

MARINE AQUAPONICS: A SUSTAINABLE TECHNOLOGY MEETS MUCH SUSTAINABLE DIETS

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ABSTRACT

Juveniles of European sea bass (*Dicentrarchus labrax*) were divided in two groups and transferred to the Aquaponics Systems. Each group were feed with different diets for 30 days: CONTROL group was feed with commercial diet and TREATED group was feed with vegetables enriched diet formulated by the University of Udine. The analyses showed that the diet formulated using vegetable proteins source with optimal balance of aminoacids and lipids, increases growth performance in *Dicentrarchus labrax* juveniles. Marine Aquaponics represents a good technology to rear fish in presence of halophytes plants able to maintain the quality of water and to limit water and land consumption.

INTRODUCTION

Aquaponics can mitigate negative environmental effects of fish rearing and land farming. Marine Aquaponics may permit to rear commercially important fish species in places out from the sea, contributing to satisfy the increasing demand of fish market. In addition, aquaculture must deal with the sustainability of fish diet. This study integrates the use of a new aquaculture technique with an innovative vegetable proteins enriched diet for marine aquaculture.

MATERIALS AND METHODS



1-AQUAPONICS SYSTEMS:

Each Aquaponics systems consisted of a 500 l tank and a 2 m² plants growth bed. Water is pumped for 15 minutes every hour in growth bed and it drained in fish tank. Plants were enlightened with neon tubes with 12L/12D photoperiod.

2-EXPERIMENTAL MODELS: *Dicentrarchus labrax* (European sea bass) and *Salsola soda*



COMMERCIAL DIET (CONTROL)

-Fish meal
-Wheat
-Soybean

VEGETABLES ENRICHED DIET (TREATED)

-Fish meal
-Wheat
-Pea
-mix of vegetable oils (palm: rapeseed: olive= 1:1:2)
-aminoacids source (methionine and aminoacids mix)



3-DIETS:

CONTROL feed with commercial diet
TREATED feed with vegetables enriched diet

4-ANALYSIS

MORPHOMETRIC ANALYSIS

MOLECULAR ANALYSIS



-Body Weight



- Liver (Hepatosomatic Index)



Real Time PCR Reference Gene: *BACT*

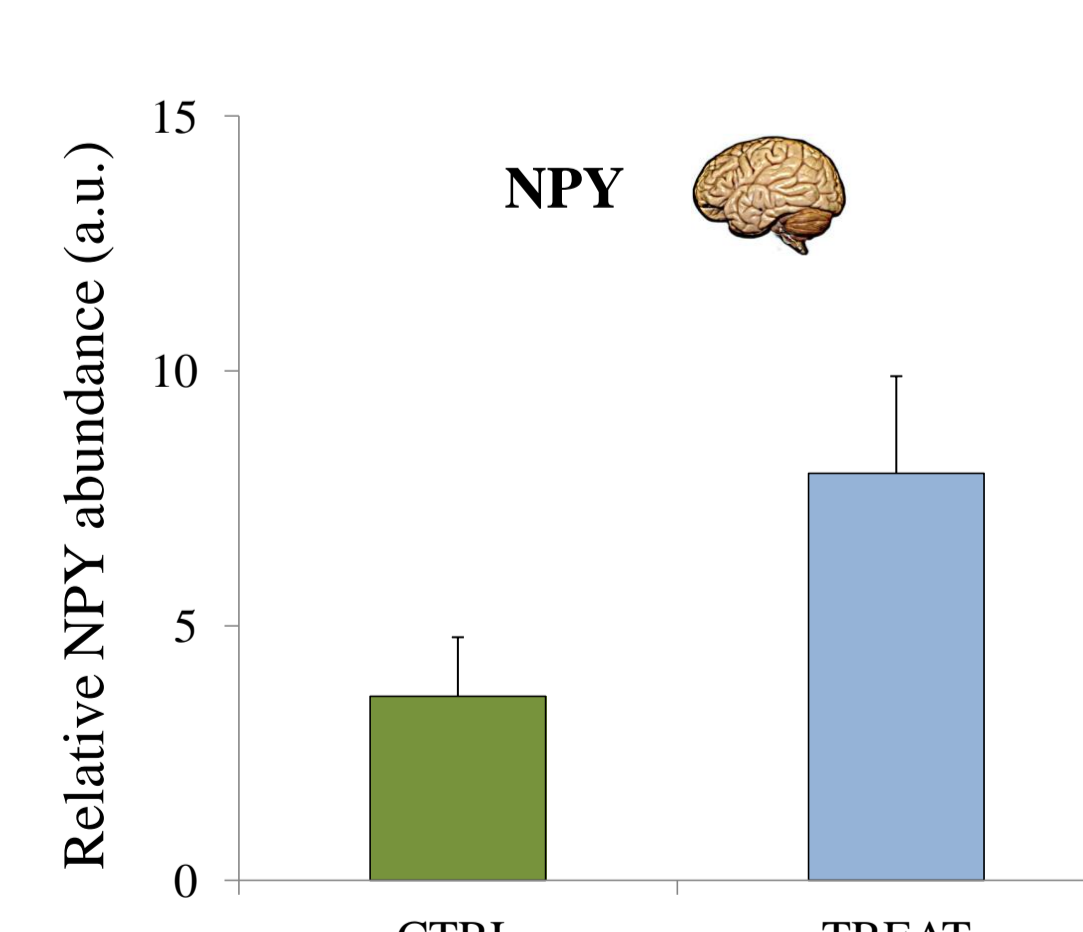
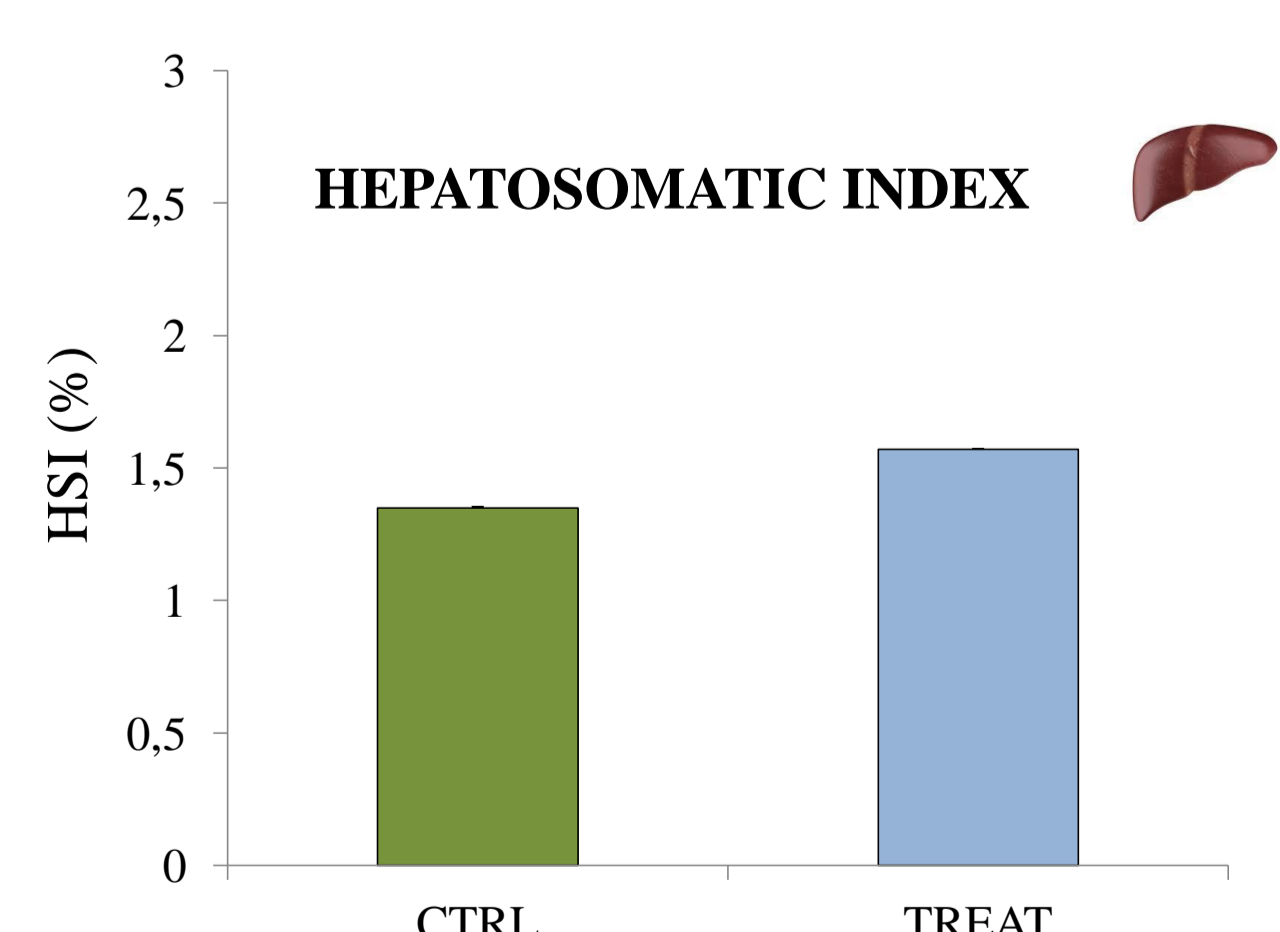
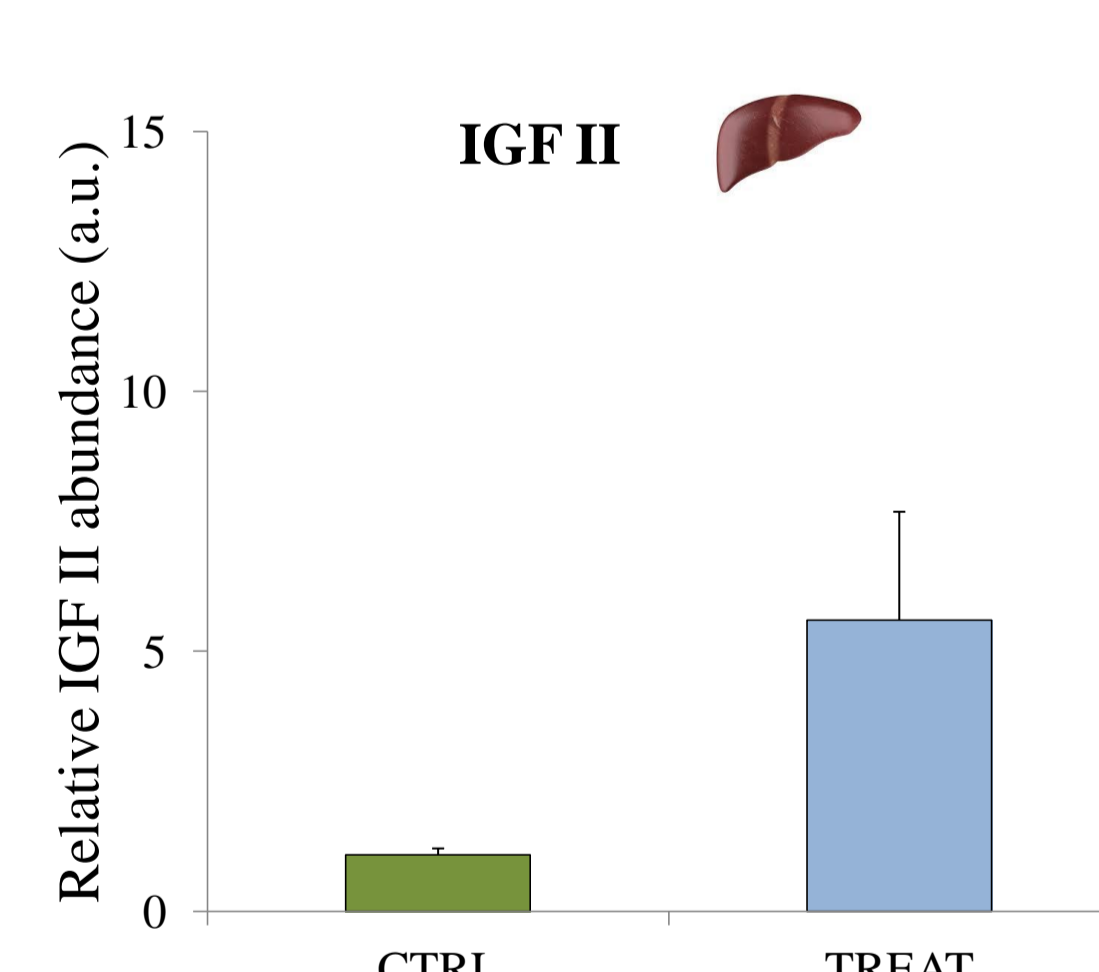
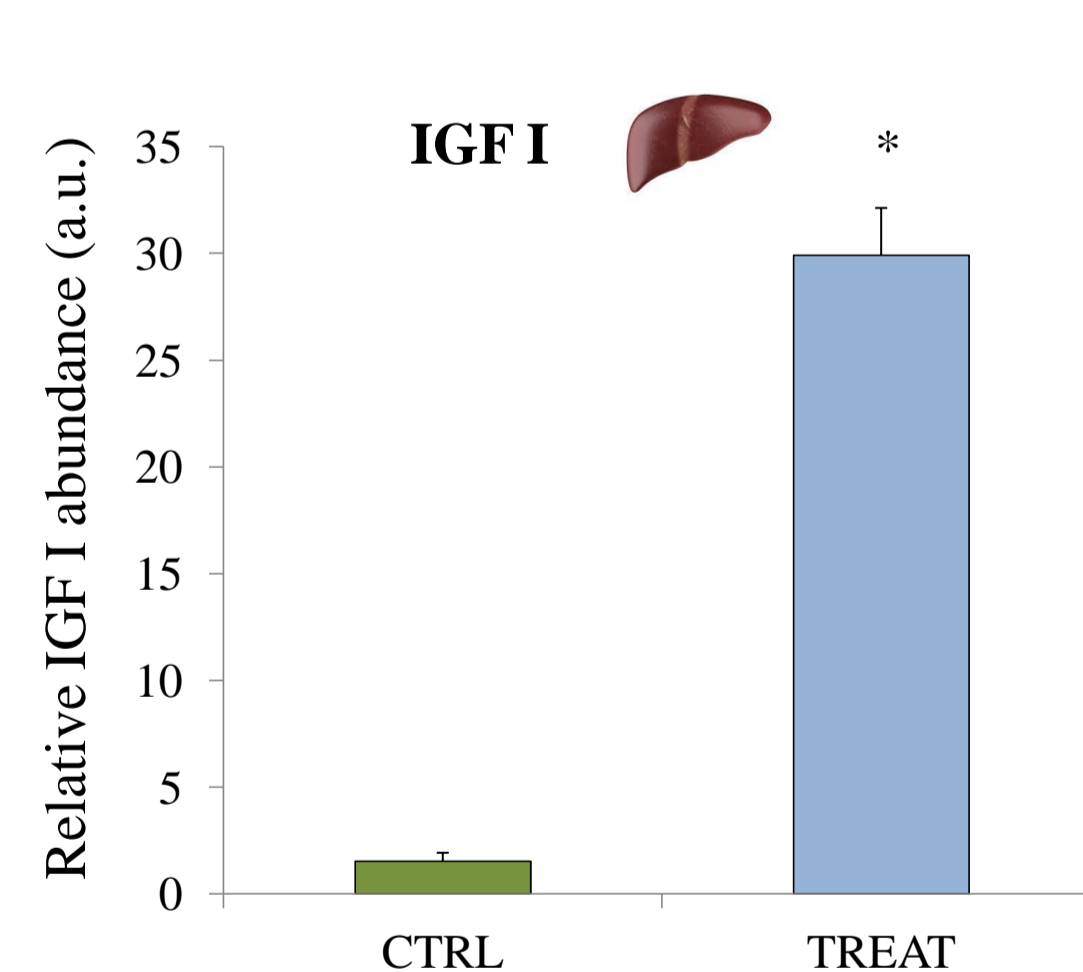
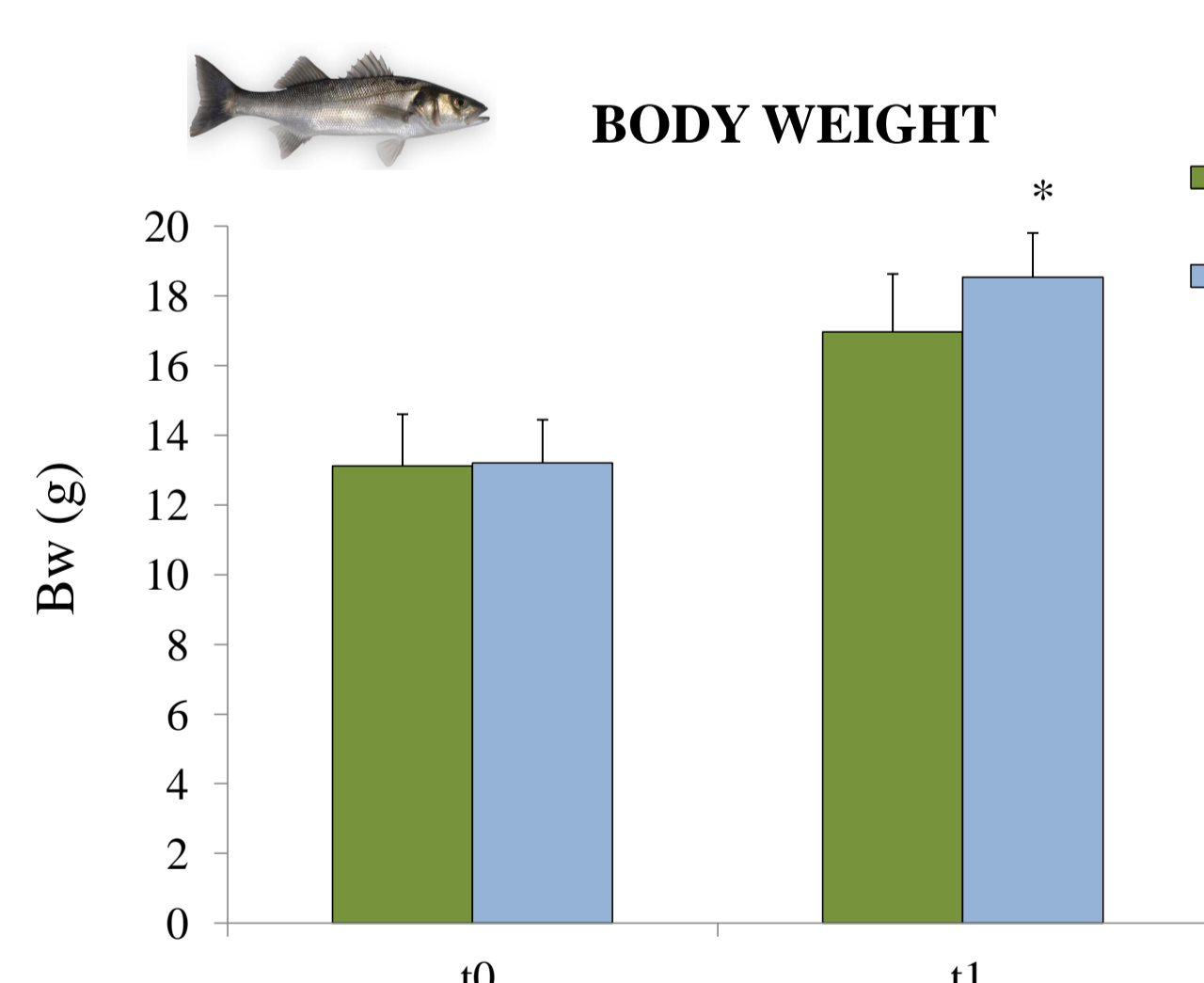
-Insulin-like growth factor 1 (IGFI)
-Insulin-like growth factor 2 (IGFII)



-Neuropeptide Y (NPY)



RESULTS AND DISCUSSION



βACT: For: 5'-TCCCTGGAGAAGAGCTACGA-3'
Rev: 5'-AGGAAGGAAGGCTGGAAGAG-3'

IGF I: For: 5'-TACAGGCTATGGCCCAAT-3'
Rev: 5'-TTGGCAGGTGCACAGTACAT-3'

IGF II: For: 5'-AATACGAGGTGTGGCAGAGG-3'
Rev: 5'-TTGATCTCTCCGCTGTCT-3'

NPY: For: 5'-GGAGCTGGCCAAGTACTACTCA-3'
Rev: 5'-GAGACCAGCGTGTCCAGAAT-3'

p<0,05

Morphometric analysis showed that the vegetables enriched diet significantly increases *Dicentrarchus labrax* growth. Hepatosomatic index is not significantly different between groups and this suggests that the mix of vegetable proteins combined with aminoacids was well tolerate by growing fish. Molecular analysis reflects morphometric results: IGF I gene expression was significantly higher in Treated compared to the Control. The higher body weight observed in Treated is in accordance to the higher expression of NPY that codifies for an orexigenic factor involved in the increase of the appetite control.

CONCLUSION

This study allowed the realization and optimization of a Marine Aquaponics system to rear *Dicentrarchus labrax* in presence of halophytes plants (*Salsola soda*). Moreover, the innovative diet, formulated using plant as proteins source and enriched with aminoacids, induced appetite and better growth performance.

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