International Journal of Medicine and Pharmaceutical Research
https://doi.org/10.30904/j.ijmpr.2026.4916 | E-ISSN: 2321-2624

QBD-Enabled HPLC Method Development and Validation for the Simultaneous Estimation of Benserazide and Levodopa in Pharmaceutical Dosage Forms

Kursam Sandhya*, Dr. K. Chaitanya Prasad, Dr. K. Nagasree, Dr. K. Shravan Kumar

Samskruti College of Pharmacy, Kondapur, Ghatkesar, Medchal, Hyderabad-501301, Telangana, India

Received: 07 Sept 2025 | Revised: 11 Oct 2025 | Accepted: 12 Dec 2025 | Published: 6 Feb 2026

Abstract:
This study presents the development and validation of a high-performance liquid chromatography (HPLC) method for the simultaneous estimation of Benserazide and Levodopa in pharmaceutical formulations. A Box-Behnken response surface design was employed to systematically optimize key chromatographic parameters, including mobile phase composition, buffer pH, and flow rate. Statistical analysis revealed that flow rate significantly influenced resolution, while buffer pH and organic phase ratio affected peak tailing. The optimized method utilized a SPURCIL C18 column (250×4.6 mm, 5 µm) with a mobile phase of ammonium acetate buffer (pH 5.0) and methanol in a 70:30 ratio, at a flow rate of 1.0 ml/min and UV detection at 220 nm. The system suitability parameters resolution >2, tailing factor <2, and theoretical plates >2000 confirmed the method's efficiency and reliability. Validation was conducted in accordance with ICH Q2(R1) guidelines, demonstrating excellent accuracy, precision, linearity, sensitivity, and robustness. Recovery rates for Benserazide and Levodopa were within the acceptable range of 98–102%, with %RSD values below 2% for both repeatability and intermediate precision. Linearity was observed over the ranges of 10–50 µg/ml for Benserazide and 40–200 µg/ml for Levodopa, with correlation coefficients of 0.9997 and 0.9998, respectively. The method exhibited low limits of detection and quantification, confirming its sensitivity. Robustness testing showed consistent performance under minor variations in chromatographic conditions. Overall, the developed HPLC method is reliable, reproducible, and suitable for routine quality control of Benserazide and Levodopa in combined pharmaceutical dosage forms.
Keywords: HPLC, Benserazide, Levodopa, ammonium acetate buffer, system suitability, ICH Q2(R1), linearity, precision, accuracy, LOD, LOQ

Introduction

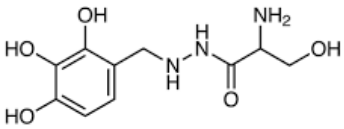

Fig.1: Benserazide

Basic Information
IUPAC Name: (S)-2-amino-3-(3,4-dihydroxyphenyl)propanoic acid
Molecular Formula: $C_9H_{11}NO_4$
Molecular Weight: 197.19 g/mol
Category: Central nervous system agent, Antiparkinsonian agent
Physical Properties
Melting Point: 275-280°C (decomposes)
pKa: 2.32 (carboxyl group), 9.74 (amino group)
Solubility
Solubility: Soluble in water; slightly soluble in ethanol; insoluble in chloroform and ether.
Description
Levodopa is a precursor to dopamine, used primarily in the treatment of Parkinson's disease. It is often administered in combination with carbidopa to enhance its efficacy and reduce side effects.
Mechanism of Action
Levodopa is converted to dopamine in the brain, replenishing the depleted levels of dopamine in patients with Parkinson's disease. This helps alleviate symptoms such as tremors, stiffness, and slowness of movement.

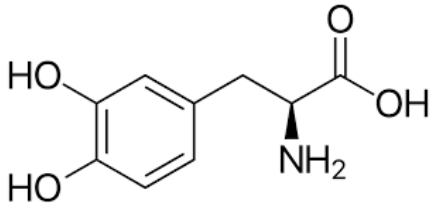

Fig.2: Levodopa

Basic Information
- **IUPAC Name**: (2S)-2-amino-3-(3,4-dihydroxyphenyl)propanoic acid
- **Molecular Formula**: $C_9H_{11}NO_4$
- **Molecular Weight**: 197.19 g/mol
- **Category**: antiparkinsonian agent

Physical Properties
- **Melting Point**: 276-278^{O}C

Solubility
- **Solubility**: slight solubility in water.

Description
Levodopa (L-DOPA) is a dopaminergic agent and dopamine precursor primarily used to treat Parkinson's disease. As a central nervous system agent, it works by crossing the blood-brain barrier and converting into dopamine.

Mechanism of Action

Levodopa by various routes crosses the blood brain barrier, is decarboxylated to form dopamine Label. This supplemental dopamine performs the role that endogenous dopamine cannot due to a decrease of natural concentrations and stimulates dopaminergic receptors.

Materials and Methods

Optimization of Column:

SPURCIL C18 (4.6*250mm, 5µ) (DIKMA) was found to be ideal as it gave good peak shape and resolution at 1.0 ml/min flow.

Optimized Chromatographic Conditions

Equipment: High performance liquid chromatography equipped with Auto Sampler and PDA detector

Column	: Spurcil C18 (4.6*250mm, 5µm) (DIKMA)
Buffer	: Ammonium acetate
PH	: 5.0
Mobile phase	: 30% buffer: 70% Methanol
Flow rate	: 1.0 ml per min
Wavelength	: 220 nm
Injection volume	: 20 µl
Run time	: 10 min.

Preparation of buffer and mobile phase:

Preparation of Phosphate buffer pH 5:

To prepare Ammonium acetate buffer solution, by adding 5gm of Ammonium acetate in 1000ml water. Adjust this solution to pH 5 by using tetrahydro furan.

Preparation of mobile phase:

Mix a mixture of above buffer 300ml (30%), 700 ml Methanol (70%) and degas in ultrasonic water bath for 5 minutes. Filter through 0.45 µ filter under vacuum filtration.

Diluent Preparation:

Ammonium acetate buffer: Methanol (70:30) ratio.

System Suitability:

Tailing factor for the peaks due to Benserazide and levodopa in Standard solution should not be more than 2.0

Theoretical plates for the Benserazide and levodopa peaks in Standard solution should not be less than 2000

Method validation parameters:

Assay:

Standard Solution Preparation:

Accurately weigh and transfer 6.25mg of Benserazide and 25mg levodopa working standard into a 25 ml clean dry volumetric flask add Diluents and sonicate to dissolve it completely and make volume up to the mark with the same solvent. (Stock solution). Further pipette 1.2ml of the above stock solution into a 10ml volumetric flask and dilute up to the mark with Diluents.

Sample Solution Preparation:

Accurately weigh and transfer equivalent to 6.25mg of Benserazide and 25mg levodopa equivalent weight of the sample into a 25 ml clean dry volumetric flask add about 7ml of Diluents and sonicate to dissolve it completely and make volume up to the mark with the same solvent. (Stock solution). Further pipette 1.2ml of the above stock solution into a 10ml volumetric flask and dilute up to the mark with Diluents.

Procedure:

Inject 10µL of the standard, sample into the chromatographic system and measure the areas for the Benserazide and levodopa peaks and calculate the % Assay by using the formulae.

Formula: Calculation: (For Benserazide and levodopa)

$$\%\ Assay = \frac{AT}{AS} * \frac{WS}{DS} * \frac{DT}{WT} * \frac{Average\ weight}{Label\ Claim} * \frac{P}{100} * 100$$

Linearity:

Preparation of stock solution:

Accurately weigh and transfer 6.25mg of Benserazide and 25mg levodopa working standard into a 25 ml clean dry volumetric flask add Diluents and sonicate to dissolve it completely and make volume up to the mark with the same solvent. (Stock solution)

Preparation of Level – I (10ppm of Benserazide and 40pp levodopa): 0.4ml of stock solution has taken in 10ml of volumetric flask dilute up to the mark with Diluents.

Preparation of Level – II (20ppm of Benserazide and 80ppm levodopa): 0.8 ml of stock solution has taken in 10ml of volumetric flask dilute up to the mark with Diluents.

Preparation of Level – III (30ppm of Benserazide and 120ppm levodopa): 1.2ml of stock solution has taken in 10ml of volumetric flask dilute up to the mark with Diluents.

Preparation of Level – IV (40ppm of Benserazide and 160ppm levodopa):

1.6ml of stock solution has taken in 10ml of volumetric flask dilute up to the mark with Diluents.

Preparation of Level – V (50ppm of Benserazide and 200ppm levodopa): 2.0ml of stock solution has taken in 10ml of volumetric flask dilute up to the mark with Diluents.

Procedure:

Inject each level into the chromatographic system and measure the peak area. Plot a graph of peak area versus concentration (on X-axis concentration and on Y-axis Peak area) and calculate the correlation coefficient.

Precision:

Standard Solution Preparation:

Accurately weigh and transfer 6.25mg of Benserazide and 25mg levodopa working standard into a 25 ml clean dry volumetric flask add Diluents and sonicate to dissolve it completely and make volume up to the mark with the same solvent. (Stock solution)Further pipette 1.2ml of the above stock solution into a 10ml volumetric flask and dilute up to the mark with Diluents.

Procedure:

The standard solution was injected for six times and measured the area for all six injections in HPLC. The %RSD for the area of six replicate injections was found to be within the specified limits.

Intermediate precision/ruggedness:

To evaluate the intermediate precision (also known as Ruggedness) of the method, Precision was performed on different day within the laboratory.

Standard Solution Preparation:

Accurately weigh and transfer 6.25mg of Benserazide and 25mg levodopa working standard into a 25 ml clean dry volumetric flask add Diluents and sonicate to dissolve it completely and make volume up to the mark with the same solvent. (Stock solution)**.** Further pipette 1.2ml of the above stock solution into a 10ml volumetric flask and dilute up to the mark with Diluents.

Procedure:

The standard solution was injected for five times and measured the area for all six injections in HPLC. The %RSD for the area of six replicate injections was found to be within the specified limits.

Accuracy:

For accuracy determination, three different concentrations were prepared separately i.e. 50%, 100% and 150% for the analyte and chromatograms are recorded for the same.

Standard Solution Preparation:

Accurately weigh and transfer 6.25mg of Benserazide and 25mg levodopa working standard into a 25 ml clean dry volumetric flask add Diluents and sonicate to dissolve it completely and make volume up to the mark with the same solvent. (Stock solution). Further pipette 1.2ml of the above stock solution into a 10ml volumetric flask and dilute up to the mark with Diluents.

Preparation Sample solutions:

For preparation of 50% solution (With respect to target Assay concentration):

Accurately weigh and transfer 3.12mg of Benserazide and 12.5mg levodopa working standard into a 25 ml clean dry volumetric flask add Diluents and sonicate to dissolve it completely and make volume up to the mark with the same solvent. (Stock solution)

Further pipette 1.2ml of the above stock solution into a 10ml volumetric flask and dilute up to the mark with Diluents.

For preparation of 100% solution (With respect to target Assay concentration):

Accurately weigh and transfer 6.25mg of Benserazide and 25mg levodopa working standard into a 25 ml clean dry volumetric flask add Diluents and sonicate to dissolve it completely and make volume up to the mark with the same solvent. (Stock solution). Further pipette 1.2ml of the above stock solution into a 10ml volumetric flask and dilute up to the mark with Diluents.

For preparation of 150% solution (With respect to target Assay concentration): Accurately weigh and transfer 9.37mg of Benserazide and 37.5mg levodopa working standard into a 25 ml clean dry volumetric flask add Diluents and sonicate to dissolve it completely and make volume up to the mark with the same solvent. (Stock solution)

Further pipette 1.2ml of the above stock solution into a 10ml volumetric flask and dilute up to the mark with Diluents.

Procedure: Inject the standard solution, Accuracy -50%, Accuracy -100% and Accuracy -150% solutions. Calculate the Amount found and Amount added for Benserazide and levodopa and calculate the individual recovery and mean recovery values.

Limit of detection:

Preparation of Benserazide and levodopa solution:

Preparation of 0.02µg/ml Benserazide solution:

Accurately weigh and transfer 6.25mg of Benserazide working standard into a 25 ml clean dry volumetric flask add Diluents and sonicate to dissolve it completely and make volume up to the mark with the same solvent. (Stock solution)

Further pipette 1.2ml of the above stock solution into a 10ml volumetric flask and dilute up to the mark with Diluents.

Further pipette 0.1ml of the above stock solution into a 10ml volumetric flask and dilute up to the mark with Diluents.

Further pipette 0.8ml of the above stock solution into a 10ml volumetric flask and dilute up to the mark with Diluents.

Preparation of 0.04µg/ml levodopa solution:

Accurately weigh and transfer 25mg levodopa working standard into a 25 ml clean dry volumetric flask add Diluents and sonicate to dissolve it completely and make volume up to the mark with the same solvent. (Stock solution)

Further pipette 1.2ml of the above stock solution into a 10ml volumetric flask and dilute up to the mark with Diluents.

Further pipette 0.1ml of the above stock solution into a 10ml volumetric flask and dilute up to the mark with Diluents.

Further pipette 0.3ml of the above stock solution into a 10ml volumetric flask and dilute up to the mark with Diluents.

Limit of quantification:

Preparation of Benserazide and levodopa solution:

Preparation of 0.07µg/ml Benserazide solution:

Accurately weigh and transfer 6.25mg of Benserazide working standard into a 25 ml clean dry volumetric flask add Diluents and sonicate to dissolve it completely and make volume up to the mark with the same solvent. (Stock solution)

Further pipette 1.2ml of the above stock solution into a 10ml volumetric flask and dilute up to the mark with Diluents.

Further pipette 0.1ml of the above stock solution into a 10ml volumetric flask and dilute up to the mark with Diluents.

Further pipette 2.4ml of the above stock solution into a 10ml volumetric flask and dilute up to the mark with Diluents.

Preparation of 0.2µg/ml levodopa solution:

Accurately weigh and transfer 25mg levodopa working standard into a 25 ml clean dry volumetric flask add Diluents and sonicate to dissolve it completely and make volume up to the mark with the same solvent. (Stock solution)

Further pipette 1.2ml of the above stock solution into a 10ml volumetric flask and dilute up to the mark with Diluents.

Further pipette 0.1ml of the above stock solution into a 10ml volumetric flask and dilute up to the mark with Diluents.

Further pipette 1.25ml of the above stock solution into a 10ml volumetric flask and dilute up to the mark with Diluents.

Robustness:

The flow rate was varied at 0.8ml/min to 1.2ml/min.

Standard solution 30µg/ml of Benserazide and 120µg/ml levodopa prepared and analysed using the varied flow rates along with method flow rate.

The Organic composition in the Mobile phase was varied from 63% to 77%: Standard solution 30µg/ml of Benserazide and 120µg/ml levodopa was prepared and analysed using the varied Mobile phase composition along with the actual mobile phase composition in the method.

Results and Discussion

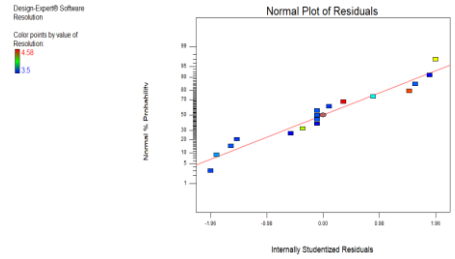

Fig.3: Normal plot of Residuals for Benserazide and Levodopa

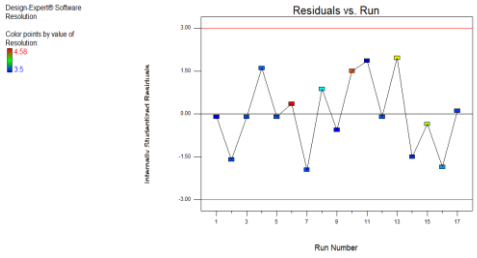

Fig.4: Residuals vs. Run for Benserazide and Levodopa

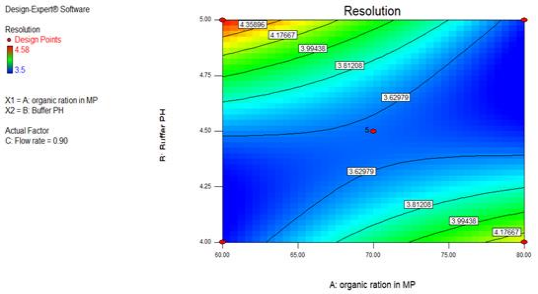

Fig.5: Resolution for Benserazide and Levodopa

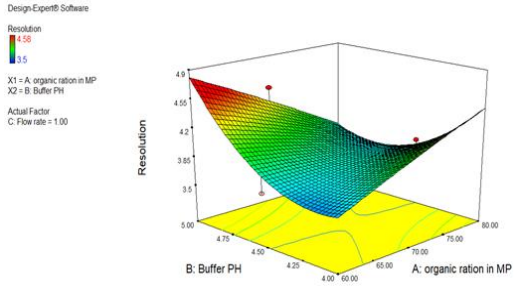

Fig.7: 3D Surface for Benserazide and Levodopa

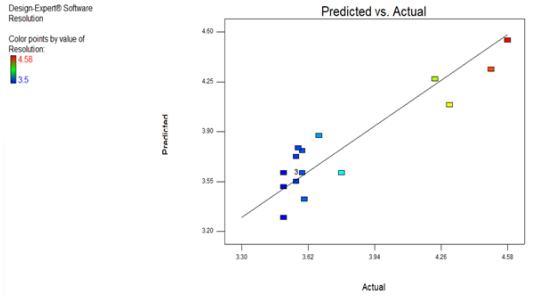

Fig.6: Predicted vs. Actual for Benserazide and Levodopa

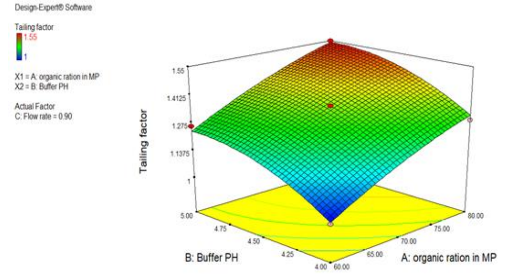

Figure 15: 3D Surface for Benserazide and Levodopa

Table 1: Tailing Factor of Benserazide and Levodopa

Source	Sum of Squares	df	mean Square	F-Value	p-value Prob> F	
Mean vs Total	27.09	1	27.09	Suggested		
Linear vs Mean	0.29	3	0.098	5.70	0.0102	
2FI vs Linear	0.10	3	0.034	2.79	0.0955	
Quadratic vs 2FI	0.087	3	0.029	5.98	0.0241	
Cubic vs Quadratic	0.034	3	0.011	6.366E+007	< 0.0001	Aliased
Residual	0.000	4	0.000			
Total	27.61	17	1.62			

Table 2: ANOVA for Response Surface Quadratic Model

Souces	Sum of square	df	Mean square	F value	P value Prob>F	
Model	0.48	9	0.053	11.01	0.0023	significant
A-organic ration in MP	0.19	1	0.19	38.96	0.0004	
B-Buffer PH	0.10	1	0.10	21.33	0.0024	
C-Flow rate	0.000	1	0.000	0.000	1.0000	
Residual	0.034	7	4.854E-003			
Lack of Fit	0.034	3	0.011			
Pure Error	0.000	4	0.000			

Table 3: Results of system suitability parameters

S.No	Name	RT(min)	Area (µV sec)	Height (µV)	USP tailing	USP plate count
1	Benserazide	3.361	18731	209210	1.15	3547
2	Levodopa	4.251	102954	418413	1.10	7412

Table 4: Results of LOD

Drug name	Baseline noise(µV)	Signal obtained (µV)	S/N ratio	Conc. In PPM
Benserazide	53	147	2.77	0.02µg/ml
Levodopa	53	151	2.85	0.04µg/ml

Table 5: Results of LOQ

Drug name	Baseline noise(µV)	Signal obtained (µV)	S/N ratio	Conc. In PPM
Benserazide	53	521	9.83	0.07µg/ml
Levodopa	53	528	9.96	0.15µg/ml

Conclusion

The analytical method developed for the simultaneous estimation of Benserazide and Levodopa using High Performance Liquid Chromatography (HPLC) was extensively optimized and validated as per ICH guidelines. A Box-Behnken response surface design was used to evaluate the effects of method parameters such as mobile phase composition, pH, and flow rate. The statistical analysis showed that the flow rate significantly influenced resolution, while the organic phase ratio and buffer pH had notable effects on the tailing factor. The optimized chromatographic conditions using a SPURCIL C18 column (250×4.6 mm, 5 µm), ammonium acetate buffer (pH 5.0), and methanol (70:30), with a flow rate of 1.0 ml/min and detection at 220 nm, yielded well-resolved peaks with acceptable system suitability parameters (resolution >2, tailing factor <2, and theoretical plates>2000). Method validation

confirmed that the developed method is robust, accurate, precise, and linear over the tested ranges. The assay results showed recovery rates within 98–102%, with %RSD values for both repeatability and intermediate precision under 2%, confirming method precision. Linearity was established for Benserazide (10–50 µg/ml) and Levodopa (40–200 µg/ml) with correlation coefficients (R^2) of 0.9997 and 0.9998 respectively. Limits of detection (LOD) and quantification (LOQ) for both drugs were satisfactorily low, supporting the method's sensitivity. The method was also robust to small variations in flow rate and mobile phase composition, indicating reliability in routine analysis. Thus, the developed HPLC method is suitable for the simultaneous quantitative determination of Benserazide and Levodopa in pharmaceutical formulations.

References

[1] Sharma PV. *Dravyaguna Vijnana*. Vol 1. Varanasi: Chaukhambha Bharati Academy; 2005.

[2] Kalia LV, Lang AE. Parkinson's disease. Lancet. 2015; 386(9996): 896–912.

[3] Olanow CW, Stern MB, Sethi K. The scientific and clinical basis for the treatment of Parkinson disease. Neurology. 2009; 72(21): S1–S136.

[4] Jenner P. Pharmacology of levodopa. J Neurol. 1995; 242(1):S2–S4.

[5] Obeso JA, Olanow CW, Nutt JG. Levodopa motor complications in Parkinson's disease. Trends Neurosci. 2000; 23(10): S2–S7.

[6] Poewe W, Antonini A, Zijlmans JC, Burkhard PR, Vingerhoets F. Levodopa in the treatment of Parkinson's disease: an old drug still going strong. Clin Interv Aging. 2010; 5: 229–38.

[7] Radhakrishna T, Narayana G, Satyanarayana A. Simultaneous determination of levodopa and benserazide in pharmaceutical preparations by HPLC. Indian J Pharm Sci. 2002; 64(5): 408–11.

[8] Snyder LR, Kirkland JJ, Dolan JW. Introduction to Modern Liquid Chromatography. 3rd ed. Hoboken: Wiley; 2010.

[9] Dong MW. Modern HPLC for Practicing Scientists. Hoboken: Wiley; 2006.

[10] Blessy M, Patel RD, Prajapati PN, Agrawal YK. Development of forced degradation and stability indicating methods a critical review. J Pharm Anal. 2014; 4(3):159–65.

[11] ICH Harmonised Tripartite Guideline. Pharmaceutical Development Q8(R2). International Council for Harmonisation; 2009.

[12] Peraman R, Bhadraya K, Reddy YP. Analytical Quality by Design: A tool for regulatory flexibility and robust analytics. Int J Anal Chem. 2015; 2015: 868727.

[13] FDA. Guidance for Industry: Analytical Procedures and Methods Validation for Drugs and Biologics. Silver Spring (MD): U.S. Food and Drug Administration; 2015.

[14] Wollmer E, Klein S. Development and validation of a robust and efficient HPLC method for the simultaneous quantification of levodopa, carbidopa, benserazide and entacapone in complex matrices. Journal of Pharmacy & Pharmaceutical Sciences. 2017; 20: 258-69.

[15] Coello J, Maspoch S, Villegas N. Simultaneous kinetic-spectrophotometric determination of Benserazide and levodopaby bi-and three-way partial least squares calibration. Talanta. 2000 Dec 4; 53(3): 627-37.

[16] Blanco M, Coello J, Iturriaga H, Maspoch S, Villegas N. Simultaneous spectrophotometric determination of Benserazide and levodopain a pharmaceutical.

[17] Anthony C, Moffat O, David M, Widdop B, Moffat AC. Clarke's analysis of drugs and poisons. Pharmaceutical press; 2003.

[18] Osselton, M. David, Brian Widdop, and Laurent Y. Galichet. "Clarke's analysis of drugs and poisons." (2003).

[19] Finkel R, Clark MA, Cubeddu LX, editors. Pharmacology. Lippincott Williams & Wilkins; 2009.

[20] Cartwright, Anthony C. "The British pharmacopoeia, 1864 to 2014: medicines, international standards and the state." (2016).

[21] Abdellatef HE. Utility of certain π-acceptors for the spectrophotometric determination of perindropil. Journal of pharmaceutical and biomedical analysis. 1998; 17(8):1267-71.

[22] Witek,A., Hopkala, H., Matysik, G.; TLC-densitometric determination of bisoprolol, labetalol and propafenone, as dabsyl derivatives, in pharmaceutical preparations; Chromatographia, (1999); 50(1): 41–44.

[23] Madhusudhanareddy, I., Bhagavan, R., Rajendra, P.; Validated, stability indicating liquid chromatography method for quantification of bisoprolol fumarate tablet dosage form; International Journal of Pharmaceutics, (2012); 2(1): 64–70.

[24] Kumar,N.S.,Sreenivasulu,V.,Ramachandra,B.,Asif,M.,Ibrahim,A.A.;A stability-indicating LC-MS method for determination of perindropil and itsprocess related impurities; Pharmaceutical Chemistry Journal, (2018); 52(4): 378–383.

[25] Dugga, H.H.T., Peraman, R., Nayakanti,D.; Stability-indicating RP-HPLC method for the quantitative analysis of perindropil Erbumine in tablet dosage for; Journal of Chromatographic Science, (2013); 52(4): 315–320.

[26] The United States Pharmacopeia and National Formulary USP 41 NF 36. 2021.

[27] Helmy S, EL-Masry S, Mazyed E, Helmy S AM. Patient-Friendly Extemporaneous Formulation of Bisoprolol: Application to Stability and Bioavailability Studies. Res Sq. 2022; 13(3): 1–23.

[28] Sudheer Moka, Sai Rajesh Kollapudi, Sainadh Ravipati, Abhilash Reddy Yaramala. Analytical Quality by Design (AQbD) Approach for the Development of a Robust RP-HPLC Method for Metformin and Nateglinide in Pharmaceutical Formulations. Journal of Rare Cardiovascular Diseases, 2025; 5(1); 506-512.

[29] Logoyda L, Kovalenko S, Abdel-Megied A, Zhulkevych I, Drapak I, Demchuk I, et al. HPLC method development for the analysis of bisoprolol in combined dosage form containing bisoprolol and

enalapril and in vitro dissolution studied. Int J Curr Pharm Res. 2019; 11(3): 186–94.

[30] Hassan S, Nashat N, Elghobashy M, Abbas S, Moustafa A. Stability-Indicating RP-HPLC and CE Methods for Simultaneous Determination of Bisoprolol and perindropil in Pharmaceutical Formulation : A Comparative Study. J Chromatogr Sci. 2020; 58(8): 747–58.

[31] Alahmad S, Hammad S, Mabrouk M, Mansour F. Development and Validation of Novel RP-HPLC Method for Simultaneous Determination of Ramipril, Hydrochlorothiazide and Bisoprolol in Ternary combinations. Der Pharma Chemica. 2017; 9(20):70

[32] Pawar SH, Tamboli A. Patil S. UV spectrophotometric area under curve method for the simultaneous determination of Bisoprolol fumarate and Cilnidipine in pharmaceutical dosage form. World J Pharm Res. 2020; 9(5): 1691-1699.

[33] Mishra P. Development and Validation of Q-Absorbance Ratio UV Spectrophotometric Method for Simultaneous Determination of Bisoprolol Fumarate and Cilnidipine in Marketed Formulation Besicor C5. Asian J Pharm. 2022; 16(3): 905–7.

Source of Support: Nil. Conflicts of Interest: None declared.