Development and Validation of Electrochemical Method for Quantification of Palbociclib (Anticancer Agent) in Biological Matrices Using Square Wave- Adsorptive Stripping Voltammetry

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The electrochemical reduction behavior of palbociclib (PLB) was studied using square wave voltammetry, differential pulse polarography and cyclic voltammetry in Britton-Robinson (B-R) buffer of pH 7.0. The mercury electrode was used to accumulate PLB into its surface to give a well-defined reduction wave at -1.05 V potential in the presence of Ag/AgCl reference electrode and Pt auxiliary electrode. There were some analytical parameters which studied to obtain the best reduction signal, such as buffer solutions (types and strength), pH values, scans and stirring rates. Britton-Robinson buffer of pH 7.0, 50 s accumulation time, 0.0 V accumulation potential, 30 Hz frequency, 300 mV s⁻¹ scan rate, 50 mV amplitude, 0.6 mm² drop area, and 3000 rpm were recorded high sensitivity for the PLB determination, so they were chosen as optimum parameters for the next work. The repeatability, stability, recovery, calibration curve and detection limit were validated to evaluate the analytical performance of the developed method. Repeatability and stability of 5 x 10⁻⁷ mol L⁻¹ of PLB were reported 0.0282% relative standard deviation (RSD%) for ten cathodic measurements, and a good stability for 120 min, respectively. Calibration curve was studied over the range 1x10⁻⁷ - 1 x 10⁻⁶ mol L⁻¹ for PLB to be obtained a linear relationship with a 0.992 correlation coefficient (r²) for six measurements (n = 6). Lower detection limit (LOD) was calculated to be 8.8 x 10⁻¹¹ mol L⁻¹ (0.039 ppb), while lower quantification limit (LOQ) was become 2.9 x 10⁻¹⁰ mol L⁻¹ (0.131ppb). The square wave voltammetry method was applied for quantification of PLB at the human plasma and urine samples.

Keywords. Voltammetry, reduction behavior, palbociclib, human plasma, mercury electrode, buffer solution.

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