



HAL
open science

An original approach to study ascorbic acid degradation kinetics as a function of temperature (50-90 °C) and O₂ concentration (0-30%)

Braulio Gomez Ruiz, Stéphanie Roux, Francis F. Courtois, Catherine Bonazzi

► To cite this version:

Braulio Gomez Ruiz, Stéphanie Roux, Francis F. Courtois, Catherine Bonazzi. An original approach to study ascorbic acid degradation kinetics as a function of temperature (50-90 °C) and O₂ concentration (0-30%). 12. International Congress on Engineering and Food (ICEF12), Jun 2015, Québec, Canada. hal-01512005

HAL Id: hal-01512005

<https://hal.science/hal-01512005v1>

Submitted on 5 Jun 2020

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.



Title:

An original approach to study ascorbic acid degradation kinetics as a function of temperature (50-90 °C) and O₂ concentration (0-30%)

Authors & affiliations:

Gomez Ruiz Braulio^{a,b}, Roux Stéphanie^{a,b}, Courtois Francis^{a,b}, Catherine Bonazzi^{a,b}

^a *AgroParisTech, UMR1145 Ingénierie Procédés Aliments, 91300 Massy, France*

^b *INRA, UMR1145 Ingénierie Procédés Aliments, 91300 Massy, France*

Abstract:

Vitamin C (L-ascorbic acid – AA – and its oxidized form, dehydroascorbic acid – DHA) is a major nutrient with antiscorbutic and antioxidant properties that must be found in food sources for preventing degenerative conditions such as cancer and cardiovascular diseases. Many studies and national nutrition policies recommend an increased consumption of fruit and vegetables which constitute an excellent source of biologically active compounds such as AA. Many of these products are available in a processed form for extending shelf life and delivery, and it is hence important to quantify and control the impact of operating parameters on the stability of nutrients during thermal processing and storage. More specifically, AA is known to be very sensitive to oxidation, but there is a lack of data available on the quantitative impact of temperature and oxygen on the degradation reactions.

An original device for assessing degradation reactions in liquid solutions was developed, with a rigorous control of temperature and concentration of dissolved O₂. It is composed of a reactor (EasyMax 102, Mettler Toledo) and a gas mixer (GasMix, AlyTech). Kinetics of AA and DHA in a malate buffer (pH3.8) were followed for temperatures in the range of 50-90 °C and O₂-partial pressures in the range of 0-30%. Concentrations in AA and DHA were measured using a fast and robust quantitative spectrometric method especially developed for this purpose.

An original experimental database was obtained, reflecting the high sensitivity of the reactions to the aforementioned parameters. A multi-response modeling of the kinetics made it possible to obtain a good fit of AA and DHA losses, but values for order with respect to O₂ concentration were difficult to interpret and varied with temperature. These results let us think that the ascorbic acid degradation pathways might include radical reactions involving different radical species for oxygen and ascorbate.