

Preliminary results of fishmeal substitution with insect meal (*Hermetia illucens*) on Platy (*Xiphophorus maculatus*) feeding: effect on gut health, reproductive parameters and water quality

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Introduction. The main ingredient in ornamental fish feeding is fishmeal [1], but no data are available on the use of insect meal in Platy (*Xiphophorus maculatus*), even if insects are an essential part of their natural diet. We here investigated the effect of fishmeal substitution with insect meal on fish gut health, reproduction and water quality.

Animals, material and methods. Six 200L aquaria, with filtration and aeration systems, were equipped (32 adult Platy; 1:3, sex ratio). Two experimental diets containing insect meal at 50% (HI50) and 100% (HI100) of inclusion, were compared with a commercial diet (C; SERA® Company) containing fishmeal as principal ingredient (two replicates each, 3x2). Water quality (temperature, oxygen, nitrites, nitrates, total dissolved phosphorus) was measured weekly, with an oxymeter (YSI, model 55) and photometer NOVA 60 Spectroquant®. Fish diets were analyzed in triplicate, according to AOAC [2], and lipid [3] were extracted. To evaluate histological pattern of digestive system, eight fish/group were randomly euthanatized. Proximal, medium and distal intestine samples were fixed following standard histological procedures, cut, examined through light microscope and digital images (lamina propria thickness, number of lymphocytes and goblet cells) were taken. Electron microscopy evaluations of intestine samples were carried out by transmission electron microscope. To evaluate reproductive performance number of pregnant females and fries were recorded. ANOVA and Tukey's multiple comparison of means tests were used with R software, significance was considered for $P < 0.05$.

Results and discussion. Proximate composition of HI diets were comparable and suitable for the species, whereas C diet did not match optimal protein ($>25\%$; $P < 0.01$) and lipid ($<26\%$; $P < 0.01$) needs of Platy [4]. Respect water quality, nitrates were significantly higher in C aquaria ($\sim 56\%$; $P < 0.01$), confirming the high production of nitrogen catabolites due to an excessive nitrogen excretion in C diet [5]. Respect quantitative histological and morphometric analyses, medium intestine tracts showed lymphocyte infiltration in C group ($P < 0.05$), while in HI groups lamina propria thickness and goblet cells number were increased ($P < 0.05$). Accordingly, C group showed numerous big electrondense lipid droplets ($P < 0.05$) in proximal tract, whereas HI groups maintained a classical morphology. The reduced number of goblet cells of C fish was influenced by diet [6] and submucosa and lamina propria cellular infiltrations are related to tissue alteration [7]. No pregnant females were recorded in C group, while the HI diets increased reproductive success ($P < 0.05$) and fries number of HI groups ($P < 0.05$).

Conclusion. On the basis of our preliminary results (increased water quality, gut health and reproduction), the substitution of fishmeal with *Hermetia illucens* meal for Platy feeding should be further studied and promoted.

References: [1] Chong et al. 2003. Aquac. Res. 34: 913-922; [2] Association of Official Analytical Chemists (AOAC), 1995; [3] Folch et al., 1957. J. of Biol. and Chem. 226: 497-509; [4] Moorhead et al., 2010. Rev. Fish. Sci.: 18 315-343; [5] Grommen et al., 2002. Aquacult. 211: 115-124; [6] Noaillac-Depeyre et al. 1976. Tissue Cell. 8: 511-530; [7] Leknes et al. 2013. Anat. Histol. Embryol. 43: 352-360.