

Dans les revues à comité de lecture de 2007 à 2010

Kouassi-Koffi J.D., Launay B., Davidou S., Kouame L.P. et Michon C. (2010)

Lubricated squeezing flow of thin slabs of wheat flour dough: comparison of results at constant plate speed and constant extension rates.

Rheologica Acta, 49:275-283

Kouassi-Koffi J.D., Davidou S., Launay B., Kouame L.P. et Michon C. (2009)

Compression en conditions lubrifiées de disques de pâtes de farine de blé d'élasticité différente à vitesses de traverse ou d'extension biaxiale constante.

Rhéologie, 15 :34-42

Résumé :

Des essais de compression en conditions lubrifiées de disques de pâtes de farine de blé sont réalisés en utilisant deux modes de pilotage de vitesse de traverse : vitesse constante et vitesse décroissante de manière exponentielle au cours du temps telle que la vitesse d'extension biaxiale (b) au sein de l'échantillon de pâte reste constante. La contribution de l'élasticité de la pâte aux propriétés rhéologiques est modifiée en testant une pâte de farine « simple » puis enrichie en glucose oxydase ce qui augmente G' et diminue $\tan \delta$. Un comportement de type rhéofluidifiant est mis en évidence dans toutes les conditions de mesure et une loi en puissance ($\sigma_b = K b^n$) peut être ajustée aux données expérimentales. Les valeurs de K sont toujours plus élevées en mode de pilotage à vitesse de traverse constante. Les valeurs de n sont, pour les deux modes de pilotage, comprises entre 0,20 et 0,30 aux faibles déformations (ϵ_b 0,1 pour la pâte témoin, ϵ_b 0,4 pour la pâte plus élastique). Au-delà, elles décroissent fortement et semblent tendre vers zéro. Le coefficient m ($= \ln \sigma_b / \epsilon_b$), souvent interprété comme traduisant le comportement rhéodurcissant des pâtes de farine, dépend de ϵ_b et est compris entre 1 et 2 aux déformations supérieures à 0,2. Aux faibles déformations ($< 0,2$), les valeurs de m sont beaucoup plus élevées mais ne peuvent pas être reliées seulement au caractère rhéodurcissant du fait de la présence d'un régime transitoire lié aux propriétés viscoélastiques de ces pâtes. Les différences importantes entre les résultats et les données publiées sont principalement attribuées à l'utilisation d'une géométrie différente (volume de pâte comprimée constant vs surface constante) et à leur rapport diamètre/épaisseur du disque de pâte beaucoup plus élevé.

Mots-clé : Rhéologie, compression en condition lubrifiée, pâte de farine, écoulement, loi en puissance, viscoélasticité, rhéodurcissement

Chériot S., Billaud C., Pöchltrager S., Wagner K.-H., Nicolas J. (2009).

A comparison study between antioxidant and mutagenic properties of cysteine-glucose-derived Maillard reaction products and neoformed products from heated cysteine and hydroxymethylfurfural

Food Chemistry. 114, 132-138.

Abstract :

It was previously reported that Maillard reaction products (MRP) obtained from glucose with cysteine (1 M/0.25 M) mixtures and compounds generated during the mixing of heated cysteine with HMF solutions (Mix) were prone to inactivate various vegetal polyphenoloxidases (PPO). In this study, antioxidant properties of these model systems were compared using in vitro assays (AAPH_•, DPPH_• and TMM tests).

Results showed that antioxidant activity observed in MRP and the Mix could be attributed to the sulfhydryl group of cysteine. The Mix behaved like a non-competitive inhibitor towards eggplant PPO ($K_i = 0.7$ IM). A highly active fraction, devoid of thiol compound and HMF, was obtained after fractionation of the Mix by SPE. The Mix was as efficient as metabisulfite in preventing enzymatic browning of apple puree (CIE-La*b*). MRP, the Mix and HMF could not be considered as mutagenic in the Salmonella microsome assay using Salmonella typhimurium TA98 and 102 strains.

Davidou S., Michon C., Ben Thabet I. & Launay B. (2008).

Influence of shaping and orientation of structures on rheological properties of wheat flour dough measured in dynamic shear and in biaxial extension.

Cereal Chemistry. 85(3), 403-408.

Abstract :

Characterisation of the rheological properties of wheat flour dough during mixing and baking without modifying its

structure and its mechanical properties is not easy. In this work, the effect of dough setting pre-orientation and of strain orientation when characterizing are assessed for differently structured wheat flour dough (various water contents and addition of glucose oxydase). Rheological properties were measured in dynamic shear, rotational (CSL2100 fitted with a cone-plate geometry) or radial (CP20 fitted with a plate-plate geometry) called small deformation mode - and in lubricated squeezing flow and relaxation called large deformation. In comparison with radial shearing, rotational shearing induces a much larger pre-orientation of the network and thus a strain hardening phenomenon which affects the rheological measurements (the storage modulus is overestimated) but relaxes, at least partially during a rest period. Consequently, a longer period of time has to be allotted (allowing stress relaxation) before starting measurements. Plate-plate geometry induces less pre-orientation and allows measurement a few minutes after setting. However, it discriminates less the differently structured dough than the cone-plate geometry used in rotational mode. Results which seem to partially agree with those of the CP20 are obtained using the lubricated flow followed by stress relaxation.

Maraschin Christelle, Robert Hughes, Boussard Aline, Potus Jacques, Baret Jean-Luc, Nicolas Jacques (2008) . **Effect of Storage Temperature and Flour Water Content on Lipids, Lipoyxygenase Activity, and Oxygen Uptake During Dough Mixing .**

Cereal Chemistry, 85, 372-378.

Abstract : Flours differing in water content of 10% (F10), 12% (F12), and 14% (F14) were stored for 16 weeks at 22, 32, and 45°C. The major changes in lipids concerned the free fatty acids (increase) and the triglycerides (decrease). In all cases, the changes increased with increasing storage temperature and water content. After 16 weeks of storage, the losses in lipoyxygenase (LOX) activity increased with increasing flour moisture and storage temperature from 10% for F10 at 22°C to 100% for F14 at 45°C. At the end of storage at 22 and 32°C, the bread volumes decreased by 10 and 25%, respectively, with no statistical differences ($P < 0.05$) between the samples. At 45°C, the volume ...

MAILLARD M.N., BILLAUD C., CHOW Y.N., ORDONAUD C., NICOLAS J. (2007). **Free radical scavenging, inhibition of polyphenoloxidase activity and copper chelating properties of model Maillard systems.** *Lebensm. Wissen. Technol.*, 40, 1434-1444.

Abstract: Antioxidant properties of Maillard reaction products (MRP) obtained from aqueous mixtures of glucose (0.8 mol/l) with proline, glycine, arginine, lysine, cysteine or glutathione (0.5 mol/l) heated at 103 °C for 1-92 h were investigated using different in vitro tests. Free

radical scavenging activity was determined by measuring their reactivity towards DPPH1 and lipidic radicals produced by AAPH. Contrary to glucose-proline and glucose-glycine MRP, glucose-lysine and glucose-arginine MRP displayed high scavenging activities.

The activity of glucose-lysine MRP peaked after 14 h of heating while the activity of glucose-arginine constantly increased during the whole heat treatment. The high scavenging capacity observed towards DPPH1 for glucose-cysteine mixtures could be attributed to the sulfhydryl group of cysteine. The inhibitory effect of MRP on activity of two copper-oxidoreductases, apple polyphenoloxidase and mushroom tyrosinase, assessed by polarography, showed that thiol-derived MRP were the most potent inhibitors, even at very low levels in the reaction medium. Conversely, the other MRP were only slightly efficient at high levels. Unheated mixtures containing thiol compounds exhibited a potent copper chelating ability, as efficient as EDTA, when determined by the tetramethylmurexide (TMM) test. After heating, these mixtures lost part of their chelating efficiency, but it remained higher than that of the other MRP, suggesting that the sulfhydryl group also played a role in the copper chelating properties.

Keywords: Maillard reaction product (MRP); Antioxidant; Free radical scavenging activity; Copper chelating; Polyphenoloxidase.

WAGNER K-H., REICHHOLD S., KOSCHUTNIG K., CHERIOT S., BILLAUD C. (2007). **The potential antimutagenic and antioxidant effects of Maillard reaction products used as natural antibrowning agents.** *Mol. Nutr. Food Res.*, 51, 496-504.

Abstract: The aim of this study was to investigate the potential antioxidative and antimutagenic effects of Maillard reaction products (MRPs) formed from glucose or fructose and cysteine or glutathione in the Ames Salmonella test and the 2,29-azobis-(3-ethylbenzothiazoline-6-sulfonic acid) (ABTS) assay. The mixtures were heated for 4 h 20 min or 14 h at 103 or 110°C and tested in five concentrations from 0.05 to 11 mg/plate in strains TA 98 and TA 102 in the plate incorporation assays. In order to promote the formation of mutant revertants the prooxidants hydrogenperoxide (H₂O₂) and tertiary-butyl hydroperoxide (tBOOH) were used in the TA 102. Tests were conducted with preincubation with (+S9) and

without (-S9) metabolic activation. 5-Hydroxymethylfurfural (5-HMF) was investigated as carbonyl compound. In TA 98, no effect of the MRPs was shown. The shorter heated samples (4 h 20 min) were in general more active than the longer heated ones (14 h). Up to 1 mg/plate (1%) all the reaction mixtures remained safe, but the 5% and in particular the 11% fractions increased the number of revertants significantly for the shorter heated mixtures. The 14 h mixtures did not show any response for almost all concentrations. No significant difference in the number of revertants could be observed between the cysteine and glutathione mixtures, the fructose mixtures increased revertants number to a higher extent than the glucose mixtures only in the 4 h 20 min heated mixtures for the highest concentration (11%). The highest activity was always observed in the +S9 tests. Antioxidative effects expressed as Trolox equivalents were higher in the 4 h 20 min heated samples. When detectable, HMF concentration was found to be higher in the 14 h MRP

samples. In order to use the tested mixtures as antibrowning agents for technological purpose, the concentration should not be higher than 1% and the longer heated reaction mixtures were preferred since the brown pigments seemed to be less reactive than the intermediate products.

Keywords: Antioxidant activity / Cysteine / Fructose / Glucose / Maillard reaction .

CHEROT S., BILLAUD C., MAILLARD M.N., NICOLAS J. (2007). **Inhibition of polyphenoloxidase activity by mixtures of heated cysteine derivatives with carbonyl compounds.** *Mol. Nutr. Food Res.*, 51, 395-403.

Abstract: It had previously been shown that soluble Maillard reaction products (MRP) made from thiol compounds and glucose or fructose contained powerful inhibitors of various fruit and vegetable polyphenoloxidase (PPO) activity. In MRP from cysteine and glucose, the amount of hydroxymethylfurfural (HMF) formed increased with the increase in glucose concentration (0-1 M), particularly under acidic (pH 2) conditions. Using model mixtures containing a preheated cysteine-derived compound and a carbonyl component, especially HMF, furfural and benzaldehyde, we showed that the neoformed compounds produced exhibited a stronger inhibitory potency toward PPO activity of eggplant, apple and mushroom than former MRP. Optimal reaction conditions for the formation of inhibitory compounds when HMF reacted with preheated cysteine were investigated. It was found that a reactants molar ratio of 1:1 and a reaction exceeding one hour were the most efficient reaction conditions to generate inhibitory compounds. The stability of the newly formed products, evaluated during storage, showed that their inhibitory potency was globally kept at 4 °C, 21 °C and 37 °C for 72 h but was unstable when stored at - 20 °C and lost when exposed to UV radiations for 24 h.

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