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OPTIMIZING THE AQUEOUS EXTRACTION OF CROCIN FROM SAFFRON AND MODELING THE KINETICS OF ITS DEGRADATION DURING STORAGE AND HEAT TREATMENT

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ABSTRACT

This study aims to optimize the extraction of crocin from saffron through various methods and energy levels, and to investigate its stability during storage and heat treatment. Three extraction techniques−maceration, microwave-assisted extraction (MAE), and ultrasound-assisted extraction (UAE)−were evaluated at different energy levels to determine the most efficient method. The resulting extracts were then subjected to stability tests under varying storage temperatures (-12 to 35 °C) and heat treatment conditions (100 to 200 °C). Our findings indicate that MAE and UAE, particularly at higher energy levels for 5 minutes, yielded the most efficient extraction, with an average coloring strength of 265. During storage, crocin degradation followed a zero-order kinetic model, with the degradation rate increasing with higher storage temperatures. The shortest half-life was observed at freezing temperature (100 hours), while the shortest half-life at 35 °C was less than 10 hours. Similarly, during heat treatment, crocin degradation followed a zero-order kinetic model at 100 and 150 °C, with half-lives of 260 and 74 minutes respectively. At 200 °C, the degradation kinetics shifted to first order, with a half-life of 20 minutes. Our results suggest that MAE and UAE at high energy levels are optimal for crocin extraction, and highlight the impact of temperature on crocin stability during storage and heat treatment.