
Applications of Food Engineering in the Hurdle Technology: An Important Area Needs to be Progressed

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In reality any food product is produced based on hurdle technology. The applied hurdles are mainly identified based on trial and error or past experience. In the case of individual hurdle, theoretical approaches or generic guidelines are available in the literature. For examples, general guidelines or predictions of stability are available for the water activity, heat treatment (i.e. F-value) and pH hurdles. However, negligible progress has been done on the prediction of food stability when combined methods or hurdle technology are used. Even empirical correlations or generic guidelines are negligible when multi-hurdles are used. In this paper, the current status of the hurdle technology will be presented followed by identifying the future needs. First the reported metaphors for the hurdle technology will be presented. Second, the basic understanding of the hurdle effects to the microbes will be discussed with selected examples (e.g. homoeostasis, metabolic exhaust or auto-sterilization and stress reactions). These reactions to the microbes can guide us to apply hurdle technology in foods in an intelligent way. Finally, the potential of the food engineering approach, for examples multiple regression, probabilistic approach considering a boundary problem, multivariate analysis, data mining, machine learning, neural networks and fuzzy logic will be discussed to develop generic guidelines and prediction models. In this regard, available empirical correlations to determine food safety will be discussed when multi-hurdles are used. In the future, a food engineering approach could play an important role to achieve the progress of hurdle technology. Overall, this paper will present the complete overview of the hurdle technology including its past, present and future progresses.