Editorial

BIOMEDICAL Journal of Scientific & Technical Research

ISSN: 2574 -1241

DOI: 10.26717/BJSTR.2022.45.007138

Prospects of UPLC in Pharmaceutical Analysis over HPLC

Rouchan Ali, Rohit Bhatia and Pooja A Chawla*

Department of Pharmaceutical Analysis, ISF College of Pharmacy, India

***Corresponding author:** Pooja A Chawla, ISF College of Pharmacy, Moga-142001, Punjab, India

ARTICLE INFO

Received: June 28, 2022

Published: July 07, 2022

Citation: Rouchan Ali, Rohit Bhatia, Pooja A Chawla. Prospects of UPLC in Pharmaceutical Analysis over HPLC. Biomed J Sci & Tech Res 45(1)-2022. BJSTR. MS.ID.007138.

Keywords: Ultra Performance Liquid Chromatography; Advanced Methods; High-Performance Liquid Chromatography; Analytical Techniques

ABSTRACT

As interest in current therapeutic breakthroughs has grown, new analytical techniques have been thrown into the spotlight. UPLC (Ultra Performance Liquid Chromatography) is a relatively new technique to liquid chromatography (LC) that opens up new possibilities, primarily in terms of reducing solvent usage and time. The chromatographic system for UPLC is designed to tolerate high back pressures. The UPLC system can cut the analysis time by up to nine times when compared to chromatographic systems using 5 µm particle size packed analytical columns, and by up to three times when compared to chromatographic systems using 3 µm particle size packed analytical columns. In UPLC, smaller column dimensions and column particle sizes compared to HPLC result in faster analytical times and significant solvent savings, cutting the cost. The peaks have lower noise levels and a higher signal-to-noise ratio. UPLC delivers narrower and sharper peaks with more information as compared to HPLC peaks. As a result, this technology opens up new avenues for high-profit business efficiency.

Abbreviations: APIs: Active Pharmaceutical Ingredients; BEH: Bridged Ethyl Siloxane/Silica Hybrid; CSH: Charge Surface Hybrid; HPLC: High-Performance Liquid Chromatography; HPT: Hybrid Particle Technology; HSS: Hybrid Particles, High-Strength Silica; LC: Liquid Chromatography; UPLC: Ultra Performance Liquid Chromatograph

Introduction

The most often used liquid chromatographic approach in the quantitative and qualitative analysis of medications is HPLC (High-Performance Liquid Chromatography). For decades, it has been used to quantify and identify chemicals in the drug development process all over the world. Recent improvements in pharmaceutical analysis have enabled the use of chromatographic media with a particle size of 1.7µm, as well as a liquid handling system capable of running such columns at much higher pressures. ultra-performance liquid chromatography (UPLC) uses very high pressure (up to 100 MPa) to increase procedure resolution, sensitivity, and speed when compared to regular HPLC. When compared to chromatographic systems using 5µm particle size packed analytical columns, the UPLC technology can reduce analysis time by up to nine times [1]. Pharmaceutical companies are looking for new ways to increase production and shorten medication development time. Quantification and separation are carried out under extreme pressure in UPLC. In comparison to HPLC, high pressure has no negative impact on the analytical column. Other parameters, such as solvent and time usage, are also decreased with UPLC. In 1999, Waters developed the HPLC column Hybrid Particle Technology (HPT), which has superior mechanical strength, peak shape, pH stability, and efficiency for basic chemicals. The creation of a second-generation hybrid material particle with a BEH (Bridged Ethyl

Siloxane/Silica Hybrid) structure improved strength, efficiency, and pH range. High-strength silica (HSS) particle technology outperforms hybrid particle technology in terms of chemical selectivity and retention time.

Charge Surface Hybrid (CSH) technology, which incorporates surface charge inside the packing materials to increase peak form and selectivity, is the most recent advance in hybrid materials. As a result of the aforementioned advances in column packing material and particle size, Waters Company obtained the trade name UPLC [1,2]. Many scientists have used HPLC and UPLC analyses to estimate compounds and compared the results. In terms of resolution, speed, and sensitivity, UPLC has substantial advantages. The main advantage is that analysis time is reduced, which means that solvent usage is reduced as well. As a result, UPLC costs less than HPLC since it can do more analyses per unit of time and consumes less eluent [3]. Because it provides reliable, valuable, and exact data in a short amount of time, UPLC technology is frequently employed in bio-analytical laboratories and the pharmaceutical industry. It's also used to create reliable and accurate drug estimation methodologies. The hyphenated UPLC/MS technique has gained widespread usage as an analytical tool for the quantitative and qualitative investigation of a variety of chemicals and contaminants because UPLC significantly increases MS detection [3]. UPLC technology is a well-established and fast-growing field with numerous potential applications in the research of pharmaceutical and biological compounds [4],

some of which are included below:

1. Therapeutically active ingredients in natural extracts and herbal medicine are identified, separated, and quantified.
2. Dissolution testing is used for quality control and to verify batch-to-batch uniformity of APIs in formulation and manufacturing processes.
3. Proteomics research involves the study of protein and peptide medicines.
4. Detecting and quantifying drug-related impurities in both raw materials and finished products.
5. Analysis of medicines and their metabolic metabolites in biological fluids, such as urine and human plasma, for biotransformation pathway profiling.
6. Measurement of a biological system's metabolic response to genetic alteration or pathological stimuli.

When standard HPLC has practically completed separation, UPLC has demonstrated to increase the value of separation science. Because most pharmaceutical companies are trying to cut R&D time and expenses, a faster and better UPLC separation can assist analytical labs save time and money when designing techniques. Instrumentation technology and innovative, fine particle chemistry for LC have advanced with the invention of UPLC, allowing for better productivity and hence analytical speed without sacrificing chromatographic efficiency. The UPLC technology may perform superior resolution procedures by using smaller packing particle sizes, shorter columns, and higher flow rates under high pressure. Because the diameter of the column is smaller in UPLC than in other chromatographic procedures, the volume of injection is reduced by around 5-10 times, resulting in enhanced peak bands and lower carryover impacts. Additionally, increased backpressure reduces column life. However, the advantages of UPLC, such as faster separation, reduced solvent usage, and higher sensitivity and selectivity, outweigh the disadvantages. It increases productivity by providing more information per unit of labour and improving the resolution and speed of LC analysis [4,5].

Acknowledgement

The authors are heartily thankful to the management of ISF College of Pharmacy for Constant Encouragement, Support, and Motivation.

Conflict of Interest

The authors declare no conflict of interest.

References

1. Swetha SR, Bhavya S, Mounika K (2020) Review on Comparative study of HPLC and UPLC. Research Journal of Pharmacy and Technology 13(3): 1570-1574.
2. Khan H, Ali J (2017) UHPLC: Applications in Pharmaceutical Analysis. Asian Journal of Pharmaceutical Analysis 7(2): 124-31.
3. Kamal S, Sharad W (2018) Step-up in liquid chromatography from HPLC to UPLC: a comparative and comprehensive review. Journal Pharma. Innovation 7(8): 342-347.
4. Gita Chawla, Chanda Ranjan (2016) Principle, Instrumentation, and Applications of UPLC: A Novel Technique of Liquid Chromatography. Open Chemistry Journal 3: 1-16.
5. Rabia Basharat, Vijay Kotra, Lean Yen Loong, Allan Mathews, Mahibub Mahamadsa Kanakal, et al. (2021) A Mini review on Ultra Performance Liquid Chromatography. Oriental Journal of Chemistry 37(4): 847-857.

ISSN: 2574-1241

DOI: 10.26717/BJSTR.2022.45.007138

Pooja A Chawla. Biomed J Sci & Tech Res

This work is licensed under Creative *Commons* Attribution 4.0 License

Submission Link: https://biomedres.us/submit-manuscript.php

Assets of Publishing with us

- Global archiving of articles
- I*mm*ediate, unrestricted online access
- Rigorous Peer Review Process
- Authors Retain Copyrights
- Unique DOI for all articles

https://biomedres.us/