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QUANTIFICATION AND METHOD DEVELOPMENT OF BENZOYL PEROXIDE IN PHARMACEUTICAL GEL USING UV/ VIS-SPECTROPHOTOMETRY

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ABSTRACT

The key objective of this research is to provide a new quantitative test method for determining the quality and quantity of Benzoyl Peroxide from prescription drugs using UV/VIS-spectrophotometry techniques. This UV technique is based on Methanol and Acetone. The validation of the development technique was carried out in accordance with the International Conference on Harmonization. The wavelength chosen for the analysis Is 264nm. The regression equation y = 0.0977x – 0.2134 shows that the approach has excellent linearity over the range of 5 to 15 ug/ml. This work contributed to better use of pharmaceutical medications and a clear grasp of the Benzoyl Peroxide content, or doses to be provided not just for acne treatment but also for overall health.

KEYWORDS: Benzoyl peroxide (BPO), UV-Spectroscopy (UV), Linearity, Precision, Accuracy

INTRODUCTION

Benzoyl peroxide is a frequent element in skincare products, especially those intended to cure acne. It is a topical drug it has been used for several decades because it effectively treats acne problems. Benzoyl peroxide helps by decreasing acne-causing germs on the skin, unclogging pores, and lowering inflammation. Benzoyl peroxide is essentially insoluble in water. It is soluble in a variety of organic solvents, such as acetone, ethanol, chloroform, ether, and dichloromethane.

When used for the skin's surface, benzoyl peroxide produces oxygen, creating an atmosphere full of oxygen that is unfriendly to the germs that cause acne. It also helps to eliminate extra oil and skin cells that have died from the skin's surface, which prevents them from blocking the pores. Benzoyl peroxide, which targets both bacteria and factors that lead to pore blockage, can be an effective treatment for a variety of acne types, includes mild to moderate acne that is inflammatory.

The solubility of benzoyl peroxide in a given solvent is determined by a number of parameters, including temperature, pressure, and the presence of other solutes, such as sodium chloride. Benzoyl peroxide is a natural peroxide having the chemical formula: $C_{14}H_{10}O_4$. It is a white, crystalline substance with a melting point of around 105°C -110°C.

The molecular mass of benzoyl peroxide is 242.23 g/mol. Benzoyl peroxide's IUPAC name is benzene carboperoxoate. Common names: Benzoyl peroxide Benzoyl peroxide has the appearance of an odourless white powder.

Solubility: Very soluble in solvents that are organic, such as acetone and methanol. In terms of reactivity, benzoyl peroxide can react with a wide range of chemical molecules, including alcohols, ketones, and aldehydes, via a method known as free radical addition. Benzoyl peroxide's reactivity makes it useful in a variety of industrial processes, including the manufacturing of polymers, plastics, and adhesives.

In general, benzoyl peroxide is a reactive chemical molecule with both oxidative and free radical characteristics. Its capacity to produce oxygen and interact with organic molecules makes it a versatile chemical in a variety of uses, including acne treatment and industrial processes.

Theory of UV spectroscopy:

UV spectroscopy, also known as ultraviolet-visible spectroscopy, studies how matter interacts with light in the ultraviolet and visible parts of the electromagnetic spectrum. It entails measuring the degree of light absorption by the material at different wavelengths.

UV spectroscopy involves passing a beam of UV or visible light across a sample and measuring the degree of light absorbed by the sample. The resulting spectrum, known as a UV Vis spectrum, displays the strength of the absorbed light as an outcome of wavelength.

UV spectroscopy is a popular technique in analytical chemistry for identifying and quantifying compounds since various molecules absorb light at different wavelengths. It is also used in biochemistry to investigate the structures and activities of proteins, nucleic acids, and other biological substances.

UV spectroscopy can provide vital information about a molecule's electrical structure since light absorption in the UV and visible regions corresponds to electron excitation to higher energy levels. The resultant spectra can be used to find functional groups and estimate the concentration of a chemical in a sample.

UV spectroscopy has a variety of applications, including drug discovery, environmental analysis, and quality control in the sector of food and beverages.

UV spectroscopy is a commonly utilized and adaptable method with numerous practical applications in both science and industry.

Application of benzoyl peroxide:

Benzoyl peroxide is a medicine used mostly to treat acne. It works by lowering the quantity of bacteria that cause acne on the skin and aiding in the removal of dead cells from the skin and excess oil, both of which can contribute to acne.

Benzoyl peroxide comes in a range of topical forms, including creams, gels, lotions, and washes. It is often used to the affected regions of the skin once or twice a day, depending on the potency of the product and the degree of severity of acne.

In addition to treating acne, benzoyl peroxide can be being utilized as a topical antiseptic for small cuts and burns. It can also be used to treat seborrheic dermatitis, a skin ailment that results in red, scaly spots on the face and scalp.

It is vital to know that benzoyl peroxide might irritate the skin, causing dryness, redness, and peeling. It is advisable to begin with a lesser dosage product and gradually raise as tolerated. When using benzoyl peroxide, it is also necessary to use sunscreen and prevent long-term sun exposure because it may elevate the risk of dermatitis.

Common applications of benzoyl peroxide:

1.Acne therapy: The most often used treatment for acne is benzoyl peroxide. It can be obtained in a range of strength levels, between 2.5% to 10%. It is usually administered once or twice every day to the afflicted areas of skin. Benzoyl peroxide is helpful at treating every kind of acne, including blackheads as well whiteheads, and inflammatory acne.

2. Acne prevention: Benzoyl peroxide can also be used to avoid acne breakouts. When used on a daily basis, it can help to maintain pores clear and prevent the chance of developing fresh acne.

3. Antiseptic: This compound can be applied as a topical antiseptic to small cuts and burns. This allows to avoid infection and promotes recovery.

4. Seborrheic dermatitis: Benzoyl peroxide can also be used to treat seborrheic dermatitis, which is characterized by red, scaly spots on the face and scalp. It helps to minimize irritation and peeling of the skin.

USES OF BENZOYL PEROXIDE

Benzoyl peroxide is a medicine used mostly to treat acne. It works by lowering acne-causing germs on the skin and aiding in the removal of dead cells in the skin and excess oil, both of which may be contributing to acne. Here are some frequent uses for benzoyl peroxide.

LITERATURE REVIEW

1. **Nathanael Heckmann, MD, K. Soraya Heidari, MD, Omid Jalali, BS, Alexander E. Veber, MD. (2019)** Cutibacterium acnes persists after topical clindamycin and benzoyl peroxide treatment. The study's goal was to examine the efficacy of topical benzoyl peroxide monotherapy, topical clindamycin alone, and a combination of topical benzoyl peroxide and clindamycin in treating c acnes in the dermal layer of the skin. Clindamycin and benzoyl peroxide were applied serially but failed to entirely remove C acne from the skin's dermal layer in all participants. Additional clinical research is needed to assess the role of topical antimicrobial therapy in decreasing C acnes infections after shoulder surgery.
2. **R. Dave Jay and Benjamin Surbhi (2018)** provides a new method for detecting and quantifying benzoyl peroxide in wheat flour samples using spectrophotometry. The authors are both connected with PAHER University in Udaipur, India, where Mr. Jay is a Ph.D. scholar and Ms. Surbhi is an assistant professor. The authors' method is based on a reaction between benzoyl peroxide and potassium iodide in an alcoholic solution, which results in the oxidation of potassium iodide and the generation of colored iodine. The greatest absorption peak is seen at 580 nm wavelength.
3. **R. Dave Jay and Benjamin Surbhi (2018)** devised a spectrophotometric approach to detect benzoyl peroxide in wheat flour samples. This proposed method is a simple, fast, and sensitive method for determining benzoyl peroxide in wheat flour samples. The results were satisfactory. This method was compared to the other method. The proposed method relies on an alternate procedure. The proposed technology was successfully used to detect benzoyl peroxide in a wheat flour sample.
4. **Emine kahramam, Gul Ozhan (2016)** proposed using polymeric micellar nanocarriers of benzoyl peroxide as a follicular targeted strategy for acne treatment. This method of benzoyl peroxide-loaded micelle formulation using Pluronic was developed and characterized. Overall data suggest that Pluronic f127 micellar nanocarriers may enable efficient and safe drug delivery to the skin by targeting hair follicles, which would improve the topical delivery of drugs used in dermatological diseases such as acne. This strategy requires additional well-designed in vivo investigations to confirm the in vitro findings and establish the therapeutic effectiveness potential of produced micellar carriers.
5. **Kraingkrai Ponhong, Kate Grudpan, Ponhong et al. (2015)** developed a unique and effective spectrophotometric method for determining benzoyl peroxide (BPO) in wheat flour samples. The authors sought to address the need for a quick and sensitive method to identify and quantify BPO, a common bleaching chemical and dough conditioner in the food sector. BPO residues in wheat flour represent possible health hazards to consumers, hence proper measurement is critical for food safety.

6. **Shiqi Xu, veronica l. cavera, Micheal a. rogers, Qingrong huang, Konstantin Zubovskiy, and Michael L. chikindas. (2013)** Benzoyl peroxide-formulated polycarbophil/Carbopol 934P hydrogel with specific antibacterial activity, potentially useful for the treatment and prevention of bacterial vaginosis. In this study, we designed and tested a BPO-encapsulated hydrogel formulation that inhibits the growth of the BV-associated pathogen G. vaginal ecosystem. The gel's rheological qualities indicate that it is suitable for the recommended use.
7. **Rohini Wankhede, suhasini bhalerao, hiten panchory, aruna pundir, ram pradhan (2012),** The developed approach aimed to determine the concentrations of erythromycin and benzoyl peroxide in the gel. The specificity, reproducibility, and recovery of both approaches were investigated. The proposed methods for the simultaneous estimate of erythromycin and benzo peroxide in combination dosage were found to be accurate, simple, and speedy, with well-understood validation results. The

linear regression equation method revealed linearity between erythromycin and benzoyl peroxide at various concentrations.

8. **Vijay k. Kaushik, Anil Kumar, Susheel Kalia (2012)** The influence of mercerization and benzoyl peroxide treatment on the morphology, thermal stability, and crystallinity of sisal fibers. This technology was established through the study of natural fibers as an alternative for man-made fiber. This approach involves sisal fibers being changed with alkali and BPO solutions of varying concentrations or time intervals. Morphological changes in thermal stability and crystallinity of fibers were studied using scanning electron TGA and XRD techniques.
9. **Mu, G., Liu, H., Gao, Y., & Luan, F. (2012)** The authors discuss the growing worry in China about the addition of BP to wheat flour and the necessity for an accurate way to identify its presence. While medical research has not definitively shown the detrimental effects of BP in wheat flour on human health, it is critical to monitor its levels because benzoic acid is its primary metabolite in the human body.
10. **Qiui wang, wenzhenshi and caiyun hou (2010) determination of benzoyl peroxide content in wheat products by high-performance liquid chromatography** We described a method for accurately determining the concentration of benzoyl peroxide contamination in wheat flour and wheat products using high-performance liquid chromatography analysis. The standard curve of BP concentration against peak area for steaming bread (C = 1.9711a-0.0938, r2 = 0.9999) and noodles (C = 1.9711a-0.0938, r2 = 0.9999) showed a significant linear response ($P < 0.01$) across a wide range of concentrations.
11. **Ankush Gupta, Monica Gulati and Narendra Kumar Pandey (2009)** Designed for the simultaneous measurement of benzoyl peroxide and tretinoin in bulk and semi-solid dose forms. This proposed approach is a simple sensitive spectrophotometric method in which the standard solution of benzoyl peroxide exhibits maximum absorbance at 234 nm. Statistical evolution of analysis and recovery experiments were conducted. The proposed approach demonstrated satisfactory method accuracy, with low standard deviation values.
12. **James J. leyden, MD, Mitchell Wortman, PhD, Edward k. Ballwin Antibiotic (2008)** Benzoyl peroxide cleanser suppresses resistant Propionibacterium acnes. 6% of this approach is sensitive. Samples from all 30 participants revealed P acne strains with erythromycin MIC levels greater than 512ug/mL. Therapy with BOP cleanser 6% resulted in a considerable reduction in overall acne. Count and counts of erythromycin/clindamycin, tetracycline, doxycycline, and minocycline resistant strains after one week of therapy.
13. **Qihul wang, wenzeen shi & caiyun hou (2008)** Describe a method for using high performance liquid chromatography to properly measure the concentration of the contaminant benzoyl peroxide in wheat flour and wheat products. The suggested method is a simple HPLC method for determining BP in wheat flour products. This approach should be useful for analyzing BPAF concentrations because there are various regulations about wheat flour.
14. **Ali Nokhodchi, Mitra Jelveghari, Mohammad, Reza Siahi, Siavoosh Dastmalchi (2005).** Devised a method for determining how formulation type affects the release of benzoyl peroxide from microsponges. High performance liquid chromatography was used to determine the amount of BPO microsponges, and UV detection at 265 nm detected the eluent. Data were collected, and the results showed that the drug ratio increased and the release rate was obtained from lotions containing BPO micro particles, while the lowest was obtained from cream formulations.
15. **Hiroki Kubota (2004)** The work extends beyond determining BP and BA in flour, successfully detecting the presence of BP in imported noodles using LC-MS analysis. This extra verification method strengthens the HPLC-based technique's trustworthiness while also providing a full review of the tested food samples.
16. **Yukiko Abe onishi, Chikako Yomoto Naoki Sugimoto, Hiroki Kubota, Kenichi Tanamoto. (2004)** Developed a High-Performance liquid chromatography method for determining benzoyl peroxide and benzoic acid in wheat flour using HPLC and identifying it with High Performance liquid chromatography-mass spectrometry. This method is easy and reliable for determining the amount of benzoyl peroxide and benzoic acid. It uses a C18 mobile phase. The retention duration of benzoyl peroxide was 17.5 minutes, and absorbance was measured at 235 nm. This is a simple and reliable HPLC method for quantifying BP and BA separately.
17. **A.I. Saiz, G.D. Manrique, and R. Fritz (2001)** The stated method is the use of HPLC to determine the quantities of benzoyl peroxide and benzoic acid during the bleaching process. Wheat flour samples were treated with 150ppm BPO to begin the bleaching process, with a maximum benzoic acid

concentration of 16ppm.This approach compares the UV absorbance of a standard preparation of benzoyl peroxide, benzoic acid, and a sample flour treated with a bleaching agent. Benzoyl peroxide recovers at 79%, while benzoic acid recovers at 80%

18. **Donald P. Lookingball, MD, Dan K. Chalker, MD, jane S. Lindholm, MD, Harry Irving Katz MD, Stephen E. (1997**) Determined by Treatment of acne with clindamycin/benzoyl peroxide gel versus clindamycin gel, benzoyl peroxide gel, and vehicle gel: combined findings of two double-blind studies. To assess the efficacy and safety of a clindamycin/benzoyl peroxide gel as compared to benzoyl peroxide, clindamycin, and vehicle gels. In the treatment of acne, topical clindamycin/benzoyl peroxide combo gel is well tolerated and superior to either ingredient alone.
19. **Nehru gaddip, frank volpe and g. anthony (1983)** A selective high performance liquid chromatographic technique for the quantitative detection of benzoyl peroxide in medicinal dosage forms is. This approach describes a selective titrimetric procedure that modifies the generally used iodometric method, and Oliveri-High and Hainsworth proposed an HPLC procedure that is selective in the presence of benzoic acid and benzoic acid. The proposed approach is simple, precise, accurate, and specific in its measurement of benzoyl peroxide. This method includes spectrophotometry, polarography, TLC, and high-performance liquid chromatography.
20. **Akshata Lasure, Afaque Ansari, and Dr. Mallinath Kalsheti** were developed. A new affordable sensitive, simple, and rapid UV spectrophotometric approach for the measurement of benzoyl peroxide in pure form and pharmaceutical formulation. The proposed method is accurate, exact, stable, linear, specific, and simple for quantifying bpo in bulk and prescription dosages.
21. **Linda Stein Gold, MD; Jerry Tan, MD; Alma Cruz Santana, MD; Kim Papp, MD; Yves Poulin, MD; Joel Schlessinger, MD; Jud Gidher, BS; Yn Lu, PhD; and Michael Graeber, MD. Galderma R&D Inc.** provided funding for this study. Dr. Stein Gold, and This study provides compelling evidence for the efficacy and safety of a fixed-dose combination gel containing adapalene and BPO in the treatment of acne vulgaris. The combination of these two medicines has complementary modes of action, targeting both comedonal and inflammatory acne lesions. The combo gel's early treatment efficacy implies that it could be an effective alternative for quickly lowering acne lesion counts. The combination gel has a comparable safety profile to monotherapies and gel vehicles, indicating that it is a well-tolerated therapeutic alternative. Overall, this study supports the use of adapalene-BPO combination gel as an effective and safe treatment for acne vulgaris.

NEED OF PRESENT INVESTIGATION

A number of drugs are introduced in the market every year pharmaceutical products formulated with single drug or in combination, are intended to meet previously unmet patients need and to achieve better therapeutic effects. These products can present daunting challenges to the analytical chemist responsible for the development and validation of analytical methods. To consider the quality of the product and to carry out the analysis of the content without separating of extracting became today's need, because such processes of extraction or separation are time consuming, tedious and always costlier. Therefore, it is necessary to develop a rapid, accurate and reproducible method to estimate the drug concentration in presence of other drugs, chemicals, excipients etc**.**

OBJECTIVE OF PRESENT INVESTIGATION

The study makes an attempt to establish sensitive and accurate analytical method for estimation of perindopril erbumine in bulk and pharmaceutical dosage form.

1. To develop analytical method for active pharmaceutical ingredient (API) in dosages form.

2. To develop newer analytical methods of perindopril erbumine byspectrophotometry and chromatography.

3. To Validate and develop analytical method as per ICH guidelines.

PLAN OF WORK

1. Literature Review.
2. Selection and procurement of drug, chemicals and dosage form.
3. Determination of solubility of drug in different solvents.
4. Selection of analytical techniques.
   - UV. Spectrophotometry.

❖ Estimation of Benzoyl Peroxide by UV Spectrophotometric Method Involving Following Steps:
   - Selection of common solvent.
   - Study of spectra
   - Selection of method and wavelength.
   - Analysis of Marketed formulation
   - Validation of developed method includes accuracy, precision, LOD, LOQ, Linearity, Robustness, and Ruggedness.

DRUG PROFILE

❖ **IUPAC Name**: benzoyl Benzenecarboperoxoate
❖ **Structure of Benzoyl peroxide:**

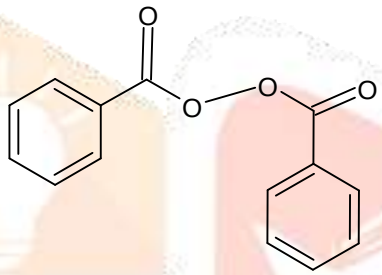

fig 1. structure of benzoyl peroxide

❖ **Molecular Formula;** $C_{14}H_{10}O_4$
❖ **Molecular Weight:** 242.23 g/mol
❖ **Description:** White granular or crystalline solid with a faint odour of benzaldehyde**.**
❖ **Melting Point:** 103 °C
❖ **Solubility:** Poorly soluble in water but soluble in acetone, ethanol, and many other organic solvents.
❖ **Category:** Antiseptic, Antiacne, Anti-inflammatory etc

MATERIALS AND EQUIPMENT

Reagent: Benzoyl Peroxide 97% pure was acquired through RESEARCH LAB FINE CHEM INDUSTRIES in Mumbai. The acetone and methanol used were analytical grade.

Instrument:

- UV-visible spectrophotometer SHIMADZU scientific instrument Standard cuvettes with a 10 mm route length are utilized for analysis.

fig 2: uv-1900i shimadzu spectrophotometer

- Drug and sample were weighed using an electronic ATOM analytical balance.

fig 3: weighing balance

CHEMICALS:

Benzoyl peroxide was kindly supplied as standard sample was purchased form REASEARCH-LAB FINE CHEM INDUSTRIES Mumbai.

5% Benzoyl peroxide gel is purchased from local market.

Acetone, Methanol.

EXPERIMENTAL INVESTIGATION:

Preparation of standard stock solution:

100 mg drug was properly weighed into a 100 ml volumetric flask, dissolved in 10 ml of acetone, and sonicated for 2 minutes before being volumetrically filled with 100 ml of methanol (1000ppm). We take 10ml of the aforesaid solution and dilute it to 100ml, then make it up to the mark (100ppm). From the above solution, take 2.5ml and put it to a 25ml volumetric flask, sonicate it for 2 minutes, then dilute it with methanol to the mark.

Preparation of sample stock solution

5 grams were correctly weighed into a 100 mL volumetric flask. It was dissolved in a volumetric flask with 10 mL of acetone and sonicated for 2 minutes before being diluted with 100 mL of methanol. Take 2.5ml of the aforementioned solution and transfer it to a 25ml volumetric flask that has been sonicated for 2 minutes. Dilute with methanol to the mark.

Determination of λmax:

To identify the wavelength for measuring benzoyl peroxide solution, it was scanned in the 200-400 range over methanol as a blank solution.

The wavelength of maximum absorption was measured for the medication. The highest absorption wavelength for benzoyl peroxide is 264 nm.

table no. 1 determination of wavelength

Wavelength/nm	Absorbance
205	1.6497
215	2.4884
225	2.7652
235	2.9154
245	2.9303
255	2.8716
264	**2.794**
275	2.6868
285	2.6234
295	1.0912
305	0.4218
315	0.1426
325	0.0603
335	0.0421
345	0.0345

Analytical Method of Validation

Linearity:

Five separate concentrations in a range of 5 to 15 ppm were prepared and evaluated at wavelength 264nm. The absorbance ranged from 0.0977 to 0.2134 and was linear with a regression coefficient r2 of 0.9995.

Accuracy:

Solutions were produced in triplicate at 50%, 100%, and 150% of the test concentration using benzoyl peroxide samples, and absorbance was measured three times. The percentage recovery ranged from 105% to 103%. Consequently.

Precision:

Weigh 1gm of benzoyl peroxide precisely and transfer to a 100 ml volumetric flask containing 10 ml of acetone. Sonicate for 5 minutes before adding methanol to fill to 100 ml. Six replicates were used to analyze the solution**.**

Limits of quantification (LOQ) and detection (LOD):

To assess the method's sensitivity, the LOD and LOQ were used. LOD stands for limit of detection, which is the method's ability to quantify an analyte's minimum concentration in a sample as precisely as possible . The limit of minimal detection capability of the method used to test the analyte in a sample that reliably quantitates it with the required degree of accuracy and precision is known as the limit of quantification, or LOQ.

Robustness

Robustness was tested by making deliberate small changes in concentration of solvent used in estimation of API's and observed the changes in various parameters like absorbance maximum, Beer's law limit, slope, intercept and correlation coefficient.

RESULT AND DISCUSSION:

The method used to validate benzoyl peroxide was determined to be accurate, with a percentage of standard deviation (%RSD) value of 0.3340. The validation method also indicated that it was specific, with a percentage recovery of 102.9%. The assay results confirmed that the amount of medication was consistent with the label claim of the relevant formulation.

Wavelength of Benzoyl Peroxide

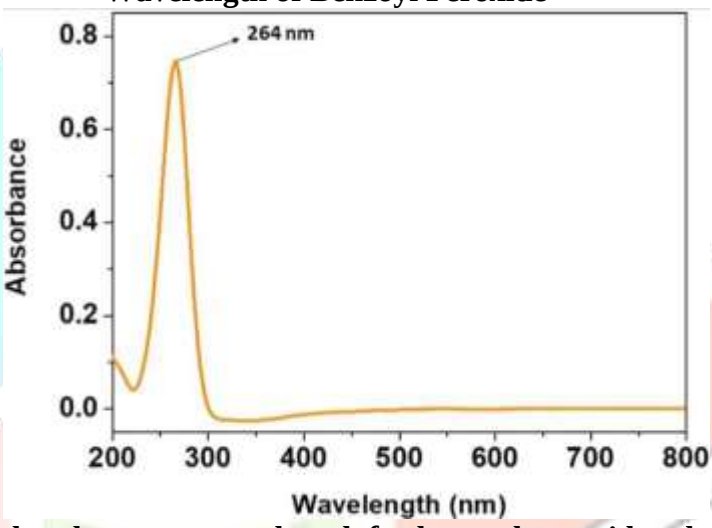

fig no. 4 graph of absorbance vs. wavelength for benzoyl peroxide solution by uv/vis spectrophotometry technique

Linearity:

Five separate concentrations in a range of 5 to 15 ppm were prepared and evaluated at wavelength 264nm. The absorbance ranged from 0.0977 to 0.2134 and was linear with a regression coefficient r2 of 0.9995, indicating that the studied parameter was table 1.

table 2: result of linearity for benzoyl peroxide

Sr no	Concentration of PPM	Absorbance
1	5	0.2655
2	7	0.4826
3	10	0.7601
4	12	0.9636
5	15	1.2478

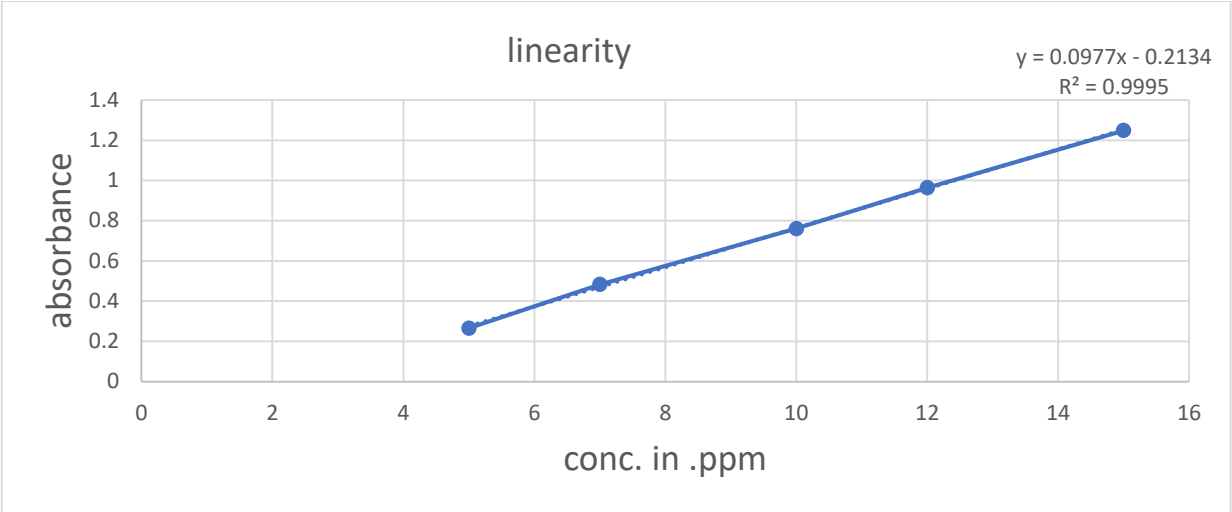

fig no.5 linearity

table no 3. result of linearity

Sr.no	Absorbance.1	Absorbance.2	Absorbance.3	Mean	SD	%RSD
1.	0.2651	0.2655	0.2659	0.2654	0.0212	0.075
2.	0.4822	0.4826	0.4830	0.4826	0.0004	0.0828
3.	0.7696	0.7601	0.7606	0.7601	0.0007	0.0920
4.	0.9632	0.9636	0.9640	0.9636	0.0002	0.0207
5.	1.2973	1.2478	1.2483	1.2478	0.0001	0.0404

a) Standard Derivation (S.D) =

Where,

X = absorption

X = mean

n = no. of reading

$$SD = \sqrt{\frac{\sum(x - \bar{x})^2}{n - 1}}$$

b) %Relative Standard Deviation (RSD)

In this method % Relative Standard Deviation was calculated the following formula

$$\%RSD = \frac{\text{value of SD}*100}{\text{Mean}}$$

Accuracy:

Solutions were produced in triplicate at 50%, 100%, and 150% of the test concentration using benzoyl peroxide samples, and absorbance was measured three times. The percentage recovery ranged from 105% to 103%. Consequently, the parameter was confirmed to be validated.

table 4: result of accuracy for benzoyl peroxide

Sr No.	Accuracy level	Mean	Absorbance ± SD	% RSD
1	50%	0.555	0.00183	0.3243
2	100%	1.011	0.00111	0.1088
3	150%	1.442	0.00155	0.1040

Precision:

Weigh 1gm of benzoyl peroxide precisely and transfer to a 100 ml volumetric flask containing 10 ml of acetone. Sonicate for 5 minutes before adding methanol to fill to 100 ml. Six replicates were used to analyze the solution**.**

table 5: result of precision

Sr No.	Concentration	Absorbance	SD	% RSD
1	5	0.1673	0.00057	0.3390
2	5	0.1676		
3	5	0.1686		
4	5	0.1686		
5	5	0.1686		
6	5	0.1682		

LOD (Limit of Detection) and LOQ (Limit of Quantification):

The LOD is calculated from a set of five calibration curves used to assess technique linearity. To compute the limit of detection, use the formula

LOD = 3.3 x (SD / Slope).

Where,

SD is the standard deviation of the Y-intercept of five calibration curves.

Slope equals the average slope of the five calibration curves.

LOD: 3.3 x (3x10-4)/0.0977 = 0.0092.

The LOQ is calculated using a set of five calibration curves designed to assess technique linearity. The LOQ can be calculated as:

LOQ = 10 x (SD/Slope).

Where SD represents the standard deviation of the Y-intercept of five calibration curves.

Slope equals the average slope of the five calibration curves.

LOQ = 10 x (3x10-4)/1.1307.

= 0.0307

Robustness

To identify the wavelength for measuring benzoyl peroxide solution, it was scanned in the 200-400 range over methanol as a blank solution.

The wavelength of maximum absorption was measured for the medication. The highest absorption wavelength for benzoyl peroxide is 264 nm.

CONCLUSION

The research successfully developed and tested a method for monitoring concentrations in a solution using benzoyl peroxide UV spectroscopy.

This provides a simple, rapid, as well as sensitive method for determining benzoyl peroxide. The development technique included preparing known quantities of benzoyl peroxide solutions, measuring their UV spectra, determining the wavelength of maximum absorption, and creating a calibration curve that relates absorbance to concentration. The approach was determined to be accurate, exact, and linear. The recovery result showed good accuracy; thus, the UV spectrophotometer results are noteworthy.

SUMMARY OF THE PROJECT

Benzoyl peroxide is a chemical molecule often used to treat acne. It is an organic peroxide with antibacterial and keratolytic qualities, which means it can eliminate microorganisms on the skin while also unclogging pores.

Many over-the-counter acne remedies contain benzoyl peroxide, which comes in a number of formulations like as creams, gels, lotions, and washes. It is also accessible with a prescription at higher strengths.

When applied to the skin, benzoyl peroxide works by releasing oxygen into the pores, thereby killing germs that can turnover and improving the overall appearance of the skin. Benzoyl peroxide is typically safe for most people to use, although it can cause some complications. These can include skin dryness, redness, peeling, and itching. In rare situations, the medicine might produce an allergic reaction, including hives, swelling, and difficulty breathing.

Benzoyl peroxide is relatively stable when stored in a dry, cool atmosphere, but it decomposes quickly in the presence of heat, light, or moisture. For the measurement of benzoyl peroxide in various pharmaceutical samples. The standard, Solution, was prepared. By using pure benzyl peroxide for the sample. Benzyl peroxide (a 5% gel tube).

For the wavelength, scan the entire spectrum of UV absorbance Bom He 200 to 400. The wed sample of UV range absorbance or wavelength scan is 5ppm. The Simple UV-vis spectrophotometer Method. The absorbance maxima for Benzyl peroxide were determined at 264 nm. The mobile phase was methanol. The concentrations range between 5 and 15 ppm. The determination coefficient was 0.9995. The relative standard deviation for the benzoyl peroxide solution is 0.3390.

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