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**Italian Journal of  
Animal Science**

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**ASPA 23<sup>rd</sup> CONGRESS**

**Sorrento, June 11-14, 2019**

**Book of Abstracts**

**Guest Editors: Fulvia Bovera (Coordinator),  
Marzia Albenzio, Mariangela Caroprese, Rosaria Marino,  
Gianluca Neglia, Giovanni Piccolo, Angela Salzano.**



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# Italian Journal of Animal Science

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and Production Association

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## Italian Journal of Animal Science

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The journal serves as essential reading for animal scientists, technicians and all those who research animal production.

The journal encourages submissions of international relevance on the following subjects:

- Animal derived food quality and safety
- Animal genetics and breeding
- Aquaculture, poultry, companion and wild game animals
- Livestock systems, management and environment
- Non-ruminant or ruminant nutrition and feeding
- Production physiology and functional biology of farmed, companions and wild game animals.
- Animal behavior
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- In vitro studies that have an application to farmed livestock

Manuscripts must address topics based on research at molecular, cellular, organ, whole animal and production system levels. Manuscripts discussing milk or meat analysis and compositions must show a direct link to either livestock production system, product quality, animal feeding/nutrition, animal genetics or breeding. Manuscripts describing laboratory animal models will be considered where the study highlights a potential benefit to farmed livestock.

Submissions discussing epidemiology, parasitology, infective diseases, food-borne diseases do not fit with the aims and scope of the journal.

Meeting reviews, book reviews and conference supplements are also published, as well as news and guidelines from the Animal Science and Production Association (ASPA). We welcome submissions from ASPA members and non-members alike.

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# Italian Journal of Animal Science

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## ASPA 23<sup>rd</sup> Congress

Sorrento, June 11-14, 2019

### Guest Editors

**Fulvia Bovera (Coordinator), Marzia Albenzio, Mariangela Caroprese,  
Rosaria Marino, Gianluca Neglia, Giovanni Piccolo,  
Angela Salzano**

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## **Sorrento, June 11-14, 2019**

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the most abundant bacterial phyla of gut mucosa. *Actinobacteria*, *Firmicutes* and *Proteobacteria* represented, instead, the dominant phyla of trout intestinal lumen.

Dietary inclusion of insect meal significantly reduced the amount of *Proteobacteria*, both in resident and transient microflora. Our findings clearly indicated that insect meal positively modifies trout gut microbiota, by increasing microbial diversity of intestinal lumen and mucosa. In particular, the profile of transient microbiota of fish fed with insect meal showed an increased number of beneficial lactic acid- and butyrate-producing bacteria in comparison to the control group. Furthermore, based on the present study and other published articles, we believe that the prebiotic effect of insect meal is principally due to the fermentable chitin.

#### Acknowledgements

The research was funded by AGER project Fine Feed for Fish (4F), Rif. no. 2016-01-01, and by Fondazione Cariplo grant no. 2014-0550 (project acronym, InBioProFeed).

## O078

### Lipid metabolism and fillet quality of rainbow trout fed diets including *Hermetia illucens* full-fat larvae

Leonardo Bruni<sup>1</sup>, Giulia Secci<sup>1</sup>, Matteo Zarantoniello<sup>2</sup>, Basilio Randazzo<sup>2</sup>, Ike Olivotto<sup>2</sup>, Fabio Mina<sup>3</sup>, Francesca Tulli<sup>3</sup>, Giugliana Parisi<sup>1</sup>

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The use of insects as protein source in feed is a hot topic in the present aquaculture scenario. Aquaculture production escalation must be supported by an increase in feed production and the conventional dietary protein sources must be substituted by cheaper and more eco-friendly ingredients, such as insects. Although a substitution of up to 50% of the conventional protein sources with insect meals is possible without jeopardising *in vivo* performances of salmonids, the effect on fillet quality is still of concern.

The present study enquired the effects of three diets (Hi0, Hi25, Hi50) with increasing substitution levels (0, 25, 50%) of dietary fishmeal with *Hermetia illucens* full-fat larva meal on liver (L), pyloric caeca (C) and mid intestine (M) lipid metabolism and on fillet quality of rainbow trout (*Oncorhynchus mykiss*), after a feeding period of 98 days. The physical analyses on fillets included colour measurement by a Chroma Metre CR-200 (Chroma Metre CR-200, Tokyo, Japan), water holding capacity determination and

pH instrumental measurement. The assessment of fillet fatty acid (FA) profile was also performed. The expression of genes related to lipid metabolism (*abcg5*, *cd36*, *elovl1*, *elovl2*, *fads2*, *fads6*, *hmgcr*, *ppar $\alpha$* , *ppar $\beta$* , *ppar $\gamma$* , *ppar $\delta$* , *srebp1*, *srebp2*) was investigated by two-step RT-qPCR.

Dietary treatments did not noteworthy affect physical characteristics. Since the insects were not defatted, saturated FAs (SFAs) were abundant in the diets including insect meal; as a consequence, fillet FA profile showed an increased SFA content comparing Hi50 and Hi0 ( $p < .05$ ). Significant differences and clear trends were revealed between the treatments as concerns the genes related to the lipid metabolism.

To sum up, the inclusion of full-fat *H. illucens* meal in diets for rainbow trout did not alter the physical traits of fillet but affected fillet cardioprotective lipid profile as well as liver and intestine lipid metabolism. An understanding of lipid metabolism, cross-checked with the lipid status of the fillets, can give hints to modulate diet formulation, aiming to improve the nutritional and functional characteristics of the final product.

#### Acknowledgements

Research funded by Pj\_libera Tulli.

## O079

### Effects of dietary inclusion of defatted black soldier fly (*Hermetia illucens*) meal on gut health in gilthead seabream (*Sparus aurata*)

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Fishmeal (FM) is the optimal source of animal proteins in commercial aquaculture feeds. However, it is becoming less available and not sustainable for environment, due to overfishing. Hence, research in this sector is oriented to find alternative sources of proteins. Insects proteins, specially, black soldier fly (*Hermetia illucens*-HI) meal has been investigated, recently, for its valuable nutritional properties. This study aims to evaluate, by histological approach, the effect of dietary inclusion of defatted HI meal on gut health of 360 gilthead

seabreams. Fishes with an initial weight of 181.6 g ( $\pm 13.5$ ) were fed for 120 days with a control diet (CTR: 100% fishmeal) and three experimental diets containing increasing levels of defatted HI meal in substitution of 25 (R25), 50 (R50) and 75% (R75) of fishmeal, leading to a HI inclusion of 9.2%, 18.4% and 27.6%, respectively. At the end of the feeding trial, growth performances such as specific growth rate (SGR), feed conversion rate (FCR) and protein efficiency rate (PER) were calculated and the gut of fifteen fishes (per treatment) were fixed in Bouin (24 h), dehydrated in ethanol and embedded in paraffin, to obtain 5  $\mu$ m-thick sections stained with haematoxylin and eosin. In addition, on gut sections, the following morphometric indexes were measured: villi length; villi ramification; number of goblet cells; submucosa layer detachment; villi fusion; position of enterocytes nuclei; vacuolation of enterocytes.

Results on growth performances highlight that dietary inclusion of HI meal in seabream fed up to 18.4% of inclusion level did not influence any of the growth performance traits. On the other hand, HI inclusion level of 27.6% worsened significantly SGR ( $p=.003$ ), FCR ( $p=.007$ ) and PER ( $p=.007$ ). Histological evaluation showed no significant differences between the CTR group and the R25 one. On the contrary, in some R50 subjects anatomical-functional changes of the gut were observed. More frequent and pronounced structural alterations were observed in R75 group, both in the anterior and posterior part of gut; in some cases, haemorrhagic spots were observed. Significant ( $p<.05$ ) changes in the morphometric parameters of groups fed higher levels of HI (mostly R50 and R75) confirmed the results of anatomopathological exam. In conclusion, it is important to take into account not only the effects of HI meal on growth performances but also those on the histological analyses that highlight the onset and increasing of an irritant state of gut-associated with the increase of HI substitution level.

## O080

### Fillet qualitative characteristics of Atlantic salmon fed diets including *Hermetia illucens* larvae

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Aquaculture is expected to supply more than 65% of global fish production by 2030, thus increasing quantities of fish meal (FM) will be necessary as protein source in aquafeeds. However, the fish stocks (mainly anchovy and herrings) from

which FM derives are nowadays overexploited. Hence, aquafeed production needs to be based on alternative protein sources. Among the other, insects are promising due to their fast growth, easy reproduction, few nutritional requirements and their ability to recycle organic waste. The present study tested the effects of the replacement of FM with partially defatted *Hermetia illucens* larva meal (HI) in the diet for seawater-phase Atlantic salmon (*Salmo salar* L.) on physico-chemical characteristics and consumer liking of fillets. Triplicate sea-cages of A. salmon were fed one of four isoproteic, isoenergetic and isolipidic diets for 16 weeks: a control diet (C, 0% of HI) and three diets with increasing substitution levels of FM with HI (33, 66 or 100%; IM33, IM66 and IM100, respectively). Then, fish were percussively slaughtered and filleted. Four salmon fillets from each sea-cage were allotted to physico-chemical analyses ( $n=6$ ) and consumers' test ( $n=6$ ). The physico-chemical analyses included colour evaluation (Chroma Metre Cr-200, Tokyo, Japan), water holding capacity (WHC), texture profile analysis (Zwick Roell® texturometer, Zwick GmbH & Co. KG, Ulm, Germany), and proximate composition determination. A blind product test was performed with 80 consumers who evaluated on a 9-points scale the liking for appearance, odour, flavour, texture, and the overall judgement; they evaluated the adequacy of colour, texture, appearance, aroma, flavour and salty intensity, juiciness and fibrousness. Colour, WHC, texture and proximate composition were not affected by diet. Only IM66 group contained higher amount ( $p<.05$ ) of protein than IM100 (20.92 and 19.48g/100g of fillets, respectively), while C and IM33 assumed intermediate values. Consumers' liking was unaffected by the diet and received scores from 6 to 9. The main criticisms were related to the adequacy of colour and textural attributes. Indeed, IM100 group was considered the palest, the most fibrous and with the lowest aroma and flavour. Nevertheless, consumers highlighted their propensity to future consumption. To sum up, the inclusion of HI in diets for A. salmon determined physical modifications which were not instrumentally quantified, but which were perceived and accepted by consumers.

#### Acknowledgements

This study was supported by the Norwegian Research Council project Aqauffy, grant number 238997.

## ANIMAL PHYSIOLOGY, HEALTH AND WELFARE – ANIMAL NUTRITION: EFFICIENCY

## O081

### Sources of variation in TMR delivered to dairy cows: a field study

Vera Perricone<sup>1</sup>, Alessandro Agazzi<sup>1</sup>, Annamaria Costa<sup>1</sup>, Aldo Calcante<sup>2</sup>, Giovanni Savoini<sup>1</sup>, Massimo Lazzari<sup>1</sup>, Federica Cheli<sup>1</sup>, Antonio Crotti<sup>1</sup>, Diego De Nisi<sup>1</sup>, Francesco Maria Tangorra<sup>1</sup>