Abstracts and Links to Papers of Interest from Other Journals

This section contains links to recent papers, published in a number of Journals considered of interest to our readers.

Journal of the American Society of Brewing Chemists

Volume 66(4) 2008

Links to the full abstracts from the papers below can be found at

http://www.asbcnet.org/Journal/

Changes in Barley Kernel Hardness and Malting Quality Caused by Microwave Irradiation. P. López-Perea, J. D. C. Figueroa, E. Sevilla-Paniagua, A. Román-Gutiérrez, R. Reynoso, and R. Martínez-Peniche. *JASBC,* Vol. 66(4), 2008, pp. 203-207.

Extraction of Spent Hops Using Organic Solvents. M. Anioł and A. Żołnierczyk. *JASBC,* Vol. 66(4), 2008, pp. 208-214.

A More Cost- and Labor-Efficient Assay for the Combined Measurement of the Diastatic Power Enzymes beta-Amylase, alpha-Amylase, and Limit Dextrinase. D. E. Evans. *JASBC,* Vol. 66(4), 2008, pp. 215-222.

Improved Prediction of Malt Fermentability by Measurement of the Diastatic Power Enzymes beta-Amylase, alpha-Amylase, and Limit Dextrinase: I. Survey of the Levels of Diastatic Power Enzymes in Commercial Malts. D. E. Evans, C. Li, and J. K. Eglinton. *JASBC,* Vol. 66(4), 2008, pp. 223-232.

Effect of Oxygen Supply on Flavor Formation During Continuous Alcohol-free Beer Production: A Model Study. R. Lehnert, M. Kuřec, T. Brányik, and J. A. Teixeira. *JASBC,* Vol. 66(4), 2008, pp. 233-238.

Effects of Beer Adaptation on Culturability of Beer-Spoilage *Dekkera/Brettanomyces* Yeasts. K. Suzuki, S. Asano, K. Iijima, T. Ogata, Y. Kitagawa, and T. Ikeda. *JASBC,* Vol. 66(4), 2008, pp. 239-244.

Determination of Tyrosol, 2-Phenethyl Alcohol, and Tryptophol in Beer by High-Performance Liquid Chromatography. M. Li, Z. Yang, J. Hao, L. Shan, and J. Dong. *JASBC,* Vol. 66(4), 2008, pp. 245-249.

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Master Brewers Association of the Americas Technical Quarterly

Volume 45(4), 2008

Links to the full abstracts from the papers below can be found at

http://www.mbaa.com/TechQuarterly/

Some Factors Impacting Beer Foam. Charles Bamforth, Alexandros Kalathas, Yann Maurin, and Candace Wallin. *MBAA TQ* Vol. 45(4), 2008, pp. 332-336.

Beer Stabilization: Comparison of Alternative Methods. J. Zuber and U. Gans. *MBAA TQ* Vol. 45(4), 2008, pp. 337-339.

Biofouling and Process Cleaning: A Practical Approach to Understanding What Is Happening on the Walls of Your Pipes. Mark Fornalik. *MBAA TQ* Vol. 45(4), 2008, pp. 340-344.

Control of Laboratory Fermentations with Weight Analysis. P. Kosin, J. Savel, and A. Broz. *MBAA TQ* Vol. 45(4), 2008, pp. 345-347.

A New Global Approach to Tasting. Barry Axcell. *MBAA TQ* Vol. 45(4), 2008, pp. 348-351.

Are Craft Brewers Underaerating Their Wort? Neva Parker. *MBAA TQ* Vol. 45(4), 2008, pp. 352-354.

Brewing Science – Monatsschrift für Brauwissenschaft

Fachverlag Hans Carl, Nürnberg, Germany

Vol 61 (May–December), 2008

Design of a Pilot Setup to sort Damaged Returned Empty Beverage Crates in an Automatic Filling Line. M. Schmidt, C. Eder and A. Delgado. *Brewing Science (Monatsschrift für Brauwissenschaft)* Vol. 61 (May/June), 2008, pp. 81-93.

The inspection of returned beverage crates as well as bottles in industrial automatic filling lines is mainly performed by imaging systems. These systems are not able to detect invisible damages or embrittlement. A powerful novel system based on the principle of mechanical vibration analysis for the detection of small and concealed

damages is presented. The selection of individual crates is performed automatically by a pre-trained artificial neural network (ANN). Numerical finite element simulations form a basic insight into the vibration behaviour of the crates and help to plan a pilot setup. This leads to a final recognition rate of more than 99% over all checked crates in a prototype for industrial use.

The Use of Response Surface Methodology to Optimise Malting Conditions of Tef (*Eragrostis tef* (Zucc.) Trotter) as a Raw Material for Gluten-free Foods and Beverages. M. Zarnkow, C. Almaguer, F. Burberg, W. Back, E. K. Arendt, S. Kreisz and M. Gastl. *Brewing Science (Monatsschrift für Brauwissenschaft)* Vol. 61 (May/June), 2008, pp. 94-104.

Celiac disease is a condition, in which case the person's body reacts to the prolamins of wheat, rye, barley, and oats. The only way to treat CD is a total lifelong avoidance of gluten consumption. In this study Tef (*Eragrostis tef* L.), which belongs to the family poaceae that is regarded as gluten free, was used as raw material. The objective of this study was to optimize the malting conditions to produce a gluten free malt of high quality for gluten free foods. Tef, with a thousand kernel weight of 0.3–0.4 g, needed special arrangements like small sieves etc. Tef has a remarkable agronomical advantage that the water requirement is probably the lowest of any major cereal. Response surface methodology was used to investigate the influence of the three malting parameters, vegetation time, degree of steeping and temperature on the quality of tef malt. Each predictor variable was tested at three levels. Vegetation times were 4, 5 and 6 days, degrees of steeping were 46, 50 and 54% and vegetation temperatures were 16, 20 and 24°C.

Kilning temperatures of 65°C were used. The used analyses were based on methods outlined in EBC or by MEBAK. The raw material was yielded 2006 in Utah, USA. A range of malt quality parameters was determined including extract, apparent attenuation limit, gelatinisation temperature, α-amylase activity, β-amylase activity, limit dextrinase activity, Kolbach index, alpha amino nitrogen, viscosity, and colour. The achieved values slightly deviate from the calculated ones. The obtained attributes were 52.1% extract, 69.1% AAL, 84 U/g α-amylase activity, and 187 U/g β-amylase activity, 1062 U/kg limit dextrinase activity, 5.9 EBC colour, 285 mg/100 g FAN and 2.782 mPa × s viscosity. This publication shows clearly that on the one hand RSM is a prove method for testing the malting conditions of unknown cereals and on the other hand *Eragrostis tef* is a crop with a potential as a raw material for malting purposes. Descriptors: tef, malt, response surface technology, gluten-free, cereal.

Measurement of Water Vapour Ingress in PET Bottles and Correlation with Oxygen and Carbon Dioxide Permeation. J. Schneider, I. Weber and R. Pahl *Brewing Science (Monatsschrift für Brauwissenschaft)* Vol. 61 (May/June), 2008, pp. 105-112.

The beer and beverage industry is using ever more barrier enhanced plastic bottles for the filling of its products. The quality of the products can be considerably affected by the permeation of oxygen into the bottle and carbon dioxide out of it. The quality control of the bottles with particular emphasis on the gas barrier is thus of great importance. However, the conventional gas permeation measuring method needs too much time. In order to respond effectively and quickly to barrier defects, bottle production or incoming goods inspection measuring time must be shortened, for example by 2 hours. A physical problem of a quick measurement of oxygen is the comparably long unsteady state of permeation due to desorption of oxygen into the bottle after filling. In order to overbear this difficulty methods are tested which use other gases or as in this instance water vapour. Instead of a complete permeation only the migration of water from PET into the bottle inner is measured. The ruggedness of the method meets the requirements of the practical measurement conditions. The correlation of the water vapour migration rate with the permeation of carbon dioxide and oxygen measured with a real-time method is linear. Active barriers employing scavenger material can not be detected by the water vapour ingress measurement.

The Influence of Hop Products on Beer Flavour Stability. C. Zufall, K. Wackerbauer and C. Brandt *Brewing Science (Monatsschrift für Brauwissenschaft)* Vol. 61 (May/June), 2008, pp. 113-120.

The use of reduced iso-alpha-acids in brewing has become more widespread in past years, although their characteristics during beer ageing are not completely known. During our investigations, important differences in ageing characteristics were detected not only between the categories of reduced and non-reduced hop extracts, but also within the group of beers containing reduced hop products. Forced ageing in the absence of light had the strongest impact on beers hopped with CO_2-extract, followed by iso-alpha-extracts. Rho, Tetra and Hexa showed a significantly better stability with the tendency to improve from Rho- over Tetra- to Hexahydro-isohumulone. Under light exposure, besides showing lightstruck flavour, beers hopped with CO_2-extract were the first to show cardboardy oxidation aroma, while beers containing only reduced hop products were virtually unaffected. Extended periods of light exposure, however, led to the formation of methyl-furfuryl-disulphide (MFDS) off-flavour, also in light stable beers, as previously reported [1]. The findings from sensory analysis could be confirmed by instrumental analysis of chemiluminescence behaviour. The results indicate clearly that the choice of hop products has a decisive influence on beer flavour stability.

Characterization and Quantification of Thermal Load during Wort Boiling. D. P. De Schutter, M.-R. De Meester, D. Saison, F. Delvaux, G. Derdelinckx, J.-M. Rock, H. Neven and F. R. Delvaux *Brewing Science (Monatsschrift für Brauwissenschaft)* Vol. 61 (July/August), 2008, pp. 121-134.

Thermal load is often considered as a vague and obscure burden for brewers. In order to clarify the concept of thermal load, this paper aimed to characterize and quantify thermal load during wort boiling. Thermal processing of wort was found to cause the accumulation of Maillard intermediates, which might lead to the generation of off-flavours during beer ageing. The amount of intermediates could be quantified in terms of HMF-equivalents. A part of these intermediates was reduced by yeast

during fermentation. The remaining non-reducible intermediates in beer can therefore be considered as the chemical memory of thermal load on wort.

In order to quantify thermal load in wort, the kinetic behaviour was examined and a pseudo 0th order kinetics was established. The quantification of thermal load was then captured in a formula, which consisted of two terms. The first is a specific wort term, which evaluates the susceptibility of a particular wort to applied thermal load. This tool could be used by every brewer to predict the effect of boiling process changes on the wort. In addition, a boiling system term was created. Although the latter term is highly theoretical, it provides insights in the impact of differences in boiling intensity on thermal load of wort.

Hop Volatile Compounds (Part I): Analysis of Hop Pellets and Seasonal Variations. M. Herrmann, S. Hanke, D. Kaltner and W. Back *Brewing Science (Monatsschrift für Brauwissenschaft)* Vol. 61 (July/August), 2008, pp. 135-139.

The measurement of the hop volatiles targets the flavour-active components, mainly terpene and sesquiterpene alcohols, that are able to create the typical hoppy flavour in beer. These substances are both indicator substances as well as key components of the flavour. This paper presents the method of analysis via aqueous extraction, water steam distillation and detection by GC-FID. Furthermore data is provided, describing the relationship between alpha acids content and oil content compared to actual flavour component levels. Neither alpha acids content nor oil content show a reliable correlation to the actual content of flavour compounds. It is therefore proposed to dose hop pellets according to the actual level of hop flavours and not according to the currently used dosage based on alpha-acids content. Part 2 of this paper presents data on transfer rates.

Hop Volatile Compounds (Part II): Transfer Rates of Hop Compounds from Hop Pellets to Wort and Beer. S. Hanke, M. Herrmann, J. Rückerl, C. Schönberger and W. Back *Brewing Science (Monatsschrift für Brauwissenschaft)* Vol. 61 (July/August), 2008, pp. 140-147.

Several hundred aroma compounds are known in hops but only a few have great impact to hop aroma of beer. Adding hops at late stages of boiling gives a pleasant hoppy flavour to the final beer. Linalool is known to be a good indicator for such a hoppy flavour. In this study it could be shown that different hop varieties have different transfer rates of linalool and other aroma compounds. The behaviour of the aroma compounds is different and compound specific. Linalool increases during fermentation and there were differences between beers fermented at 8°C and 12°C. The 12°C samples showed lower concentrations of linalool but higher scores in aroma intensity. Possible explanation are additive interactions between fermentation-by-products and hop aroma compounds.

Yeast Quality Distribution in the Cone of Cylindro Conical Tanks. F. Thiele, A. Hartwig and W. Back *Brewing Science (Monatsschrift für Brauwissenschaft)* Vol. 61 (July/August), 2008, pp. 148-161.

Yeast cropping from cylindro-conical tanks and repitching of the yeast is a key procedure in the brewing industry. In general it is assumed that the yeast collected from the cone of a tank is a homogenous culture. However results from studies investigating this aspect indicate that yeast quality as well as the environmental conditions within the cone can vary extensively. Results from different studies have been contradictory in various aspects. In order to add more information to this topic several yeast crops in two industrial breweries were followed obtaining samples in certain intervals. Each sample was analyzed for the physiological conditions of the yeast and various characteristics of the recoverable beer were investigated. In addition for some trials the replicative age and the fermentation performance in EBC Tall tubes have been examined. It was found that yeast vitality and viability did not vary considerably throughout the individual crops but large differences were found in between several crops. Similar results were found for the characteristics of the recoverable beer. Regarding the replicative cell age a gradient throughout the crop was found. But the fermentation performance of the individual samples could not be related to the cell age.

Vaporisation of Aromatic Components during the Beer Production. H. Scheuren, K. Sommer and M. Hertel. *Brewing Science (Monatsschrift für Brauwissenschaft)* Vol. 61 (September/October), 2008, pp. 162-169.

In a lot of processes and production steps in the Life-Science-Industry liquid semi-finished products are in contact with high temperatures and associated pressures. As a result steaming operations occur which have to be seen as thermodynamic separation processes. Concerning the exhaustion of aromatic components these steps influence intentionally or unintentionally the quality of the final product. The purport of this article is an overview of the thermodynamical basics concerning the steaming of aromatic components. Therefore the process of vaporisation by vaporescence and the vaporisation by boiling are both explained and defined. Furthermore this theoretical background and the corresponding formulas are tested and proofed by two samples of the sum of all existing experiments.

Changes of the Content of Water-soluble Bioactive Compounds during the Malting Process of Spelt Wheat (*Triticum aestivum var. spelta*). M. Krahl, C. Hagel, M. Zarnkow, W. Back and S. Kreisz. *Brewing Science (Monatsschrift für Brauwissenschaft)* Vol. 61 (September/October), 2008, pp. 170-174.

Spelt wheat (*Triticum aestivum var. spelta*), a hexaploid variety of the genus Triticum is a cereal closely related to common wheat (*Triticum aestivum*). The major non-starchy carbohydrates in spelt wheat are arabinoxylans and fructans. Furthermore spelt wheat is known to contain relatively high levels of thiamine and riboflavin, two vitamins from the B-group. In this work the influence of a standard malting process on the content of these four bioactive compounds was studied. The amount of water-extractable arabinoxylan increased significantly during the malting process, as well as the water-extractable riboflavin content. The fructan concentration in the analysed samples showed a slight increase and thiamine levels staid stable.

γ-Nonalactone in Beer: Biosynthesis by Yeast. L.-A. Garbe. *Brewing Science (Monatsschrift für Brauwissenschaft)* Vol. 61 (September/October), 2008, pp. 175-180.

γ-Nonalactone is known as an aroma active and chiral compound in beer and other fermented products. Labeling experiments with tetra deuterated (9,10,12,13-$_2H_4$)-linoleic acid, single deuterated 13- and 9- hydroxyoctadecadienoic acids (HODE) and its corresponding oxygen-18 labeled oxidation product [$_{18}O_1$]- 13- and 9- HODE elucidated two different biosynthetic routes from linoleic oxidation products (HODE) to γ-nonalactone in brewers yeast *Saccharomyces cerevisiae* and a model yeast *Sporobolomyces odorus*. I) 13-Peroxidation of linoleic acid into 13-HODE in barley or during malting and β-oxidation followed by one α-oxidation type step finally resulting in γ-nonalactone with (*S*)-stereospecificity ((*S*) ~60% e.e.). II) 9-Peroxidation of linoleic acid into 9-HODE in barley or during malting and Baeyer-Villiger type oxidation resulting in 2*E*,4*E*-nonadien-1-ol and azelaic acid. 2*E*,4*E*-nonadien-1-ol was further transformed to γ-nonalactone with (*R*)-stereospecificity((*R*) ~46% e.e.).

Effects of Mash Acidification. T. Reiter, W. Back and M. Krottenthaler. *Brewing Science (Monatsschrift für Brauwissenschaft)* Vol. 61 (November/December), 2008, pp. 162-169.

Acidification can be useful not only for mash or wort, but also for the decarbonation of brewing liquor. According to the Provisional Beer Law in Germany, an acidification in the brewhouse is permitted, when the lactic acid is obtained biologically. This work gives an overview about the effects of mash acidification at different mashing-in temperatures. Laboratory trials were performed at 58-61-64°C, on the one hand with and on the other hand without mash acidification (pH-lowering of 0.2 units). Industrial-scale tests, in which a total of over 19,000 hl wort was produced, showed that mash acidification up to a mashing in temperature of 61°C has a significant influence on the nitrogen content in wort. Formula for the calculation of the decarbonation are shown.

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