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EFFECT OF SEAWEED BIOMASS (*Ulva ohnoi*) AND CHLOROPHYLL ON LIGHT EXTINCTION COEFFICIENT IN TANKS WITH OPAQUE WALLS

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Introduction

One of the bottlenecks in multitrophic recirculation culture systems (IMTA-RAS) of fish and macroalgae is to increase the productivity and reduce the land surface required for seaweed production. The knowledge of the effect of the fluctuations in the irradiance received by the algae along their trajectory inside the tanks on the processes of photoinhibition and growth, will contribute to increase the productivity and the elimination of nutrients by surface unit in fish-seaweed multitrophic systems.

In tanks with opaque walls, where light received by the seaweed comes from the incident light in the water surface, light attenuation along a vertical axis depends on algal biomass. The incident irradiance to the water surface (E_0) attenuates through the water columns and declines exponentially with depth. According to Lambert-Beer law the irradiance at a depth Z (E_z) below the surface will be: $E_z = E_0 \cdot \exp(-K'Z)$. K' ($K' = K_0 + K_a \cdot B_v$) is the light attenuation constant (m^{-1}), which will be determined by the water light extinction coefficient (K_0 in m^{-1}), the seaweed biomass per unit volume (B_v in g/m^3) and the seaweed light extinction coefficient (K_a in m^2/g). In tanks with seaweed K_0 has a small relative contribution to the K' value.

The aim of this work was to determine the effect of the *Ulva* biomass and chlorophyll content on the light extinction coefficients in seaweed tanks with opaque walls.

Material and methods

Three circular tanks (64 cm diameter, 30 cm height) with bottom air injection ($6\ l\ min^{-1}$) and opaque walls that received the irradiance through the water free surface were used. A height of water equal to the radius of the tank was always maintained to ensure the formation of two rotating flow cells placed, in the vertical section of the tank, at both sides of the aeration inlet. The incident irradiances in the surface of the tanks were: 1090, 476 and 183 $\mu mol\ m^{-2}\ s^{-1}$ in tanks 1, 2 and 3.

Experiments were carried out with three *Ulva ohnoi* biomass (256, 512 and 768 g, which correspond to stocking densities SD 0.8, 1.6 and 2.4 $kg\ m^{-2}$). For each biomass, five PAR measurements were made every 5 cm from the surface to the deepest point of the tank (30 cm). K_0 was calculated without seaweed at different days in the tanks, and the relation between turbidity and K_0 was established (Fig. 1).

The seaweed used in each tank was acclimated during 1 week at SD 2.4. $kg\ m^{-2}$, before the experiments were made. Chlorophyll content was determined after the period of acclimation in 10 fronds of each tank with a portable chlorophyll optical meter using the method described by Masaló and Oca (2020). To carry out the PAR measurements the biomass was extracted, centrifuged and consecutively the biomass was increased from 256 to 768 g. With each biomass the PAR along the vertical axis was measured (5 measures at each depth) in the three tanks.

The chlorophyll content in Tanks 1, 2 and 3 were 102.2, 119.8 and 120.1 $\mu mol\ m^{-2}$, respectively (Table 1).

K' increased (Fig. 1), as it was expected, with seaweed biomass. Calculated K_a (from K_0 and K') were higher in Tanks 2 and 3 and was highly correlated with chlorophyll content (Table 1).

Results presented show that light extinction coefficients decreased with a decrease in chlorophyll concentration, indicating that tanks with a low chlorophyll concentration received more irradiation than the ones with higher chlorophyll concentration and could be photoinhibited and productivity would be negatively affected.

The knowledge of K_a for specific seaweed condition will allow to determine the light extinction coefficient in function of *Ulva* biomass and to estimate the PAR received by the alga fragments in each position of the tank.

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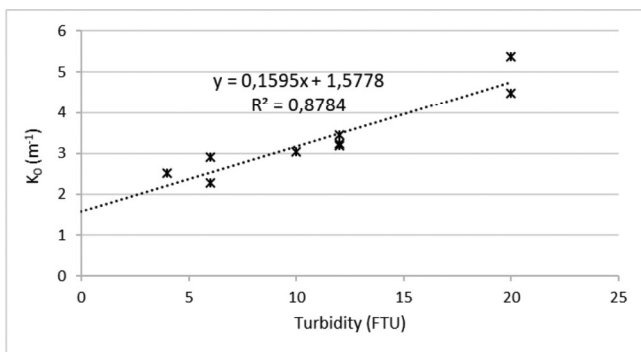


Fig. 1. Relationship between the water light extinction coefficient K_0 and turbidity.

	Tank 1	Tank 2	Tank 3
E_0 ($\mu\text{mol m}^{-2} \text{s}^{-1}$)	1090	476	183
Chlorophyll ($\mu\text{mol m}^{-2}$)	102.2±29.4	118.8±16.2	120.1±19.2
K_a ($\text{m}^2 \text{g}^{-1} \text{FW}$)	1.65×10^{-3} $\pm 3.5 \times 10^{-4}$	1.81×10^{-3} $\pm 4.9 \times 10^{-4}$	1.86×10^{-3} $\pm 3.1 \times 10^{-4}$

Table 1. Experiments conditions and results. K_a is the average of the coefficient obtained in each tank with the three biomass used.

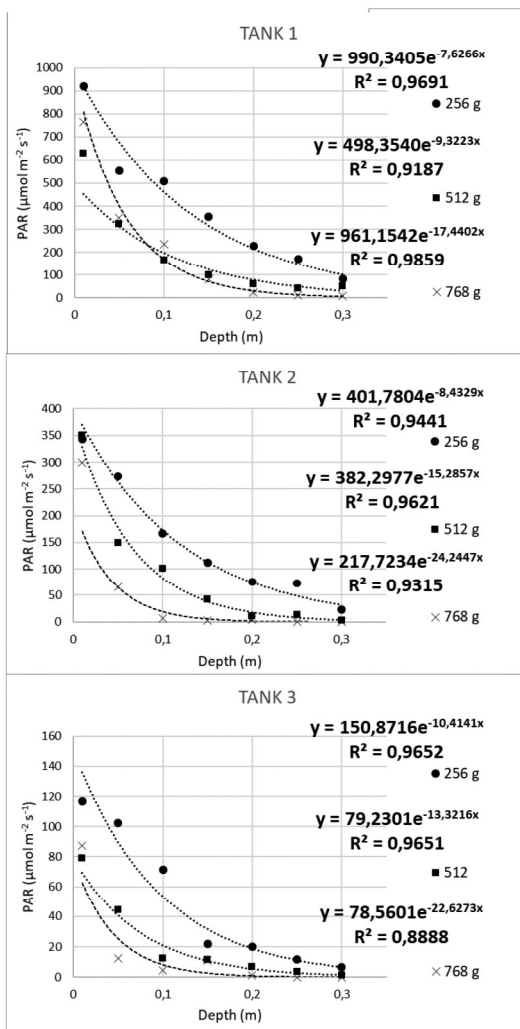


Fig. 2. Relationship between PAR and depth in tanks 1, 2 and 3.

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References

Masaló I, Oca J (2020) Evaluation of a portable chlorophyll optical meter to estimate chlorophyll concentration in the green seaweed *Ulva ohnoi*. *J Appl Phycol* 32: 4171–4174