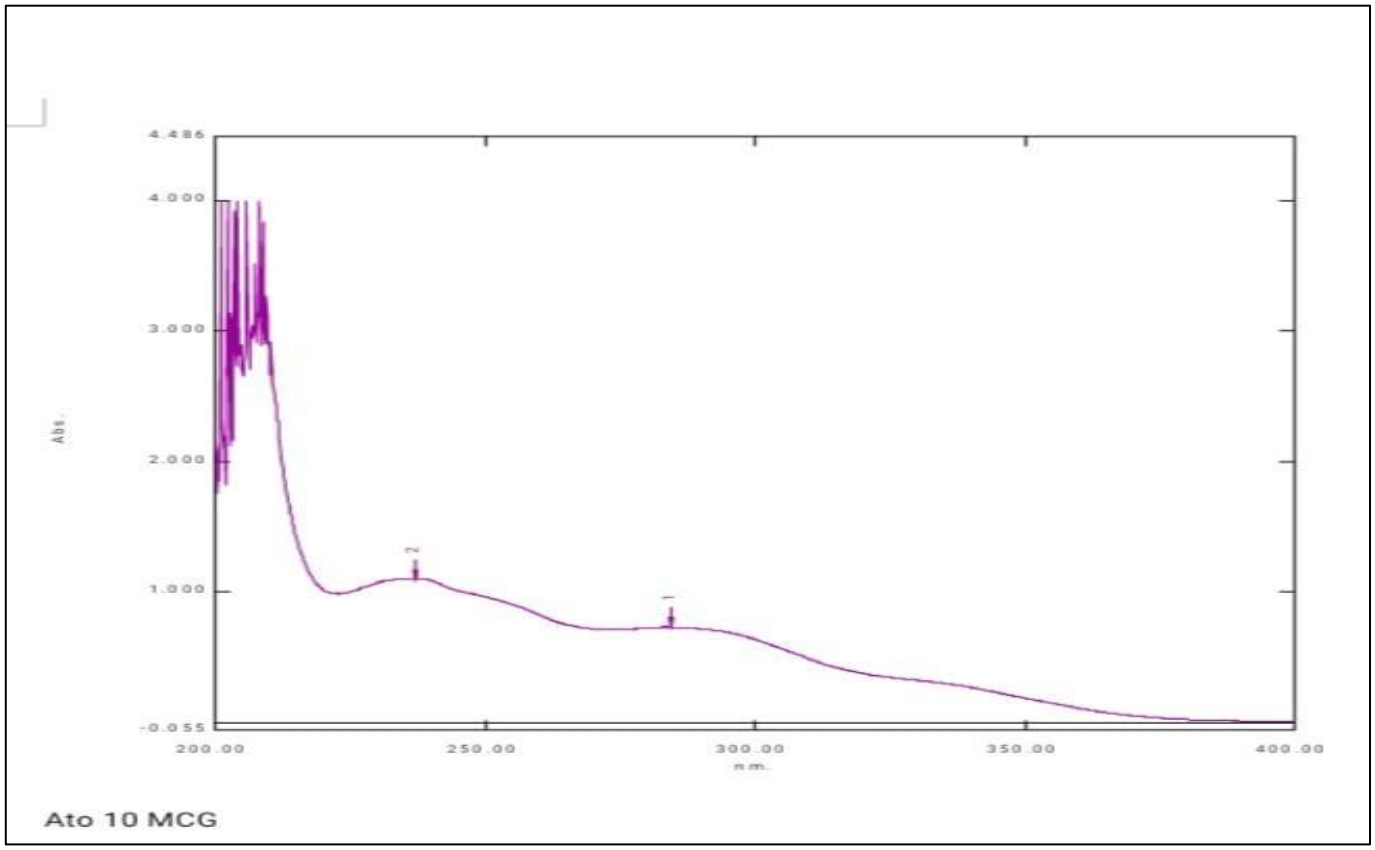
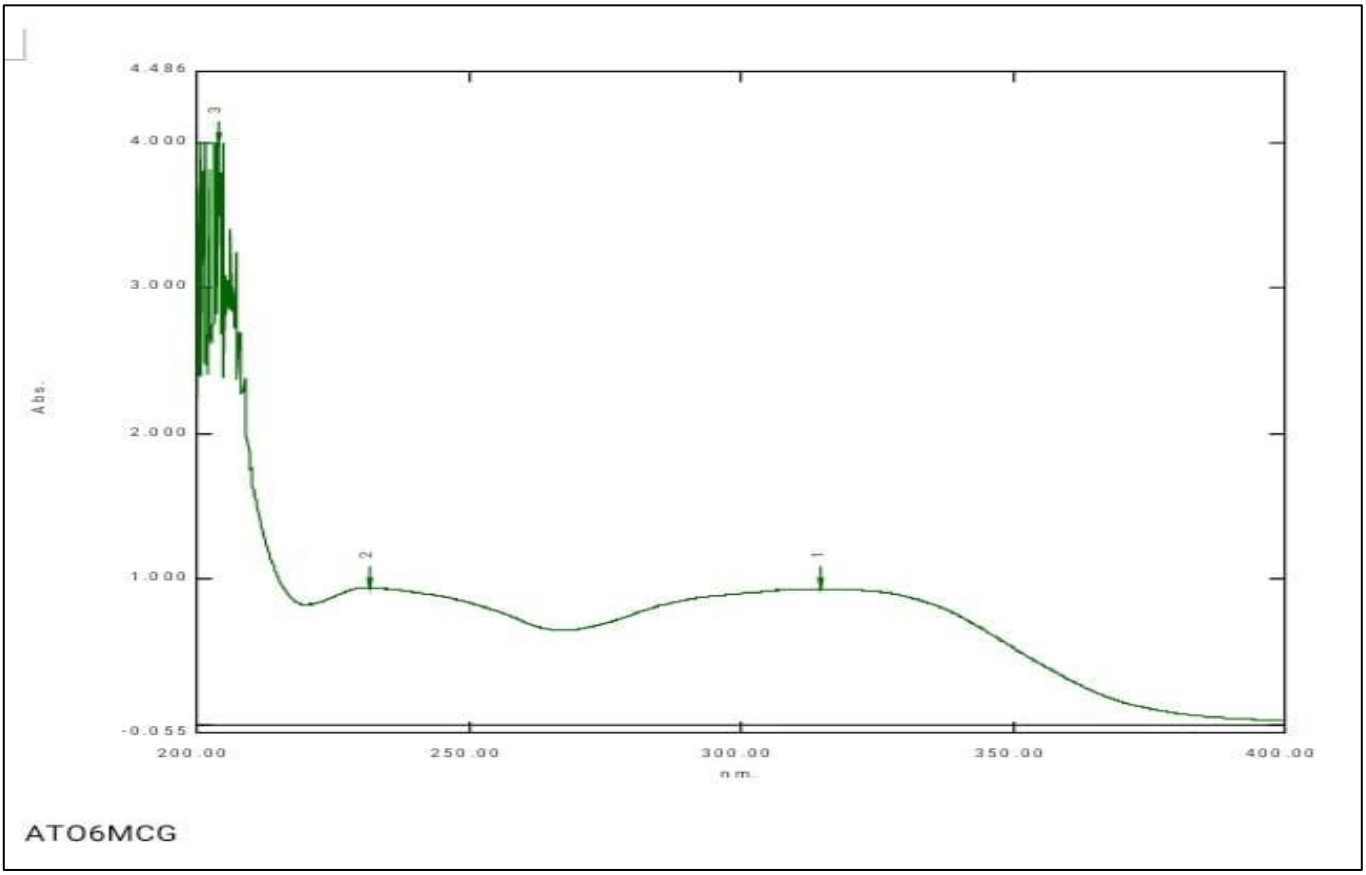


Graph 7: Atorvastatin (10 Microgram)



Graph 8: Atorvastastin (6 Microgram)

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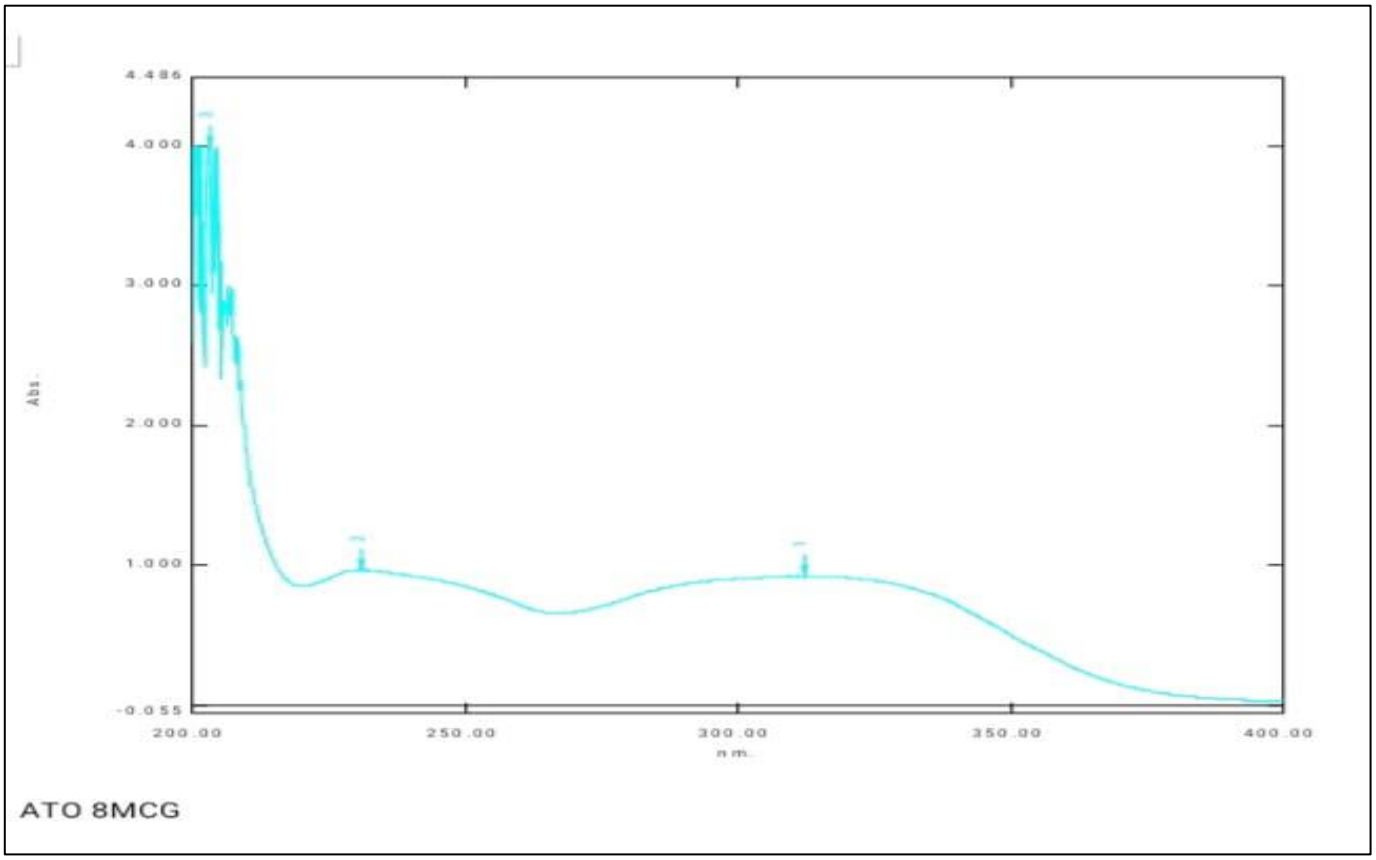

Graph 9: Atorvastatin (8 Microgram)

Fig 6: UV-Spectroscopy

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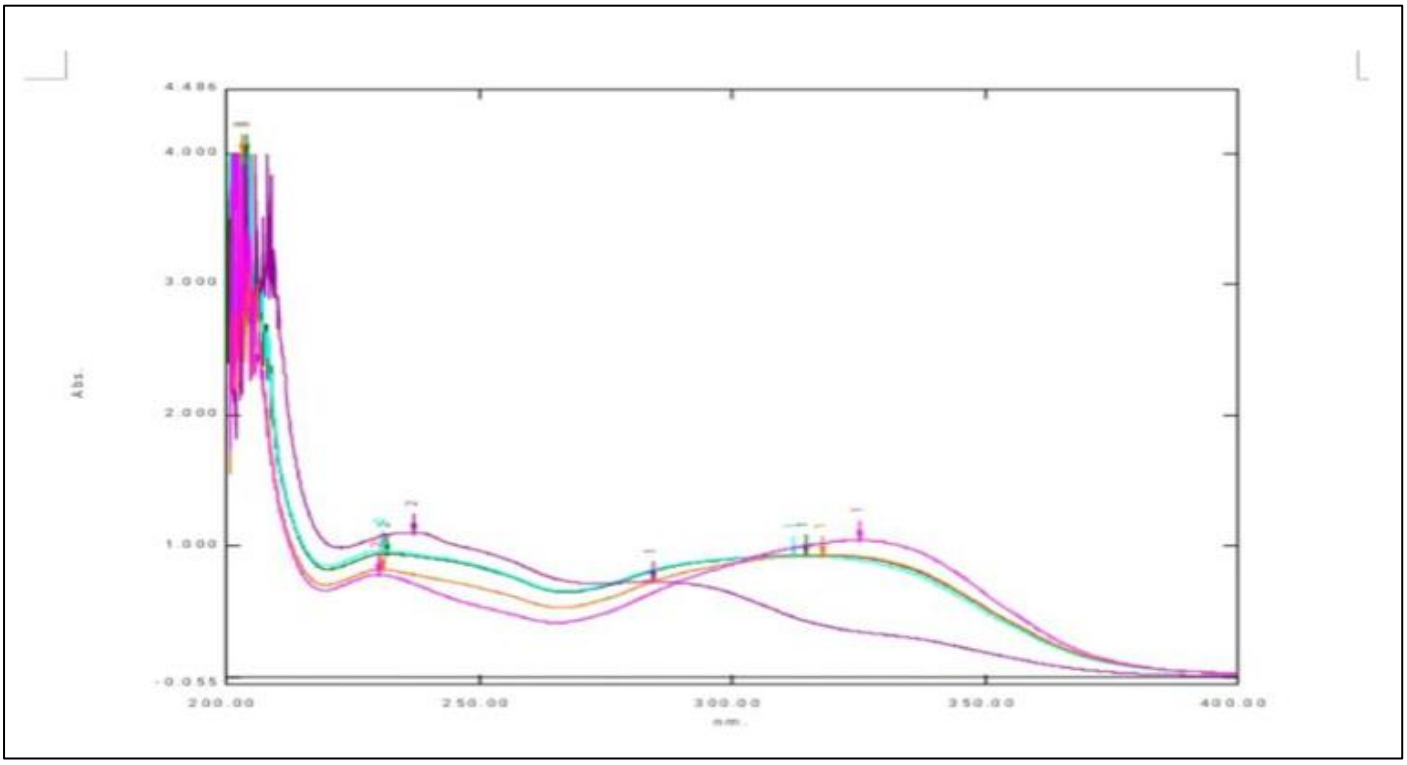
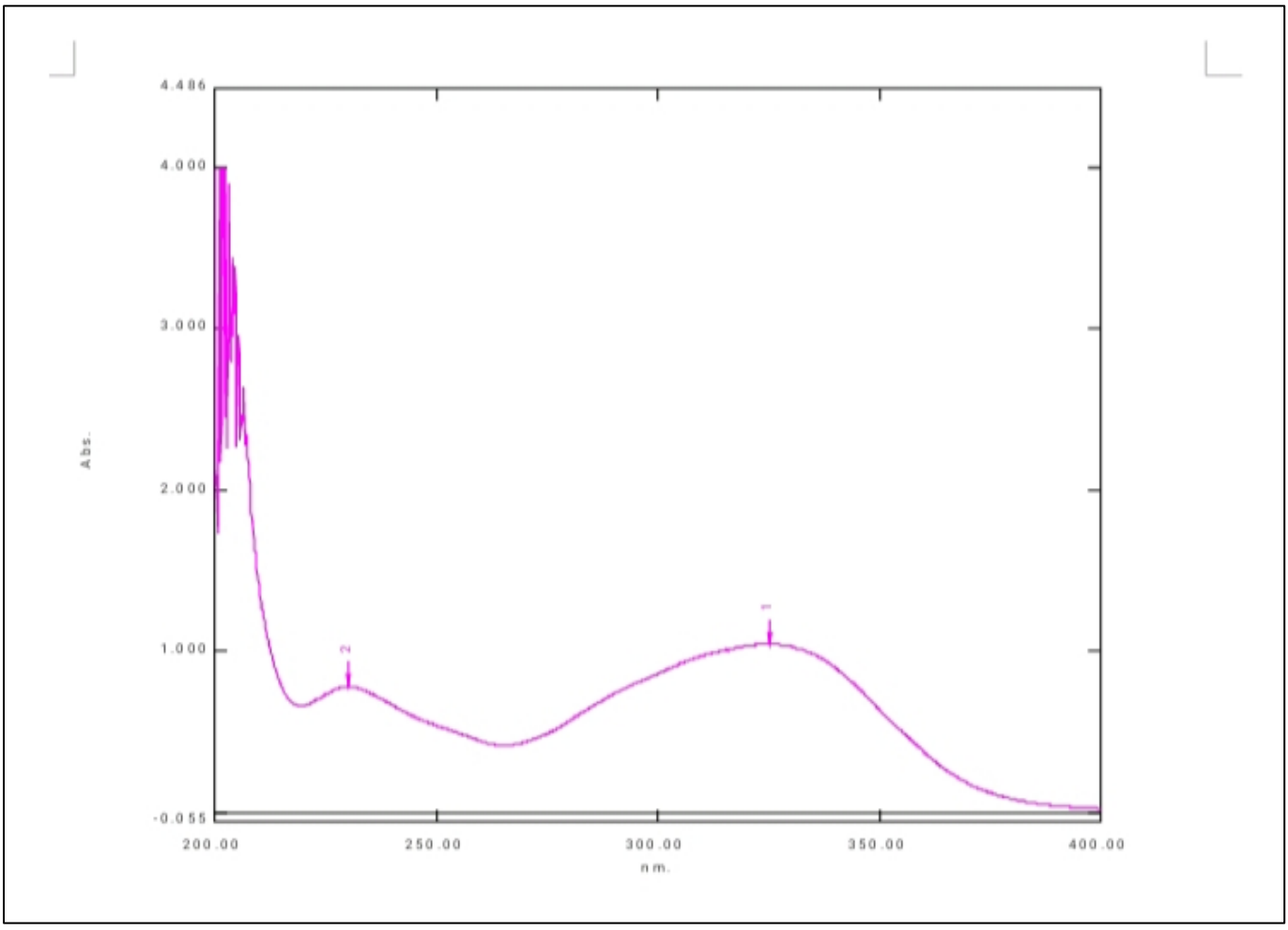


Graph 10: Overlapping Graph of the Atorvastatin



Graph 11: Atorvastatin (2 Microgram)

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II. CALCULATION

Two equations are constructed based upon the fact that at Aland 12, the absorbance of the mixture is the sum of the individual absorbance of X and Y.

At Al

A1ax1 b Cx+ay1b Cy... (1)

At A2

A2=ax2 b Cx + ay2b Cy. (2)

- ax1 and ax2 are the absorptivities of X at lambda_(1)11 and lambda_{2}A2 respectively
- ay1 and ay2-The absorptivities of Y at lambda_(1) x1 and lambda_(2)12 respectively
- A1 and A2-The absorbance of the diluted sample at Lambda_{1) Aland lambda (2) A2 respectively.
- cx and cy are the concentration of X and Y respectively.

The overlain spectra of the X and Y, showing the wavelength of the assay of X and Y in admimixture by method of simultaneous equations.

For measurements in 1 cm cells, b-1 Rearrange equation number 2

Cy=A2-aX2Cx/aY2

Substituting for Cy in equation number 1 and rearrange gives_

Cx-A2 aY1-A1 aY2/ax2 aY1-ax1 aY2 (3)

Cy-A1ax2-A2ax1/ax2 aY1-ax1 aY2... .. (4)

A2/A1/ax2/ax1 and aY2/aY1/A2/A1

III. RESULT

The simultaneous estimation of multicomponent containing formulation by using UV spectroscopy was performed and studied.

IV. CONCLUSION

In contrast to other methods, the suggested method for developing UV-visible spectroscopy was determined to be the least accurate, sensitive, precise, and quick.This approach cannot adequately analyse many samples, hence it cannot be utilised for regular analysis of AZPin formulations in different forms. Research revealed that the suggested method is dependable, easy to use, and nearly exact.

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