

2010 Annual Meeting Abstracts

Agricultural Microscopy

MONDAY

MORNING

AM 1: Agricultural Microscopy I

Chair(s): G. Ideus, Archer Daniels Midland Co., USA; and G. Kobata, California Dept of Food & Agriculture, USA

Nutrient Variation of Common Ingredients. D. Hill, ADM Alliance Nutrition, Inc., Quincy, IL, USA

The use of computer programs for formulation of pet food and farm animal diets has resulted in significant gains in productivity for formulators and significant cost savings for manufacturers. This use of the complex mathematical equations in these programs requires the use of specific nutrient values in the complex matrix and mathematical equations. The use of these precise formulas and nutrient levels often lead us to forget (or ignore) normal biological variation of these nutrient levels. This normal biological variation occurs due to different geographic conditions, environmental conditions, crop varieties and other factors. The origin and variability of bulk ingredients is somewhat challenging due to ingredients coming in from world-wide sources. This adds to the importance of laboratory testing and knowing the biological and geographical variation. Commercial livestock feed manufacturers take advantage of nutrient variability and frequently adjust manufacturing formulas to meet legal labeling requirements. By focusing and formulating on the major nutrients, there is still some degree of uncertainty and variability in the micro-nutrient levels. Nutrient values in calculated formulas, while likely close to "average", may vary considerably up or down. There is also a degree of uncertainty and variability of nutrient levels when fixed formulas are used. This presentation will discuss common ingredients and nutrient variation based on a commercial feed lab and analysis by a NIRS instrument manufacturer.

Airborne Dust Particles Size and Size Distribution by Machine Vision. C. Igathinathane¹, L.O. Pordesimo², S. Melin³, S. Sokhansanj⁴, E.P. Columbus⁵, ¹Department of Agricultural and Biosystems Engineering, North Dakota State University, Fargo, ND 58108, USA, ²ADM Alliance Nutrition, Quincy, IL 62301, USA, ³Delta Research Corporation, Delta, BC, Canada V4L2L5, ⁴Department of Chemical and Biological Engineering, University of British Columbia, 2360 East Mall, Vancouver, BC, Canada V6T1Z3, ⁵Department of Agricultural and Biological Engineering, Mississippi State University, Mississippi State, MS 39762, USA

A simple and inexpensive machine vision method that evaluated the minute particles size and particle size distribution (PSD) using a user-coded image processing plugin operated on the digital images from the commercially available flatbed document scanner was developed and successfully tested. The test material used were airborne dust from wood pellet industries. The existing highly expensive devices for similar measurements utilize light scattering, acoustic spectroscopy, and laser diffraction principles; but they evaluate particle dimensions indirectly and assume spherical geometry for the particles. Since the developed machine vision method ImageJ plugin operates directly on the particle images, it determines the true dimension measurements from the irregularly shaped particles. Furthermore, the method automates the PSD analysis in a sieveless manner, outputs the results in textual and graphical formats, simulates standard mechanical sieving, calculates several descriptive PSD parameters (> 20), produces accuracy > 99.7%, has 2 µm resolution, and analyzes with great speed (3000-14000 particles in 5-8 s). Being user-coded, the plugin can be modified to suit any specific measurement or output requirements easily. Suitable high-resolution images from other devices such as digital imaging or electron microscopes can also be readily analyzed.

Melamine in the Feed and Food Chain. Christian W. Cruywagen, Tanja Calitz, Stellenbosch University, Stellenbosch, South Africa

Melamine contains 667 g/kg N, which makes it an attractive protein adulterant, as it has the ability to inflate the crude

protein content of feed- and foodstuffs artificially. Our research confirmed for the first time that a pathway exists for the transmission of melamine from feed to milk. Melamine appeared in the milk as soon as 8 h after first ingestion and reached a maximum concentration within 56 h after first ingestion. Upon melamine withdrawal, milk melamine concentration responded rapidly and dropped 85% within 32 h. Only after 152 h upon melamine withdrawal, melamine was non-detectable in the milk samples. Excretion via milk accounted for only 2% of the ingested melamine. An experiment with sheep showed that the apparent absorption rate of ingested melamine was 77%. Urine was the major excretion route at 53%, followed by faeces at 23%. Approximately 3.5% of the ingested melamine was deposited in muscle. Our research also confirmed that melamine is excreted in eggs as soon as one day after first melamine ingestion. Maximum concentrations were reached on day 3 of melamine ingestion and four days after melamine withdrawal, melamine disappeared from the eggs. Our pilot pot plant studies indicated that melamine, when applied as fertilizer, is taken up by pasture grass and appears in the leaves as soon as one week after fertilization. Melamine was still detectable in the grass 17 weeks after fertilization.

Equine Nutrition - Plain and Simple. D.M. Green, Los Cedros USA, Scottsdale, AZ, USA

Horses unique dietary needs Gut length... full vs empty .. grazing animals False ruminant - microbial cecum Horses daily min requirements Caloric requirement 1½ to 2% of bdywt in roughage Roughage requirement Different types of roughage Alfalfa vs. grasses Concentrates Whole grains, processed pelleted feeds Roughage vs. Concentrate High carb diet .. Excess energy ? behavioral challenges Laminitis ? founder Anaerobic metabolism .. azoturia . Colic precursor .. molasses , corn Obesity Supplements vs. No Supplements Most supplements do more for the owners not the horse Fat sol vs non fat sol. Nutritional vs therapeutic vs. prophylactic

****CANCELED** Understanding Lipid Distribution in New Zealand King Salmon (*Oncorhynchus tshawytscha*) during Thermal Processing, Using Confocal Microscopy and Magnetic Resonance Imaging (MRI).** D. Larsen, The University of Auckland, New Zealand

AFTERNOON

AM 2/PRO 2: Food/Feed Safety and Quality

Chair(s): M. McCutcheon, West Virginia Dept of Agriculture, USA; and J. Willits, Desmet Ballestra North America Inc., USA, and M. Snow, Bunge North America Inc., USA

Salmonella Prevention in Oilseed Meals. T. Kemper, Desmet Ballestra North America, Inc., Marietta, GA, USA

Salmonella enterica is a bacterium which can grow in reduced oxygen environments. This bacterium often exists and multiplies in the intestinal tract of birds and mammals. Bird stool in particular can come into contact with oilseeds and oilseed meals during processing and transport, thereby transferring the bacterium to these oilseed products. Recent measurement and detection of positive presence of salmonella enterica in oilseed meals has created feed quality concerns, and led to global import-export problems with oilseed meals. This paper will discuss where salmonella enterica generally enters the oilseed crushing process, how its multiplication can be minimized, and how it can be thermally destroyed. A list of key recommendations will be provided for prevention of salmonella enterica presence in oilseed meal.

Deodorization as a Driver for Product Quality. Dennis Otten, Cargill Inc., USA

General discussion on the effects of deodorization on product quality. Presentation will include deodorizer effects on pesticides, PHA's, allergens, heating fluids, trans fatty acids, comingling, etc.

Safe Feed/Safe Food and International Trade. Keith Epperson, American Feed Industry Association, USA

AFTERNOON**AM 3: Agricultural Microscopy II**

Chair(s): P. Ramsey, Retired, California Dept of Food & Agriculture, USA; and C. Rogers-Kelly, Mississippi State Chemical Lab, USA

Adulteration of Protein Sources. Christian W. Cruywagen, Stellenbosch University, Stellenbosch, South Africa

Protein feedstuffs that are used in animal feeds are expensive and are often subjected to adulteration. The protein content of feeds is not determined directly, but is calculated from their N content, and thus commonly referred to as crude protein. Any nitrogen source can therefore artificially increase the apparent protein content when added to feeds or feed ingredients. Non-protein nitrogen sources, such as melamine and urea, have been used as adulterants in the past. The crude protein content ($N \times 6.25$) of pure melamine would be 4167 g/kg, which is substantially higher than that of pure urea (2917 g/kg), which makes melamine especially attractive as a protein adulterant. A variety of other protein adulterants have, however, also been observed by the author during the last few years. Fish meal, especially, is an expensive protein source used in animal feeds. Adulterated fish meal, originating from various countries, has been observed and the most popular adulterants were blood meal, meat and bone meal and hydrolyzed feather meal or poultry by-product. In one case, sand and poultry manure was found in a fish meal sample. Wheat bran and corn gluten have also been observed in a few fish meal samples. Adulterated poultry by-product and meat and bone meal have also have been observed frequently. In these cases, the one is often contaminated or adulterated with the other.

The Forensics of High Concentrate Fertilizer of DAP, MAP, and GTSP. J. Falls, CF Industries, Inc., Plant City, FL, USA

High concentrated fertilizer products are shipped around the world and can be contaminated with other types of fertilizer products during the transportation and storage. The identification of the contamination is necessary to settle disputes in the industry. The chemistry of reactions in the manufacture of products will be discussed with typical analysis of products, including Diammonium Phosphate (DAP), Monoammonium Phosphate (MAP) and Granular Triple Super Phosphate (GTSP). Trace elements will be identified to help in the origin of manufacture. Physical contamination is obvious in identifying the contamination, but ground samples make the process more difficult in determining the contamination. An analytical chemistry process will be discussed to identify contamination in fertilizer products using ICP-OES and XRF.

Detecting and Quantifying Prions: Mass Spectrometry-based Approaches. Christopher J. Silva¹, Bruce C. Onisko², Irina Dynin¹, Melissa L. Erickson¹, J. Mark Carter¹, ¹United States Department of Agriculture, Agricultural Research Service, Western Regional Research Center, Albany CA, 94710 USA, , ²OniPro Biosciences, Kensington, CA, USA

Prions are novel pathogens that cause a set of rare fatal neurological diseases know as transmissible spongiform encephalopathies. Examples of these diseases include Creutzfeldt-Jakob disease, scrapie and chronic wasting disease. Prions are able to recruit a normal cellular prion protein and convert it into a prion and thereby propagate an infection. Unlike other pathogens, the information necessary to propagate the infection is contained in the conformation of the protein comprising the prion isoform and not in nucleic acids. Prions and the normal cellular prion protein isoform have different physicochemical properties although they possess identical covalent structures. We exploit ultracentrifugation to isolate infectious prions and analyze them by mass spectrometry. This approach works on both proteinase K resistant and sensitive forms of prions. We use a nano LC-MS-MS system to quantitate the prions present in a sample. Our limit of detection is in the attomole range (10^{-18} mole). Oxidation of methionine has been proposed to be important in prion formation. Using mass spectrometry, we assessed the role of methionine oxidation in prion propagation in hamsters. We have used mass spectrometry to quantitate prions and determine the role of specific amino acids in the pathology of prions.

WEDNESDAY

N/A

[Technical Program](#)