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UV-SPECTROCTOPHOTOMETRIC ESTIMATION OF PARACETAMOL IN DIFFERENT MARKETED BRANDS OF PARACETAMOL TABLET IN SOLID DOSAGE FORM

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ABSTRACT

In Present study, Estimation of Paracetamol content in different three marketed brand of Paracetamol Tablet formulation from different manufacturer. Quantitative estimation of Paracetamol carried out by UV visible Spectrophotometric method by single point standardization and calibration plot method. Single point standardization percentage of paracetamol present below the label claimed limit and same tablet formulation estimated for percentage purity test using calibration plot method observed quantity of paracetamol is below the labeled contain. The marketed product of paracetamol might be less amount of paracetamol present therapeutic effect of formulation depends on its quality of product.

KEYWORDS: UV Spectrophotometer, Paracetamol tablet, Single point standardization, Calibration plot method.

Abbreviations

UV- Ultra Violet Spectroscopy; R2-Correlation coefficient; nm- Nanometer; ml- Milliliter; IUPAC- International Union of Pure and Applied Chemistry µg- Microgram g- Gram; No - Number; N- Normal solution

INTRODUCTION

UV-Visible Spectrophotometer

Spectrophotometer is one of the valuable technique in pharmaceutical analysis, which deals

with the measurement of spectra. It is a branch which embraces the measurement of absorption of radiation energy of definite and narrow wavelength approximating monochromatic radiation by chemical species.[1]

Absorption spectrophotometry is the measurement of the absorption of electromagnetic radiation of definite and narrow wavelength range by molecules, ions and atoms of a chemical substance. Technique most commonly employed in analytical field includes ultraviolet, visible, infrared and atomic absorption spectroscopy.[2]

UV absorption spectroscopy deals with absorption of light by sample in the Ultra Violet (UV) region between wavelengths 190-380 nm while UV-Visible absorption spectrophotometry (colorimetry) deals with absorption of light by sample in the visible region between 380-780 nm. Absorption of UV-Visible light causes promotion of a valence electron from bonding to antibonding orbitals.[3]

The wavelength at which the maximum absorption bands occur will give information about the structure of the molecule or ion and the extent of the absorption is proportional with the amount of the species absorbing the light. It is used for both qualitative and quantitative investigation of samples.[12] The absorption of electromagnetic radiation of wavelength between 200 to 800 nm by molecules which have π electrons or atoms possessing unshared electrons pairs can be employed for both qualitative and quantitative analysis.[4]

Applications of UV Spectrophotometer

Detection of functional groups: The technique is applied to detect the presence or absence of chromospheres. The absence of a band at a particular wavelength may be regarded as an evidence for the absence of a particular group in the compound.

Extent of conjugation: In unsaturation with the increase in the number of double bonds shift the absorbance to the longer wavelength.

Identification of unknown compounds: An unknown compound can be identified by comparing its spectrum with the known spectra.

Preference over the Tautomeric forms: If a molecule exists in two Tautomeric forms, preference of one over the other can be detected by UV spectroscopy.

Identification of a compound in different solvents: Sometime the structure of a compound changes with change in solvent.

Determination of configuration of geometrical isomers: The result of absorption shows that cis-isomers absorb at different wavelengths as compared to their corresponding trans-isomers.

Distinction in conjugated and non-conjugated compounds.[5]

Beer's- Lambert's Law[6]

It states that when monochromatic light is passed through a medium, the intensity of a beam of monochromatic light decreases exponentially as the concentration of solution containing absorbing chemical species and thickness of solution increases arithmetically.

$$Log\frac{I_o}{I_t} = A = abc - - - - - (1)$$

Where,

I_0: Intensity of incident light.

I_t: Intensity of transmitted light.

A: Absorbance.

a: Absorptivity or extinction co-efficient.

b: path length or thickness of medium.

c: concentration of solute in solution.

Limitations to Beer's Law

There are few exceptions to the linear relationship between the absorbance of the sample and its concentration. The law may show some deviations from the linear behavior due to various reasons. Some of these deviations are fundamental and are called as Real deviations while others which occur due to the method used are called as Instrumental deviations**.**

Quantitative Spectrophotometric assay of medicinal substances

The assay of an absorbing substance may be quickly carried out by preparing a solution in a solvent and measuring its absorbance at a suitable wavelength.

Single Component Analysis

The analysis of sample containing single component can be carried out using one of the

following modes-

Using Standard Absorptivity Values

The Absorptivity value A (1%, 1cm) of a standard at selected wavelength (usually) in a particular solvent is established and concentration of sample is determined by comparison with standard value.

Using Standard Calibration Graph

Calibration graph of number of standard solutions encompassing concentration of sample is constructed and concentration of sample is read from the graph. The concentration of the substance in the sample is calculated from the proportional relationship that exists between absorbance and concentration.

$$C_{test} = \frac{A_{test} \times C_{std.}}{A_{std.}} \text{-----(2)}$$

Where…….

C_{test} and C_{std}: Concentration of the sample and standard solutions respectively.

A_{test} and A_{std}: Absorbance of the sample and standard solutions respectively.

A two-point bracketing standardization is required sometimes due to non-proportional relationship between concentration and absorbance.

The concentration of the analyte is given by equation

$$C_{test} = \frac{(A_{test} - A_{std1})(C_{std1} - C_{std2}) + C_{std1}(A_{std1} - A_{std2})}{(A_{std1} - A_{std2})} \text{-----(3)}$$

Where,

The subscript A_{std1} and A_{std2} are more and less concentrated standard respectively.

Single or Double Point Standardization

The single point involves the measurement of the absorbance of the sample solution of the reference substance.

$C_T = A_T / A_S \, C_S$

Where….

C_T = Concentration of test solution

A_T = Absorbance of test solution

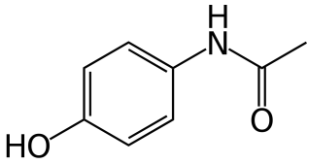
A_S = Absorbance of standard solution

C_S = Concentration of standard solution

DRUG PROFILE

Paracetamol

Molecular Structure:



IUPAC Name : N-(4-hydroxyphenyl)ethanamide, N-(4-hydroxyphenyl) acetamide

Molecular Formula : $C_8H_9NO_2$

Molecular Mass : 151.163 g/mol

Description : White Crystalline Solid

Melting point : 169 °C

Boiling point : 420 °C

Solubility : Water and Alcohol

Use : Analgesic and Antipyretic

EXPERIMENTAL AND METHODOLOGY

Sample material

All tablet formulation from different manufacturer are purchased from local market Deulgaon raja.

Labeled Claim

Paracetamol tablet ……500mg

Table No 1: Sample Information.

Sr. No	*Brand Name*	*Name of Manufacturer*	*Sample Code*
01	***Pacimol***	Ipca Laboratories Pvt. Ltd.	A
02	***Pyrigesic***	East India Pharmaceutical Works Ltd.	B
03	***Calpol***	GlaxoSmithKline Pharmaceuticals Ltd	C

Chemicals

1. All Required Chemical Purchased from Ozone Chemical Mumbai.
2. Distilled water purchased from local market Deulgaon Raja.
3. Whatman No. 41 Filter paper was used for experimental work.

Apparatus

Volumetric flasks-200 mL, 10 mL beakers, measuring cylinders, pipettes.

Equipment's

1. Single beam UV-Visible spectrophotometer.
2. Electronic weighing balance Model No.AW-220 & BX-620 S, Shimadzu Corporation, Koyto, Japan.

Preparation of Standard Solution

1. Weigh 0.15 gm powdered drug of paracetamol and add 50 ml of 0.1 N Sodium Hydroxide solutions.
2. Dissolve the powdered contain of paracetamol using sufficient quantity of water for homogenize the content shaking vigorously for It an about 15 min and add water to produce a volume up to 200 mL.
3. The above solution filtered using Whatman No. 41 Filter paper.
4. Prepare stock solution from the filtrate pipette out the 10 ml filtrate in a 100 mL previously cleaned volumetric flask and volume make up to the mark with the help of water and add 10 mL water.
5. Resulting solution to 10 mL of 0.1 N Sodium hydroxide solution scan in ultraviolet range UV Spectrophotometer in the 200 to 400 nm.

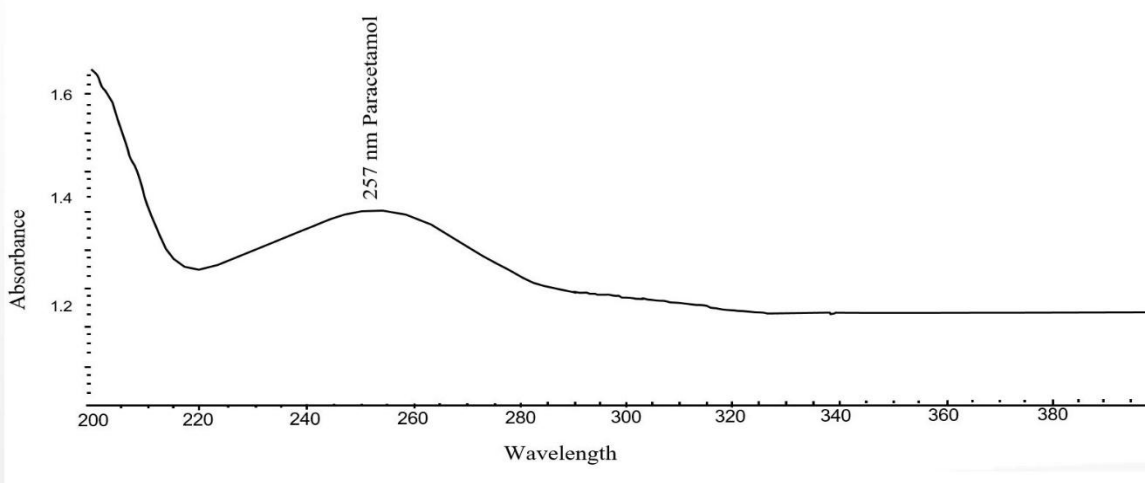


Figure No 1: Absorption maxima of Paracetamol.

Preparation Standard Calibration Curve

1. From prepared stock make working solution in a series of 10 to 60 µg/mL using prefiltered solution of 0.1 N Sodium hydroxide.
2. Take a absorbance of different working solution at 257 nm.
3. Plot the graph between for obtained absorbance (nm) and concentration of different

working solution (µg/mL).

Table No 2: Readings for Different concentration of paracetamol at 257nm.

Concentration (µg/mL)	*Absorbance (nm)*
0	0
10	0.128
20	0.497
30	0.648
40	0.884
50	1.011
60	1.211

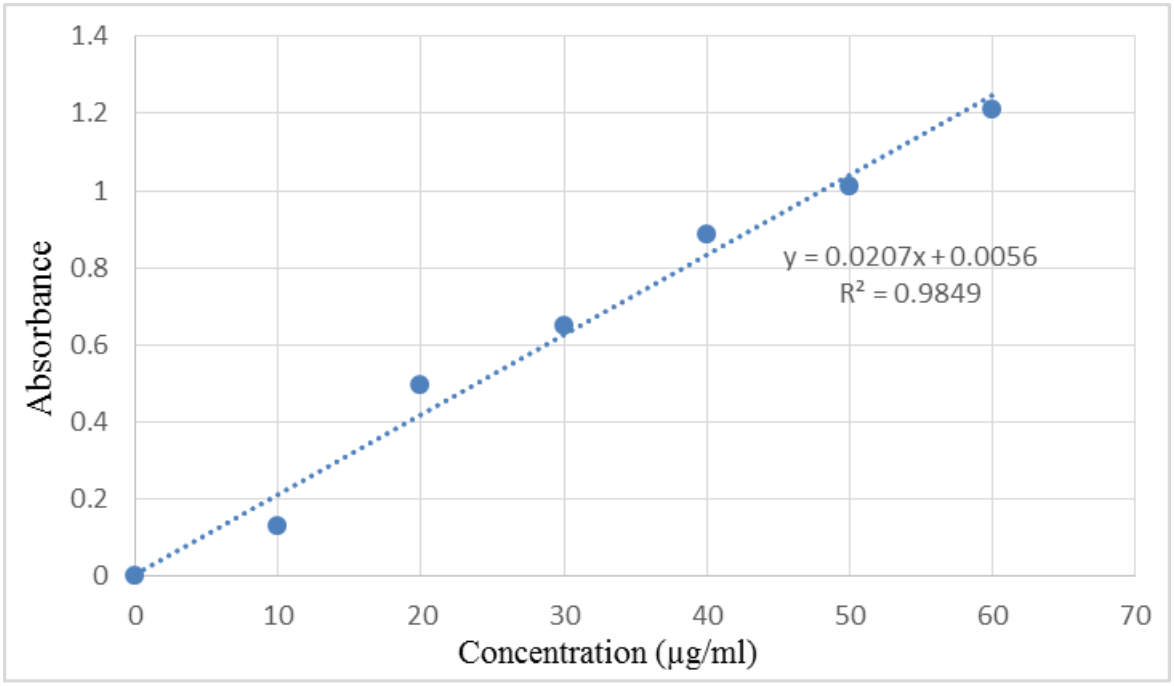


Figure No 2: Standard Calibration curve of paracetamol.

METHODOLOGY

Single point standardization

1. Weigh a 20 tablet of paracetamol crush it in powder form in a previously cleaned mortal and pastle.
2. Powdered paracetamol weight 0.15 g of equivalent to paracetamol.
3. Add 50 ml of 0.1 N Sodium hydroxide dilute with 100 ml of deionised water shake for 15 min, add sufficient water to produce 200 ml.
4. Mix filter and dilute 10 ml of the filtrate to 100 ml with water.
5. 10 ml of resulting solution add 10 ml of 0.1 N Sodium Hydroxide dilute to 100 ml with water and mixed.

6. Measure the absorbance of resulting solution at the maximum at about 257nm.
7. Calculate the content of paracetamol taking 750 as the specific absorbance at 257nm.

$\mathbf{C_T = A_T / A_S\ C_S}$

Where….

C_T = Concentration of test solution

A_T = Absorbance of test solution

A_S = Absorbance of standard solution

C_S = Concentration of standard solution

C_S = 0.0075 µg/ml

Calibration Plot Method

Preparation of stock solution

1. Stock solution of Paracetamol (1 mg/ml) is prepared by dissolving 100 mg of drug in 10 ml solution of Sodium Hydroxide to make up volume up to 100 ml with water.

Preparation of test solution

1. Pipette out 1 ml of stock solution and transfer it into 100 ml volumetric flask and dilute with up to 100 ml water, the resultant solution becomes 10 µg/ml.
2. Similarly by same procedure prepared 20 µg/ml, 30 µg/ml, 40 µg/ml, 50 µg/ml, 60 µg/ml concentration and measure the absorbance in UV spectrophotometer at 257 Wavelength and plot the graph concentration VS. Absorbance.

RESULT

Estimation of Paracetamol in tablet dosage forms by UV spectrophotometric method was carried out using UV visible spectrum of Paracetamol The standard and sample solutions were prepared and the absorbance were recorded The absorbance maxima was calculated. The results of analysis shows that the amount of drugs was in good agreement with the label claim of the formulation. The tablet shows percentage purity values ranging from 92.36% to 100.00 % assay results were shown in given table.

Single Point Standardization

Table No 3: Results by single point standardization method.

Sample Code	A_T	A_S	C_T	*Assay*
A	0.127	0.131	0.0072 mg/ml	96.94%
B	0.121	0.131	0.0069 mg/ml	92.36%
C	0.124	0.131	0.0070 mg/ml	93 %

Calibration Plot Method

Table No 4: Results by Calibration plot method.

SAMPLE CODE	*A*	*B*	*C*
Unknown concentration (y)	0.149	0.151	0.147
Slope (m)	0.02	0.02	0.02
Concentration (x)	7.45 µg/ml	7.50 µg/ml	7.30 µg/ml
Percentage Purity	98.66 %	100 %	97.33 %

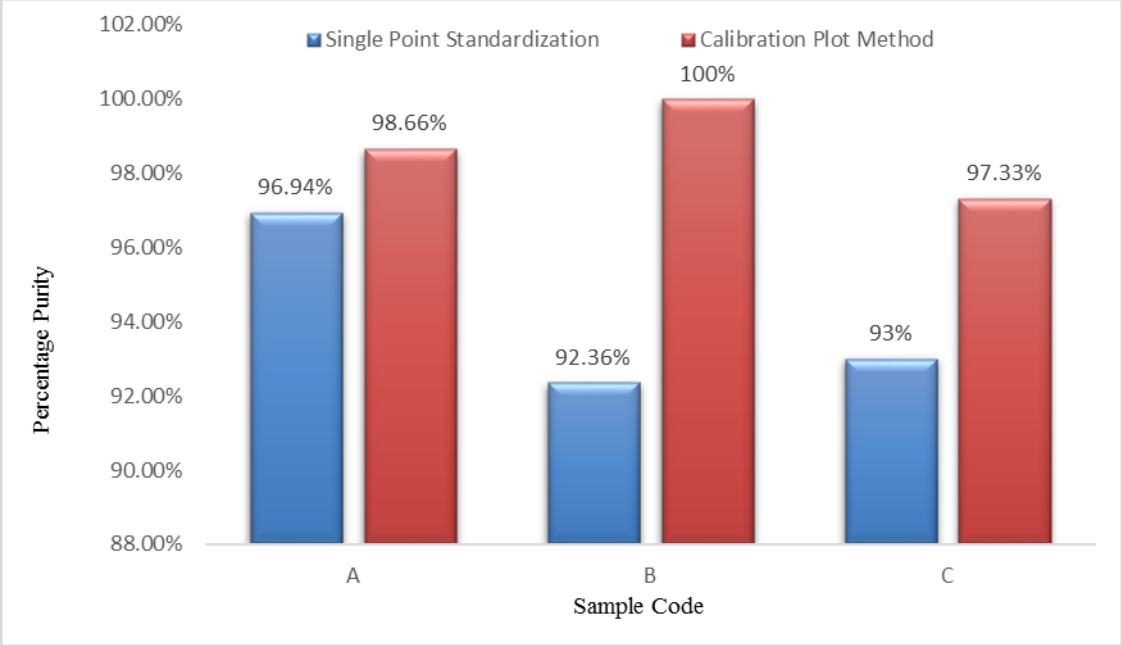


Figure No 3: Content of paracetamol by both method.

DISCUSSION

In present study estimation of Paracetamol in solid dosage from was studied. Tablets of Paracetamol were collected from local market of Deulgaon raja. All three brand of sample tablets from different manufacturer. This all three sample were studied using UV spectrophotometer by two method. The UV scan of standard solution of Paracetamol between 200–400nm gives the absorption maxima at 257nm, The Beer's law was verified from the

calibration curve by plotting observed between 10-60 µg/ml. The plot clearly showed a straight line(y = 0.0207x + 0.0056) with the coefficient of correlation 0.9849.

The sample of Paracetamol estimated by single point standardization sample A shows the highest amount of Paracetamol content is 96.94% and sample B and C shows the less amount of Paracetamol present 92.26% and 93.00% respectively.

By Calibration plot method the percentage purity of Paracetamol shows in the range of 97.33% to 100%. Calibration plot method shows more accurate results compared to single point standardization method. In sample A shows purity of Paracetamol 98.66% and Sample B and C purity 100% and 97.33% respectively.

CONCLUSION

From present study concluded that the amount of Paracetamol in tablet can be present as per the labeled claim. In methodology calibration plot method shows the accurate result compared to single point standardization. The marketed product of Paracetamol might be safe for use and it shows good therapeutic effect.

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REFERENCES

1. Beckett AH., Stenlake JB. Practical Pharmaceutical chemistry. 4th ed., Part II, CBS Publishers and Distributors, 2002; 379.
2. Sharma BK. Instrumental methods of chemical analysis. Geol publishing house, Krishna Prakashan Meerut; 2004; 67.
3. www.americanpharmaceuticalreview.com
4. Willard H. Instrumental Method of Chemical Analysis. 1st ed., Published by CBS Publishers and Distributors, 1986; 340.
5. Silverstein RM., Webster FX. Spectrometric Identification of Organic Compound, 6th ed., John Willey and Sons Asia pvt. Ltd 1998; 78-141.
6. Chatwal GR, Anand SK. Instrumental methods of chemical analysis by, Himalaya publishing house, First edition 1979, page number- 2.107.