OPTIMIZATION AND VALIDATION OF A SUSTAINABLE ECO-FRIENDLY HPTLC METHOD FOR THE DETERMINATION OF HYDROCHLOROTHIAZIDE, LOSARTAN POTASSIUM AND RAMIPRIL IN BULK AND TABLET DOSAGE FORMS

Vidhya K. Bhusari[a]*, Aditi M. Chavan[a] and Minal R. Ghante[a]

(Received 03 March 2025) (Accepted 12 July 2025)

ABSTRACT

This study presents a novel and efficient HPTLC method for the simultaneous quantification of hydrochlorothiazide, losartan potassium and ramipril in tablet and bulk dosage forms. Chromatographic separation was achieved using precoated TLC plates and as mobile phase composition toluene, chloroform, methanol and acetic acid (4:6:2:0.1 V/V/V/V)). Densitometric analysis at 212 nm yielded Rf values of 0.21 ± 0.02 for hydrochlorothiazide, 0.39 ± 0.02 for losartan potassium and 0.51 ± 0.02 for ramipril. The method showed a linear relationship within 50-300 ng spot^{-1} for hydrochlorothiazide, 200-1200 ng spot^{-1} for losartan potassium and 20-120 ng spot^{-1} for ramipril, with accurate calibration curves. Robustness, accuracy and recovery were validated, confirming consistency, specificity and selectivity, in line with ICH guideline Q2(R2) and Q14. Quality by design principles and optimization with Design-Expert Software were applied. Environmental impact was assessed using analytical greenness metric approach, complex green analytical procedure index and blue applicability grade index analysis, confirming the method's eco-friendly approach.