DEVELOPMENT OF AN ANALYTICAL METHOD USING HPLC-DAD FOR THE QUANTIFICATION OF CURCUMIN FROM NANOCAPSULES ADMINISTERED TO *DROSOPHILA MELANOGASTER*

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ABSTRACT

INTRODUCTION: Curcumin (CUR), a bioactive compound extracted from the rhizome of *Curcuma longa*, is widely recognized for its anti-inflammatory potential, as well as its antioxidant and neuroprotective properties. However, pharmacokinetic limitations such as poor water solubility and low oral bioavailability hinder its therapeutic application. In this context, polymeric nanocapsules have been explored as a promising strategy to overcome these barriers, providing increased stability and controlled release. To investigate the biodistribution behavior of nanoencapsulated curcumin (NC-CUR), *Drosophila melanogaster* was used as an experimental model due to its high genetic similarity to humans, including the ability to metabolize compounds similarly to the human liver. This feature makes the species effective for toxicological and drug metabolism studies. OBJECTIVE: To develop and validate a bioanalytical method for the quantification of curcumin in *Drosophila melanogaster* homogenates using high-performance liquid chromatography with diode-array detection (HPLC-DAD). MATERIALS AND METHODS: Curcumin extraction from whole body flies was performed by liquid-liquid partitioning. A C18 reverse-phase column (150 mm × 4.6 mm, 5 µm) was used, with a mobile phase composed of acetonitrile, methanol, and water (43:10:47, v/v/v). The aqueous phase containing 0.3% triethylamine was adjusted to pH 3 with phosphoric acid. The flow rate was maintained at 1 mL/min, with detection at 424 nm (CUR) and 365 nm (internal standard). The total run time was 11 minutes. RESULTS: The method showed linearity (R^2 = 0.9979) over the range of 3–150 ng/mL. Intraday precision ranged from 0.09% to 14.1%, while interday precision ranged from 2.72% to 12.94%. Accuracy ranged from 90.85% to 112.37%.

The limits of detection and quantification were 0.30 µg/mL and 1.01 µg/mL, respectively. Processed samples remained stable for up to 30 days at -20 °C. CONCLUSION: The validated HPLC-DAD method proved to be effective and reliable for the quantification of curcumin in biological samples, making it suitable for biodistribution studies involving CUR and NC-CUR in *Drosophila melanogaster*.

Keywords: Bioanalytical method; HPLC; Validation

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