Invitation

The International 32nd VH Yeast Conference provides you with lectures and presentations on current topics in the fields of markets and quality, applied yeast research and process innovations in yeast production.

The focus is on “baking with yeast(s)”. You are invited to join the interdisciplinary dialogue with experts and partners from applied science and practical experience. VH members are called to invite their partner companies to enable reduced fees for attendants.

We look forward to welcoming you in Potsdam, Germany.

A. Chagnon President of VH

M. Quantz General Manager of VH

Baking with yeast(s)

Monday, April 15th 2019

08:15 a.m. Registration

08:30 a.m. General Assembly of the VH members (on special invitation)

Markets

10:15 a.m. Conference opening and welcome

President A. Chagnon

Lallemand Inc. (CAN)

10:30 a.m. Deconstructing myths about Baking products and baker’s yeast

J. Côté

Lallemand Baking (CAN)

Bread is an important foodstuff in everyday life. A healthy, balanced diet is the foundation of good health, and nutritionists and most health professionals recognize that bread should be part of a healthy diet. However, for multiple reasons the consumption of bread has been declining across the EU in the last decades. Some global population trends might influence bread consumption, such as younger consumers, who eat less bread on a daily basis. But nowadays, yeast-raised goods are also exposed to attacks by many influential self-proclaimed health and wellness gurus’ misconceived ideas. Here are the real facts about baking products and baker’s yeast, hopefully helping to debunk some popular beliefs, such as bread consumption causing gluten sensitivity or obesity.

11:00 a.m. Alternative baker’s yeasts in the modern bakery

N. Zhou[1] and W. Knecht[2]

1 Department of Biological Sciences and Biotechnology, International University of Science and Technology, (BOT)

2 Department of Biology, Lund University, Lund (SWE)

Saccharomyces cerevisiae remains the most domesticated and routinely used baker’s yeast monopolizing the baking industry. This yeast has several desirable attributes such as its high fermentation efficiency and production of desirable aromatic flavours, as well as its GRAS status. However, the rapid consumption of sugars and production of CO2, an important attribute required to leaven the dough, is not unique to *S. cerevisiae*. There are multitudes of non-conventional yeasts, characterised by a wide genetic and phylogenetic diversity in the *Saccharomycetaceae* family, that can ferment complex sugars found in bread flour and produce unlimited and diverse aromatic flavors, a trait not found in *S. cerevisiae*. Here we discuss non-conventional yeasts as alternative commercial baker’s yeasts, which present a vast untapped potential for use as leavening agents in a modern bakery.

11:30 a.m. From flour to machinery

F. Paschen

DIOSNA Sourdough (DEU)

Flour is subject to natural fluctuations and varies from one cereal crop to the next. Even if the same type of grain is grown year after year, it is different each time. Both, the grain and the flour change in the course of storage, too. The art of milling lies in ensuring that bakers scarcely notice these fluctuations – or ideally that they are not noticeable at all. But unfortunately that is not the case in practice. As a machine builder, DIOSNA Dierks & Söhne GmbH has set itself the task of entering a partnership with its customers. When planning machinery and plant, DIOSNA takes the customer’s flour, analyses it and uses the results as a basis for planning and designing the machines. If the plant is installed and the raw material – the flour – changes, DIOSNA can minimize the fluctuation by adjusting the process or making suitable recommendations. In other words: the customer does not only have the miller to support him. With DIOSNA Analytics and Technology up

behind him, he can be sure to achieve more product safety and quality. The analysis of the flour ranges from its moisture content, falling number and water absorption to fermentation trials, gas activity and dough volume increase measurement, but it also includes mixing trials and energy consumption. The presentation shows how DIOSNA goes about designing machinery and plant in this way, and which analyses play an important role.

Poster session

12:00 a.m. Short poster presentations 5x5min

Poster 1: Fermentation control to increase trehalose with industrial ideas and increase the quality of dry yeast

K.Javidaneh

Khuzestan Yeast (IRA)

Investigation of effective methods on control of S*accharomyces cerevisiae* metabolism for storage of trehalose and evaluation of the effect of trehalose on the resistance of s*accharomyces serevisiae* cells to environmental stress.

Trehalose (α-D-glucopyranosyl-α-D-glucopyranoside) is a non-reducing disaccharide found in different species but not in vertebrates. The ability of anhydrobiotes such as yeast (saccharomyces cerevisiae) to survive great periods of extreme desiccation is associated with high trehalose levels found in these organisms. Its concentration levels increase as a response to stress conditions, such as dehydration, temperature increase, oxidative stress, glucose starvation, osmotic pressure and growth factor (μ).

We investigated the effect of three parameters in our recipe design: temperature, growth rate and time of aeration after stopping feeding molasses for synthesis of trehalose in baker's yeast by using an experimental design method in an industrial fermenter in the Khuzestan Yeast company.

The results showed that the temperature had the greatest effect on the synthesis of trehalose and the combination of three parameters had the desirable result. Furthermore, by increasing the level of trehalose, we also managed to increase gas production in the dough.

Poster 2: NutriAct – Nutritional Intervention: Food Patterns, Behavior and Products: Project New Products

C. Rauh (TU Berlin), S. Drusch (TU Berlin), E. Flöter (TU Berlin), C. Kanzler (TU Berlin); T. Grune (German Institute of Human Nutrition Potsdam-Rehbruecke), O. Schlüter (Leibniz Institute for Agricultural Engineering and Bioeconomy), A. Voss (Institute for Food and Environmental Research), M. Schreiner (Leibniz Institute of Vegetable and Ornamental Crops), S. Baldermann (Leibniz Institute of Vegetable and Ornamental Crops)

Most people wish to be fit and healthy up until old age. Hereto, a healthy and balanced diet can contribute significantly. People who follow a healthy and balanced diet throughout their life are at a lower risk of developing type-2-diabetes, cardio-vascular disease or cancer. As has been determined many times, it can be difficult to abandon unhealthy dietary habits in favor of an enduring healthy diet. This is the focused concern for which the competence cluster “NutriAct” seeks a solution. Therefore, a multidisciplinary team of researchers from the diverse fields of nutrition science, food chemistry and technology, biology, medicine, and the humanities and social sciences, are working together in close cooperation with representatives from the food industry. The results of the project will support knowledge needed to improve the nutritional and health conditions of 50 to70- year-olds, so they can maintain mental and physical fitness until old age. The investigation is focused on which neurobiological, psychological, social and family factors influence an individual’s choice of food. The existing dietary habits within the capital region of Berlin-Brandenburg were analyzed for the purposes of this study. The information, gathered in the form of dietary patterns, identifies those dietary habits which are best suited to minimize the risk of age-related disease. The basis for this is the existing EPIC-Potsdam Study from 1994.
Based on this scientific knowledge, suggestions were made for a healthy diet in old age, which can easily be adapted and permanently pursued by the population. To make the transition easier to these suggestions, tasty products are being developed with the help of innovative food technologies and food concepts. The acceptance of these newly developed products, their health-enhancing effect, and the feasibility of this special NutriAct-dietary pattern are tested within the scope of this nutritional study. In addition to that, new biological parameters, so called biomarkers, are to be identified and against which the health effect of different dietary habits can be measured and assessed. NutriAct will make an important contribution to laying the foundation for a healthy aging process. To that end the network partners from more than 30 regional and interregional research institutions and companies are working together intensively.

The aim of the project “New Products” is to investigate the interaction and the effect of different food components, i.e. protein, fiber or fat with a high degree of unsaturated fatty acids, on the bioavailability of micro- and macronutrients, on the food texture and flavor and on the physico-chemical stability to generate foods with intended nutritive patterns. This means that new scientifically grounded tailor-made products with high consumer acceptance, which fulfill the NutriAct pattern, will be developed. To fit the costumer’s expectations, the off-flavor from several food components such as peas or unsaturated fatty acids needs to be masked. The approach is to avoid the generation of those off-flavors or to control the release by modifying the food matrix. Thus, another research object is to investigate how the flavor perception can be controlled by the food structure and composition. For this purpose, foam structures like bread feature ideal characteristics. Besides flavors, texture perception needs also to be adapted to the consumer preferences, since the enrichment of food with dietary fiber or protein can alter the hardness of e.g. bread or the creaminess or graininess of viscous food, e.g. yogurt. The objective at this point is to create desired texture properties by controlling and modifying the micro- and macrostructure of food, e.g. particle size, water and oil binding capacity of components, foam bubble size distributions etc. A neuro-numerical hybrid for objective sensory prediction has been developed and will be extended to predict adequate processing conditions. Another aspect to investigate is the stability of food components, which are sensitive to oxidation reactions, such as unsaturated fatty acids or protein hydrolysates. To increase the stability, the processing and storage conditions, as well as reaction partners inside the food matrix and structure will be determined and controlled. In an analogue manner, the physical stability of food products will be investigated in terms of the food constitution and structure, e.g. phase separation of foams, emulsions, fibers. Finally, demonstrator food products will be developed, which will fit into the NutriAct pattern. Those products will be bread and fermented yogurt type products.

Poster 3: B4 as a salt substitute in bread. Impact on fermentation, saltiness and on additional interactions with starch during the bread making process

P. Le-Bail [A,C] D. Crucean [B,C,] C. Jonchere [A,C], B. Pontoire [A,C]
, G. Debucquet [D], A. Le-Bail [B,C,]

a INRA-BIA, INRA, Nantes (FRA)
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Salt (sodium chloride) plays a major role in bread making and contributes to water holding, gluten network setting etc. Salt also interacts with fermentation; it yields an osmotic stress and tends to slow down yeast activity. Salt also contributes to the extension of the shelf life of bread. Finally, salt contributes to the organoleptic qualities of bread. According to scientific studies, overconsumption of salt contributes to increased blood pressure and development of CVD. In a standard bread recipe (60 g water, 2 g salt and 100 g flour), the aqueous phase has the same salt content as seawater (ca. 33g/l). Salt reduction is thus recommended by all heath authorities.

Vitamin-B4 is able to act as a substitute for salt (NaCl). This has been pointed out by Locke and Fielding (1994). Le-Bail et al (2013) showed that 50% salt reduction was possible in pizza dough by adding 25% of nominal salt. It seems that this was explained by a synergistic effect between these two constituents. Salt is known to lower the yeast activity. Vitamin B4 allowed a significant reduction of salt and was less impacting on yeast activity. Vitamin-B4 may also act as an anti-staling ingredient as in it behaves as an ionic liquid in an aqueous solution and may contribute to starch depolymerisation.

An in-depth study was done to assess the anti-staling effect with different levels of Vitamin B4 concentration. Several techniques were used (X-ray diffraction, calorimetry) with a kinetics approach to assess the impact of vitamn-B4 on starch during mixing, baking and storage/staling. In particular, a mixing cell was used in DSC to measure the thermal effect of water, salt and vitamin-B4 on starch during mixing.

An optimized recipe was studied and compared in terms of texture, staling and organoleptic perception, showing that a “reduced in salt” claim (-25%) was possible by using Vitamin-B4.

Acknowledgments: this project was cofunded by ONIRIS (Ministry of agriculture), INRA-BIA and ONIRIS-GEPEA within the ID4FOOD program

Poster 4: *Chromatographic determination of mono- and polysaccharidspectra for yeast fermentation processes*

C. Dauwe

AppliChrom (GER)

Newest chromatographic results on molasses (e.g. raw material for bioethanol) and newest results of compounds related to beer process and products will be presented.

Knowledge about composition of sugar is important for the efficiency of yeast based fermentation processes.

Molasses for bioethanol:
Molasses obtained as a byproduct from saccharose production can be a powerful starting material for yeast process based bioethanol production. Molasses contains the highly valuable compounds like sucrose, maltose, fructose and glucose. Higher amounts of raffinose from molasses might be critical for speed and stability of the yest fermentation process. Raffinose concentrations should be known to keep the yeast based fermentation process stable and efficient. A HPLC column and method for the determination of the sugar spectrum of sugar mixtures typical for molasses with emphasis on raffinose were developed.

This powerful new analytical method was conducted in environmental friendly pure water. The time for an analysis takes only about 20mins. A reduction to 10mins/measurement plus „automated close to fermenter control“ could be achieved by further hardware and software adaptation.

Beer related products:
The beer process contains many steps and can be controlled by many parameters. One initial step contains the degradation of starch to mainly maltose. Maltose will be fermented in a later step to alcohol by yeast. Polymeric and oligomeric maltodextrins that are obtained (in smaller amounts) from the initial degradation of starch are not fermented by yeasts to alcohol. These maltodextrins give an important parameter on one special taste parameter of beer.

By means of new chromatography developments (HPLC and SEC/GPC methods using new media), the multistep process parameters of converting starch to maltose, maltodextrins and to the final beer composition can be monitored in regards to many molecular base parameters.

Poster 5: (Yeast) Filtration – Noodles – Blocks - Bagging

M. Dannenberg

Van Mourik Yeast & Packaging (NLD)

12:30 p.m. Lunch break

Analytics/ Quality

02:00 p.m. Impact of freezing conditions on yeast activity, in the case of frozen dough and prefermented frozen bread

A. Le-Bail

ONIRIS UMR GEPEA (FRA)

Bakery products such as bread & viennoiserie are more and more produced from frozen products. This offers convenience to produce freshly baked products at home or in “baking stations” in down town areas. The corresponding technologies called “Bake Off Technologies” (BOT) encompass several baking processes such as «green» frozen dough, frozen partially baked breads, fully baked frozen breads or prefermented frozen dough.

This presentation will give a quick overview on the European market of BOT. A first focus will be put on frozen dough showing that a slow freezing rate is rather preferred to preserve yeast activity. A second focus will concern the concept of partially fermented dough. This is largely used for the frozen viennoiserie industry, and not so much for bread. This technology is also called “ready to bake” or “ovenrise”. The objective is ideally to have a product that may be transferred directly from the freezer to the oven; in such a case, the thawing and the baking is done in one shot. Intuitively, one may easily understand that the degree of fermentation before freezing plays an important role. Indeed, the structure of the dough, which is made of closed cells, will collapse during chilling and freezing due to gas contraction. Some experimental and modeling work will be presented to highlight different issues related to yeast activity and CO2 solubilisation.

Acknowledgments; most of the work has been carried out during the European Project “EU-FRESHBAKE” (2006-2009) which was coordinated by the author of the paper.

02:30 p.m. It’s all about yeast – current trends in the hobby baker scene

S. Herberth

hefe-und-mehr.de (DEU)

Baking bread as hobby has become quite popular in Germany during the last five years. Blogs which are dedicated to bread baking are an even older phenomenon. But what is blogging about and which are current fashions in the hobby baker scene?

The word “blog” is the short form of the term “weblog”. It is a kind of homepage on which new posts are published on a regular basis. Bread blogs are blogs which are

focused on bread related topics. The bloggers invest a lot of time in creating recipes and sharing them with their readers. Sharing tutorials for baking techniques can be found as well. Due to commenting functions a lively exchange between readers and blogger is possible. Often the reader asks for advice for bread baking problems or for a special recipe.

And as with everything else in modern times, there are fashions evolving in the hobby baker scene, too. Beside trends which are focused on grains and flour, there are trends in how bread is leavened. While in 2008 one of the most popular breads in the online communities was the “three minute bread”, which uses a high amount of yeast to cope with the missing proofing time, today the trend is pointing in the direction of a long fermentation time with minimal amounts of yeast and the use of various preferments.

There are many hobby bakers who try to cut down the use of commercial produced yeast. Baking breads with different kinds of sourdough or with “wild yeast”, cultivated from dried fruits and honey, are very popular with these bakers.

03:00 p.m. Coffee break

Applied Research

03:30 p.m. Raising power measurement as a yeast performance parameter – affecting factors and development of measurement methods

E.Pollmann

VH Berlin (GER)

Raising power is considered the performance parameter for baker‘s yeast due to its primary use for leavening dough by the production of CO2, and thus needs to be assessed for quality assurance.

Many factors can affect the amount of raising power which is generated by a given amount of yeast, thus making the development of a reliable analysis setup necessary. Last but not least, the choice of the measurement system is important and often requires correlation experiments in order to compare results between laboratories.

04:00 p.m. End of Monday lecture sessions

05:00 p.m. *Shuttle bus to starting points leaving in front of the hotel*

05:30 p.m. Alternative 1: City Tour Potsdam, starting point tour: obelisk at old market

05:30 p.m. Alternative 2: Visit TU Berlin/Nutriact, starting point: TU Berlin, Fakultät III Prozesswissenschaften, Königin-Luise-Straße 22, D-14195 Berlin

07:45 p.m. Conference dinner (buffet) at INSELHOTEL Potsdam Convivial evening (until 11 p.m.)

Tuesday, April 16th 2019

Applied Research

9:00 a.m Yeast strain improvement strategies for baking applications

J. Morrissey, J. Varela

School of Microbiology, University College Cork (IRA)

Saccharomyces cerevisiae, often known as “baker’s yeast”, is the predominant yeast used in the baking industry. The most important characteristics that make this yeast suitable for baking are its capacity to assimilate maltose, a major sugar in cereals, to produce carbon dioxide by fermentation. Together these comprise the leavening activity of yeast.

There are additional requirements for high-performing commercial starter strains, with traits such as fermentation rate, production of certain enzymes, synthesis of flavour molecules, resistance to osmotic stress and tolerance to freezing processes all playing a role. Most commercial starters have been selected over time to perform specific fermentations but, as the baking sector changes, and new substrates are used, these strains may no longer be optimum for all processes. There is, therefore, interest and opportunities in developing new strains. This is challenging due to intrinsic problems like variable chromosome numbers in commercial yeasts, and extrinsic factors linked to consumer and regulatory requirements with regards to the methods that can be used to develop strains.

Consequentially, there has been relatively limited development of improved strains based on rational strain design. There are interesting parallels between the baking and the brewing and wine sectors, where very similar challenges pertain, but more advances are evident.

For yeast used for production of fermented beverages, three very significant technological approaches have been applied to develop new strains, some of which have progressed to commercial use. First, evolutionary engineering or

adaptive laboratory evolution can be used to select better performing strains. This method is a technological advance on classic strain selection. Second, mating and hybridization approaches can be used to identify genes or alleles that contribute to the trait of interest and to facilitate knowledge-led strain breeding. Both of these methods take advantage of high-tech molecular DNA-based methods, but the strains that are made are not classed as being genetically modified.

The third approach is CRISPR-based genome editing. This is a powerful method that enables precise amendment of the genome of a yeast (or other species). It has revolutionized the bio-sciences and has tremendous potential for biotechnology. Because of its precision, most jurisdictions do not class organisms developed by CRISPR as GM, but this is not the case in Europe where a controversial 2018 European Court of Justice decision ruled to the contrary.

This presentation will review the approaches that can be taken for strain improvement and will draw on precedents in the fermented beverage industry to discuss how similar approaches could be used for baking applications.

09:30 a.m. Enrichment, isolation and identification of indigenous *Saccharomyces cerevisiae* strains for baking purposes and performance

P. Mohammady

Khuzestan Yeast (IRA)

Isolation of native strains of *S. cerevisiae* was carried out from different environmental and industrial samples including local fruits, surface of different plants, vinegar, date, sugar cane molasses and malt extract by an enrichment procedure using liquid medium containing 8% ethanol, low pH (3.8) and 7 days incubation at 30°C. The isolates were identified through determination of morphological, sporulation and biochemical characteristics. Species-specific primers used for distinguishing between *S. cerevisiae* and other members of *Saccharomyces* sensu stricto complex. CO_2 production rate was evaluated using S.J.A fermentograph, and leavening properties of each strain were studied by preparing standard dough.

A total of 26 strains of *S. cerevisiae* were isolated and verified using both traditional and molecular methods. Among those, two strains (S4 and S1) were able to produce CO_2 at similar levels as commercial baker's yeast (240 ml/2hours). Eight strains named S6, S8, S9, S10, S14, S18, SSL1, SSL4 had a higher CO_2 production level than commercial strains in the standard dough, and strains S6 and SSL4 were chosen as the best strains to use as baker's yeast.

The research presents an efficient strategy to select and identify native strains of *S. cerevisiae* with desirable ability to use as leavening agent in bakery products.

10:00 a.m. *Transforming Yeast: From Tool to Jewel*

A. Che

Ginkgo Bioworks, Boston (USA)

Yeast has served as a commodity tool in baking with relatively little differentiation or innovation. Ginkgo has built an automated, massively-parallelized foundry well suited for engineering yeast across numerous industries using both non-GMO and GMO techniques. The foundry enables the discovery, characterization, and improvement of strains using capabilities such as classical yeast genetics, screening, sequencing, and fermentation optimization. Our GMO capabilities leverage DNA design, synthesis, and novel enzyme discovery to engineer strains to produce flavors, fragrances, or to have other unique traits. While GMO techniques have previously been used to test the limits of what baker's yeast can do, we envision a world in which GMO yeast can bear the burden of expensive nutritional additives, colorants, or even fragrances. Ginkgo's platform presents an opportunity to massively increase the strains available for baking, transforming yeast from a commodity to a specialty ingredient of significant value for the bread-baking industry.

10:30 a.m. Coffee break

Process

11:00 a.m. Beer fermentation mixing behavior, design and simulation

C. RAUH

TU Berlin (DEU)

The fermentation of wort and maturation of beer is a key process in beer production both economically and qualitatively. These processes are characterized by strong thermofluiddynamical, (bio)chemical and microbiological interactions. A technological optimization leads e.g. to uniform process conditions and therefore to shorter process times and high product quality. This results in a shorter tank holding time, longer filter life and reduced utilization of thermal energy for the cooling. The objective of this work is to show the concept of an adaptive hybrid flow design and control approach. The hybrid uses cognitive algorithms and consists of a combination of knowledge about convection processes as well as about technological, biochemical processes and induced mechanical stresses which occur during the fermentation and maturation.

The investigation of the thermofluiddynamical phenomena is based on both Laser Doppler Anemometry in model fluids at laboratory scale and numerical simulations (ANSYS CFX) of the multi-phase flow (gas – CO_2, solid – yeast, and liquid – wort) leading to the generation of a data base for the hybrid design and control system. This research is complemented by insights into the interactions of the yeast metabolism, mass and heat transfer with thermofluiddynamical (free convection due to buoyancy) transport phenomena in the fermentation tanks. The resulting hybrid flow control system leads to the creation of an artificial neural network that can be applied for the online and / or the structural optimization.

Experimental results using a cylindroconical-laboratory reactor with six separate temperature-controlled cooling zones provide a systematic insight into the dependency of flow phenomena of model fluids on temperature distributions. Furthermore, numerical simulations study the transient processes of interaction of gas bubbles, yeast particles, the surrounding fluid and the biochemical reactions. In the control system the cooling zones are triggered to achieve a homogeneous yeast distribution and uniform mechanical stresses on the yeast. In the practical application in breweries this system is able to propose online and/or structural optimization measures to the brewer based on artificial neural networks.

11.30 a.m. Effective control of the industrial production of yeast – upscaling from lab to industry

S. Wegerhoff, S.Engell

TU Dortmund (GER)

The competitiveness of industrial biotechnological production processes and its energy and resource efficiency, the space-time yield and the final concentration of the target product are important criteria.

In the production of baker's yeast, the optimal yield of biomass and the production time are influenced by the production of ethanol, which results from the Crabtree effect and from an oxygen limited production phase at the end of the fermentation. The production of ethanol does not only reduce the yield of biomass, but the product quality can also be affected.

An optimal control strategy must guarantee that molasses is fed to the reactor so that the process works at the optimal point, where the growth of the cells is maximized and no ethanol is produced. Underfeeding and overfeeding must be avoided. The optimal feed rate varies, depending on the composition of molasses, the yeast strain and the environmental conditions, which must be taken into account by the controller.

We propose an optimizing model-based control strategy which optimizes the production process under varying conditions. The model-based controller uses a mathematical model which is derived from the biochemistry of yeast cells to predict the production of ethanol over time and to estimate the unmeasured concentrations such as biomass or oxygen in the liquid phase. The model-based control was extensively tested in preliminary work in labscale at the VH Berlin under different conditions, with the result that the process time could be reduced by more than 20% which saves more than 10% of energy.

The next step will be to transfer the model-based control from lab to industry to prove that the expected savings can be achieved. The work is funded by the European Union and the federal state of North Rhine Westphalia by an EFRE.NRW project (EFRE-0400225).

12:00 a.m. Wood juice as additional substrate in yeast fermentation

S. Tenekam, A. Wilke

Fachhochschule Offenburg (CMR/DEU)

Yeasts are used in different industrial applications, e.g. bakery, wine, beer or the Pharmaceutical industry. Due to its high demand in the market, there is a need to increase the propagation efficiency. Using byproducts or organic waste as cosubstrate in cultivation processes could be a promising alternative to reduce costs.

The aim of this study was to apply wood juice as a cosubstrate for the industrial cultivation of yeast. The wood juice is a liquid bio waste obtained by the mechanical compression/drying process of wood chips.

In a first step, a screening of different yeast strains was conducted to identify promising strains for this purpose. In shaking flask experiments the growth kinetic and the substrate yield were determined to screen the best performing microorganisms.

Two strains show promising results for industrial purposes with a maximal productivity of about 0.86 g yeast/ g TOC/ hour.

In a second step the shaking flask process was transferred to lab scale fedbatch process.

In these experiments *Candida krusei* was found to have a maximum specific growth rate μ_{max} of 0.56 h-1 and a biomass yield $Y_{x/s}$ of 1.14 gram biomass per gram TOC in a media composed of 80% v/v Wood Juice from spruce/fir trees.

The same fedbatch process, using an industrial media, leads to a decrease of the maximum specific growth rate of 0.48 h-1 and biomass yield of 0.77 g/g.

12:30 a.m. Novel technologies in proofing wheat dough – the impact of CO2 on process - and product -qualities

K. Lösche

Northern Food Tec (DEU)

humidity equilibrium

A simple wheat dough is characterized by a water activity of around a_w = 0,96. To avoid desorption effects during processing and to keep heat conductivity high, it is necessary to take an appropriate equilibrium humidity on that level (around 96 % rel. humidity). The use of electric steamers in proofers is not able to fulfill these requirements. In addition, the use of steam very often leads to exceeding the dew-point which induces mold grow.

The use of water-aerosols together with a specific and laminar air flow on the other hand, will enable the baker to meet the desired conditions. At the same time energy consumption is decreased (> 30%), the quality of baked goods is increased as well and hygienic problems could be controlled better. Many novel equipment and processing is presented like proofers, retarders and others. Some backgrounds, examples and practical applications will be given.

Impact of the ambient atmosphere during fermentation in proofers on dough-properties, hygiene-situations and baked good -quality

Fermentation of wheat dough is mainly done by baker`s yeast. Around 1/3 of the produced C02 will go out of the dough piece into the ambient air. Depending on the procedure of proofing and on the design of technical systems, the C02 concentration will rise. In many cases the C02 concentrations reach levels during proofing of up to 2000 ppm, 5000 ppm or more than 10.000 ppm. These higher levels of C02 will e.g. dilute the oxygen in the air, dough will become more sticky and viscosity property change and less browning happens during baking.

Very often proofers are defined as a critical control point according HACCP concepts, because the conditions during dough-fermentation (e.g. temperature like 35°C, humidity like 80%, dew point depends on) will induce the growth of molds as well as the production of mycotoxins and more. In general, the hygienic situations in proofers is not always well controlled until today.

Novel data indicates that the combination of high C02 with other environmental stressors produce a compounding effect on mold growth compared to that of individual stressors.

Nowadays, novel technologies are able to decrease the temperature in proofers a lot (example: instead 35°C only 26/27°C), because the heat conductivity can be kept high. This is one important variable to decrease mold growth (at constant fermentation time in comparison).

At the same time the rel. humidity can increase up to around > 90 % by using water-aerosols (avoiding dew point), because the C02 concentration is controlled on a level of around 1500 ppm. Controlling the important process parameters like humidity, temperature and C02 (others like dew point, oxygen) during proofing, is done by monitoring this data and by specific plant control systems for the first time.

Finally a novel and controlled process in proofing or retarding of dough is described, which in comparison is less energy-consuming, more safe in hygienic aspects and better for health and safety at work, leading to constant and improved quality of baked goods.

The final products are expected to be characterized by lower mold and mycotoxin levels, which can increase shelf life and decrease health risks.

01:00 p.m. Feedback and final remarks

01:30 p.m. Lunch

02:45 p.m. End of conference