Strawberry puree processed by thermal, high pressure, or power ultrasound: process energy requirements and quality modeling during storage

ABSTRACT

Strawberry puree was processed for 15 min using thermal (65 °C), high-pressure processing (600 MPa, 48 °C), and ultrasound (24 kHz, 1.3 W/g, 33 °C). These conditions were selected based on similar polyphenoloxidase inactivation (11%–18%). The specific energies required for the above-mentioned thermal, high-pressure processing, and power ultrasound processes were 240, 291, and 1233 kJ/kg, respectively. Then, the processed strawberry was stored at 3 °C and room temperature for 30 days. The constant pH (3.38±0.03) and soluble solids content (9.03 ± 0.25°Brix) during storage indicated a microbiological stability. Polyphenoloxidase did not reactivate during storage. The high-pressure processing and ultrasound treatments retained the antioxidant activity (70%–74%) better than the thermal process (60%), and high-pressure processing was the best treatment after 30 days of ambient storage to preserve antioxidant activity. Puree treated with ultrasound presented more color retention after processing and after ambient storage than the other preservation methods. For the three treatments, the changes of antioxidant activity and total color difference during storage were described by the fractional conversion model with rate constants k ranging between 0.03–0.09 and 0.06–0.22 day − 1, respectively. In resume, high-pressure processing and thermal processes required much less energy than ultrasound for the same polyphenoloxidase inactivation in strawberry. While high-pressure processing retained better the antioxidant activity of the strawberry puree during storage, the ultrasound treatment was better in terms of color retention.

Keyword: High-pressure processing; Sonication; Polyphenoloxidase; Antioxidant; Color