GROWTH PERFORMANCE AND QUALITY TRAITS OF SIBERIAN STURGEON *A. baerii* JUVENILES FED DIETS INCLUDING *Nannochloropsis gaditana* AND *Scenedesmus almeriensis* MICROALGAE MEAL

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Introduction

The demand for aquafeed grown exponentially in the last decade and is expected to increase further in the coming years (FAO 2018). The wild fish used for the fish meal and oil, currently used in feed formulated for carnivorous species, will be used in human consumption and less available for aquaculture. Among the potential ingredients of future use in aquafeed, microalgae represent a promising matrix, as characterized by nutritional, nutraceuticals and immunostimulant properties (Camacho-Rodríguez *et al.,* 2017). However the high production cost is a limiting factor for their use. The development of a microalgae-based biorefiner , able to use some by-products and agro-industrial waste to produce biomass would enable to limit the disposal costs sustained by the companies and to lower the production costs of the microalgae. The present research was undertaken to evaluate effect on growth response and fillet quality traits of sturgeon (*A. baerii*) fed with two microalgae freeze-dried biomass *Nannochloropsis gaditana* and *Scenedesmus almeriensis* grown in Sinthetic Medium (SM) or in diluted Pig Manure (PM) and included in partial substitution of dietary fish meal and oil

Materials and methods

Four complete diets were formulated to be grossly iso-proteic and iso-lipidic. A control diet (C) was prepared using a blend of conventional animal and vegetal protein sources. The test diets coined respectively *N. gaditana* grown on Synthetic Medium (NSM), *N. gaditana* grownoin pig manure (NPM), *S. almeriensis* grown on Synthetic Medium (SSM) and *S. almeriensis* grown on Pig Manure (SPM) were prepared by replacing the 10% of protein and lipid supplied by the blend of conventional protein and lipid-rich ingredients with microalgae. All the ingredients are mixed and pelleted by a cold extrusion process (70°C). Each diet were randomly assigned to tank and tested in triplicate according to a monofactorial design. Microalgae dried biomass and diets were analized microbiologically and verified for nutritional quality. To carried out the feeding trials 240 juvenile *A. baerii* (average 12.8±0.3g each) were randomly allocated among 15 circular tanks (16 fish/tank) in RAS system under controlled rearing conditions (temperature, 19°C, DO 9.6 mg/L, artificial daylenght, 12h). Diets were offered in two daily meals with a fixed feed ratio (3% body mass) over 6 weeks and each group were weighted every week under moderate anaesthesia. At the end of the trial, survival rate (%), Final Body Weight (FBW), Specific Growth Rate (SGR), Feed Conversion Ratio (FCR), Feed Intake (FI), were evaluated. Furthermore, nine fish per feed treatment were analized to determine the biometric indeces, fillet proximate composition and oxidation parameters (SOD, CAT, GPX, 8-isoprostanes). Data were subjected to ANOVA and differences tested by the Tukey's test ($P < 0.05$).

Table I Proximate composition of microalgae biomass included in the experimental diets

	Water (%)	Protein (%)	Lipid (%)	Ash (%)	Carbohydrate (%)
N. gaditana on PM	4.7	48.4	18.6	23.8	4.5
N. gaditana on SM	4.5	35.8	14.5	32.8	8.2
S. almeriensis on PM	3.4	33.8	8.4	13.7	29.1
S. almeriensis on SM	8.0	29,1	2.1	25.1	18.5

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Results

The macronutrient composition of the dried micoalgae biomass are reported in Table I.
Microbiological analysis of microalgae biomass showed no difference in TBC (Total Bacterial Count) among the different thesis (average 5.9±0.07 log CFU/g). *E. coli* were found below the detection limits of the method (< 2 log CFU/g) in *N. gaditana* grown on PM and *S. almeriensis* grown in both SM and PM, while its value was 3log CFU/g in *N.gaditana* grown on SM. Enterobacteriaceae resulted respectively 2.7 and 2.0 log CFU/g in *N. gaditana* and *S. almeriensis* grown on SM and under detection limits of the method (< 2 log CFU/g) in *N. gaditana* and *S. almeriensis* grown on PM. *Salmonella* resulted absent in all the microagae biomass. All the diets used in feeding trial resulted similar for their proximate, fatty acid composition and microbiological quality (data not reported). Dietary treatments significantly affected FBW that resulted similar in the groups C (44.2g), NSM (44.7g) e NPM (43.9g), while it was significantly lower ($P<0.05$) in the SSM (40.8g) and SPM (40.5g) groups. However, did not result in significant changes in survival rate, SGR, FCR and of the biometric index (K), nor fillet composition. Also oxidation parameters (SOD, CAT, GPX, 8-isoprostanes) of fillet were not significantly a fected by dietary treatments ($P>0.05$).

Discussion and Conclusion

Very few data are available on the use of microalgae biomass in acipenserids diet. Spirulina meal integrated with plant oils was found to be a good alternative to replace fish oil in white (*A. transmontanus*) and siberian (*A. baerii*) sturgeon diet (Palmegiano *et al.,* 2008; 2002). The data observed in this study confirm the potential use of the microalgae *N. gaditana* and *S. almeriensis* in the siberian sturgeon diet, in fact all the experimental diets tested, both based on microalgae grown on SM and on PM ensure a balanced and complete level of the nutrients, suitable for the growth of sturgeon juveniles and nutritional quality of the fillet, analogous to the control group fed with a fish meal/oil-based diet. Moreover the use of agrozootenic by-products, such as pig manure, for the growth of microalgae, appears to be a good alternative to common fertilizers, to reduce production costs.

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