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QUANTITATIVE ESTIMATION OF ASPIRIN DRUG BY USING UV VISIBLE SPECTROSCOPY

***[1]Dipali Deshmukh, [2]Akash Pathre, [2]Himani Farkare, [2]Jaichand Chauhan, [2]Jyoti Patel, [3]Kalpesh Gawhade, [3]Kapil Kushwaha, [3]Karan Adlak, [4]Dr. Jagdish C. Rathi**

NRI Institute of Pharmaceutical Sciences, Bhopal (M.P.).

***Corresponding Author: Dipali Deshmukh**

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ABSTRACT

The quantitative estimation of Acetylsalicylic acid present in the marketed tablet formulation was carried out successfully using UV–Visible spectrophotometry, which is based on the measurement of absorbance of ultraviolet radiation by the analyte at a specific wavelength. The standard drug solution exhibited maximum absorbance at a wavelength (λmax) of approximately 275 nm, which was selected for further analytical measurements. A series of standard solutions of varying concentrations were prepared accurately, and their absorbance values were recorded using a UV– Visible spectrophotometer against a suitable blank. These absorbance values were plotted against the corresponding concentrations to obtain a calibration curve, which demonstrated a linear relationship over the selected concentration range. This linearity confirms the applicability of BeerLambert Law, which states that the absorbance of a solution is directly proportional to its concentration, provided the system follows ideal conditions. The regression analysis of the calibration curve showed a high correlation coefficient (close to 1), indicating excellent linearity and reliability of the analytical method. The slope and intercept obtained from the calibration curve were used to determine the concentration of acetylsalicylic acid in the sample solution prepared from the marketed tablet. The sample preparation involved accurate weighing, crushing of tablets, dissolution in a suitable solvent, filtration to remove insoluble excipients, and appropriate dilution to bring the concentration within the linear range of the calibration curve. The absorbance of the sample solution was measured under identical experimental conditions, ensuring consistency and minimizing variability. The calculated concentration of acetylsalicylic acid in the marketed formulation was found to be very close to the labelled claim, and the percentage purity was within the acceptable pharmacopoeia limits (typically ranging between 95% and 105%). This indicates that the marketed product complies with quality standards and contains the appropriate amount of active pharmaceutical ingredient. The results obtained demonstrate good accuracy and precision of the method, as evidenced by minimal deviation between experimental and theoretical values.

KEYWORDS: Estimation, Spectrophotometer, Absorbance, Wavelength, Inflammation.

INTRODUCTION

Acetylsalicylic acid, commonly known as aspirin (2-acetoxybenzoic acid), is one of the oldest and most widely utilized therapeutic agents in modern medicine. Since its introduction into clinical practice, aspirin has remained a cornerstone drug due to its multifaceted pharmacological properties, including analgesic, antipyretic, anti-inflammatory, and antithrombotic effects mediated primarily through irreversible inhibition of cyclooxygenase (COX) enzymes and subsequent suppression of prostaglandin and thromboxane synthesis. Because aspirin is extensively consume d worldwide in both prescription and over-the-counter formulations, stringent quality control of its pharmaceutical preparations is essential to ensure therapeutic efficacy and patient safety. A major analytical challenge associated with aspirin is its inherent instability in the presence of moisture and alkaline conditions, where it readily undergoes hydrolysis to yield salicylic acid and acetic acid. The presence of salicylic acid as a degradation product not only reduces drug potency but may also increase gastric irritation; therefore, accurate determination of both aspirin content and salicylic acid impurity is of significant pharmaceutical importance.

Chemically, aspirin is known as 2-acetoxybenzoic acid (2-(acetyloxy) benzoic acid). Its molecular formula is $C_9H_8O_4$, and the molecular weight is 180.16 g/mol. The structure of aspirin consists of a benzene ring attached to both a carboxylic acid group (–COOH) and an ester functional group (–$OCOCH_3$).

These functional groups are responsible for the chemical and pharmacological properties of the molecule. A variety of analytical techniques have been reported for the determination of aspirin in bulk drugs and dosage forms, including acid–base titrimetry, high- performance liquid chromatography (HPLC), gas chromatography–mass spectrometry (GC-MS), derivative spectrophotometry, fluorimetry, and flow- injection analysis.

Among these, HPLC methods provide excellent specificity and sensitivity but often require expensive instrumentation, complex sample preparation, and longer analysis times. In contrast, UV–Visible spectrophotometry offers notable advantages such as operational simplicity, rapid analysis, minimal solvent consumption, and cost-effectiveness, making it highly suitable for routine quality control, especially in resource limited pharmaceutical laboratories. Previous investigations have demonstrated that aspirin and its primary degradation product salicylic acid exhibit characteristic UV absorption maxima near 226 nm and 296 nm, respectively, allowing their direct spectrophotometric determination in appropriate solvent systems. Furthermore, indirect spectrophotometric methods based on alkaline hydrolysis of aspirin followed by complexation of the resulting salicylate ion with ferric ions produce a stable violet chromogen with maximum absorbance around 535 nm, providing an additional sensitive approach for quantitative analysis.

Published validation studies have confirmed that UV–Visible spectrophotometric methods for aspirin analysis obey Beer–Lambert's law over suitable concentration ranges and demonstrate acceptable accuracy, precision, sensitivity, and reproducibility for pharmaceutical applications. Considering the continued need for rapid and economical analytical procedures, the development and validation of a robust UV–Visible spectroscopic method remain highly relevant. Therefore, the objective of the present work is to evaluate and identify acetylsalicylic acid in pharmaceutical formulations using UV–Visible spectroscopy and to establish a reliable, validated procedure suitable for routine quality control in accordance with pharmacopeial recommendations and contemporary analytical practices.

Because of its widespread therapeutic use, the accurate determination of aspirin in bulk drug and pharmaceutical formulations is of great importance for quality assurance and regulatory compliance. Over the years, numerous analytical techniques have been reported for aspirin estimation, including high-performance liquid chromatography (HPLC), gas chromatography– mass spectrometry (GCMS), potentiometric methods, flow-injection spectrophotometry, and various derivative UV spectrophotometric procedures. Although these methods provide reliable results, some of them require sophisticated instrumentation, complex sample preparation, or higher operational costs. Various analytical techniques have been developed and reported for the determination of acetylsalicylic acid in bulk drug substances and pharmaceutical formulations.

These techniques include high-performance liquid chromatography (HPLC), gas chromatography–mass spectrometry (GC-MS), spectro fluorometry, titrimetric methods, and UV-Visible spectrophotometry. Among these techniques, chromatographic methods such as HPLC provide highly accurate and selective analysis; however, they often require expensive instrumentation, sophisticated operation, and extensive sample preparation procedures. Consequently, these methods may not always be convenient for routine laboratory analysis, especially in small research laboratories and educational institutions.

In contrast, UV-Visible spectrophotometry is considered one of the most widely used analytical techniques in pharmaceutical analysis due to its simplicity, rapid analysis, cost-effectiveness, and acceptable accuracy.

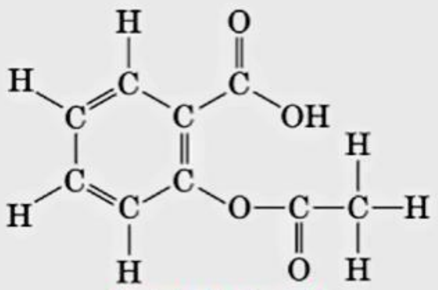
DRUG PROFILE — (ASPIRIN)

1. Introduction

Acetylsalicylic acid (ASA) remains one of the most widely used and extensively studied medicines. Its clinical roles include symptomatic treatment of pain and fever and long-term low dose use for prevention of arterial thrombosis. The pharmacological utility of ASA derives from its ability to irreversibly acetylate cyclooxygenase enzymes, thereby altering prostaglandin and thromboxane synthesis. ASA is inexpensive, widely available in multiple solid oral dosage forms, and is listed in major pharmacopoeias.

1. Historical Note

ASA was first synthesized as an acetylated derivative of salicylic acid in 1897 by the German chemist Felix Hoffmann while working for the pharmaceutical company Bayer. The acetylation reduced gastrointestinal irritation relative to sodium salicylate and enabled widespread therapeutic use.



Acetylsalicylic acid (Aspirin)

2. Chemical identity & synthesis

- IUPAC name: 2-acetoxybenzoic acid
- Common names: Acetylsalicylic acid, ASA, aspirin
- Molecular formula: $C_9H_8O_4$
- Molecular weight: 180.16 g•mol^{-1}
- Structure: Benzene ring bearing a carboxylic acid (–COOH) at ortho position to an acetoxy (–O–CO–CH_3) group.

Marketed Product of Aspirin

Laboratory synthesis

Industrial and laboratory syntheses typically use acetylation of salicylic acid with acetic anhydride (or acetyl chloride) in the presence of an acid catalyst (e.g., sulfuric acid or phosphoric acid). A typical lab-scale procedure:

1. Salicylic acid is heated with acetic anhydride (excess) under stirring.
2. Reaction is monitored; after completion the mixture is cooled and water is added to hydrolyze residual acetic anhydride.
3. Crude ASA precipitates and is filtered, washed (cold water) and recrystallized from ethanol/water to give white crystalline ASA.
4. Yield and purity are improved by careful control of temperature and recrystallization.

Physico-chemical properties

- Appearance: White crystalline powder
- Melting point: 134–136 °C (decomposes if overheated)
- Solubility: Slightly soluble in water (solubility increases with temperature); freely soluble in organic solvents such as ethanol, acetone, and ether.
- pKa: ≈ 3.5 (carboxyl group) — implications: unionized in acidic gastric environment, ionized in alkaline urine.
- Log P: moderately lipophilic — supports passive absorption across gastrointestinal mucosa.
- Stability: Susceptible to hydrolysis (yields salicylic acid and acetic acid) under moist conditions and at elevated temperature and alkaline pH. Protection from moisture and heat is important in solid dosage forms.

5. Mechanism of action

ASA irreversibly acetylates a serine residue in the active site of cyclooxygenase (COX) enzymes (COX-1 and COX-2), blocking conversion of arachidonic acid to prostaglandin H_2 (PGH_2). Downstream consequences.

- **Analgesic/antipyretic/anti-inflammatory:** Reduced prostaglandin E_2 and other prostanoids lowers peripheral sensitization of nociceptors and central fever pathways.
- **Antiplatelet:** In platelets, irreversible inhibition of COX-1 prevents thromboxane A_2 formation, impairing platelet aggregation for the platelet lifespan (~7–10 days). This underpins low-dose ASA cardioprotective use.
- Irreversibility distinguishes ASA from many reversible NSAIDs and explains prolonged antiplatelet effect after single low doses.

6. Pharmacodynamics and pharmacokinetics (ADME)

6.1 Absorption

ASA is rapidly absorbed from the stomach and proximal small intestine after oral administration. Rate of gastric emptying and formulation (enteric-coated vs plain) influence onset. Enteric coatings delay absorption and reduce direct gastric mucosal exposure.

6.2 Distribution

ASA is distributed to body fluids and tissues; it crosses the placenta and may enter breast milk. Salicylic acid (the primary metabolite) is extensively protein- bound (albumin binding is concentration-dependent).

6.3 Metabolism

ASA is rapidly hydrolyzed (in plasma and liver) to salicylic acid. Salicylic acid is further metabolized by conjugation (glycine → salicyluric acid, glucuronidation → salicyl acyl and phenolic glucuronides) and by oxidation.

6.4 Elimination

Excretion is primarily renal. Salicylate elimination is dose-dependent: at low/therapeutic concentrations, elimination follows first-order kinetics; at high/toxic concentrations, elimination can become zero-order due to saturation of metabolic pathways — clinical relevance in overdose.

7. Therapeutic uses and dosing

- Analgesic/antipyretic: Adult oral typical dose 325–650 mg every 4–6 h as needed (do not exceed recommended maximum).
- Anti-inflammatory: Higher doses used in rheumatic disease under supervision.
- Antiplatelet (cardio protection): Low dose ASA 75–150 mg once daily for secondary prevention of myocardial infarction and ischemic stroke; primary prevention decisions depend on risk assessment and guidelines.
- Other uses: Transient ischemic attack prophylaxis, certain obstetric or rheumatologic indications (under specialist guidance).

8. Formulations, compounding, and stability considerations

8.1 Common pharmaceutical forms

- Immediate-release tablets (325 mg, 500 mg, etc.)
- Low-dose (enteric-coated or plain) tablets (75–100 mg) for antiplatelet therapy
- Effervescent preparations, dispersible tablets, chewable tablets, suppositories

8.2 Excipients and manufacture

- Excipients selected to minimize hydrolytic degradation (e.g., desiccants in packaging). Enteric coats (e.g., cellulose acetate phthalate) used to reduce gastric irritation.

8.3 Stability and storage

• Store in airtight containers, protect from moisture and heat; typical storage below 25–30 °C. Moisture accelerates hydrolysis to salicylic acid and acetic acid (detectable by odor of acetic acid).

9. Laboratory analysis

9.1 UV–Visible spectroscopy

• Analytical note for UV-Vis assay: ASA shows absorbance due to conjugated aromatic system. Typical λmax ≈ 275 nm for aspirin or its salicylate derivative depending on solvent and pH. For quantitative estimation in formulations, many undergraduate protocols hydrolyze ASA to salicylic acid. (which has a λmax ≈ 296 nm in alkaline medium) and use Beer–Lambert principles. Choose solvent and pH so that interferences from excipients are minimized.

9.2 HPLC assay

• Reverse-phase HPLC with C18 column, mobile phase commonly a water: acetonitrile (or methanol) mix with acid modifier (e.g., 0.1% phosphoric acid), detection at 230–280 nm gives robust quantitation of ASA and salicylic acid. Validate method for linearity, accuracy, precision, LOD/LOQ per ICH Q2(R1) guidelines.

9.3 Titrimetric methods

• Acidimetric titration (e.g., with standardized NaOH) after dissolution is a classical USP/IP method for assay in some cases — simple but less specific than HPLC.

10. Adverse effects & toxicity

10.1 Common adverse effects

• Gastrointestinal irritation, dyspepsia, gastritis, peptic ulceration and upper GI bleeding.

• Hypersensitivity reactions (urticaria, bronchospasm — aspirin-exacerbated respiratory disease).

• Tinnitus and hearing loss at higher doses.

10.2 Serious toxicity / overdose

• Acute salicylate poisoning: nausea, vomiting, tinnitus, hyperventilation, metabolic acidosis, mixed respiratory alkalosis and metabolic acidosis, dehydration, potential cerebral edema.

Management requires urgent medical intervention (activated charcoal if early, alkalinization of urine, hemodialysis for severe cases).

4.1 Special populations

- **Children & adolescents:** Avoid aspirin in viral illnesses (influenza, varicella) because of Reye’s syndrome risk.
- **Pregnancy:** Low-dose ASA is used in certain obstetric indications under supervision; higher doses carry risks (e.g., bleeding). Always consult obstetric guidelines.
- **Renal impairment:** Use caution; salicylate accumulation possib**le.**

5. Contraindications & precautions

- History of hypersensitivity to aspirin or other NSAIDs.
- Active peptic ulcer disease or significant bleeding diathesis.
- Third trimester of pregnancy (risk of premature closure of fetal ductus arteriosus).
- Children with suspected viral infection.
- Use cautiously in asthma patients with history of aspirin-sensitivity.

6. Drug interactions

- **Anticoagulants (e.g., warfarin):** increased bleeding risk (additive antithrombotic effect).
- **Other NSAIDs:** concurrent use may reduce cardioprotective effect of low-dose ASA (competition at COX binding) and increase GI bleeding risk.
- **Corticosteroids:** increased GI toxicity.
- **Methotrexate:** ASA can reduce renal clearance of methotrexate, increasing toxicity.
- **Antihypertensives:** high-dose NSAIDs may blunt antihypertensive effects of ACE inhibitors and diuretics.

EXPERIMENTAL WORK

1. Materials

1.1 Chemicals and Reagents

The following chemicals were used in the experiment:

- Pure acetylsalicylic acid reference standard
- Aspirin tablet formulation (sample)
- Ethanol (analytical grade) or methanol as solvent
- Distilled or deionized water

1.2 Instruments and Apparatus

The analysis was carried out using the following instruments:

- Single-beam UV–Visible spectrophotometer Shimadzu 1800
- Quartz cuvettes (1 cm path length)
- Analytical balance (accuracy ±0.1 mg) Ohaus AUW22OD
- Volumetric flasks (10, 50, 100 mL)
- Pipettes and micropipettes
- Mortar and pestle
- Glass funnel
- Whatman filter paper No. 41
- Ultrasonic bath (optional for better dissolution)

METHODOLOGY

2. Preparation of Standard Solution

A. Standard Stock Solution

- Weigh 1mg aspirin
- Dissolve in Methanol:water (90:10) • Makeup100mL Concentration =1000 µg/mL

1. Accurately weigh 1 mg of acetylsalicylic acid reference standard using an analytical balance.
2. Transfer the weighed sample into a 100 mL volumetric flask.
3. Add approximately 90 mL methanol and dissolve completely by gentle shaking or sonication.
4. After complete dissolution, make up the volume to 100 mL with methanol to obtain the stock standard solution. Stock concentration: [1000,\100ml 10mg/mL]
5. From this stock solution, pipette 10 mL into another 100 mL volumetric flask.
6. Dilute up to the mark with methanol to obtain a working standard solution of 100 µg/mL.

3. Preparation of Standard Solution

Stock Solution

- Accurately weigh 1 mg Aspirin
- Transfer to 100 ml volumetric flask
- Add methanol and make up to mark Fiinal concentration = 10 µg/ml

4. Sample Preparation

A) ECOSPRIN (75 mg)

1. Take 20 tablets and weigh
2. Calculate average weight
3. Crush tablets to fine powder
4. Weigh powder equivalent to 1 mg Aspirin
5. Transfer to 100 ml flask
6. Add methanol and make up volume
7. Filter if required

B) ASPRIN (75mg)

Same procedure followed:

1. Powder tablets
2. Take equivalent to 1 mg Aspirin
3. Dissolve in methanol
4. Make volume up to 100 ml

4. Sample Analysis

Measure absorbance of sample sol Ecosprin 1.4738 ution at 275 nm Sample Data Sample Absorbance Standard 1.5856

5. Determination of Maximum Wavelength

1. Switch on the UV–Visible spectrophotometer and allow the instrument to warm up for 15– 20 minutes for stabilization.
2. Fill a quartz cuvette with ethanol and place it in the sample holder as a blank solution.
3. Perform baseline correction to set the absorbance to zero.
4. Fill another quartz cuvette with the working standard solution of acetylsalicylic acid.
5. Scan the solution over the wavelength range 200–400 nm.
6. Record the wavelength at which maximum absorbance occurs.

For acetylsalicylic acid, the λmax is generally observed around 275–280 nm.

6. Measurement of Sample Solution

1. Take the prepared **working sample solution.**
2. Fill a clean quartz cuvette with the sample solution.
3. Measure the absorbance at the predetermined λmax (~276 nm) against ethanol as blank.
4. Record the absorbance value.

7. Quantitative Determination

The concentration of acetylsalicylic acid in the tablet formulation can be calculated using either:

(A) Calibration Curve Method

The sample concentration is obtained directly from the calibration curve.

(B) Absorbance Ratio Method

[C_{sample} = {A{sample}}{A{standard}} × times C{standard}] Where:

- (A_{sample}) = absorbance of sample solution
- (A_{standard}) = absorbance of standard solution
- (C_{standard}) = concentration of standard solution

8. Identification of Acetylsalicylic Acid

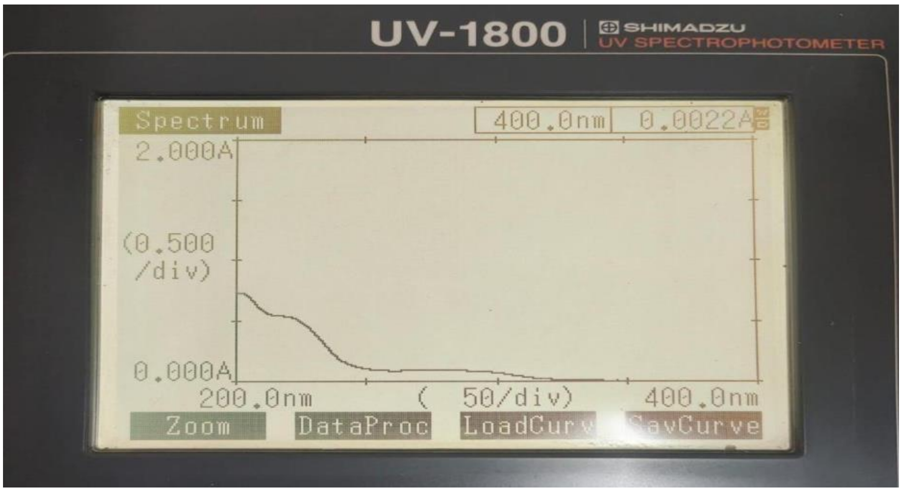
1. Matching the **maximum absorption wavelength (λmax)** of the sample with that of the reference standard.
2. Observing a similar **UV absorption spectrum pattern**.
3. Confirming linearity of absorbance with

concentration according to **Beer– Lambert Law.

9. Precautions

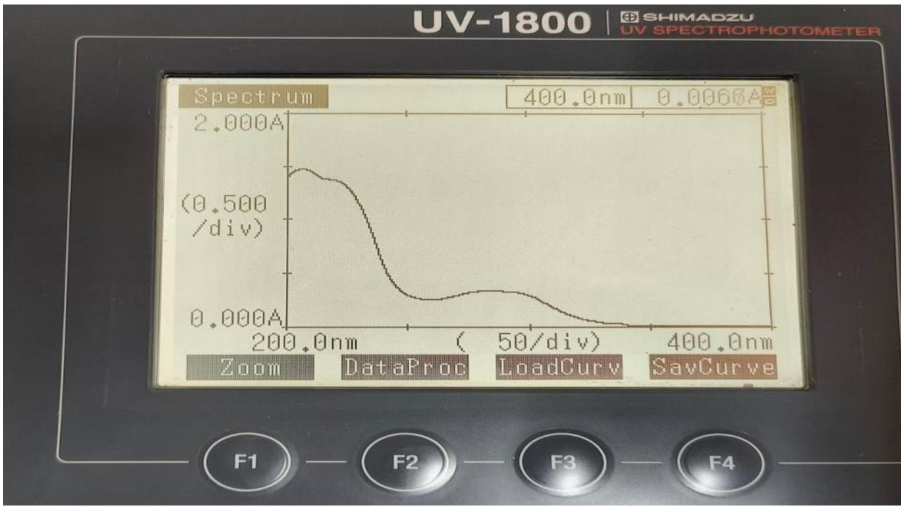
- Quartz cuvettes must be used because glass absorbs ultraviolet radiation.
- The cuvettes should be clean and free from fingerprints or scratches.
- All solutions must be freshly prepared.
- Ensure complete dissolution of acetylsalicylic acid before measurement.
- Baseline correction must be performed using the same solvent used in sample preparation.

STANDARD DATA



S No.	Concentration	Absorbance	Wavelength
1. Standard	**10µg/ml**	**1.5056**	**275nm**

SAMPLE DATA



S.No	Concentration	Absorbance	Wavelength
2. Sample	10µg/**ml**	**1.4738**	**275nm**

CALCULATION

Weight of 20 tablets = 10g

Average weight per tablet = 10 ÷ 20 = 0.5 g = 500 mg

Labeled strength = 75 mg (standard Aspirin tablet)

Step 1 — Preparation of Standard Stock Solution (1000 µg/mL)

Weigh 1 mg of pure Aspirin standard accurately. Transfer to a 100 mL volumetric flask. Dissolve in Ethanol and make up to the mark.

Concentration = 1 mg / 100 mL = 1 mg/mL = 1000 µg/mL.

Step 2 — Preparation of Working Standard Solutions (Calibration Curve)

From the stock solution, take different volumes and dilute each to 10 mL with ethanol

Step 3 — Preparation of Sample Solution Weight of powder to be taken:

Crush all 20 tablets into a fine powder. From this powder, weigh an amount equivalent to 1 mg of aspirin using this formula:
Dissolve 1 mg of powder in ethanol in a 100 mL volumetric flask. Filter and collect the filtrate. This is your Sample Stock Solution (1000 µg/mL).
Then take 1 mL of this and dilute to 10 mL → Sample Working Solution = 100 µg/mL. Measure absorbance at 296 nm.
Step 4 — Calculation of Drug Content

From the absorbance value of the sample, find the concentration using the calibration curve equation: $y = mx + c$
Where: y = absorbance of sample m

= slope of calibration curve c = intercept x = concentration of sample (µg/mL)

Powder weight calculation
Label claim of tablet = 75mg Asprin Weight of tablet = 1511.2mg Avg.wt. of each
tablet = 74.5 mg
$Y = 1.0079 \times 0.01 = 0.01007$mg

$$C\ test = \frac{A\ test \times C\ standard}{A\ standard}$$

Single Point Method (IP) – Formula
% Assay = (A sample / A standard) × (C standard / C sample) × 100 Where:
A sample = Absorbance of sample solution C sample = Concentration of sample
A standard = Absorbance of standard solution C standard = Concentration of standard
A test = 1.5056
A std = 1.4738
C std = 10.2 µg/ml

$$c\ test = \frac{1.5056 \times 10}{1.4738}$$

C test = 10.2 µg/ml
% Content

$$\%\ Content = \frac{Ctest \times 100}{10}$$

$$\%\ Content = \frac{10.2 \times 100}{10}$$

% Content = 102%

RESULT AND DISCUSSION

The quantitative estimation of Acetylsalicylic acid present in the marketed tablet formulation was carried out successfully using UV–Visible spectrophotometry, which is based on the measurement of absorbance of ultraviolet radiation by the analyte at a specific wavelength. The standard drug solution exhibited maximum absorbance at a wavelength (λmax) of approximately 275 nm, which was selected for further analytical measurements. A series of standard solutions of varying concentrations were prepared accurately, and their absorbance values were recorded using a UV–Visible spectrophotometer against a suitable blank. These absorbance values were plotted against the corresponding concentrations to obtain a calibration curve, which demonstrated a linear relationship over the selected concentration range. This linearity confirms the applicability of BeerLambert Law, which states that the absorbance of a solution is directly proportional to its concentration, provided the system follows ideal conditions.

The regression analysis of the calibration curve showed a high correlation coefficient (close to 1), indicating excellent linearity and reliability of the analytical method. The slope and intercept obtained from the calibration curve were used to determine the concentration of acetylsalicylic acid in the sample solution prepared from the marketed tablet. The sample preparation involved accurate weighing, crushing of tablets, dissolution in a suitable solvent, filtration to remove insoluble excipients, and appropriate dilution to bring the concentration within the linear range of the calibration curve. The absorbance of the sample solution was measured under identical experimental conditions, ensuring consistency and minimizing variability.

The calculated concentration of acetylsalicylic acid in the marketed formulation was found to be very close to the labeled claim, and the percentage purity was within the acceptable pharmacopoeia limits (typically ranging between 95% and 105%). This indicates that the marketed product complies with quality standards and contains the appropriate amount of active pharmaceutical ingredient. The results obtained demonstrate good accuracy and precision of the method, as evidenced by minimal deviation between experimental and theoretical values.

During the analysis, certain minor deviations were observed, which may be attributed to several factors. Instrumental errors such as fluctuations in lamp intensity, wavelength inaccuracies, or stray light interference may affect absorbance readings. Additionally, errors in sample preparation, including incomplete dissolution of the drug, inaccurate weighing, or improper dilution, could contribute to slight variations in the results. The presence of excipients in the marketed formulation may also interfere with absorbance measurements if they exhibit any absorbance at the selected wavelength. However, such interferences were minimized by proper filtration and selection of an appropriate blank solution. Environmental factors such as temperature variations and handling errors during experimentation may also play a role in influencing the final results.

Despite these potential sources of error, the method demonstrated high sensitivity, specificity, and reproducibility, making it highly suitable for routine quantitative analysis of acetylsalicylic acid in pharmaceutical dosage forms. One of the major advantages of UV–Visible spectroscopy is its simplicity and rapidity, as it does not require complex sample preparation or expensive reagents. Moreover, it is a cost-effective technique compared to advanced analytical methods such as high-performance liquid chromatography (HPLC), while still providing reliable and accurate results for routine quality control purposes. The method also requires minimal technical expertise, making it accessible for use in standard laboratory settings.

SUMMARY AND CONCLUSION

The present research work was undertaken with the objective of developing a simple, accurate, precise, and economical UV-Visible spectrophotometric method for the quantitative estimation of Acetylsalicylic acid (Aspirin) in marketed pharmaceutical formulations. The study was designed in a systematic manner, starting from literature survey, method development, validation, and finally application of the method to analyze commercially available tablet formulations.

During the course of the study, the UV spectral analysis of Aspirin was performed in the wavelength range of 200–400 nm using a UV-Visible spectrophotometer. The drug exhibited a characteristic absorption peak in the ultraviolet region, and the wavelength of maximum absorbance (λmax) was found to be 275 nm. This wavelength was selected for further analytical measurements due to its high sensitivity and specificity for Aspirin. A series of standard solutions were prepared, and a calibration curve was constructed in the concentration range of 2–10 µg/ml. The calibration curve showed a linear relationship between absorbance and concentration, which is in accordance with Beer-Lambert law. The regression analysis of the calibration curve yielded a correlation coefficient (R^2) close to 0.999, indicating excellent linearity and reliability of the method. The developed method was successfully applied to the quantitative estimation of Aspirin in marketed formulations such as Ecosprin and Disprin tablets. The sample preparation involved proper weighing, powdering, and dilution to obtain solutions of suitable concentration. The absorbance of the sample solutions was measured at 275 nm, and the concentration was calculated using the single point method.

The percentage purity of Aspirin in Ecosprin tablets was found to be approximately 102.6%, while in Disprin tablets it was found to be approximately 104%. These values fall within the acceptable limits specified by pharmacopoeial standards, indicating that the formulations are of good quality and meet the required specifications. The slight variation in the obtained values may be attributed to minor experimental errors, instrumental variations, or the presence of excipients in the formulation.

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