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EFFECT OF SUCROSE ON PHYSICAL PROPERTIES OF SPRAY-DRIED WHOLE MILK POWDER

U.V. Lay Ma, G.R. Ziegler, and J.D. Floros
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Spray-dried whole milk powders were prepared from whole condensed milk with various sucrose concentrations (0%, 2.5%, 5%, 7.5%, and 10% w/w), and their glass transition temperature and some physical properties of importance in chocolate manufacture were evaluated. In milk powder samples, the glass transition temperature and free-fat content decreased in a nonlinear manner with sucrose addition. Moreover, increasing sucrose concentration reduced the formation of dents on the particle surface. Addition of sucrose in whole condensed milk increased linearly the apparent particle density and in a nonlinear manner the particle size of spray-dried milk powders. The particle size volume distribution of milk powders with the highest sucrose concentration differed from the log-normal distribution of the other samples due to the formation of large agglomerates. Neither vacuole volume, nor the amorphous state of milk powders was affected by sucrose addition.

PHYSICAL PROPERTIES OF WHEY PROTEIN HYDROXYPROPYLMETHYLCELLULOSE BLEND EDIBLE FILMS

L.P. Brindle and J.M. Krochta
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The formations of glycerol (Gly)-plasticized whey protein isolate (WPI)–hydroxypropylmethylcellulose (HPMC) films, blended using different combinations and at different conditions, were investigated. The resulting WPI: Gly-HPMC films were analyzed for mechanical properties, oxygen permeability (OP), and water solubility. Differences due to HPMC quantity and blend method were determined via SAS software. While WPI: Gly and HPMC films were transparent, blend films were translucent, indicating some degree of immiscibility and/or WPI–HPMC aggregated domains in the blend films. WPI: Gly-HPMC films were stronger than WPI: Gly films and more flexible and stretchable than HPMC films, with films becoming stiffer, stronger, and less stretchable as the concentration of HPMC in-

creased. However, WPI: Gly-HPMC blended films maintained the same low OP of WPI: Gly films, significantly lower than the OP of HPMC films. Comparison of mechanical properties and OP of films made by heat-denaturing WPI before and after blending with HPMC did not indicate any difference in degree of cross-linking between the methods, while solubility data indicated otherwise. Overall, while adding HPMC to WPI: Gly films had a large effect on the flexibility, strength, stretchability, and water solubility of the film polymeric network, results indicated that HPMC had no effect on OP through the polymer network. WPI–HPMC blend films had a desirable combination of mechanical and oxygen barrier properties, reflecting the combination of hydrogen-bonding, hydrophobic interactions, and disulfide bond cross-linking in the blended polymer network.

EFFECT OF PH ON CHARACTERISTICS OF LOW-MOISTURE MOZZARELLA CHEESE DURING REFRIGERATED STORAGE

M.A.S. Cortez, M.M. Furtado, M.L. Gigante and P.S. Kindstet
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This study evaluated the effect of cheese pH on proteolysis, calcium distribution, and functional characteristics of Mozzarella cheese. On 4 occasions, cultured low-moisture part-skim Mozzarella cheeses were obtained from a commercial producer on the day after manufacture. Cheese blocks were randomly assigned to 2 groups. One group was shredded, subdivided, and exposed to either ammonia vapor to increase the pH or HCl vapor to decrease the pH. Samples were vacuum packaged, stored at 4 °C, and analyzed for pH 4.6 and 12% TCA soluble nitrogen, apparent viscosity, free oil, and water-soluble calcium on days 5, 12, 22, and 40. The 2nd group was sectioned into 23-mm thick slabs and similarly exposed to either ammonia vapor to increase the pH or HCl vapor to decrease the pH. The slabs were vacuum packaged, stored at 4 °C, and analyzed for pH 4.6 and 12% TCA soluble nitrogen, TPA hardness, springiness and cohesiveness, and meltability on days 17, 29, and 41. Data were analyzed by ANOVA according to a spilt-plot design. Experimentally induced pH differences persisted and significantly affected TPA hardness, apparent viscosity, meltability, and water-soluble calcium throughout 40 d of storage, but did not affect soluble nitrogen changes. Thus, cheese pH affected functional characteristics and calcium distribution but did not affect proteolysis rates. Higher cheese pH resulted in a harder cheese that required longer aging to develop desirable melting characteristics, whereas cheese with lower pH developed desirable melting characteristics more quickly but had a shorter functional shelf life.

CONSUMER PREFERENCES FOR MILD CHEDDAR CHEESE FLAVORS

S.L. Drake, P.D. Gerard and M.A. Drake
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The objectives of this study were to document the distinct flavor profiles among commercially labeled mild Cheddar cheeses, and to characterize if consumer preferences existed for specific mild Cheddar cheese flavors or flavor profiles. Flavor descriptive sensory profiles of a representative array of commercial Cheddar cheeses labeled as mild (n= 22) were determined using a trained sensory panel and an established cheese flavor sensory language. Nine representative Cheddar cheeses were selected for consumer testing. Consumers (n= 215) assessed the cheeses for overall liking and other consumer liking attributes. Internal preference mapping, cluster analysis, and discriminant analysis were conducted. Mild Cheddar cheeses were diverse in flavor with many displaying flavors typically associated with more age. Four distinct consumer clusters were identified. The key drivers of liking for mild Cheddar cheese were: color, cooked/milky, whey and brothy flavors, and sour taste. Consumers have distinct flavor and color preferences for mild Cheddar cheese. These results can help manufacturers understand consumer preferences for mild Cheddar cheese.

EFFECT OF WHEY PROTEIN COATING ON QUALITY ATTRIBUTES OF LOW-FAT, AEROBICALLY PACKAGED SAUSAGE DURING REFRIGERATED STORAGE

J. Shon and K.B. Chin
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Whey protein-based edible coating was used to reduce oxidative degradation and microbial growth of low-fat sausages (LFSs) stored at 4 °C for 8 wk, under aerobic package. Whey protein coating reduced ($P < 0.05$) thiobarbituric acid-reactive substances (TBARS) and peroxide value (PV) formation compared to control sausages. The percent inhibition of TBARS and PV for whey protein-coated sausages, compared to the control, was 31.3% and 27.1%, respectively. The ability of the whey protein coating to provide a moisture barrier for the sausages was reduced ($P < 0.05$). In addition, a reduction of moisture loss by 36.7% compared to the control was achieved by whey coating. However, whey protein coating of LFSs did not inhibit the growth of either the total number of aerobic bacteria or of *Listeria monocytogenes.* These results indicated that whey protein coating had an antioxidative activity in LFSs under aerobic package during refrigerated storage.

APPLICATION OF IMAGE TEXTURE ANALYSIS FOR ONLINE DETERMINATION OF CURD MOISTURE AND WHEY SOLIDS IN A LABORATORY-SCALE STIRRED CHEESE VAT

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A noninvasive technology, which could be employed online to monitor syneresis, would facilitate the production of higher quality and more consistent cheese products. Computer vision techniques such as image texture analysis have been successfully established as rapid, consistent, and nondestructive tools for determining the quality of food products. In this study, the potential of image texture analysis to monitor syneresis of cheese curd in a stirred vat was studied. A fully randomized 2-factor (milk pH and stirring speed), 2-level factorial design was carried out in triplicate. During syneresis, images of the surface of the stirred curd–whey mixture were captured using a computer vision system. The images were subjected to 5 image texture analysis methods by which 109 image texture features were extracted. Significant correlations were observed between a number of image texture features and curd moisture and whey solids. Multiscale analysis techniques of fractal dimension and wavelet transform were demonstrated to be the most useful for predicting syneresis indices. Fractal dimension features predicted curd moisture and whey solids during syneresis with standard errors of prediction of 1.03% (w/w) and 0.58 g/kg, respectively. It was concluded that syneresis indices were most closely related to the image texture features of multiscale representation. The results of this study indicate that image texture analysis has potential for monitoring syneresis.

DESIGNING YOUR DUST COLLECTION SYSTEM TO MEET NFPA STANDARDS – PART I

G.Q. Johnson
Powder & Bulk Engineering 22(12): 53. 2008.

About 40% of combustible dust explosions reported in the U.S. and Europe over the last 25 years have involved dust collectors. Dust collection systems are now a primary focus of inspections required by OSHA's National Emphasis Program on safety handling combustible dusts. OSHA also has the authority to enforce National Fire Protection Association (NFPA) standards for preventing or protecting against dust explosions. This two-part article focuses on how you can design your duct collection system's dust collector, ductwork, and exhaust fan to meet the intent of these NFPA requirements.