International Journal of Social Science, Educational, Economics, Agriculture Research and Technology (IJSET) | ISSN (e) : 2827-766X
Volume 4 No. 9 (2025)

REVIEW OF THE USE OF UV-VIS SPECTROPHOTOMETRY IN ANALYSIS ACTIVE COMPOUNDS IN HERBAL PRODUCTS

Nurul Azizah[1], Firda Sahara Nida[2], Siti Nurdiana[3], Sheva Firdaus. N[4], La Ode Akbar Rasydy[5].
Faculty of Pharmacy, Muhammadiyah University of A.R. Fachruddin
E-mail: nurulazizah7711@gmail.com

Received	: 20 May 2025	Published	: 03 July 2025
Revised	: 28 May 2025	DOI	: https://doi.org/10.54443/ijerlas.v4i6.2061
Accepted	: 15 June 2025	Link Publish	: https://www.ijset.org/index.php/ijset/index

Abstract
UV-Visible spectrophotometry (UV-Vis) is one of the most widely used instrumental analytical methods in the fields of pharmacy, food science, and analytical chemistry, particularly for determining the concentration of active compounds in various types of samples. The working principle of UV-Vis spectrophotometry is based on the ability of a compound to absorb light at a specific wavelength, resulting in an absorbance value proportional to the concentration of the substance in solution. This method is considered efficient due to its relatively simple operation, short analysis time, and lower cost compared to other instrumental methods such as HPLC, AAS, or GC-MS. In addition, UV-Vis spectrophotometry can be applied to a wide range of compounds containing chromophoric groups, making it suitable for analyzing herbal products that consist of complex natural matrices. This study aims to review the application of UV-Vis spectrophotometry in the analysis of active compounds in herbal products through a literature review of ten relevant and recent scientific journals. Based on the results of the review, it was found that UV-Vis spectrophotometry is widely used to analyze compounds such as flavonoids, vitamin C, caffeine, paracetamol, and oxalates derived from natural sources such as tea, fruits, vegetables, as well as traditional herbal preparations such as jamu and supplements. In addition, this method is also applied in solubility studies of active compounds within drug delivery systems such as Self-Nanoemulsifying Drug Delivery Systems (SNEDDS), analytical method validation, and evaluation of compound stability in final formulations. Several studies also demonstrated the ability of UV-Vis spectrophotometry to detect the presence of synthetic contaminants in herbal products quickly and simply. From the overall findings, it can be concluded that UV-Vis spectrophotometry plays a significant role in the development, formulation, and quality testing of herbal-based products. This method is not only practical and efficient but also capable of producing reliable quantitative data that can be applied in various research and industrial contexts.

Keywords: UV-Vis spectrophotometry", "herbal products", "active compounds", "quantitative analysis", "literature review

INTRODUCTION

The demand for herbal products in Indonesia continues to increase along with increasing public awareness of natural lifestyles and the use of traditional medicine as an alternative to modern therapy. Herbal products are often chosen because they are considered safer, have minimal side effects, and come from natural ingredients that have been used for generations. However, claims of efficacy and safety of herbal products must be supported by valid and standardized scientific evidence. Therefore, an analysis method is needed that can ensure the content of active compounds in the product, so that the quality and consistency of the product are maintained over time (Ministry of Health of the Republic of Indonesia, 2017).

One of the methods widely used in herbal product analysis is UV-Vis spectrophotometry. This instrument works based on the principle of light absorption by a compound at a certain wavelength, producing quantitative data that can be used to determine the concentration of active substances in a sample. This method is considered simple, fast, and economical, so it is widely used in both academic

laboratory research and quality testing in the pharmaceutical and food industries (Dalimartha, 2010). UV-Vis spectrophotometry is ideal for analyzing compounds with chromophore groups, such as flavonoids, phenolics, vitamins, and other compounds commonly found in medicinal plants.

The availability of standardized analysis methods is an important part of the herbal product quality control system. UV-Vis spectrophotometry is also often used in the validation of analysis methods because it has a fairly high sensitivity and can produce consistent results. In a study conducted by Harahap et al. (2015), UV-Vis spectrophotometry can be used to determine flavonoid levels in soursop leaf extract with results that meet validation parameters such as linearity, accuracy, precision, and detection limits. This method can also be applied to detect dangerous synthetic compounds mixed into herbal products, such as paracetamol or steroids, which of course can endanger consumer health if not detected early (BPOM, 2022).

In addition, the use of UV-Vis spectrophotometry is also developing in the context of the formulation and development of natural-based drug preparations. For example, compounds that have low solubility such as curcumin or its derivatives can be analyzed for their solubility in drug delivery systems such as SNEDDS (Self-Nanoemulsifying Drug Delivery System) using the UV-Vis method. In this case, this tool is not only used to measure the levels of active ingredients, but also to evaluate the efficiency of the delivery system (Putri et al., 2021). In other words, UV-Vis spectrophotometry is an important tool in supporting phytopharmaceutical-based innovation and the development of modern herbal products that comply with applicable scientific standards and regulations.

Through this literature review, the author attempts to review and analyze how UV-Vis spectrophotometry is used in various scientific studies to analyze active compounds in herbal products. By summarizing ten relevant journals, it is hoped that a complete picture can be obtained regarding the trend in the use of this method, the types of samples and compounds commonly analyzed, and the effectiveness of UV-Vis spectrophotometry as an analytical tool in research and quality control of medicinal plant-based products (Rahmawati et al., 2022).

METHOD

This study was conducted using a literature study approach that aims to review the use of UV-Vis spectrophotometry in the analysis of active compounds in herbal products. Data sources were obtained from ten scientific journals accessed through databases such as Google Scholar and ResearchGate, considering the relevance of the topic and the availability of complete manuscripts. The selected journals are publications that use UV-Vis spectrophotometry as the main method in analysis, and focus on natural materials, medicinal plants, or herbal preparations. The analysis process was carried out descriptively by observing the types of compounds tested, the purpose of using the tool (such as quantification, validation, or solubility testing), and its contribution to the research process. The results of the analysis were used to identify general patterns and trends in the use of UV-Vis spectrophotometry in the field.

RESULTS AND DISCUSSION

Table 1.Results

Author Name, Year	Journal Title	Summary of Results
Antonia Vani Kurniawati, IAK Pramushinta, AS Sinulingga, Novamei Indriani (2024)	Comparative Analysis of Total Flavonoid Levels of Green Tea and Black Tea Using Spectrophotometric Method UV-Vis	The results showed that the total flavonoid content in green tea was higher than in black tea. UV-Vis spectrophotometry has been proven to be effective in comparing the phenolic compound content between two types of tea and can be applied as a method of controlling the quality of food or herbal drinks.
The film is directed by Denia Pratiwi, who is also the author of the film, and is also the author of the film.	Validation of Vitamin C Analysis Method in Pineapple Fruit and Chips Using UV-Vis Spectrophotometry	This study proves that the UV-Vis spectrophotometry method can be validated to analyze vitamin C in both fresh and processed forms such as chips. The validation test showed accurate and precise results, making UV-Vis a feasible method for quality control of vitamin C content in processed fruit products.
Ika Yuni Astuti, Marchaban, Ronny Martien, Agung Endro Nugroho (2017)	Validation of UV-Vis Spectrophotometry Method for Solubility Study of Pentagamavunon-0 in Self-Nanoemulsifying Drug Delivery System Carrier	UV-Vis was used to measure the solubility of the active compound Pentagamavunon-0 (PGV-0) in a SNEDDS-based drug delivery system. The results showed that the compound was well soluble and the UV-Vis method was able to produce valid quantitative data, making it a good choice for pharmaceutical formulation studies.
Dzurriatul Maghfiroh, Eva Monica, Muhammad Hilmi Afthoni (2022)	Development and Validation of UV Vis Spectrophotometry Derivative Method for Analysis of Caffeine in Supplements	This study developed a UV-Vis derivative method to analyze caffeine levels in supplements. The resulting method showed good sensitivity and selectivity, and can be used as a simple alternative for routine testing of caffeine in supplement products without the need for complex equipment.
English: Haryanto, Sitti Nur Atika Ningsih, Nabila Syahrani Anwar, Farda Nur Annisa, Sri Purnama, Meilinda Putri Anastasya, Muh Abdiyal, Ispa Novianti Nanrang, Adinda Safira, Queen Raisyah Rahmatia	Analysis of Paracetamol Content Levels in Herbal Medicine for Aches and Pains Using UV VIS Spectrophotometry	This study successfully detected the presence of paracetamol in herbal products for aches and pains using UV-Vis spectrophotometry. This finding indicates the presence of a mixture of synthetic chemicals in traditional herbal medicines and shows that UV-Vis can be used as an initial screening tool to ensure the safety and

		authenticity of herbal products.
Khoirul Ngibad, Dheasy Herawati (2019)	Comparison of Vitamin C Level Measurement Using UV-Vis Spectrophotometry at UV and Visible Wavelengths	This study compares the optimal wavelengths between ultraviolet and visible light in measuring vitamin C. The results show that UV wavelengths provide more accurate and sensitive results than visible, strengthening the role of UV-Vis spectrophotometry in the analysis of micronutrients such as vitamin C.
Niken Ambar Pratiwi, Sunarto, M.Sc (2018)	Comparison of Validation of Copper(II) Ion Analysis Method Without Complexing Agent and With Na-Diethyldithiocarbamate Complexing Agent by UV-Vis Spectrophotometry	In this study, UV-Vis was used to analyze the levels of Cu(II) ions with a complexation approach using Na-DDTC. The results prove that the method with complexation provides more stable and accurate results than without a complexing agent, demonstrating the flexibility of UV-Vis in the analysis of heavy metals in solution.
The film stars Ninis Yuliati, Silvia Putri Agustini, Fery Eko Pujiono, Tri Ana Mulyati (2023)	Analysis of SPF Values in Sunscreen Products Using the UV-Vis Spectrophotometry Method	UV-Vis is used to measure the SPF value of several sunscreen products. The results of the study showed that this method is able to provide consistent results and can be used as an initial method for evaluating the effectiveness of skin protection products without the need for direct clinical trials, making it efficient for initial screening of cosmetic formulations.
Ika Yuni Astuti, Marchaban1, Ronny Martien, Agung Endro Nugroho (2017)	Validation of UV-Vis Spectrophotometry Method for Solubility Study of Pentagamavunon-0 in Self-Nanoemulsifying Drug Delivery System Carrier	UV-Vis spectrophotometry was used to measure the solubility of the active compound Pentagamavunon-0 (PGV-0) in a SNEDDS-based delivery system. The results showed that this method provided accurate, precise, and suitable measurement results for the evaluation of nanoemulsion formulations, especially in the study of the solubility of lipophilic compounds.
Rusvirman Muchtar, Yusi Fudiesta, Sukrido, Devi Windaryanti (2017)	Analysis of the Effect of Heating Time on Oxalate Levels in Green Spinach (Amarantus Hybridus) Using the UV-Vis Spectrophotometry Method	This study showed that the heating process significantly reduced the oxalate content in green spinach. UV-Vis spectrophotometry was used to measure the oxalate content at each time treatment, and was shown to provide accurate quantitative data, making it an effective tool in the study of antinutrients in food.

Based on the review results of ten scientific journals that use UV-Vis spectrophotometry as the main analysis tool, it can be seen that this method is widely applied to analyze various types of active compounds in herbal ingredients or products. UV-Vis spectrophotometry is utilized in various types of research such as method validation, solubility studies, development of derivative methods, and analysis of active substance content in natural and semi-synthetic preparations. Generally, the studies reviewed used experimental or quantitative analytical designs with samples in the form of natural ingredients (tea, spinach, fruit, etc.) or finished products (herbal medicine, supplements, sunscreen). The variables analyzed included flavonoid levels, vitamin C, paracetamol, caffeine, oxalate, Cu^{2+} metal ions, and SPF values. The use of UV-Vis spectrophotometry in these studies shows the flexibility and reliability of the method in detecting and measuring the concentration of various bioactive compounds.

Antonia Vani Kurniawati, IAK Pramushinta, AS Sinulingga, and Novamei Indriani conducted a study on the comparative analysis of total flavonoid levels in green tea and black tea using the UV-Vis spectrophotometry method. This study was conducted with a quantitative analytical study approach in which both tea samples were extracted and analyzed using a spectrophotometer at a certain wavelength that corresponds to the characteristics of flavonoids. The aim was to prove the difference in flavonoid content due to differences in the tea production process, such as fermentation in black tea which is thought to cause a decrease in flavonoid levels. The results showed that green tea had higher flavonoid levels than black tea, supporting the hypothesis that the fermentation process affects the content of bioactive compounds in tea. The advantages of this journal are its direct application to consumer products and the ability of the UV-Vis method to reveal significant differences in the content of active compounds in commonly used materials. This study also uses a method that is easy to replicate. However, the drawbacks lie in the validation aspects of the method that are not explained in depth, such as precision, accuracy, and wavelength selectivity to other components in tea, which can affect the accuracy of the measurement.

Azlaini Yus Nasution, Denia Pratiwi, Yola Frimananda, and Ardiansyah conducted a study with the aim of validating the UV-Vis spectrophotometry method to measure vitamin C levels in pineapple and pineapple chips as processed products. This study is included in the method validation design that emphasizes testing parameters such as accuracy, precision, linearity, and detection limits to ensure that the method can be used in food quality control. Samples in the form of fruit juice and processed chips were extracted and tested using a UV-Vis spectrophotometer at a specific wavelength of vitamin C. The results of the study showed that although there was a decrease in vitamin C levels due to the drying process, the vitamin C content could still be detected accurately and precisely. The advantages of this journal are that it is able to show that the UV-Vis method is not only effective for fresh ingredients, but also for processed products, and presents a fairly complete method validation. However, the drawback is that this journal does not explore the degradation factors of vitamin C during processing and does not present variations in temperature or heating time as additional factors that can affect the results of the analysis more broadly.

Ika Yuni Astuti, Marchaban, Ronny Martien, and Agung Endro Nugroho conducted a study on the validation of the UV-Vis spectrophotometry method in the study of the solubility of the active compound Pentagamavunon-0 (PGV-0) in the SNEDDS (Self-Nanoemulsifying Drug Delivery System) delivery system. This study has a laboratory experimental design aimed at evaluating the effectiveness of the SNEDDS system in increasing the solubility of PGV-0, a compound that has pharmacological activity but low solubility in water. PGV-0 was dissolved in the SNEDDS system and tested using UV-Vis to

determine the dissolved content with a calibration curve approach. The results showed that the UV-Vis method was able to measure the solubility of PGV-0 accurately and consistently, and supported the potential of SNEDDS as an efficient delivery system. The advantages of this journal are its strong application in the field of modern pharmaceutical formulation, as well as the use of UV-Vis spectrophotometry in the context of the solubility of active substances which are quite complex. However, the drawbacks are the limitations in the variation of the solvent system and the concentration of the active substance used, and the lack of comparison of the results with other methods such as HPLC which is commonly used for compounds with low solubility.

Dzurriatul Maghfiroh, Eva Monica, and Muhammad Hilmi Afthoni conducted a study on the development and validation of the UV-Vis derivative spectrophotometry method for analyzing caffeine levels in supplement products. This study is a form of development of conventional methods by utilizing derivative techniques that aim to improve the accuracy and sharpness of the spectrum, especially when there are interfering compounds in the sample. The research design is experimental with validation of parameters such as linearity, precision, accuracy, and detection limits carried out according to standards. The results obtained indicate that the UV-Vis spectrophotometry derivative method has good sensitivity and can be used to reliably detect low levels of caffeine. The advantages of this study are the innovation of the method that has not been widely applied in Indonesia, and the approach is very appropriate for improving detection capabilities in compounds whose spectra have the potential to overlap. However, the shortcomings of this journal lie in the limited comparison of the method to other instruments such as HPLC or GC-MS which can provide stronger confirmation of the analysis results, and the scope of sample types is still limited to only one supplement product.

Haryanto, Sitti Nur Atika Ningsih, Nabila Syahrani Anwar, Farda Nur Annisa, Sri Purnama, Meilinda Putri Anastasya, Muh Abdiyal, Ispa Novianti Nanrang, Adinda Safira, Ratu Raisyah Rahmatia Rumbara, and Liska Nur conducted a study on the analysis of paracetamol content in herbal medicine for aches and pains using the UV-Vis spectrophotometry method. This study was motivated by concerns that some herbal medicine manufacturers mix synthetic drugs such as paracetamol into herbal products without listing the content on the label. The study was conducted by preparing herbal medicine samples, carrying out the extraction process, and measuring absorbance at the maximum wavelength of paracetamol. The results of the study showed that there was paracetamol content in the herbal medicine products studied, indicating a violation of safety and honesty in the preparation of the herbal product formula. The advantages of this journal are its courage to raise sensitive but very relevant issues related to the safety of traditional products, as well as the application of UV-Vis spectrophotometry which is easy to do for initial screening. However, the shortcomings of this journal are the lack of comparison between brands or variants of herbal medicine for aches and pains, and the absence of cross-confirmation tests using more specific methods to support the main findings.

Khoirul Ngibad and Dheasy Herawati conducted a study on the comparison of vitamin C measurement results using UV and visible spectrophotometry methods. This study aims to determine which wavelength provides the most accurate and precise results in vitamin C analysis. The sample used was a standard vitamin C solution analyzed at two wavelength ranges, namely in the ultraviolet and visible regions. This study used a simple laboratory experimental design but focused on the technical aspects of instrument parameters. The results showed that the wavelength in the UV region provided higher absorbance, better linearity, and more precise results than the visible region. The advantages of this journal are that it provides a practical basis for laboratories in choosing the optimal wavelength when

measuring vitamin C with UV-Vis, and presents directly applicable comparative data. However, the disadvantages are that the focus of the study is limited to standard solutions without testing the effect of matrices from real food ingredients, and the number of measurement replications is not mentioned in detail, thus reducing the weight of the validity of the results.

Niken Ambar Pratiwi and Sunarto, M.Si conducted a study on the analysis of copper metal ions (Cu^{2+}) using UV-Vis spectrophotometry by comparing two conditions, namely without complexing and with Na-diethyl dithiocarbamate (Na-DDTC) complexing. The purpose of this study was to determine the effectiveness of the complexing in increasing the sensitivity and stability of the measurement results of the metal ions. The study was conducted by preparing a standard solution of Cu^{2+} ions, then measuring the absorbance in two treatment conditions, and evaluating it against the method validation parameters. The results showed that the use of the Na-DDTC complexing produced more stable and intense absorption values, which facilitated the quantification process of Cu^{2+} ions in solution. The advantage of this journal lies in its practical approach that teaches simple but effective techniques to improve the accuracy of heavy metal analysis using simple tools such as UV-Vis. However, the disadvantage is that this study has not been equipped with a comparison with more sophisticated metal analysis methods such as AAS or ICP-OES, so the discussion of the effectiveness of the method is still limited to one tool.

Ninis Yuliati, Silvia Putri Agustini, Fery Eko Pujiono, Tri Ana Mulyati conducted a study on the analysis of Sun Protection Factor (SPF) values in sunscreen products using the UV-Vis spectrophotometry method. This study aims to evaluate the effectiveness of sunscreen products in absorbing UVB rays that have the potential to cause skin damage. Sunscreen product samples were dissolved in specific solvents, then absorbance measurements were carried out in the wavelength range of 290–320 nm which is the maximum area of UVB absorption. The SPF value was then calculated using a mathematical formula based on the absorption data obtained. This study used a laboratory quantitative approach, and the results showed that the SPF value could be estimated quite accurately using only the UV-Vis instrument. The advantages of this study are that it provides an alternative SPF test method that is more cost-effective and can be carried out in small-scale laboratories without the need for expensive and complex in vivo tests. This study is also relevant in supporting the quality control of cosmetic products. However, the drawback of this journal is that the method used is a theoretical estimate and has not been validated with reference methods such as in vivo tests or in vitro tests, so the accuracy of the SPF values obtained still depends on the mathematical model and sample conditions.

Ika Yuni Astuti, Marchaban1, Ronny Martien, Agung Endro Nugroho conducted a study on the solubility of the active compound Pentagamavunon-0 (PGV-0) in the Self-Nanoemulsifying Drug Delivery System (SNEDDS) using UV-Vis spectrophotometry. This study aims to evaluate the efficiency of the SNEDDS system in increasing the solubility of PGV-0 which is known to have very lipophilic properties. SNEDDS samples containing PGV-0 were dissolved and their absorbance values were measured at maximum wavelengths. The absorbance data were then compared between formulations to determine which was most effective in increasing the solubility of the compound. The results showed that SNEDDS was significantly able to increase the solubility of PGV-0 and the UV-Vis method was effective in evaluating it. The advantages of this journal are its relevant application in the field of modern pharmaceutical formulation, as well as a structured experimental design that focuses on the efficiency of the drug delivery system. However, the drawbacks are the limited variety of solvent systems and the lack of confirmation of results using alternative methods such as HPLC, which can provide sharper quantitative data for highly lipophilic compounds.

Rusvirman Muchtar, Yusi Fudiesta, Sukrido, Devi Windaryanti conducted a study on the effect of heating duration on oxalate levels in green spinach (Amaranthus hybridus) using the UV-Vis spectrophotometry method. This study aims to determine how heating treatment can reduce oxalate content which is known as an antinutrient compound, so this result is important in the context of the safety of daily vegetable consumption. Spinach samples were heated for different times, extracted, and then analyzed using spectrophotometry at certain wavelengths that match the characteristics of oxalate. The results showed that the longer the heating process, the oxalate levels in spinach decreased significantly. This study confirms that food processing such as boiling can affect the content of certain compounds chemically. The advantages of this journal are its very relevant application in the field of food and community nutrition, as well as a clear and applicable experimental approach. However, the disadvantages are the lack of explanation regarding the effect of different temperatures or other heating methods, as well as the possibility of other compounds in spinach that also affect the absorbance reading results.

CONCLUSION

Based on the results of a review of ten scientific journals, it can be concluded that UV-Vis spectrophotometry is an effective, simple, and versatile analytical method in assessing the content of active compounds in various types of products, especially herbal products. This instrument is widely used in studies aimed at determining the levels of compounds such as flavonoids, vitamin C, paracetamol, caffeine, oxalate, and metal ions, both in the form of natural materials, pharmaceutical preparations, and cosmetic products. Most studies use UV-Vis spectrophotometry for method validation, solubility studies, analysis of active substance content, and development of derivative methods. The results obtained show that this method provides accurate, precise results, and is suitable for use in quality control and the development of herbal products and their derivatives. With advantages such as low operational costs, fast analysis time, and ease of use, UV-Vis spectrophotometry remains the main choice in quantitative analysis of active substances, both in academic and industrial settings. Therefore, this method is recommended as the main tool in testing the content of active compounds in herbal products and as a basis for future research and formulation development.

Thank-you note

The authors would like to thank Universitas Muhammadiyah AR Fachruddin for their assistance in this literature research. In addition, we give our highest appreciation to La Ode Akbar Rasydy, S.Farm., M.Si as the Lecturer in Charge of the Course, for his guidance, direction, and important contribution in the preparation of this article or literature study assignment. In addition, we would like to thank the editors and reviewers for their time, attention, and useful criticisms they provided during the review process. The suggestions and corrections provided are very important to improve the quality of this manuscript, both in terms of content and presentation.

REFERENCES

BPOM. (2022). Annual Report on Supervision of Traditional Medicinal Products. Jakarta: BPOM Supervisory Agency

Republic of Indonesia Food and Drug Administration.

Dalimartha, S. (2010). Atlas of Indonesian Medicinal Plants (Volume 1). Jakarta: Penebar Swadaya.

Harahap, U., Satria, D., & Meilani, D. (2015). Validation of Flavonoid Level Determination Method in Soursop Leaf Extract Using UV-Vis Spectrophotometry. Indonesian Phytopharmaca Journal, 2(1), 22–28.

Ministry of Health of the Republic of Indonesia. (2017). Indonesian Health Profile 2017. Jakarta:

Data and Information Center of the Ministry of Health of the Republic of Indonesia.

Putri, DA, Susilowati, A., & Pramesti, F. (2021). Study of Curcumin Solubility in SNEDDS System

Using the UV-Vis Method. Udayana Journal of Pharmacy, 10(3), 150–157.

Rahmawati, N., Nugroho, WA, & Fitriani, I. (2022). Utilization of UV-Vis in Validation and

Analysis of Herbal Products. Journal of Pharmaceutical Sciences, 6(2), 105–114.

Harlianti, R., Irawati, LF, & Rahayu, S. (2016). The Influence of Pharmacist Counseling on Compliance

Drug Use. Indonesian Journal of Clinical Pharmacy, 5(1), 12–18.

Kurniawati, AV, Pramushinta, IAK, Sinulingga, AS, & Indriani, N. (2024). Analysis

Comparison of total flavonoid levels of green tea and black tea using the UV-Vis spectrophotometry method. Journal of Clinical Science Health Analysis, 12(2), 204–213.

Astuti, IY, Marchaban, Martien, R., & Nugroho, AE (2017). Validation of UV spectrophotometry method

Vis for solubility study of pentagamavunone-0 in self-nanoemulsifying drug delivery system. Pharmacy, 14(1), 127–136.

Dwihartanti. (2017). Validation of UV-Vis spectrophotometry method for solubility studies. Pharmacy, 14(1),

127–136.

(2020). Validation of Analysis Method

Vitamin C in Pineapple Fruit and Chips by UV-Vis Spectrophotometry. Scientific Journal of Pharmacy, 8(1), 16-24.

Dzurriatul Maghfiroh, Eva Monica, Muhammad Hilmi Afthoni. (2022). Development and Validation

Uv Vis Spectrophotometry Method Derivative Method For Analysis Of Caffeine In Supplements. Scientific Journal Of Science & Technology Vol. 2 No. 2-FARMASI.

Haryanto, Sitti Nur Atika Ningsih, Nabila Syahrani Anwar, Farda Nur Annisa, Sri Purnama, Meilinda

Anastasya, Muh Abdiyal, Ispa Novianti Nanrang, Adinda Safira, Ratu Raisyah Rahmatia Rumbara, Liska Nur. (2025). Analysis of Paracetamol Content Levels in Herbal Medicine for Aches and Pains Using UV VIS Spectrophotometry. Journal of Pharmaceutical and Health Sciences Students Volume 3 Number 1.

Khoirul Ngibad, Dheasy Herawati. (2019). Comparison of Measuring Vitamin C Levels Using

Uv-Vis Spectrophotometry At Uv And Vis Wavelengths. Borneo Journal Of Medical Laboratory Technology Volume 1 No. 2.

Niken Ambar Pratiwi. (2018). Comparison of Validation of Copper(Ii) Ion Analysis Methods Without

Complexing And With Na-Diethyldithiocarbamate Complexing By Uv-Vis Spectrophotometry. Journal of Basic Chemistry Volume 7 No 3.

Analysis of SPF Values on

Sunscreen Products Using Uv-Vis Spectrophotometry Method. Journal of Pharmacy and Herbal Vol.5 No.2.

Rusvirman Muchtar, Yusi Fudiesta, Sukrido, Devi Windaryanti. (2017). Analysis of the Influence of Time

Heating on Oxalate Levels in Green Spinach (Amarantus Hybridus) Using the Uv-Vis Spectrophotometry Method. Journal of Science and Health. 2017. Vol 1. No 8.