Determination of Optimum Time – Temperature Combination for Pasteurization and Estimation of Shelf Life of Carbonated Fruit Beverage

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It is important to deliver safe carbonated fruit beverages to the market. The aim of this research was to determine the optimum time-temperature combination for the pasteurization of carbonated fruit beverages and estimate the shelf-life. The optimum time-temperature combination was determined by subjecting the samples into different pasteurization conditions (63 □C/5 min, 63 □C/10 min, 71 □C/5 min, 71 □C/10 min, 75 □C/5 min, 75 □C/10 min, 80 □C/5 min and 80 □C/10 min) with or without sorbic acid as a preservative. The effectiveness of the appropriate time-temperature combination was measured using the yeast and mold count and it was considered as the critical factor for shelf-life determination. The shelf-life was determined based on the optimum heat treatment. Heat treated beverage cans were stored at accelerated temperatures of 35 □C, 45 □C for 9 weeks to evaluate the pH, acidity (%), total soluble solids (°Brix) and yeast and mold count (cfu/ml) in every week. The shelf-life of the product was determined by the accelerated shelf-life method using the Arrhenius model. The Q_{10} values were obtained from the model and literature data to calculate the estimated and predicted shelf-life, respectively. Based on the results, lowest heat treatment of 63 □C/5 min was not recommended for the pasteurization. However, heat treatment of 71 □C/10 min was recommended for the pasteurization. It was observed that, the quality attributes such as acidity, pH and °Brix of the product decreased with time. Based on the Arrhenius model, the growth of yeast and mold followed the first-order reaction. The change in yeast and mold count was used to estimate the shelf-life of carbonated fruit beverages in terms of microbial safety. According to the accelerated shelf-life model, the estimated shelf-life of carbonated fruit beverage (without preservative) was 15.44 weeks at room temperature (25 °C) and the predicted shelf-life for carbonated fruit beverage (without preservative) was 35.76 weeks at room temperature.

Keywords: Carbonated, Fruit beverage, Pasteurization, Quality, Time-temperature

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