

2009 Annual Meeting Abstracts

MONDAY

MORNING

AM 1: Agricultural Microscopy I

Chair(s): M. McCutcheon, West Virginia Dept. of Agriculture, USA; and G. Kobata, California Dept of Food & Agriculture Feed & Fertilizer Lab, USA

Prion Diseases: A Little Prevention Can Prevent a Catastrophe. C.J. Silva, USDA, ARS, Western Regional Research Center, USA

Chronic wasting disease and bovine spongiform encephalopathy (BSE) are two of the best known examples of transmissible spongiform encephalopathies (TSEs). These diseases are characterized by a very long asymptomatic incubation period followed by a short disease course that ends in death. TSEs are caused by a novel molecular pathogen known as a prion. Prions are able to convert a normal cellular protein into a prion, thereby propagating an infection. A given host can propagate more than one strain of prion. Each prion strain has its own characteristic pathology, incubation time, and stability to different forms of inactivation. Prions have the ability to adapt to new hosts while retaining their distinct properties. Prions persist in the environment and survive most conventional forms of inactivation. The long asymptomatic incubation period of a TSE makes them difficult to control. The most successful approach to controlling a TSE requires the implementation of an enforceable feed ban coupled with postmortem testing of animals for the presence of TSEs. This twofold approach is the standard method of controlling BSE throughout the world. Feed microscopy is essential component of this twofold approach, for it is the major means of enforcing a feed ban.

State of the Art of Quantification for Processed Animal Proteins (PAPs) in Feedingstuffs: Results and Perspectives. P. Veys, V. Baeten, Community Reference Laboratory for Animal Proteins in Feedingstuffs, Gembloux, Namur, Belgium

In 2006, shortages and the inapplicability of the quantification method of PAPs in feed as stated in the EC 126/2003 Directive, implemented by official control laboratories within the EU, have been revealed. The CRL-AP investigated on possible improvements of the method. Accurate quantification of PAPs is the prerequisite for the lift of the total feed ban on animal proteins in the EU and the discussed reintroduction of fishmeal in ruminant feed limited at a maximum threshold. After preliminary study, the CRL-AP organized in 2007 an interlaboratory study with as goal to evaluate the revised protocol for the quantification. The revision was based on stereology and the use of a calculation tool for the final estimation of adulteration by animal proteins. Results of this study are presented with emphasis on progress for standardization of measurements and improvements for the reproducibility. Though the method is not yet validated, tuning of the revised method is still required for future improvements. Not only the ongoing tests and researches for future development of quantification by way of classical microscopy are discussed but also the ways to achieve advances will be explained even as new challenging alternative methods such as those based on NIR microscopy or PCR are presented.

Detection of Food Adulterants using Microscopy. N. Vary, Canadian Food Inspection Agency - Ottawa Laboratory (Carling), Ottawa, Ontario, Canada

Microscopy has long been used to examine agricultural and agri-food commodities. This presentation will examine a number of case studies having used microscopy in the areas of food forensics, detection of food adulteration and economic fraud, and food safety. Case studies will include: 1) Aiding law enforcement officials in the conviction of suspects (e.g. illegal hunting, baby formula swapping) 2) Demonstrating the capability of determining economic fraud in various food commodities (e.g. Manuka honey, maple butter) 3) Contributing to food safety along the farm to fork food continuum (e.g. protecting against the transmission of vCJD)

AFTERNOON

AM 2: Agricultural Microscopy II

Chair(s): C. Rogers-Kelly, Mississippi State Chemical Lab, USA; and K. Koch, Northern Crops Institute, USA

Particle Size Analysis of Ground Biomass by Image Processing and Experimental Verification of Results. C.

Igathinathane¹, L.O. Pordesimo², W.D. Batchelor¹, ¹Mississippi State University, Mississippi State, MS, USA, ²ADM Alliance Nutrition, Quincy, IL, USA

Sieve analysis is the standard method of determining particle size distribution of particulate material such as ground biomass particles; however to produce a balanced distribution of fractions it involves much guesswork in sieve set selection. An image processing method as an alternative for sieve analysis was developed and verified. This implementation in ImageJ measures particles dimensions and analyze their size distribution from flatbed scanner captured images. Hammer-milled dry pine forest first thinning and elephant grass were the test materials. The plugin used pixel-marching method for determining the particle dimensions and ASABE Standard S319.3 for analyzing particle size distribution. Observed deviation between the experimental and simulated sieving were attributed to the difference in densities of individual fractions and the "fall-through" effect of longer particles through smaller sized sieve openings. Because of this situation, it is proposed that the image processing sieving simulation plugin producing the "true separation" of particles can totally replace mechanical sieving and analysis, especially when dealing with particles fibrous in nature ($L/W \gg 1$). The plugin application was accurate (96.6%), fast (more than 450 particles/s), cost effective, reduced the drudgery of sieve analysis, and can be readily applied to other particulate systems.

Microscopic Characteristics of Dacron Bags used in Ruminant *in sacco* Trials and the Effect of Particle Size on Substrate Loss. Christian W. Cruywagen, Stellenbosch University, Stellenbosch, South Africa

Feedstuffs are prepared for *in sacco* nutrient degradation trials by milling through a 1 or 2 mm screen. Samples are then incubated in the rumen in dacron or nylon bags for specific times, including 0 h where bags are washed in water to obtain the soluble fraction. Microscopic image analysis in our lab has indicated that the pore size of dacron material with a nominal average pore size of 53 μ , may vary from 31 to 99 μ . Milled feedstuffs would contain particles that are quite smaller than these pore sizes. Fine particle washout would thus result in an over-estimation of disappearance values. A trial was done to determine the effect of fine particle removal on the chemical composition and 0 h nutrient disappearance values of forages. Alfalfa hay, oat hay and wheat straw samples were obtained from seven locations. Samples were milled through a 2 mm screen and sub-samples were sieved through 106, 125 or 150 μ sieves. Samples of each fraction were weighed into dacron bags, washed in water, dried and analyzed for DM, CP, NDF, and ash. Sieving had a small effect on the chemical composition of the respective forages, but all sieve sizes significantly decreased 0 h incubation values. It was concluded that the removal of extremely fine particles would improve the accuracy of nutrient degradability estimations of feedstuffs.

TUESDAY

AFTERNOON

AM 3 / PCP 3.1: Alternative Sources in Aquafeeds

Chair(s): N. Vary, Canadian Food Inspection Agency, Canada; and K. Liu, USDA ARS, USA

The Beneficial Effect of Probiotics in Cultured Fish. T. Nakano, T. Yamaguchi, M. Sato, Graduate School of Agricultural Science, Tohoku University, Sendai, Miyagi, Japan

In aquaculture, it is known that prevention of disease is more important than medical treatment. Part of disease prevention could come from daily diet. This concerns functional constituents, that is, food factors of feed other than essential constituents. Those functional feed ingredients have three categories; probiotics, prebiotics and biogenics. Probiotics (e.g. lactic acid bacteria) are defined as components of microbial cells or products from microbes that affect the host health. Prebiotics (e.g. oligosaccharides) are recognized as a nondigestible food ingredient that promotes the

growth of beneficial intestinal microbes. Biogenics (e.g. polyphenolic compounds and vitamins) are defined as ingredients that modulate several functions of the body. Recently, some kinds of probiotics, in the wide sense, are often used under the assumption that they are equivalent to probiotics, prebiotics and biogenics are matched. Here, we will present some results of the effect of one of biogenics, polyphenolic procyanidins from grape seed, on the fish health. We found that procyanidins might improve antioxidant defense ability of fish. The use of probiotics in aquaculture should be regarded as a milder supplement therapy for fish and an environment-friendly method of aquaculture. We expect that ideal supplements for aquafeeds might be developed by the research of probiotics in the near future.

Nitrogen Utilization from Poultry Processing Co-products used in Diets for Florida Pompano. M. Riche, T. Pfeiffer, USDA, ARS, Fort Pierce, FL, USA

Feed represents the highest variable cost associated with fish production. High quality fishmeal (FM) continues to be the principal source of protein for fish, particularly carnivorous species that typically have dietary protein requirements of 40% or more. FM continues to be an expensive protein, with tight supplies when available, and little relief in sight. Replacement of FM with alternative protein sources will increase sustainability and profitability of the aquaculture industry. At the NOAA-USDA Alternative Feeds Initiative stakeholder's meeting in April 2008, poultry processing co-products were identified as top-tier candidates for evaluation as FM replacements in aquafeeds. However, one constraint to greater utilization of these co-products is the observed high variation in both quality and digestibility. It is well established processing conditions can affect amino acid availability in rendered products, and chemical composition and protein digestibility vary by product source. The goal of food fish production is the efficient conversion of dietary protein, measured as nitrogen (N), into salable fish flesh. This presentation reports on protein digestibility, amino acid availability, N excretion, and N retention in Florida pompano fed diets substituting five different poultry processing co-products as partial FM replacements.

Improvement of Nutritional Value of Lipid Sources by Monoacylglycerol Supplementation in Kuruma Prawn. Manabu Ishikawa, Shunsuke Koshio, Saichiro Yokoyama, Shinichi Teshima, Faculty of Fisheries, Kagoshima University, Kagoshima City, Kagoshima, Japan

This study presents effects of dietary lipid sources and monoacylglycerol (MG) supplementation on the growth and body lipid profiles for *M. japonicus* juveniles and larvae. Two feeding trials were conducted with 9 treatments (3x3), 3 lipid sources, triacylglycerols (TG), ethyl esters (EE), free fatty acids (FFA) and 3 supplements (control, Glycerol, MG). EE, FFA and MG were prepared from squid liver oil (SLO). In juvenile experiment, nine test diets were fed to prawns (body weight 0.4g) in triplicate 54-liter tanks. After 30 days feeding trial, body weight gain (BWG) and survival among the different treatments were statistically analyzed. Test prawn carried out to determine body fatty acid contents and the apparent digestibilities of dietary fatty acids. Results showed that there was a significant difference in BWG between the prawns fed the TG diets and those fed the EE diet. However, Supplementation of MG or glycerol trend to improve the growth of prawn in EE and FFA treatments. There were no significant differences in survival and total lipid content among the treatments. In larval experiment, similar trends were shown in the growth of the prawn. But glycerol supplementation was not effective for the improvement of larval growth.

WEDNESDAY