570 Effect of the pH on the microstructure, firmness and meltability of cultured Cream cheese. R. R. Monteiro[1], D. Q. Tavares[1], P. S. Kindstedt[2], and M. L. Gigante*[1], [1]*State University of Campinas*, *Campinas, SP, Brazil*, [2]*University of Vermont*, *Burlington*.

Previous studies demonstrated that the firmness and water holding capacity of cream cheese were highly pH-dependent and inversely related. These results suggested that higher pH in cream cheese promoted increased casein-water interactions, which in turn triggered changes in cheese structure that gave rise to softer texture and greater water holding capacity. The objectives of the present study were to evaluate the effect of the pH on the microstructure of Cream cheese and to compare pH-induced changes in microstructure with concomitant changes in cheese firmness and meltability. Cultured cream cheese was manufactured and analyzed for initial chemical composition. The cheeses were then sectioned into samples that were randomly assigned to seven different treatments. Three groups were exposed to ammonium vapor for 1, 3 and 5 min to increase the pH; three groups were exposed to acetic acid for 30, 60 and 90 min to decrease the pH, and one unexposed group served as the control. After equilibration at 4°C samples were analyzed for firmness, meltability and microstructure by scanning electron microscopy. The entire experiment was repeated three times and the relationships between pH and melting or firmness were analyzed by regression. Cheese microstructure changed dramatically with increasing pH from 4.2 to 6.8. The volume of the protein network surrounding the fat droplets increased markedly with increasing pH, presumably due to casein swelling. Concomitantly, cheese firmness decreased (R^2 = .95) and meltability increased (R^2= .98) in a linear manner. Consequently, firmness and meltability were strongly correlated (R^2= -.96). These data support the hypothesis that casein:water interactions increased as the cheese pH increased, which gave rise to progressive swelling of the casein network. Swelling, in turn, caused the mechanical resistance of cheese structure to decrease, resulting in softer texture and increased meltability.

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Key Words: Cream Cheese, Microstructure, Firmness

571 Effect of the addition of potassium sorbate on the stability of cream cheese. A. S. Salles[1], A. A. Vitali[2], P. S. Kindstedt[3], and M. L. Gigante*[1], [1]*State University of Campinas*, *Campinas,SP,Brazil*, [2]*Institute of Food Technology*, *Campinas,SP,Brazil*, [3]*University of Vermont*, *Burlington*.

Previous studies showed that the syneresis potential of Cream cheese made with locust bean gum (LBG) stabilizer was influenced by the viscosity of the serum phase, which in turn was determined by the stabilizer. Furthermore, a direct relationship was observed between microbial growth and decreases in the viscosity of LBG in aqueous solution during storage. Thus, it is possible that decreased viscosity of the serum phase of Cream cheese during storage may be related to microbial growth. The objective of this study was to evaluate the effects of the addition of potassium sorbate, an antimicrobial agent, on the microbiological activity and the viscosity of the serum phase of cultured cream cheese made with LBG. Standardized milk was fermented with lactic culture. The curd was divided and cheeses were manufacture with and without potassium sorbate. The cheeses were divided into two batches and stored at 4 or 20^{0}C. Samples were taken at random after 4, 10, 17, 24, 31, 38, 45, 52 and 59 days of storage and analyzed for chemical composition, pH, amount of expressible serum, total microbial count and yeast and mold count. The expressible serum was evaluated for total solids and apparent viscosity. Results were evaluated by ANOVA according to a Split-Split-Plot design with three experimental replications. Cheese water holding capacity decreased significantly during storage in a temperature dependent manner, with faster decreases occurring at 20^{0}C. The total microbial and yeast and mold counts increased linearly and significantly during the storage. Furthermore, counts were higher in the cheeses manufactured without the addition of potassium sorbate and stored at 20^{0}C. As the microbial counts increased, both the apparent viscosity of the expressible serum and the water holding capacity of the cheese decreased. These results suggest that viscosity of the serum phase decreased as a result of microbial growth, thus leading to decreased water holding capacity and increased potential for syneresis and quality defects.

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Key Words: Cream Cheese, Syneresis, Locust Bean Gum

572 Textural properties of commercial cream cheese. T. Wang*, Y. Chan, M. Brighenti, S. Govindasamy-Lucey, and J. A. Lucey, *University of Wisconsin*, *Madison*.

There has only a limited amount of information published on the textural and rheological properties of cream cheese. Objective of this study were to characterize the textural properties of commercial cream cheese products. Nine types of commercial cream cheeses including full fat, (one-third) less fat and fat-free (one sample), were obtained from a local grocery store. Typical moisture contents of full fat, less and fat free cream cheeses are ~54, ~64, and ~73%, respectively. Texture properties were analyzed by penetration test. Dynamic rheological properties were measured by small amplitude oscillation during heating from 5 to 80°C at 1°C/min and cooling at the same rate. Parameters measured were storage modulus (SM) and loss tangent (LT). The penetration test clearly indicated that full fat cream cheese had greater hardness (mean values ranged from 308 to 588g) compared to less fat (50 to 236g) or fat free (182g) cheeses. SM values decreased rapidly as temperatures increased, which would help cream cheese become spreadable at room temperature. SM values at < 40°C were significantly higher in full fat cheese during heating or cooling sweeps. In full fat cream cheese, one maximum in the LT (value = 0.26-0.35) was observed at 24-30°C, while no clear maximum in LT were observed during cooling sweep but LT increased greatly at low temperature. In less fat cream cheeses, a smaller maximum in LT was observed at 20-25°C, while a second maximum in LT was observed at ~55°C, which was also observable during cooling. There was no noticeable maximum LT observed during either the heating or cooling sweeps of fat free cream cheese samples. The LT peak in full fat cream cheese was presumably due to structural changes to the network after melting of fat. In full fat cream cheese homogenization of the high fat milk resulted in greatly increased surface area of fat globules covered by protein (mostly casein). The increased protein surface area helped to re-enforce the acid-induced casein network and contributed to increased hardness and SM values at < 40°C of full fat cheese.

Key Words: Cream Cheese, Texture

573 Effect of somatic cell count on Prato cheese ripening. G. Mazal[1], M. V. Santos[2], and M. L. Gigante*[1], [1]*State University of Campinas*, *Campinas, SP, Brazil*, [2]*University of Sao Paulo*, *Pirassununga, SP, Brasil*.

The objective of this work was to evaluate the effect of somatic cell count (SCC) on proteolysis and firmness of Prato cheese during ripening. Initially, two groups of animals were selected to obtain milk with low (< 200,000 cell/ml) and with high (> 600,000 cell/ml) SCC. The milk was submitted to three treatments to obtain Prato cheese: (1) from milk with low SCC and clotting time of 35 minutes; (2) from milk with high SCC and clotting time of 35 minutes; and (3) from milk with high SCC and adjusted clotting time. The cheeses were evaluated after 5, 12, 19, 26, 33, and 40 days of ripening, according to pH, moisture, total nitrogen, soluble nitrogen at pH 4.6 and at 12% TCA, and texture and eletrophoretic profiles. The ratios of width (SNpH4.6/TN*100) and depth (SN-12%TCA/TN*100) of ripening were calculated. A randomized block design was used, with two factors: treatment (three levels) and storage time (six levels). The treatments affected significantly the pH, moisture and the ratios of

width and depth of ripening. The cheeses with high SCC showed the highest pH, moisture, and the most intense proteolysis, followed by the cheeses with high SCC and adjusted clotting time and lastly, those with low SCC. The ratios of width and depth of ripening increased significantly throughout storage time; however, they were not significantly affected by the interaction of the treatments and the storage time. The cheese with high SCC showed significantly less firmness than the cheese with low SCC and the cheese with the high SCC and adjusted clotting time; these last two did not differ between themselves. The firmness of all the cheeses decreased significantly throughout ripening. The cheeses with high SCC showed higher degradation of α_{s1}-casein. In short, the cheeses with high SCC, clotting time notwithstanding, showed higher pH and moisture, more intense proteolysis, and less firmness, which can compromise the typical sensorial quality of the product.

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Key Words: Somatic Cell, Proteolysis, Firmness

574 Effect of mixing speed during manufacture and type and level of emulsifying salt used on the microstructure of process cheese. R. Kapoor*, S. K. Garimella Purna, and L. E. Metzger, *University of Minnesota*, *St. Paul*.

A 2 X 2 X 3 factorial design was used to manufacture twelve process cheese foods (PCF) utilizing 12 different factor-level combinations including two levels of mixing speed during manufacture (low and high) and three levels of trisodium citrate (TSC) (2, 2.5 and 3% respectively) and di-sodium phosphate (DSP) (1.5, 2 and 2.5% respectively). All 12 PCF treatments were manufactured using a rapid visco analyzer. Microstructural analysis of the PCF manufactured was performed using Cryo-Scanning Electron Microscopy (cryo-SEM). The PCF samples were mounted onto copper holders and plunged into a liquid nitrogen slush at -207°C. The frozen samples were then fractured under vacuum and the fractured surface was freeze dried at -80°C for 5 min followed by gold coating. The gold-coated samples were then transferred to the cold stage of the cryo-SEM at -140°C and imaging was performed. Cryo-SEM images were collected in triplicate for each PCF treatment and were evaluated for the diameter (D), number of fat globules / 100 sq microns PCF surface (N) and distribution in fat globule diameter (FD). Mixing speed showed a significant effect on N, D and FD, with PCF made using high mixing speed showing a significantly higher N and a significantly lower D with a more uniform FD when compared to PCF made using a low mixing speed for both TCS and DSP treatments. Increasing the level of TSC and DSP showed an increase in the N and a decrease in D with a more uniform FD for the high mixing treatments. When similar levels (2% and 2.5%) of TSC and DSP treatments were compared with each other at the two mixing speeds individually, there was no significant difference in N, D and FD of the PCF on the basis of the type of emulsifying salt. Consequently, cooking conditions such as the mixing speed at which a process cheese is manufactured as well as the level of the emulsifying salt used for process cheese manufacture have a significant effect on process cheese microstructure.

Key Words: Process Cheese, Cryo-Scanning Electron Microscopy

575 Nutraceutical components of Pecorino Toscano cheese. M. Antongiovanni*[1], S. Rapaccini[1], A. Buccioni[1], M. Mele[2], A. Serra[2], and F. Petacchi[1], [1]*University of Florence*, *Firenze, Italy*, [2]*University of Pisa*, *Pisa, Italy*.

The acidic composition of milk fat is characterized by the presence of acids such as vaccenic (VA) and conjugated linoleic acid isomers (CLA), very important nutraceuticals to human health.

Three large samples of Spring bulk milk were collected and divided into subsamples: 3 sub-samples of raw milk (RM); 3 of pasteurised milk (PM, 73° C for 15 sec); 3 of PM added with ferments (PF). Fifteen sub-samples were made cheese from PF (according to the Pecorino Toscano disciplinary directions). The added ferments were selected Lactobacilli. Three cheese samples were analysed on the very day of cheese making, 3 at day 30 of ageing, 3 at day 60, 3 at day 90 and the last 3 at day 120 of ageing.

The levels of palmitic acid (PA), oleic acid (OA), myristic acid (MA) and VA in RM samples were 23.4, 16.7, 10.5, 3.4 mg/100g total lipids, respectively. CLA was quite high (1.6 mg/100 g total lipids), due to the Spring pasture grazing. Both the pasteurisation and the addition of ferments did not alter the composition of milk as well as of fresh cheese samples. The ageing process led to a slight decrease of both MA and PA after day 90 and day 120, respectively. The differences resulted statistically significant ($p<0.05$), but indeed very small. Actually, the levels of these two harmful acids did not increase with ageing. The same may be said for OA, slightly decreased at day 90. VA, linoleic acid (LA) and CLA remained steady throughout the ageing period.

Since the analytical procedure (Christie, 1982) allows the determination of esterified acids only, the slight decrease with ageing of the most abundant acids MA, PA, and OA, could mean that the lipolysis and oxidation processes were not so pronounced.

In conclusion, it is confirmed that the milk fat from grazing ewes contains appreciable amounts of nutraceutical fatty acids, particularly of CLA, and that this beneficial characteristic is maintained during both cheese making and cheese ageing, with little lipolysis and oxidation processes.

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Key Words: Sheep Cheese, CLA

576 Changes in sensory properties of Ragusano cheese from cows raw milk at different level of pastures. S. Carpino*[1], G. Marino[1], and G. Licitra[1,2], [1]*CoRFiLaC, Regione Siciliana*, *Ragusa, Italy*, [2]*D.A.C.P.A. Catania University*, *Catania, Italy*.

Our objective was to determine the influence that different level of pastures had on the sensory properties of Ragusano cheese. Sensory properties were studied on 24 samples of Ragusano cheese in spring 2004. The cheese milk was from three groups of cows on a farm sited at mountain level (ML) in the Hyblean region of Sicily. One group was fed only Total Mixed Ration (TMR) (ML0).The second group was fed TMR supplemented with 30% Dry Matter (DM) of native pasture (ML30).The third group was fed TMR supplemented with 70% DM of native pasture (ML70).Milk was collected 4 times with 15 d interval.Two blocks (14 kg each) of cheese were made from each batch of milk.The experiment was repeated 4 times, with 24 experimental cheeses produced, eight for each level of pasture. Twelve cheeses were aged at 4 mo and 7 mo at CoRFiLaC aging center in ventilated rooms at 14 to 16°C. Twelve trained panelists tested all the cheeses. Quantitative Descriptive Analysis was used to describe the cheeses.A score card ranging from 1 to 15 was used.Repeated measures Anova was used to determine the effect of different treatment.The overall odor intensity and pungency, characteristics of typical Ragusano good quality cheese, were higher ($P<0.005$) for the 4 mo ML70 cheeses.The consistency and mouth feel attributes such as smooth/rough, oily, plasticity, and piquancy were also higher ($P<0.005$) for the 4 mo ML70 cheeses.Intensity of floral odor attribute was higher ($P<0.005$) for the 4 mo ML30 cheeses showing that an integration of 30% DM of pasture is sufficient to have a good perceptible grade of floral odor from panelist.Panelists graded hardness and bitterness significantly higher ($P<0.005$) for the 4 and 7 mo ML0 cheeses. The ML30 results were compared with other cheeses produced contemporary on another farm for one group of cows fed TMR supplemented with 30% of pasture at sea level (SL30).Breed, milk production levels, and days in milk were similar for the two groups of cows ML30 and SL30.Sensory attributes of ML30 were scored significantly higher ($P<0.005$) than cheeses from SL30 suggesting that a higher altitude of the farm may influence sensory properties in cheeses.

Key Words: Cheese, Sensory, Pastures