Predicting the shelf life of postharvest *Flammulina velutipes* at various temperatures based on mushroom quality and specific spoilage organisms

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Abstract

Rapid senescence and microbial infection lead to a short shelf life for postharvest *Flammulina velutipes*. Therefore, a model for predicting the shelf life for this product would be meaningful and enable necessary steps to be taken to reduce losses. We simulated shelf storage of *F. velutipes* at three temperatures (4, 15 and 25 °C). Sensory, biochemical and microbial evaluations of the samples were carried out at frequent intervals. The kinetic models combined with the Arrhenius equation were used to establish shelf life prediction models based on quality indexes; whereas, the Gompertz model combined with the Belehradek equation were used to establish a growth trend and shelf life prediction model for *F. velutipes* based on the presence of *Pseudomonas* spp. Moreover, the microbial growth model was verified by several indices including the correlation coefficient R^2, accuracy factor A_f and bias factor B_f. The results showed that the shelf-life kinetic models established according to four quality indicators were highly accurate, the R^2 was >0.90 and the relative error between the measured and the predicted values were less than ±10%. In particular, the shelf-life prediction model established using the whiteness value was best. The mathematical model at different temperatures fitted the modified Gompertz model with a high correlation coefficient (R^2 > 0.95). The A_f and B_f of the Belehradek model were all between 0.9 and 1.05. The residual value between the predicted value and measured values was less than ±0.1. Using these validated models, the shelf life of *F. velutipes* can be estimated at any point in the cold chain if the temperature history is known. These models can serve as effective tools for predicting shelf life and developing new products for the fresh produce food sector.