
Heat transfer coefficients and temperature distribution in conventional and microwave-assisted pasteurization of mango pulp

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Mango is the second most produced tropical fruit and the fourth most exported worldwide. Emerging electric and dielectric technologies, such as continuous-flow microwave heating, offer advantages over conventional processing. The objectives of this work were to study, model and simulate heat transfer and temperature history in the continuous flow pasteurization of mango pulp. For that, a Lab25-UHT/HTST EMVH pasteurization unit (MicroThermics, USA) was used, which consist of two countercurrent helical coil heat exchangers (Heater 1 and Cooler, with water as utility), a microwave heater (Heater 2) and a holding tube. Palmer mango (*Mangifera indica* L.) pulp was extracted and processed by conventional and microwave heating methods for process temperatures of 70, 75, 80 and 90 °C and residence times of 30, 20, 10 and 5 s. The experimental overall heat transfer coefficient (U) was determined from the heat loads of the product. Four semi-empirical models for U were tested, which considers the convective and conductive thermal resistances and use up to seven parameters. The correlations were adjusted minimizing the mean squared error for prediction of U. For Heater 1, correlation with six parameters provided a good fit, while for Cooler only three parameters were necessary, and for the holding tube, an average value was considered for the heat losses. The best adjusted correlations were used to predict the temperature history T(t) considering a mathematical model of unidimensional flow. Simulations provided the temperature history along the process. The difference between predicted and experimental temperatures were under 1.3, 1.7, 4.3 and 3.7 °C for Heater 1, Heater 2, holding tube and Cooler, respectively. The temperature history for conventional heating indicates that the product stays at the process temperature way longer than needed, which may suggest over-processing. Microwave heating occurred in less than 5 s at the lowest flow rate (0.2 L/min), while conventional heating took 20 s at the highest flow rate (1.2 L/min). Therefore, for all process conditions, microwave heating was faster than conventional. The proposed model can be used to evaluate the lethality of the process for both processing methods. Support: FAPESP 2013/07914-8, CAPES 88887.469353/2019-00, CNPq 316388/2021-1.