Official Journal of the Animal Science and Production Association (ASPA)

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ISSN 1594-4077

eISSN 1828-051X

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http://www.tandfonline.com/tjas

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Italian Journal of Animal Science

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volume 16

supplement 1

2017

# italian journal of animal science

## ASPA 22nd CONGRESS

**Perugia, June 13–16, 2017**

## Book of Abstracts

**Guest Editors: Massimo Trabalza-Marinucci (Coordinator), Cesare Castellini, Emiliano Lasagna, Stefano Capomaccio, Katia Cappelli, Simone Ceccobelli, Andrea Giontella**

## O104

## Use of a new instrument for the *in vitro* evaluation of ruminants feeds through gas production: preliminary study

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The gas production technique has been applied, until now, only for scientific purposes and had relathely limited diffusion, since it was based mainly on the use of syringes and data collection was generally non-automated.
The present study was conducted to evaluate a new instrument to be used in the "*in vitro*" measurement of gas production as an alternative to the method by Menke and Steingass (1988) to evaluate dairy cattle feed nutritive value.
Starting from a patent of the University of Uppsala (Sweden), and with the Start up "Bioprocess Control", a new instrument called "Gas Endeavour" was enveloped and adapted to ruminal fermentation studies. This instruments allow to: a) operate with 500 ml batches b) simulate the physiological rumen movements by continuous or discontinuous stirring c) operate using from 2 to 8 g of dry sample or about 20 grams of fresh forage, depending on the substrate; d) measure and register continuously the amount of gas produced on 15 batches.
Cumulative gas production profile of 24 hours interval were generated using the GAS ENDEAVOUR® at a temperature of 39 °C under discontinuous stirring (20 sec on and 40 sec off). Van Soest buffer, macro-mineral and micro-mineral solution were used to obtain the fermentation medium while the Van Soest method was the reference for the amount of rumen fluid inoculum, medium and sample substrate, that were proportioned to batches of 400 ml. The fermentation trials were made on four corn silage samples having different composition (starch content: 32.00, CSA; 18.31, CSB; 21.57, CSC and 27.74%, CSD) and on a sample of alfalfa hay on three different fermenters with of 5 g of pre-dried sample. In particular, CSA has been tested 11 times while measurements on CSB, CSC and CSD were repeated four times to assess the reproducibility of the fermentation process and the repeatability of the resulting amount of gas ($CH_4$ + $CO_2$) produced. The average amount of gas produced (ml/g DM), the relative standard deviation and the coefficient of variation (CV %) amounted to 199.94 ± 4.03 ml (CV 2.02%), 158.86 ± 4.69 ml (CV 2.95%), 176.09 ± 6.48 ml (CV 3.68%), 192.71 ± 5.88 ml (CV 3.05%). The alfalfa hay sample was repeated 5 times with a gas production (ml/g DM) equal to 141.09 ± 4.93 ml (CV 3.50%). Compared to bibliographic data, obtained with the use of syringes and other systems without automation, the GAS ENDEAVOUR equipment proved to be very reliable and performed highly repeatable measurement over time.

*Acknowledgements*

The Authors gratefully thanks Mrs. Costanza Ampollini and Mr. Luigi Faroldi for the collaboration and the technical support.

## O105

## Electronic nose for the detection of mycotoxin contaminations in maize kernels

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The aim of this study was to evaluate the potential use of an electronic nose (e-nose) in cereal industry for rapid mycotoxin detection. Twenty-eight maize samples were collected from warehouses for stockpiling and analysed by commercial Lateral Flow Immuno Assays (LFIA) for the determination of total aflatoxins and fumonisins. Samples were stored at -18 °C in vacuum-sealed conditions prior to e-nose analysis. Two aliquots of each sample were processed and each analysis was run in triplicate. The headspace of each vial was analysed by the 10 MOS (Metal Oxide Semiconductor) sensors of a PEN3 e-nose. Ten different descriptors, representing each sensor of the e-nose, were used to detect aflatoxin and fumonisin contamination below (uncontaminated) or above (contaminated) the maximum acceptance limits for maize intended for feed. Data were analysed by Discriminant Function Analysis (DFA) procedures using IBM SPSS Statistics 22 (SPSS Inc.). Stepwise variable selection was done to select the e-nose sensors for classifying samples by DFA.
Discriminant function used to identify aflatoxin contaminated or uncontaminated samples included 3 e-nose sensors (W1C-aromatic, W3C-aromatic and W5C-arom-aliph). The overall leave-out-one cross-validated percentage of samples correctly

classified by the tri-variate DFA model for aflatoxins was 71.4%. In the case of uncontaminated samples, the percentage of samples correctly classified was 71.1%, while in the case of contaminated samples it was 75.0%.
Discriminant function used to identify fumonisin contaminated or uncontaminated samples included 6 e-nose sensors (W1C-aromatic, W3C-aromatic, W1S-broad-methane, W1W-sulphur-organic, W2W-sulph-chlor, W3S-methane-aliph). The overall leave-out-one cross-validated percentage of samples correctly classified by the six-variate DFA model for fumonisins was 81.7%. In the case of uncontaminated samples, the percentage of samples correctly classified was 87.9%, while, in the case of contaminated samples, it was 75.0%.
Even though a larger dataset is needed to perform an effective validation procedure, by using a dataset not included in the model e-nose seems to be a promising rapid/screening method to detect mycotoxin contamination in maize kernel stocks. From a technical perspective, contaminated samples misclassified as non-contaminated represent the worst outcome under in-field conditions in order to select samples that must undergo further accurate quantitative analysis.

*Acknowledgements*

The authors would like to thank CerealDocks for providing the samples.

## O106

## Evaluation of heavy metals in intensive animal production systems

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Modern animal production systems produce large quantities of manure by-products that can be used as nutrient resource and soil conditioner in agriculture. Manure is also recognized as a significant source of contaminants of groundwater, surface water and soil with heavy metals (HM). Some HM are essential and are used as feed additives to enhance growth performance, improve meat quality and control diseases. The spread of high amounts of HM in the environment causes their accumulation in the food chain with negative effects on human health. For sustainable animal production and to develop effective approaches to preserve soil and water quality from the HM pollution, it is necessary to know the nutritional basis of the interaction between organisms and environment. The aim of this study was to evaluate the HM pollution in intensive animal production systems in order to establish which elements could represent critic aspects in sustainability and to set-up experimental conditions of phytoremediation strategy. Samples of feed, faeces and drink water were collected from ten intensive breeding farms (dairy cow and swine) in the North of Italy. Obtained samples were dried (on DM basis, AOAC), mineralized and analyzed using inductively coupled plasma mass spectrometry in order to detect the following elements: Na, Mg, K, Ca, Cr, Mn, Fe, Co, Ni, Cu, Zn, As, Se, Mo, Cd and Pb. Considering feed samples of growing animals, principal component analysis allowed to separate cattle from pigs. Swine diets presented the highest concentration of minerals, depending on the herd ages. In fact, the highest amount was observed in the weaning phase (Zn: 884.22 ±1201.59 mg/kg DM; Cu 176.27 ±28.68 mg/kg DM; Mn: 147.42 ±51.56 mg/kg DM; Se: 0.68 ± 0.51 mg/kg DM) indicating that these additives were widely applied in swine production and that farmers tend to use more additives to promote the growth of pigs. Co, Ni, As, Mo, Cd and Pb elements resulted under tolerable intake levels and did not represent an apparent risk. The general increase of HM content was registered in the livestock output, reflecting their content in feeds. The data showed that swine manure was an important source of Zn, Cu, Mn and Se to the environment. For the development of effective strategies of phytoremediation, integrated in the animal production systems, the attention should be focused on mineral supplementation that represents the major HM output of modern intensive farms.

*Acknowledgements*

Supported by MIPAAF 2015.

## O107

## Application of FT- NIRS to estimate chemical components of freeze-dry herbages of Tuscany natural pasture

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Near infrared spectroscopy has been successfully applied at analysis of animals feed, but not many authors have tested NIRs technologies on natural pasture and almost all the