



## ASPA 24th Congress Book of Abstract

Roberto Mantovani & Alessio Cecchinato

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# Italian Journal of Animal Science

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Email: anudda@uniss.it

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Email: manuela.renna@unito.it

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Email: giuseppe.stradaoli@uniud.it

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Email: fowlfeed@163.com

## Italian Journal of Animal Science

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# Italian Journal of Animal Science

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## ASPA 24<sup>th</sup> Congress

*Padova, September 21-24, 2021*

### *Guest Editors*

**Roberto Mantovani (Coordinator), Alessio Cecchinato, Giovanni Bittante, Maurizio Ramanzin, Lucia Bailoni, Mauro Penasa, Flaviana Gottardo, Sara Pegolo, Giorgio Marchesini, Rebecca Ricci, Cristina Sartori, Marco Cullere, Marco Birolo, Severino Segato, Valentina Bonfatti, Marta Brscic, Luigi Gallo, Stefano Schiavon, Franco Tagliapietra**

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## ***Padova, September 21-24, 2021***

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in CM (3.5) cheeses;  $\alpha$ -tocopherol values were 9.7, 8.2 and 7.9 (mg/kg of cheese) for PE, MR and CM, respectively.

TCP values were 4.66, 3.75 and 3.93 (g GAE/kg cheese) in CM, PE and MR, respectively. FRAP assay detected a wide range of values: 1.77, 3.10 and 2.56 (mmol FeSO<sub>4</sub>/kg cheese) in CM, PE and MR, respectively. TEAC values (mmol Trolox/kg cheese) were significantly higher ( $p < .001$ ) in CM (63.1) and MR (44.6) respect to PE (16.2) cheeses. In conclusion, values of fatty acids, vitamins, TCP, FRAP and TEAC characterize the single cheese because they are linked to the breed, feeding system, production season and ripening phase. This gives them the characteristic of uniqueness.

#### Acknowledgements

This work has been supported by AGER 2 Project, grant n° 2017–1144.

## P053

### Poultry meal in feed for Gilthead seabream (*Sparus aurata*): results from an ‘on farm’ feeding trial

Genciana Terova<sup>a</sup>, Simona Rimoldi<sup>a</sup>, Biagina Chiofalo<sup>b</sup>, Micaela Antonini<sup>a</sup>, Fabio Brambilla<sup>c</sup>, Marco Saroglia<sup>a</sup>

<sup>a</sup>*Biotechnologie e Scienze della Vita, University of Insubria, Varese, Italy*

<sup>b</sup>*Scienze Veterinarie, University of Messina, Messina, Italy*

<sup>c</sup>*VRM srl Naturalleva, Verona, Italy*

Contact [marco.saroglia@uninsubria.it](mailto:marco.saroglia@uninsubria.it)

An ‘on farm’ feeding trial was conducted on Seabream (*Sparus aurata*), with inclusion of poultry meals (PM) in the diet to replace fishmeal (FM) as protein source. The aim of the study was to evaluate the possibility of a complete substitution of FM; therefore, the inclusion of other alternative protein sources, such as plant-derived proteins and an addition of AA, including taurine, was adopted. Three floating cages of 5600 m<sup>3</sup> each, moored in the North Adriatic Sea, were loaded with 173,589–185,213 fish/cage of 267–285 g mean initial weight, total biomasses ranging from 46,348 to 52,786 kg. Fish were fed for 83 days with either a Ctrl (a commercial diet) or two experimental diets: A (20% PM +10% FM), and B (20% PM +10% corn gluten meal). At the end of on-growing, total biomass and fish average size were measured. Gut samples were collected for histological and microbiota analysis.

The fish cage that received Ctrl feed (49,700 kg in total), reached a production of 24,742 kg, SGR 0.514, FCR 2.001, with a mortality of 620 fish. The cage that received diet A (52,900 kg feed), reached a production of 27,032 kg, SGR 0.495, FCR 1.957, with mortality of 143 fish. The third cage, receiving diet B (41,975 kg feed), reached a biomass of 20.816 kg, SGR 0.474, FCR 2.016, with a mortality of 595 fish.

Histological examination revealed alterations attributable to enteritis in all fish, in particular in those receiving zero FM and

unexpectedly, in those fed the Ctrl diet, whereas fish receiving 10% FM the enteritis was significantly less severe. Gut microbiota analysis is still in progress and results will be shortly available. The apparently higher biomass reached with diet A may be explained by an higher feed consumption and a lower FCR. The Ctrl diet led to a better SGR, nevertheless FCR was the same as FCR of diet B (FM free). The results showed that the performance of fish fed with diet B with a complete substitution of FM, did not differ markedly from fish fed with the Ctrl diet, nevertheless the intestinal morphology indicated a nutritional imbalance in diet B. Therefore, in spite of similar performances observed among the cages, before the marketing of FM-free commercial diets, further studies need to be conducted at a laboratory scale, to identify how to further balance the feed formulations.

## P054

### Quails meat quality as affected by *Tenebrio molitor* larva meals in feeds

Sihem Dabbou<sup>a</sup>, Lina Fernanda Pulido Rodríguez<sup>b</sup>, Giulia Secci<sup>b</sup>, Giuseppe Moniello<sup>c</sup>, Giuliana Parisi<sup>b</sup>

<sup>a</sup>*Centro Agricoltura Alimenti Ambienti (C3A), University of Trento, Trento, Italy*

<sup>b</sup>*Dipartimento di Scienze e Tecnologie Agrarie, Alimentari, Ambientali e Forestali, University of Firenze, Firenze, Italy*

<sup>c</sup>*Dipartimento di Medicina Veterinaria, University of Sassari, Sassari, Italy*

Contact [sihem.dabbou@unitn.it](mailto:sihem.dabbou@unitn.it)

Insects have been rapidly emerging as an alternative high quality, efficient and sustainable protein source to the conventional livestock feed protein. *Tenebrio molitor* (TM) is considered one of the most promising species in this sense. This study evaluated the effect of a partial replacement of soybean and corn meal with TM larval meal in the diet of common quails (*Coturnix coturnix*) on physical and chemical characteristics of raw and cooked meat. To this purpose, 96 quails, divided into four groups (24 quails per group), were fed with four different diets for a period of 42 days. A group with soybean and maize meal (C), the other three groups with a partial replacement of soybean meal at 5, 10, 20% with TM meal (T5, T10, T20, respectively). All the diets were isonitrogenous, isolipidic, and isoenergetic. At 42 days of age, quails were slaughtered, and the peeled carcasses were used for meat quality evaluations. Specifically, each carcass was divided into two symmetrical halves to analyze the left side as raw, allotting the right half to the cooking trial (baking in oven at 200 °C for 35 min). Data related to the raw and cooked samples were analyzed separately by means of one-way ANOVA using PROC GLM of SAS statistical software. Marketable and physical parameters showed that the inclusion of TM meal did not compromise the carcass traits and cooking losses of the product. The T20 raw breasts were



more tender ( $2.16 \text{ N/g}$ ;  $p < .01$ ) than breasts of T5 and T10 groups ( $2.48$  and  $2.62 \text{ N/g}$ , respectively), but did not differ from the C one ( $2.36 \text{ N/g}$ ). Regarding the fatty acid profile, slight differences were found in raw and cooked meat in TM groups, with a higher content of C18:3n3 in the cooked meat of TM10 group ( $p < .01$ ). The TM inclusion in feed significantly affected the oxidative status of breast raw meat. Specifically, the T20 group was scarcely subjected to lipid degradation, having  $0.033 \text{ mg MDA-eq./100 g}$  meat that was significantly lower than TBARS content of T5 and C ( $0.040$  and  $0.045 \text{ mg MDA-eq./100 g}$  meat, respectively). In contrast, the T10 meat was the most oxidized ( $0.053 \text{ mg MDA-eq./100 g}$  meat) group. No significant differences were observed for cooked meat. In conclusion, results highlighted that TM meal represents a valuable protein source in the diet of common quails when included by up to 20% in their diet, without any detrimental effect on meat quality parameters and fatty acid profile.

## FOOD PRODUCTION AND PROCESSING

### P055

#### The effects of donkey meat cooking processes on vitamins and minerals content

Paolo Polidori<sup>a</sup>, Giuseppe Santini<sup>b</sup>, Natalina Cammertoni<sup>b</sup>, Yulia Klimanova<sup>b</sup>, Silvia Vincenzetti<sup>b</sup>

<sup>a</sup>*Scuola di Scienze del Farmaco e dei Prodotti della Salute, University of Camerino, Camerino, Italy*

<sup>b</sup>*Scuola di Bioscienze e Medicina Veterinaria, University of Camerino, Matelica, Italy*

Contact [paolo.polidori@unicam.it](mailto:paolo.polidori@unicam.it)

Meat is an important source of minerals and vitamins, and for this reason largely contributes to the daily intakes of these micronutrients in human diet. Meat cooking techniques showed significant effects on vitamin and trace element contents, with important losses of B-vitamins. Losses in minerals after cooking occur too, so the amounts of these nutrients really ingested with meat intake could vary greatly. The aim of the present study was to detect minerals and vitamins B-complex content in raw donkey meat and to analyze the influence of the cooking process on the level of these micronutrients. Twelve male entire crossbred donkeys born and reared in the same farm were slaughtered at 20 months of age, with an average final body weight of  $246 \pm 20 \text{ kg}$ . After slaughtering four samples of 600 g were taken from the muscle *Longissimus thoracis* (LT). Two samples of LT were used for raw meat chemical analysis, the other two LT samples were cooked in an oven at  $170 \text{ }^\circ\text{C}$  for 45 min. B-vitamins were quantified by HPLC, whereas macro (Ca, K, Mg, Na, P) and microelements (Cu, Mn, Fe, Zn) were determined by means of atomic absorption spectroscopy. Data were analysed by the method of least squares using the GLM procedure. Niacin content was the most abundant vitamin determined in raw meat,  $6.9 \pm 0.27 \text{ mg/100 g}$ , followed by pantothenic acid,  $1.13 \text{ mg/100 g}$ ,

vitamin B<sub>6</sub>,  $0.61 \pm 0.12 \text{ mg/100 g}$ , then riboflavin,  $0.22 \pm 0.07 \text{ mg/100 g}$ . Thiamine content was  $0.09 \pm 0.01 \text{ mg/100 g}$ , vitamin B<sub>12</sub> content was  $1.8 \pm 0.15 \text{ } \mu\text{g/100 g}$ . Cooking procedure decreased B-vitamins complex content, mainly thiamine, that resulted significantly ( $p < .01$ ) reduced (trace) by thermal degradation. Niacin content showed a significant ( $p < .01$ ) decrease after cooking ( $5.22 \pm 0.16 \text{ mg/100 g}$ ); riboflavin resulted more stable to heat. Vitamin B<sub>12</sub> showed a significant ( $p < .05$ ) decrease in cooked donkey meat ( $1.10 \pm 0.04 \text{ mg/100 g}$ ). Potassium is the most abundant mineral in raw donkey meat ( $375 \pm 23.4 \text{ mg/100 g}$ ), followed by phosphorus ( $261 \pm 14.4 \text{ mg/100 g}$ ) and sodium ( $44.7 \pm 2.11 \text{ mg/100 g}$ ). Considering the microelements, raw meat iron content was  $2.87 \pm 0.28 \text{ mg/100 g}$ , whereas zinc was  $5.60 \pm 1.01 \text{ mg/100 g}$ . Cooked donkey meat did not show a significant decrease in minerals content compared to raw meat, both in macro and in microelements. Donkey meat can represent a valuable niche food in human diet; use of indigenous donkey breeds can help in preserving local animal biodiversity.

### P056

#### Use of L-ascorbic acid diesters to preserve rabbit meatballs

Giulia Secci<sup>a</sup>, Damiano Tanini<sup>b</sup>, Antonella Capperucci<sup>b</sup>, Giuliana Parisi<sup>a</sup>

<sup>a</sup>*Dipartimento di Scienze e Tecnologie Agrarie, Alimentari, Ambientali e Forestali, University of Florence, Firenze, Italy*

<sup>b</sup>*Dipartimento di Chimica Ugo Schiff, University of Florence, Sesto Fiorentino, Italy*

Contact [giulia.secci@unifi.it](mailto:giulia.secci@unifi.it)

Consumers appreciate rabbit meat because of its lean meat rich in polyunsaturated fatty acids (PUFA). However, PUFA are highly prone to be oxidised, thus they need to be preserved during handling and storage. Among the others, antioxidant addition to meat products is considered an effective strategy; however, consumers' demand for natural products is rising. L-ascorbic acid (Vit. C) is one of the most potent water-soluble antioxidants whose functionalisation of the hydroxyl groups at the C-5 and/or C-6 may represent a solution to obtain effective L-ascorbic acid derivatives with improved lipophilicity. On this basis, we aimed to evaluate whether L-ascorbyl-5,6-O-dialkanoates prepared from myristic (MA) and stearic (SA) acids could be employed as novel semi-synthetic antioxidants to protect rabbit meatballs from oxidation. The carcass meat (without hind legs, and *Longissimus thoracis et lumborum* muscles) were obtained from nine male rabbits (New Zealand White  $\times$  California) for a total of 1400 g. After mincing, meat was divided into three groups: no additive (control, C), L-ascorbyl-5,6-O-dialkanoates from myristic acid (MA group), and L-ascorbyl-5,6-O-dialkanoates from stearic acid (SA group). Antioxidant powder was *ad hoc* synthesized and added at 0.1% (w/w). Overall, 48 meatballs were prepared and 4 meatballs for



each group were analyzed immediately (T0) and after 20 (T20), 40 (T40), and 80 (T80) days of frozen storage ( $-10^{\circ}\text{C}$ ). Weight loss (WL, %), primary (conjugated dienes CD, mmol hydroperoxides/100g meat) and secondary (thiobarbituric acid reactive substances, TBARS; mg MDA-eq/kg meat) lipid oxidation products were quantified. Fatty acid (FA) profile was determined by gas chromatography. The PROC GLM of SAS was used to analyse the data with antioxidant and storage as fixed effects. Antioxidants showed a marginal protection against meat oxidative damages. The WL of SA was higher ( $p = .076$ ) than C and MA, being 2.59, 2.15, and 2.49%, respectively. No effect on CD emerged, while TBARS was lower ( $p = .061$ ) in MA and C group than SA (0.512, 0.556, 0.815 mg MDA-eq/kg meat). Between T0 and T20, CD increased from 0.030 to 0.079 mmol Hp/100g meat and saturated FA from 35.37% to 36.21% of total FAME, contrariwise PUFAn-6 passed from 35.54% to 33.03% total FAME. Between the two tested antioxidants, only L-ascorbyl-5,6-O-dialkanoate from myristic acid seemed to slightly preserve meat quality during storage. Further trials are necessary to identify if higher concentrations would show more specific protection.

## P057

### Effect of heat treatment on bovine milk in three genetic groups

Michela Contò, Simona Rinaldi, Sebastiana Failla, Gianluca Renzi, Alessandra Crisà

*Centro di ricerca Zootecnia e Acquacoltura, Consiglio per la Ricerca in Agricoltura e l'Analisi dell'Economia Agraria (CREA), Monterotondo, Italy*

Contact [michela.conto@crea.gov.it](mailto:michela.conto@crea.gov.it)

Milk contains several antioxidant compounds that have positive effects on health. However, lipid oxidation occurs during milk pasteurization and processing due to the effect of heat treatments. Thiols actively participate in redox regulation processes by protecting against oxidative damage and their amount could be related to oxidation status in milk. In this study, we assessed the oxidation level in bovine milk after heat treatment by determining malondialdehyde (MDA) content as index of lipid oxidation. Moreover, thiols, glutathione (GSH), and lipoic acid were determined on raw milk as antioxidant compounds. The research was carried out on milk samples from Holstein Friesians (HO), Italian Simmental (SM) and crossbreed (SMxHO) cattle, collected from 30 animals for each genetic group at 60 and 120 days of lactation. Animals were reared, in the same feed conditions, in Research Centre for Animal Production and Aquaculture (CREA-ZA) in Central Italy. The main milk characteristics such as somatic cells, lactose, urea, protein, and fat, were determined on raw milk. MDA was quantified by HPLC method on raw milk and milk aliquots subjected to heat treatments: at  $63^{\circ}\text{C}$  for 30 min (simulating a pasteurization) and at  $90^{\circ}\text{C}$  for 15 min (high

temperature treatment). The content of thiols and GSH were not statistically significantly different among the milk of the different breeds (3.19 nmol/mL,  $p = .181$ ; 0.04 mg/100 mL,  $p = .728$  respectively on the average) whilst in lipoic acid HO showed the lowest value (158.03  $\mu\text{g/L}$  vs. 274.90  $\mu\text{g/L}$  in mean for SMxHO and SM  $p < .012$ ). MDA content increased in heated milk compared to raw milk (from 1.30 to 1.49 nmol/mL on average for the two heat treatments,  $p < .001$ ) whilst no significant difference was reported between  $63^{\circ}\text{C}$  and  $90^{\circ}\text{C}$  treatment (1.43 nmol/mL and 1.51 nmol/mL,  $p = .307$ ) confirming the oxidant effect of heat treatments, without statistically significant differences among genetic groups ( $p = .992$ ,  $p = .528$ ,  $p = .831$  respectively for MDA in raw,  $63^{\circ}\text{C}$  and  $90^{\circ}\text{C}$  treated milk). However, there was a tendency to a less MDA increase (at  $63^{\circ}\text{C}$ ) in SM milk than in HO milk ( $p = .096$ ). No significant differences were found for oxidation level between the milk at 60 and 120 days of lactation, although there was a decrease in yield and an increase in protein content. No relationship was found between the main milk characteristics and oxidation parameters. There was an inverse correlation between thiols and MDA content in both raw milk ( $r = -0.87$ ) and milk heated to  $63^{\circ}\text{C}$  ( $r = -0.84$ ) and  $90^{\circ}\text{C}$  ( $r = -0.85$ ) showing the protective effect of thiols from lipid oxidation. In fact, when thiols were higher, the increase in MDA was lower. These results could explain the higher resistance to lipid oxidation due to heat treatment in milk containing higher levels of thiols.

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## P058

### Breeding techniques and post maturation systems on biomolecules content in buffalo meat

Marika Di Paolo<sup>a</sup>, Angela Salzano<sup>a</sup>, Raffaele Marrone<sup>a</sup>, Nunzia D'Onofrio<sup>b</sup>, Maria Luisa Balestrieri<sup>b</sup>, Giuseppe Campanile<sup>a</sup>

<sup>a</sup>*Medicina Veterinaria e Produzioni Animali, University of Naples Federico II, Naples, Italy*

<sup>b</sup>*Dipartimento di Medicina di Prevenzione, University of Campania Luigi Vanvitelli, Napoli, Italy*

Contact [angela.salzano@hotmail.com](mailto:angela.salzano@hotmail.com)

The aim of this study was to understand if a production system could affect some biomolecules content in buffalo meat such as Glycine betaine (GlyBet),  $\gamma$ -Butyrobetaine ( $\gamma\text{BB}$ ),  $\delta$ -Valerobetaine ( $\delta\text{VB}$ ), L-Carnitine (Cnt), Acetylcarnitine (C2Cnt), Propionylcarnitine (C3Cnt), Butyrylcarnitine (n-C4Cnt). Moreover, another aim was to understand whether a prolonged post dry aging (PDA) maturation process in a defined system (Maturmeat<sup>®</sup>) could influence biomolecules level in raw buffalo