Development of Food Quality Prediction Models in Shared Kitchens

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Abstract:

Shared kitchens are receiving significant attention for their innovative restaurant business models that improve resource efficiency and minimize entrepreneurs' initial costs. Despite these advantages, shared kitchens have unique challenges in maintaining food quality and safety due to their dynamic and multifaceted operating environment, which includes diverse stakeholders, shared resources, and various hygiene standards. Traditional quality control systems often fall short of addressing these complexities. This study proposes a data-driven food quality prediction model specifically tailored to shared kitchens. The model integrates microbial data by categorizing them into two main groups: environmental factors such as temperature and risk of cross-contamination, and operational factors including food ingredients initial quality and cookware conditions. The food preparation process was divided into five stages(storage, preprocessing, waiting, cooking, and delivery) enabling step-by-step risk assessment. To predict microbial counts and contamination risk, this study used modified gompertz growth curves and microbial transfer equations. For model verification, this study predicted *E. coli* levels in egg salads at each stage and compared them to the actual microbial count, achieving an accuracy of less than 1 log(CFU/g). This study provides a practical framework for proactive food safety management in shared kitchens. This study can be used as a tool to predict and prevent quality degradation in the storage and delivery stages of high-temperature exposure and non-heated food. Especially, it contributes to clarifying responsibility and enhancing food safety through data-driven quality control by considering the risk of equipment sharing and cross-contamination in shared kitchens.

Keywords:

Shared Kitchen, Food Quality Management, Cross-contamination, Prediction.