Mathematical modeling *Pseudomonas spp.* growth and microflora composition variation in *Agaricus bisporus* fruiting bodies during chilled storage

Jie Li, Qi Wei, Linxiang Huang, Ting Fang, Bingzhi Chen and Yuji Jiang

Postharvest Biology and Technology, Volume 163, May 2020, 111144

Abstract

The objective of this study was to determine the dominant microorganism in *Agaricus bisporus* fruiting bodies (ABFB) and to develop kinetic models to describe its growth. The variation in microflora composition in ABFB stored at 4 °C during storage was studied using 16S rDNA sequence analyses. ABFB presented complex microbial communities at the initial stage of storage (day 0), with the dominant microorganism being *Pseudomonas* spp. along with small proportions of *Pedobacter*, *Sphingobacterium*, *Bacillus*, *Corynebacterium*, *Lactobacillus*, *Sphingomonas*, and *Staphylococcus*. On day 12, an increase of *Pseudomonas* spp. and a significant decrease of *Pedobacter* were observed. As the dominant spoilage microorganism during the storage, the relative abundance of *Pseudomonas* spp. showed an increasing trend. Additionally, samples inoculated with a cocktail of *Pseudomonas* spp., i.e., *P. fluorescens, P. migulae*, *P. tolaasii*, and *P. agarici*, were incubated at temperatures of 4, 10, 16, 20, 25, and 32 °C to assess their growth kinetics. Three primary models (Huang, Baranyi, and Reparameterized Gompertz model) and three secondary models (Huang square-root, Ratkowsky square-root, and Arrhenius-type model) were compared to evaluate the effect of temperature on bacterial growth using the Integrated Pathogen Modeling Program. The Reparameterized Gompertz model was a better fit than the Huang and Baranyi models to describe the growth of *Pseudomonas spp.*, and had the lowest mean square error (MSE) and sum of squared errors (SSE) values, ranging from 0.012 to 0.291 and 0.059–1.783, respectively. Huang square-root model MSE and SSE values were 0.002 and 0.007, respectively, and its predicted minimum growth temperature was -0.72 °C. Therefore, the Huang square-root model was more suitable for describing the effect of temperature on growth of *Pseudomonas* spp. on ABFB. The models developed in this study can be used to evaluate the growth behavior of *Pseudomonas* spp. on ABFB and assess their shelf-life.