

Validation of Escherichia coli O157:H7 Inactivation on Apple-Carrot Juice Treated with Manothermosonication by Kinetic Models

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Abstract : Several models such as Weibull, Modified Gompertz, Biphasic linear, and Log-logistic models have been proposed in order to describe non-linear inactivation kinetics and used to fit non-linear inactivation data of several microorganisms for inactivation by heat, high pressure processing or pulsed electric field. First-order kinetic parameters (D-values and z-values) have often been used in order to identify microbial inactivation by non-thermal processing methods such as ultrasound. Most ultrasonic inactivation studies employed first-order kinetic parameters (D-values and z-values) in order to describe the reduction on microbial survival count. This study was conducted to analyze the E. coli O157:H7 inactivation data by using five microbial survival models (First-order, Weibull, Modified Gompertz, Biphasic linear and Log-logistic). First-order, Weibull, Modified Gompertz, Biphasic linear and Log-logistic kinetic models were used for fitting inactivation curves of Escherichia coli O157:H7. The residual sum of squares and the total sum of squares criteria were used to evaluate the models. The statistical indices of the kinetic models were used to fit inactivation data for E. coli O157:H7 by MTS at three temperatures (40, 50, and 60 °C) and three pressures (100, 200, and 300 kPa). Based on the statistical indices and visual observations, the Weibull and Biphasic models were best fitting of the data for MTS treatment as shown by high R² values. The non-linear kinetic models, including the Modified Gompertz, First-order, and Log-logistic models did not provide any better fit to data from MTS compared the Weibull and Biphasic models. It was observed that the data found in this study did not follow the first-order kinetics. It is possibly because of the cells which are sensitive to ultrasound treatment were inactivated first, resulting in a fast inactivation period, while those resistant to ultrasound were killed slowly. The Weibull and biphasic models were found as more flexible in order to determine the survival curves of E. coli O157:H7 treated by MTS on apple-carrot juice.

Keywords : Weibull, Biphasic, MTS, kinetic models, E.coli O157:H7

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