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## ASPA 24th Congress Book of Abstract

Roberto Mantovani & Alessio Cecchinato

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production systems. Aquaculture effluents contain nitrogen and phosphorus compounds that represent the natural substrate for single-cell microorganisms including microalgae. Cultivating microalgae on finfish farm effluents in a recirculating aquaculture system could realize a wastewater treatment and provide valuable biomass available for other purposes. This study was aimed to evaluate the potential of non-axenic microorganism biomass included in aquafeed formulations.

A non-axenic microalgae consortium (80% *Oocystis* sp.) was cultivated in a conventional high-rate algal pond system (HRAP 140m<sup>2</sup> and 60m<sup>3</sup>) supplied by the effluent from European seabass (*Dicentrarchus labrax*) rearing tanks providing 80g N day<sup>-1</sup> and 30g P day<sup>-1</sup> (fish biomass: 2000 fish with average body weight 80 ± 2.3g) at the facilities of Ifremer (Palavas les Flots, F). The microalgae consortium (MC) biomass was recovered and freeze-dried until used. Four isoproteic (CP 48.5 %) and isolipidic (CL 18.3 %) diets were formulated: a fishmeal, fish oil and plant protein sources basal diet was used as a control (C), two test diets including increasing levels (10% and 20%) of MC (MC10 and MC20, respectively) and a diet (NAN10) including 10% of commercial mono-cultured *Nannochloropsis* sp. biomass (GREENSEA, Meze, F) was used for comparison. The diets were offered to 636 E. seabass juveniles (18 ± 0.28g) randomly allotted among 12 tanks/groups for 10 weeks. The effect of the microalgae dietary inclusion was evaluated on seabass zootechnical performance, morphometric indexes, in vivo nutrient digestibility and gut morphology and functionality.

The dietary MC inclusion did not hamper feed palatability, fish growth and preserved intestinal morphology ( $p > .05$ ). Diets including MC resulted in dry matter, protein and energy digestibility coefficients lower than diets C and NAN10 ( $p < .05$ ). MC also affected the maltase, sucrase-isomaltase and  $\gamma$ -GT specific enzymatic activities in the seabass distal intestine ( $p < .05$ ).

This is the first attempt utilizing a marine microalgae consortium from fish farm wastewaters in a species of commercial interest to enhance a circular economy approach in recirculating aquaculture systems. Further efforts and the safety issues connected with its utilization need specific evaluations.

#### Acknowledgements

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The black soldier fly (BSF) is one of the most promising insects for intensive breeding, given its adaptability, its waste conversion efficiency, and the simple management of its life cycle. The aim of BSF breeding is not only focused on the use of waste materials as growth substrate, but also on production maximization. In order to create a sustainable insect farm, the gap between these two aspects needs to be reduced. To formulate diets that maximize the production using waste, it is fundamental to determine previously the larvae requirements in terms of macronutrients. This study aims to evaluate the effects of different, practical, semi-purified (PSP) and isoenergetic diets with increasing protein levels on larval development and mortality, and adult parameters. A total of 2000 6-day-old larvae (100 larvae/box and 4 box replicates/diet) were randomly divided into 4 PSP diets with increasing protein levels (10%, CP10; 14%, CP14; 16%, CP16; 19%, CP19), and the control diet (Gainesville; GA). To evaluate the growth of the larvae, a total of 3 samplings at 4-day intervals were carried out. At the end of the experiment, the survival rate was calculated. To assess the adult emergence, 35 pupae per replicates were positioned in boxes (1 pupae/box). Once the fly emerged, the fly's live weight (FLW) was recorded. At the death, the fly life span (FLS), the exuvia weight (EW), and the dead flyweight (DFW) were evaluated. Data were analysed by means of One-way ANOVA and the General Linear Mixed Model (IBM SPSS Statistics V20.0.0,  $p$ -value  $< .05$ ). Considering the larval stage, the CP16 treatment showed the greatest weight, while CP10 and GA groups displayed the worst growth performance ( $p < .01$ ). All the adult stage parameters were influenced by the dietary treatment, except for the FLS. As regards the FLW, experimental diets had a similar weight ( $p > .05$ ). On the contrary, the lowest DFW was recorded in the CP19 treatment ( $p < .01$ ). The GA diet showed the lowest weights in terms of both the DFW and the EW ( $p < .001$ ). Finally, the PSP diets displayed a very low emergence rate when compared to GA. In conclusion, the optimal protein level in the larvae stage can be considered 16%, while the result obtained on adult emergence in PSP diets, the protein content may be excluded as a cause. For this reason, further researches on the determination of macronutrients requirements have to be conducted in order to evaluate the diet composition effects on the BSF life-history traits.

## O005

### Isoenergetic-practical and semi-purified diets for protein requirement determination in *Hermetia illucens* larvae: consequences on life-history traits

Sara Bellezza Oddon, Ilaria Biasato, Laura Gasco

Dipartimento di Scienze Agrarie, Forestali e Alimentari, Grugliasco, Italy

Contact [sara.bellezzaoddon@unito.it](mailto:sara.bellezzaoddon@unito.it)

## O006

### Effects of the inclusion of *Hermetia illucens* meal in diets for rainbow trout (*Oncorhynchus mykiss*) reared in a low-tech aquaponic system

Francesco Bordignon<sup>a</sup>, Laura Gasco<sup>b</sup>, Marco Birolo<sup>c</sup>, Christian Caimi<sup>b</sup>, Gerolamo Xiccato<sup>c</sup>

<sup>a</sup>Dipartimento di Biomedicina Comparata e Alimentazione (BCA), University of Padova, Padova, Italy

<sup>b</sup>Dipartimento di Scienze Agrarie, Forestali e Alimentari

(DISAFA), University of Torino, Torino, Italy  
°Dipartimento di Agronomia, Animali, Alimenti, Risorse naturali e Ambiente (DAFNAE), University of Padova, Padova, Italy  
Contact [francesco.bordignon.3@phd.unipd.it](mailto:francesco.bordignon.3@phd.unipd.it)

The study evaluated the effects of the partial substitution of fish meal (FM) with partially defatted *Hermetia illucens* (HI) meal on growth, gut morphology and fillet quality of rainbow trout reared in a low-tech aquaponic system. A total of 173 rainbow trout (initial body weight:  $156 \text{ g} \pm 39.8 \text{ g}$ ) were distributed into nine experimental aquaponic units (3 tanks per treatment, initial tank biomass  $5.74 \pm 0.44 \text{ kg m}^{-3}$ ) and fed during 76 days with three diets containing 0%, 6.3% and 12.5% HI meal and 20%, 15% and 10% FM, respectively. Therefore, HI meal replaced 0% (HI0, control diet), 25% (HI25), or 50% (HI50) of FM, respectively. During the trial, water quality was not affected by dietary treatment: temperature averaged  $19.4^\circ\text{C}$  ( $13.8 - 23.7^\circ\text{C}$ ), dissolved oxygen  $8.0 \text{ mg L}^{-1}$  ( $6.08 - 10.2 \text{ mg L}^{-1}$ ), pH 7.4 ( $6.4 - 8.5$ ), and total ammonia nitrogen  $0.13 \text{ mg L}^{-1}$  ( $0 - 0.36 \text{ mg L}^{-1}$ ), while daily water losses due to plant evapotranspiration averaged  $1.31\% \text{ d}^{-1}$ . At the end of the trial, trout mortality was low (2.9%) and not affected by dietary treatment. The specific growth rate was lower in fish fed HI50 diet compared to those fed HI0 and HI25 diets after 26 days ( $1.07\% \text{ d}^{-1}$  vs.  $1.22\% \text{ d}^{-1}$ ;  $p < .001$ ) and at the end of the trial ( $0.81\% \text{ d}^{-1}$  vs.  $0.88\% \text{ d}^{-1}$ ;  $p < .05$ ). However, the dietary inclusion of HI did not affect feed conversion ratio (on average 1.53), final weight (303 g), fish condition factor (1.40), viscerosomatic index (10.9%) and hepatosomatic index (1.22%). Histological analyses of the anterior gut showed no significant differences in villi height (503  $\mu\text{m}$ ) whereas the density of goblet cells was higher in HI50 than in HI0 trout (+11%;  $p < .05$ ). Regarding fish quality, fillet redness ( $a^*$ ) and yellowness ( $b^*$ ) were lower in HI50 than in HI0 treatments (-58% and -19%, respectively;  $p < .001$ ). Fillet proximate composition, total saturated, monounsaturated and polyunsaturated fatty acids, eicosapentaenoic acid and docosahexaenoic acid were not affected by diets, whereas the content of C12:0 and C14:0 increased with HI dietary inclusion and the index of atherogenicity was higher (+6%;  $p < .05$ ) in HI50 treatment than in HI0 and HI25 ones. In conclusion, the rearing of rainbow trout was successful in the tested aquaponic system. Fish growth, health and fillet quality were not affected when HI meal replaced 25% FM, whereas at 50% replacement rate some effects on gut histology and fillet colour and nutritional characteristics were detected, which deserve further investigations to be elucidated.

## SESSION 2 MANAGEMENT STRATEGIES TO IMPROVE ANIMAL HEALTH, WELFARE AND RESILIENCE – I

0007

### Dry period management practices in 130 dairy farms

Luciana Bava, Alice Comparelli, Maria Cecilia Bianchi, Alberto Tamburini, Maddalena Zucali

Scienze Agrarie e Ambientali, University of Milan, Milano, Italy  
Contact [luciana.bava@unimi.it](mailto:luciana.bava@unimi.it)

The dry period is a crucial time in the lactation cycle and the management practices adopted have an important role in mastitis prevention and control in the following milking period. A survey about practices applied to dry period was sent to Italian dairy farmers through different social channels (email, Facebook, web sites) and specialized magazine, a 138 questionnaire was filled and answers were analysed. The most of farms were intensive (61.8%), with more than 100 lactating cows (55.07%) and located in Lombardy (59%). Dry cows were housed on straw pack (53.4% of farms) or cubicles (32.8%). Most farms used cooling systems in the dry cow barns: 45.9% fans, 24.8% fans with a nebulizer. Half of the farmers declared duration of the dry period between 55 to 65 days, while 41.3% of farms adopted a shorter period (45–55 days). Other interesting results were obtained: 51.3% of farmers adopted gradual cessation of milking while the others declared to applied abrupt cessation; in the 39.7% of farms daily milk production at dry off was among 15 to 20 kg but in 29.01% of farms the production was higher (20–25 kg/d). Some authors found that the choice of gradual or abrupt cessation did not affect milk yield or somatic cell count (SCC) in the subsequent lactation, while the high production at dry off was associated with high SCC. The antibiotic dry cow therapy (DCT) was frequent (53.6% of farms), 37.7% of farmers declared to apply a selective DCT, 8.7% of farmers did not use any treatment. A total of 49 farmers declared average milk SCC: 5.26  $\log_{10} n$  cell/ml for farms that adopted DCT, 5.21  $n$  cell/ml for farms that adopted selective DCT and 5.29  $n$  cell/ml for farms that used none treatment. Multiple correspondence analyses showed that the use of DCT was most common in farms with more than 100 lactating cows, high milk yield (>31 kg/d) and a gradual cessation of milking; on the contrary selective DCT was adopted in farms that housing dry cow on the straw pack with fans in the barn and applied abrupt cessation of milking. The results suggest that the application of a selective DCT could be encouraged among Italian farmers, particularly among high dimension farms. A reduction of the use of antibiotic therapy follows the EU commission (2015) indications that recommended avoiding routine DCT in order to reduce the antimicrobial resistance.

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