

Multi-response Modelling of the Maillard reaction in a model cheese

Emmanuel Bertrand, Xuân-Mi Meyer, Elizabeth Machado-Maturana, Barbara Rega, Anne-Sophie Guillard, Alain Kondjoyan, J Berdague, Jean-Louis Berdagué

► **To cite this version:**

Emmanuel Bertrand, Xuân-Mi Meyer, Elizabeth Machado-Maturana, Barbara Rega, Anne-Sophie Guillard, et al.. Multi-response Modelling of the Maillard reaction in a model cheese. XIth International Symposium on the Maillard Reaction, Sep 2012, Nancy, France. pp.2012 - 2012. hal-01852782

HAL Id: hal-01852782

<https://hal-amu.archives-ouvertes.fr/hal-01852782>

Submitted on 2 Aug 2018

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

MULTI-RESPONSE MODELING OF THE MAILLARD REACTION IN A MODEL CHEESE

E. BERTRAND^{1,2}, X.M. MEYER^{3,4}, E. MACHADO-MATURANA¹, B. REGA^{5,6}, A.S. GUILLARD²,
A.KONDJOYAN¹, J.L. BERDAGUE^{1,*}

1) INRA, UR 370 Qualité des Produits Animaux F-63122 St-Genès-Champanelle

2) Fromageries Bel D.R.A.G 7, Bd de l'industrie F-41100 Vendôme

3) Université de Toulouse, INPT, UPS, Laboratoire de Génie Chimique, 4 Allée Emile Monso, F-31030 Toulouse, France

4) CNRS ; Laboratoire de Génie Chimique ; F-31030 Toulouse, France

5) INRA, UMR1145 Ingénierie Procédés Aliments, F-91300 Massy

6) AgroParisTech, UMR1145 Ingénierie Procédés Aliments, F-91300 Massy

email: *jean-louis.berdague@clermont.inra.fr

Submitted for poster presentation

Presenting Author : Barbara Rega

Processed cheese derives from a secondary milk processing step that involves mixing and heating dairy (cheese, butter and milk powders) and non-dairy products (emulsifiers). This processing yields a homogeneous product, usually spreadable, with a shelf-life often longer than 6 months.

During cheese processing and storage, lipid oxidation, caramelization and Maillard reactions occur and produce odour-active compounds. In this study, a methodological approach was used in order to (i) identify odorants responsible for flavor attributes or compounds involved in the reaction chain, (ii) monitor the evolution of these markers during the heat treatment applied to the matrix, (iii) establish an observable reaction scheme and (iv) model and predict the evolution of these compounds during thermal operations.

In this aim, a model cheese and a cooking cell were elaborated. Various couplings of gas chromatography with olfactometry were used to identify odorous compounds. Two-dimensional comprehensive chromatography allowed a semi-quantitation of trace and ultra-trace compounds, while precursors were quantitated by high performance liquid chromatography. An observable reaction scheme of the Maillard reaction was extracted from these data and makes the multi-response modeling step possible despite a partial quantitation of the volatile compounds. Finally, we obtained a formal model combining 19 components (including four odorants) connected by 14 stoichiometric balanced reactions. This model makes it possible to predict the evolution of these components depending on the initial content of lactose, galactose and according to the heat treatment applied to the cheese matrix.

This work was carried out with the financial support of the ANR- Agence Nationale de la Recherche - The French National Research Agency under the Programme National de Recherche en Alimentation et nutrition humaine , project ANR-06-PNRA-023REACTIAL "Prediction and control of the appearance or disappearance of reactional markers during food process and conservation " .

Keywords : processed-cheese; Maillard reaction; observable reaction scheme; multi-response modeling;