

Abstracts from Other Journals

This section contains summaries of recent papers published in a number of other Journals considered of interest to our readers, as well as a selection of patents that have been applied for or recently granted. If you would like to serve as an abstractor for the Journal of the Institute of Brewing, please contact Richard E. Wheeler.

R.E.W.

Abstractors for This Issue

T. Bühler, I. Russell, G.G. Stewart and R.E. Wheeler

1) Raw Materials

On the composition of low molecular polyphenols in different varieties of hops and from two growing areas. A. FORSTER, B. BECK, R. SCHMIDT, C. JANSEN and A. MELLENTHIN (*Monatsschrift für Brauwissenschaft* 55, No 5/6, 98-108, 2002).

The subject of low molecular weight polyphenols in the plant world and in foods is being researched intensively at the present point in time. In this paper two teams have systematically covered the composition of low molecular weight polyphenols in hops used as raw material in brewing. More than 100 single components could be separated by means of HPLC. The majority of these can be characterised by means of DAD spectra and HPLC-MS coupling. Based on two harvests, the composition of the low molecular weight polyphenols of 11 significant European varieties of hops has been determined and described. To some extent the results reveal clear differences. In a comparison study of the Pearl and Nugget varieties from the growing areas in Hallertau, Germany, and in the USA some definite differences could be established over three harvests. As a result, evidence has been obtained for the first time showing that the growing areas can influence the chemical composition of hops. Depending on the polyphenol philosophy of a brewery the possibilities are shown for selecting hops as raw material more conscientiously according to variety and growing area.

T.B./R.E.W.

Free and triglyceride-bonded hydroxy fatty acids in barley and malt, II. Development during the malting process. K. WACKERBAUER and S. MEYNA (*Monatsschrift für Brauwissenschaft* 55, No 5/6, 110-114, 2002).

In a previous report from the same authors it was shown that the major part of hydroxy fatty acids is esterified as triacylglycerols in barley and malt. Moreover in most of the analysed samples a maximum of oxidized linoleic acid substances was found in barley and not in the corresponding malt. Examination of four different barley varieties concerning the evolution of these stale flavour precursors during malting indicates a rapid increase of their concentration during germination with a maximum at the fifth or sixth day. A longer germination period leads to a lower content of all esterified hydroxy fatty acids in most cases. During withering a strong decrease of the level of oxygen-

ated fatty acids can be detected, followed by an increase at the kilning process again. Comparison of three different kilning temperatures, in particular 70 °C, 85 °C and 100 °C gives lowest values of THOE at 85 °C. Variation of other malting parameters, e.g. germination time and temperature or steeping degree gives a considerable change in hydroxy fatty acid concentration, but an optimal malting procedure leading to low amounts of especially THOE, for all barley varieties, cannot be given yet.

T.B./R.E.W.

Influence of the species and cultivation area on the pentosan and β -glucan content in barley, malt and wort. A. MIKYŠKA, J. PROKEŠ, D. HAŠKOVÁ, P. HAVLOVÁ and M. POLEDNÍKOVÁ (*Monatsschrift für Brauwissenschaft* 55, No 5/6, 88-95, 2002).

The influence of the variety and cultivation area on the content of pentosan and β -glucan in barley, malt and wort was studied on a set of 32 specimens from eight varieties of summer-malting barley which were cultivated in the Czech Republic on four cultivation stations (Central Bohemia, Central Moravia, West Bohemia, North Bohemia).

The influence of both locality and variety on the content of soluble pentosan in the wort was determined, whereby the influence of locality was found to be greater than that of any of the varieties. The lowest content was determined for the locality III (West Bohemia) and the Olbram variety and was highest for the locality II (Central Moravia) and the Scarlett variety. The influence of the locality on the content of pentosan was also determined and could be evidenced in the case of malt likewise in the same way as the influence of locality and variety on the solubility of pentosan and the proportion of soluble pentosan on the total content of pentosan in malt. There was no relationship found between the content of pentosan in barley, malt and wort. To assess the brewing quality of malt as far as the pentosan content is concerned this also has to be determined in the wort.

The β -glucan content in malt and even in the wort depends on both the locality and the variety. The lowest values were determined for the locality II (Central Moravia) and the Compact variety and the highest content for locality III (West Bohemia) and the Scarlett varieties. The greatest correlation was given between malt and wort. There was a negative correlation between the pentosan

content and the friability, and a positive correlation with the difference in grist. Also determined was the strong influence of cytolytic and proteolytic activity in malt on the β -glucan content in malt and wort. The β -glucan content had a positive correlation with the viscosity of the wort and the difference in grist and a negative correlation with the Kolbach index and the friability. Furthermore, a trend towards reverse proportionality was determined, between the β -glucan and pentosan content, dependent on the cultivation area.

T.B./R.E.W.

2) Brewing – Fermentation

Malting – Brewing: A Changing Sector. J. LEVINSON (*Bios*, 2002, May (5), 12-15).

The world beer production in 2001 is estimated at 1400 million hectolitres and is growing at approximately 2.5% per year (including China). Apart from China and Central/Eastern Europe (with promising growth potential), the prospects for increasing per capita beer consumption are restricted by economic factors (Africa, Asia, South America), socio-demographic factors (Western Europe, Japan, USA, Canada) and cultural factors (Muslim countries, India). A great many new brewing company mergers, groupings and acquisitions have taken place over the last 2 years, all with common objectives: reconcentrating on the core trade, taking and consolidating market shares, reducing costs by economies of scale, promoting an image. The malting industry has been weakened by a long period of overcapacity which has seriously affected its results. The construction of new plants will remain limited and will have to be supported by long term commercial agreements such as mergers and alliances. One fundamental question remains and that is the prospects for malting barley production – the keystone of the industry.

G.G.S.

3) Microbiology

Not Just Bread and Beer: New Applications for Yeast and Yeast Products in Human Health and Nutrition. K. DAWSON [(in *Niche Markets to Mainstream – Nutritional Biotechnology in the Feed and Food Industries*. Proceedings of Alltech's 18th Annual Symposium on Nutritional Biotechnology in the Feed and Food Industries (ed. by T.P. Lyons and K.A. Jacques, pub. by Nottingham University Press), 2002, pp. 225-231].

The use of yeast in multiple processes to simultaneously produce several products in a "yeast biorefinery" is a concept that could revolutionize the way we design fermentation and food processing facilities in the future. Biorefinery products include whole yeast cells as supplements, yeast cell wall preparations, yeast extracts, as well as selenium and chromium yeast derived products. Examples discussed include whole viable yeast cells to stimulate beneficial bacteria in the GI tract, mannans to prevent colonization by enteric pathogens and enhance immune responses, glucans to adsorb specific fungal toxins, yeast extracts to stimulate immune development and selenized yeast preparations to provide nutritional value through the

organic form of selenium. This paper focuses on yeast-derived products used in animal nutrition and the implications of these learnings on human nutritional strategies.

I.R.

Coordinating Cytokinesis and Nuclear Division in *Schizosaccharomyces pombe*. D. MCCOLLOM (*ASM News*, 2002, 68, 325-329).

Eukaryotic organisms such as yeast maintain a stable number of chromosomes (ploidy). Keeping its chromosome number steady is crucial for a cell's ability to maintain genomic stability. Loss of that stability in mammalian cells is one of the hallmarks of cancer. During the early stages of tumour development loss of this genomic stability occurs leading to amplification of genes that stimulate tumour formation – the oncogenes. Although yeast cannot develop into cancer cells, they nevertheless need to maintain a stable chromosome number, with a proper relative copy number of individual genes and appropriate levels of gene expression. Yeast and other eukaryotic cells thus depend on a variety of cell cycle checkpoints to stabilize their chromosomal content. During the final stage of the cell cycle of the fission yeast *Schizosaccharomyces pombe*, cell cytokinesis, the division of the parent into two daughter cells, is carefully coordinated with earlier events of the cell cycle. These events are reviewed in detail in this paper. In future, it will be interesting to learn whether the mechanisms that coordinate cytokinesis with the nuclear cycle in *S. pombe* are at work in other organisms. When cytokinesis is inhibited in animal cells, the nuclear cycle is also arrested, suggesting that the same cytokinesis checkpoint pathway that operates in *S. pombe* cells occurs in animal cells.

G.G.S.

Osmotic Stress Signaling and Osmoadaptation in Yeasts. S. HOHMANN (*Microbiology and Molecular Biology Reviews*, 2002, 66, 300-372).

Yeasts are exposed to a highly variable environment with respect to the availability and quality of nutrients, temperature, pH, radiation, access to oxygen, and especially water activity. Water activity is defined as the chemical potential of free water in solution. Low water activity limits yeast growth, a fact that has been used for centuries for the preservation of fruits in dry form or with very high sugar levels, such as marmalades. The ability to adapt to altered availability of free water is a fundamental property of living cells. *Saccharomyces cerevisiae* is an excellent model system with which to study the molecular biology and physiology of osmoadaptation. An integrated understanding of osmoadaptation requires not only knowledge of the function of many uncharacterised genes but also further insight into the time line of events, their interdependence, their dynamics, and their spatial organization as well as the importance of subtle effects. Their fundamental findings have implications during brewing and distilling fermentations particularly during the use of high gravity worts.

G.G.S.

A Third Osmosensing Branch in *Saccharomyces cerevisiae* Requires the Ms62 Protein and Functions in Parallel with the Sho1 Branch. S.M. O'ROURKE and

H. HERSKOWITZ (*Molecular and Cellular Biology*, 2002, 22, 4739-4749).

Adaptation to high-osmolarity environments is of universal importance to cells. For example, free-living microorganisms (brewer's yeast cells in high gravity wort) and vertebrate kidney medullary cells are constantly exposed to conditions of changing osmolarity. The biochemical mechanisms by which eukaryotic cells sense high extracellular osmolarity are not understood in detail. Exposure of cells to high extracellular osmolarity elicits a common response: accumulation of a compatible solute inside a cell. In eukaryotes from yeasts to humans, hyperosmotic shock activates a conserved nitrogen-activated protein kinase (MAPK) cascade. Identification of all of the osmosensors in a genome is required to fully understand how cells sense and adapt to conditions of changing osmolarity. In *Saccharomyces cerevisiae*, two structurally unrelated membrane-spanning proteins function during conditions of high environmental osmolarity (*Shol* and *Slnl*). In addition a further osmosensor (coded *MSB2*) has been identified which functions in parallel to the *Shol* osmosensing branch.

G.G.S.

Yeast: A Single Cell Organism with Multiple Roles in the Food and Beverage Industries. G.G. STEWART [(in *Niche Markets to Mainstream – Nutritional Biotechnology in the Feed and Food Industries*. Proceedings of Alltech's 18th Annual Symposium on Nutritional Biotechnology in the Feed and Food Industries, (ed. by T.P. Lyons and K.A. Jacques, pub. by Nottingham University Press), 2002, pp. 295-300].

The total amount of yeast produced annually, including that formed during brewing, wine-making, distilling practices, baking and for other food and feed purposes, is millions of tonnes. Many microbiologists and fermentation/food technologists employ the term 'yeast' as synonymous with *Saccharomyces cerevisiae*. Although this yeast species is of critical economic and biochemical importance, and most of the research on yeast has been conducted on it, there are many 'exotic' yeast species that offer potential advantages for technological application and experimental studies. Nevertheless, the genus *Saccharomyces* has often been referred to as "the oldest plant cultivated by mankind". Many species of *Saccharomyces* are GRAS (Generally Regarded As Safe) and produce two very important primary metabolites – ethanol and carbon dioxide. The ethanol is used in beverages and as a fuel, solvent and sterilant. The carbon dioxide is employed for leavening in baked goods, carbonation of beverages, as a solvent in the liquid state (for example, for the production of hop extracts) and the culturing of vegetables and flowers in greenhouses under controlled environmental conditions. In addition, there are a number of other important uses for yeast. These include yeast extracts as a source of food flavouring (nucleotides, etc.) or B vitamins and as adsorbents of mycotoxins (glucan fraction) and of pathogenic bacteria (mannan fraction). In addition, yeast is used as a whole cell adsorbent for ions such as selenium, zinc and copper. The advent of genetic manipulation has introduced a number of other important uses for yeast, including cultures that have been genetically transformed to produce

important non-yeast proteins and peptides, such as the antiviral protein interferon, human serum albumin, insulin and the acid proteinase chymosin used in the milk-clotting steps during cheese production.

I.R.

4) Processing

Beer Stabilisation. K. NIEMSCH (*Brauwelt International*, 2002, 20, 152-154).

In addition to smell and taste, the optical impression (appearance of the beer) is particularly important. With the advent of transparent drinking glasses special attention began to be given to beer clarity. Clarity became of particular concern to brewers following Lorenz Enzinger's invention of beer filtration in 1878, and "brilliance" assumed importance. Beer had in the meantime become more or less biologically stable. Since then, the influence of raw materials, the brewing process and filling equipment has been extensively investigated. Also, studies on the interaction of protein, polyphenols, oxygen, molecular weight and pH are still being conducted in brewing research laboratories. For a long time, formalin, tannin, enzymes and bentonite were regarded as suitable aids for precipitating, hydrolysing or absorbing haze-forming substances. However, today, and for years to come, mainly PVPP and silica gel will be used for beer stabilisation worldwide. Within limits, hydrated silica gel has a future. Xerogels will increasingly gain acceptance because they can be used for specific purposes in view of their specifications in terms of selective adsorption. A more accurate prediction of beer stability will permit defined use and therefore better economics. It is possible to use silica gel as the only filter aid but tighter supplier specifications are required together with thorough pre-clarification.

G.G.S

5) Miscellaneous

The Scotch Whisky Industry Review 2002 – 25th Anniversary Edition. A.S. GRAY (publ. ING, *Financial Markets*, 2002, 227 pages).

This annual publication reviews in detail all aspects of the Scotch Whisky industry. Prospects for Scotch Whisky remain encouraging with the industry continuing to move ahead from the set-back suffered in 1998 and from the harmful effects of the elimination of duty free within the EU. Particularly encouraging factors for the future include the more focussed approach to brand-building by the larger companies, and the arrival of major new forces such as Pernod Ricard and Bacardi and economic recovery post the September 11th tragedy. Areas of growth are likely to include Asia, Latin America, Europe and emerging markets such as India although the USA is likely to continue its long-term decline, albeit at a modest rate. The five year annual growth predictions for the industry have been revised from 1.8 to 1.9%.

G.G.S.

6) Patents Issued and Patent Applications

The following sampling of abstracts from recently issued patents and patent applications were selected from the United States Patent and Trademark Office Website

(<http://www.uspto.gov/patft/>) and from Europe's Network of Patent Databases (<http://gb.espacenet.com>). Full patent information is available at these sites (online and at no cost) if more details are desired.

Refrigerator, Specially for Beverage Bottles, in Particular Beer Bottles, a System of Producing Humidity for a Refrigerator and a Method for Generating a Covering of Ice Crystals on a Bottle. GABRIEL GALEM-BECK, COMPANHIA CERVEJARIA BRAHMA (*United States Patent 6,363,733, April 2, 2002*).

A refrigerator is described, for beverage bottles, in particular beer bottles, a humidity production system for a refrigerator and a method for generating a covering of ice crystals on the bottle. The objective of the invention is to provide equipment for producing a covering of ice crystals on a beverage bottle, in particular beer bottles, which produces a covering of ice crystals regardless of the weather conditions of the place and without causing the freezing of the beverage. This objective is achieved with a refrigerator comprising a humidity production system to produce humidity in the internal compartment, the humidity production system having a water feed.

R. W.

Gas Lift Bio-Reactor Designs. P.H. PILKINGTON, N.A. MENSOUR, LABATT BREWING COMPANY LIMITED (*United States Patent Application 20020097634, July 25, 2002*).

A reactor (and especially a gas-lift reactor, and even more especially a bio-reactor, such as a fermentor) in-

cludes a static mixer arranged in a re-circulating reactor flow. The static mixer comprises a longitudinally elongated conduit having tabs that are arranged with respective first edges adjacent the conduit wall, and respective opposed second edges that are spaced radially inwardly from the conduit wall. These tabs are operable as fluid foils so that with fluid flowing through the conduit, greater fluid pressures manifest against the tab's upstream faces relative to reduced fluid pressures against their downstream faces. The resultant pressure difference in the fluid adjacent, respectively, the mutually opposed faces of each of the tabs causes a longitudinal flow of fluid through the conduit over and past each said tab, to be redirected. As a result of that redirection, there is introduced a radial cross-flow component to the longitudinal flow of fluid through the conduit. In particular, the reactor further comprises a draught tube (e.g. housing a co-operative, re-circulating conduit) extending generally co-axially along at least a portion of the longitudinal extent of the conduit and defining between the central body's surface and the conduit wall, an annular space confining the radial cross-flow. A method is also disclosed, which comprises static mixing, over a longitudinal extent of a mixing volume having an annular cross-section, wherein radial cross-stream mixing in a longitudinal fluid flow results from flow-redirecting tabs redirecting a longitudinal fluid flow from an outer, fluid containment boundary surface, across an intervening space having an annular cross-section towards an inner boundary surface.

R. W.

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