



# Effect of UV disinfection on water microbiology and quality of a Mediterranean Recirculated Aquaculture System

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## ABSTRACT & OBJECTIVE

Recirculation is considered to be the future of aquaculture production systems. The microbial communities developed in these systems are of great importance for the function of the system and production stability.

In this study, the main objective was to evaluate the effect of UV disinfection on the population of planktonic heterotrophic bacteria and general water quality in marine RAS where Mediterranean finfish were reared. Also, the distribution of microbial population in different RAS compartments was investigated.

## MATERIALS AND METHODS

### Experimental marine RAS

- Total volume 5.9 m<sup>3</sup>
- Fish reared: adult seabream and seabass
- Feeding regime: UV on: days 0, 2, 4 and 7 UV off: days 0, 2, 5 and 7

- ✓ Water physicochemical parameters monitored:
  - Oxygen saturation
  - pH
  - Nitrite
  - TAN (total ammonia nitrogen)

- ✓ Microbiological analysis:
  - Enumeration of marine heterotrophs on Marine Agar plates (72h at 25°C)

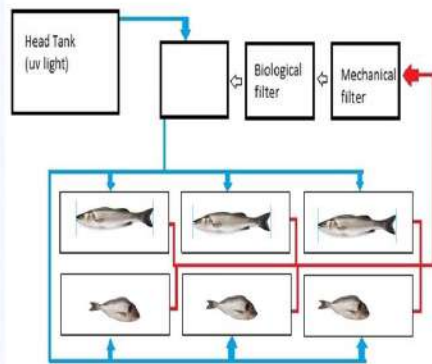
### Methodology

- ✓ Two treatments:
  1. Operating UV system
  2. Disabled UV system

- ✓ 40% water change
- ✓ Microbiological sampling and water quality monitoring
- ✓ 9 sampling points
- ✓ 7 days sampling (plus at day zero)

### Sampling points:

- Head tank
- Mechanical filter
- Biological filter
- Seabass tanks (3)
- Seabream tanks (3)



## DISCUSSION

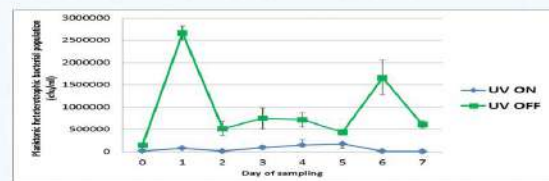
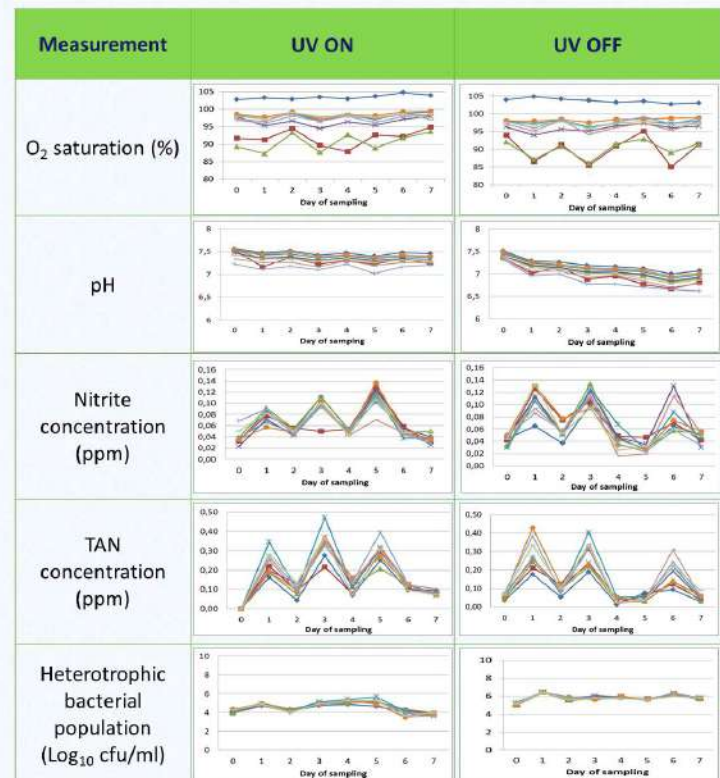
- Water physicochemical parameters during both experimental periods ensured good rearing conditions
- pH showed decreasing trend when UV system was disabled
- Fluctuations of nitrite and TAN followed feeding regime, with highest values measured 24h after feeding
- Under both treatments, bacterial load was comparable in every department of the RAS
- Population of planktonic marine heterotrophic bacteria showed a slight fluctuation that followed the feeding regime
- When UV was operating, bacterial population was only slightly affected by feeding regime
- Disabling UV system, bacterial population tended to highly increase 24h after feeding (e.g. at day 1, 1773% increase was recorded)
- Bacterial diversity was promoted when UV system was operating
- Fish performed better when UV system was operating

This work is the first step of a series of *in situ* experiments that assess the biofilm formation on sensors materials surfaces in RAS under the frame of IMPAQT project

## RESULTS

**Table 1:** Comparison of water physicochemical parameters and bacterial population of the 9 compartments of the RAS between treatments. Different compartments are labeled as follows:

- Main
- Bass 1
- Bream 1
- Mech. filter
- Bass 2
- Bream 2
- Biol. filter
- Bass 3
- Bream 3



**Figure 1 :** Comparison of the evolution of marine heterotrophic bacterial population in the RAS water when UV disinfection system was operating versus disabled. Values represent mean CFU ml<sup>-1</sup> ± SD.

### Observations of fish behaviour:

- ✓ **UV on:** energetic, no losses
- ✓ **UV off:** hyperventilation, less appetite from day 5, loss of individual recorded at day 7



**Figure 2:** Comparison of diversity in bacterial colonies of samples from mechanical filter at day 1. Right UV ON and Left UV OFF

## ACKNOWLEDGMENT



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 774109

