(OBCFA). Principal component analysis was applied to the GC results. Scores projected on principal component 1 (PC1) revealed a tendency of separation between grass-fed and silo samples. PC1 correlation loadings revealed an inverse relationship between n-6 on one hand, and n-3 and OBCFA on the other. These results confirmed that grass-fed milk can be differentiated from conventional one by the fatty acids profile. A partial least squares (PLS) regression model was built using milk spectra collected in 2019. The calibration set consisted of spectra of 11 grass-fed and 5 silo samples (average LA:ALA ± SD of 2.64 ± 1.302; range of 0.79–4.77). The model was cross-validated using a leave-one-out approach and the external validation set consisted of 76 grass-fed samples. The root mean square error of calibration, cross-validation (RMSECV), and prediction (RMSEP) were 0.46, 0.56 and 0.51, respectively. The RMSEP was acceptable according to the Canadian grass-fed standard and the close values of the 3 measurements of error indicated that the model was stable. The RMSECV was significantly different ($P = 0.003$) from the RMSECVs of 100 permutations of the LA:ALA PLS model. We concluded that FTIR spectroscopy has the potential to be used as a screening tool for LA:ALA ratio to monitor the grass-fed status of dairy herds.

Key Words: grass-fed milk, FTIR spectroscopy, chemometrics

P209 Feasibility of mid-infrared and visible/near-infrared spectroscopy to authenticate organic bulk milk. C. L. Manuelian, V. Vigolo, A. Costa*, and M. De Marchi, *University of Padova, Legnaro, Padova, Italy.*

It is important to have fast, inexpensive and nondestructive methods, such as infrared spectroscopy, to verify the declarations on the labeling of those products in which certain characteristics represent a premium in the sale price. Thus, we aimed to evaluate the feasibility of mid-infrared (MIR; 5,012–925 cm^{-1}) and Vis/near-infrared (Vis/NIR; 400–2,500 nm) spectroscopy to discriminate organic from conventional cow milk. Bulk milk samples (n = 225) from 24 farms (Organic = 12; Conventional = 12) located in the same area, mainly raising Italian Friesian cows, and similar management conditions, except for spending a period of time in the pasture when organic, were collected from September 2019 to August 2020. Chemical composition of the lactation total mixed ration was similar between groups. The MIR and Vis/NIR spectrum of each sample were collected, and a principal components analysis (PCA) and a partial least square discriminant analysis (PLS-DA) were done with R software. For the PLS-DA, records were split into a train set (75% records) and a test set (25% records), and only wavelengths with VIP >1 were retained. Results from PCA showed that PC1 and PC2 explained 64.3% and 93.2% of the variance with MIR and Vis/NIR spectra, respectively. However, the PCA plot showed the overlapping of both populations. The PLS-DA showed several MIR regions contributing to the model ($1 \leq VIP \leq 3.5$). Vis region contributed more to the Vis/NIR model ($1 \leq VIP \leq 3.0$), but few VIP peaks (≤ 1.4) in the NIR region were observed. Despite only milk protein content differed ($P = 0.04$) between groups, those MIR and NIR regions are linked to lactose, fat and protein content. Results from the PLS-DA revealed an accuracy of the model of 70.2% and 71.7%, for MIR and Vis/NIR, respectively, in the test set. In conclusion, both infrared-regions performed similarly, and the moderate accuracy of the PLS-DA could be related to the similarity of the selected farms between both categories (e.g., breed and total mixed ration composition). It would be interesting to incorporate other parameters such as the fat or protein profile of the milk to improve the models.

Key Words: infrared spectroscopy, organic production, PCA

P210 Influence of incorporation of whey protein isolates on the physicochemical, rheological, and microstructural properties of nonfat yogurt. M. A. Hashim*[1,2], L. A. Nadotchii[1], A. Prockora[1], and M. Muradova[1], [1]*ITMO University, Saint Petersburg, Russia,* [2]*Agricultural Research Center, Giza, Egypt.*

Consumers give a significant awareness for healthy, naturally functional food products with clean labels and less added ingredients and external hydrocolloids. Nowadays, the demand for low and nonfat products has increased because of the problems related to obesity, diabetes and cardiovascular diseases. So, significant attention has been given to the production of low and nonfat dairy products. This study's objective was to explore the potential of whey protein isolate (WPI) to improve the quality of nonfat yogurt made by reconstituted skim milk and in the presence of full-fat and nonfat yogurts as controls. Yogurt mixes were formulated using a skim milk powder as a milk base enriched with WPI up to 6% protein content. The replacement percentage of skim milk powder by WPI in the yogurt mixes was between 3 and 9%. Nonfat and full-fat set-style yogurts (6.0 ± 0.1% protein, 15 ± 1.0% solids) were made from skim milk and whole milk, respectively. The texture, microstructure, the rheological properties (storage modulus, loss modulus, apparent viscosity) and sensory properties of the yogurt samples were analyzed in comparison with full-fat (3.0% fat, wt/wt) and nonfat (0% fat, wt/wt) yogurts. The rheological parameters were measured using a rheometer (RN 4.1, RHEOTEST Medingen GmbH, Germany). The texture was analyzed by domestic texture analyzer "Structurometre ST2," and the maximum force required to penetrate the gel was taken as a measure of the relative gel strength. The microstructure was assessed by scanning electron microscopy. The yogurt samples were evaluated by a trained panelist familiar with sensory evaluation techniques. The average and standard error were carried out for 3 replicates using an SPSS computer program. The incorporation of WPI improved the water-holding capacity of the nonfat yogurt and the rheological properties. The nonfat yogurt incorporated with 7% WPI had comparable sensory and textural characteristics to the full-fat yogurt. The firmness of yogurt samples significantly decreased by increasing the addition of WPI. The SEM micrographs showed that the addition of WPI improved the microstructure of nonfat yogurt samples by adding WPI. So, WPI can be used as a fat replacer to develop nonfat yogurt with desired features. WPI might be a natural and economical ingredient for producing nonfat fermented dairy food products.

Key Words: yogurt, whey protein isolate, rheological properties

P211 Synergistic and antagonistic ingredient interactions as a sugar reduction strategy. A. Riak*, R. Roberts, J. Hayes, G. Ziegler, and H. Hopfer, *The Pennsylvania State University, University Park, PA.*

Approaches to combating childhood obesity include food product reformulation to decrease added sugar while maintaining product acceptability. This research is testing for perceived synergistic and antagonistic ingredient interactions between sucrose, vanillin, and cocoa powder in chocolate milk, which is the most popular flavor in the National School Lunch Program. The objectives of this study were to (i) evaluate response-surface intensities of sucrose, vanillin, and cocoa powder mixtures while assessing optimization in chocolate milk (ii) determine the presence of synergistic, additive, and antagonistic ingredient interactions using the isobole method, and (iii) measure formulation acceptability. One hundred thirty-six adults evaluated 10 of the 22 samples in a counterbalanced, incomplete block design for the response-surface and isobole findings. Final regression models were then used to create tri-variable contour plots with the Ternary package in R.