

Application of advanced data analysis techniques in food shelf-life studies.

Antonio Vázquez Palazón ^{1*}, José Miguel Bolarín Guillén²

¹ National Technological Centre for the Food and Canning Industry, CTNC, Spain.

² Technological Centre of Information Technologies and Communications, CENTIC, Spain

* Corresponding Author: avazquez@ctnc.es

INTRODUCTION

The food shelf-life study is a fundamental procedure to guarantee food safety, as well as other different technical attributes, both in the case of fresh foods, and those suffering some kind of process. In accordance with the legal requirements under 1169/2011 (EU) Regulation, about food information provided to consumers and 2073/2005 (EC) Regulation, on microbiological criteria applicable to food stuffs, the food business operators must carry out and validate useful shelf-life studies that justify that the date printed on the food packaging agrees with the right food condition.

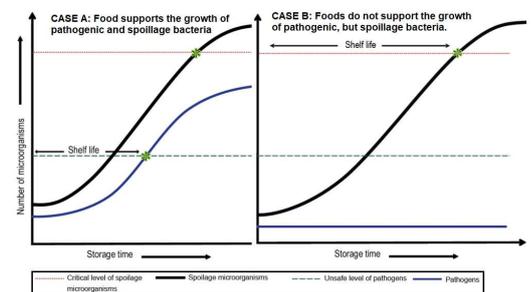
Any technological innovation that affects the development of a product, packaging or the main manufacturing process, needs to determine its shelf-life period with minimal guarantees. To overcome the temporal limitation necessary for this study, once the microbiological stability of the product has been demonstrated, the use of accelerated shelf-life studies is frequently used, in order to obtain results that could be extrapolated to the real evolution of the product under retail's storage conditions.

The general purpose of the project is to improve the precision and predictive capacity of Accelerated food Shelf-Life Tests (ASLT), using advanced data analysis techniques. To achieve this objective, different advanced methodologies for modelling, calculation, statistical analysis and artificial intelligence techniques will be used, which will allow conclusions to be drawn about the shelf-life of food, based mainly on the information obtained from accelerated aging tests.

METHODOLOGY

The methodology used is based on the following goals:

- Identification and assignment of the shelf life's limiting factors for each food.
- Design of optimal environmental conditions for accelerated shelf-life studies (ASLT) for different food groups of interest.
- Application of statistical techniques of multivariate analysis, based on Principal Component Analysis (PCA) methodology, to improve kinetic models describing food attributes evolution at different environmental storage conditions.
- Use of Artificial Intelligence (AI) techniques to justify food temporal evolution and decision-making in life-time studies, based on each food shelf-life limiting factors and their acceptance limits.



CONCLUSIONS

We have evaluated the shelf life of different products using advanced analysis techniques implemented by CENTIC, such as multivariate analysis and AI methods.

Multivariate analysis based on PCA have demonstrated multiple advantages over traditional univariate approach (Arrhenius model), recommending its use as a complement in the explanation of food spoilage phenomena.

AI methods are a wide range of algorithms which have different purposes. Besides machine learning, multiple regression algorithms are trained, evaluated and finally tested on predicting the shelf life, based on the available experimental data provided by CTNC food labs.

The use of advanced data analysis techniques will improve the capacity of food operators to design and develop accelerated shelf-life studies, extract in a precise and exact way the evolution of all microbiological, physical-chemical and organoleptic food attributes, and to identify, quantify and improve the shelf-life limiting factors.

The achievement of these specific objectives would allow food companies and Technological Centers involved in this project to acquire a fundamental knowledge for the development of the methodology that is applied in the preparation of food shelf-life.

For any additional information regarding this project: www.ctnc.es, or National Technological Centre for the Food and Canning Industry CTNC. Calle Concordia s/n 30500 Molina de Segura, Murcia, Spain. Tel: +34 968389011 ctnc@ctnc.es