SUPPLEMENTARY DATA

Influence of pH and CO_2 source on the performance of microalgae-based secondary domestic wastewater treatment in outdoors pilot raceways

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Content:

1. CALCULATIONS

a) Removal efficiencies (REs) of COD, TOC, TC, TN, N-NH_4^+, TP and *E. Coli* were calculated under steady state conditions according to equation (1) in each RW:

$$RE = \frac{(Q_{in} \cdot D_{in} - Q_{out} \cdot D_{out})}{Q_{in} \cdot D_{in}} \cdot 100 \tag{1}$$

where Q_{in} represents the influent wastewater flow rate (L d^{-1}) and Q_{out} the effluent flow rate in each RW (L d^{-1}). D_{in} and D_{out} are the influent and effluent concentrations of COD, TOC, TC, TN, N-NH_4^+, TP and *E. Coli*, respectively (in mg L^{-1} or cfu 100 mL^{-1}).

b) The CO_2 transferred from the gas to the cultivation broth (mg L^{-1} d^{-1}) was calculated using equation (2):

$$CO_{2\,transferred} = Q_{gas/air} \cdot t \cdot \frac{(y_{CO2,inlet} - y_{CO2,outlet})}{V_{RW}} \tag{2}$$

where $Q_{gas/air}$ represents the flow rate of flue gas or air sparged in the RW, respectively (mg min^{-1}); t ($min_{gas/air}$ d^{-1}) corresponds to the elapsed time when valves were opened; and $y_{CO2,outlet}$ are the CO_2 gas molar fraction at the inlet and outlet flue gas or air in the RWs, respectively, and V_{RW} is the total working volume of each RW (L).

c) The carbon, nitrogen and phosphorus mass balances expressed in mg d^{-1} were evaluated according to equations (3), (4) and (5):

$$C = (Q_{in} \cdot C_{in,liquid}) + (C - CO2_{transferred}) - (Q_{out} \cdot C_{out,liquid}) - (\frac{\%C_{biomass.}}{100} \cdot TSS_{RW} \cdot Q_{out}) \tag{3}$$

$$N = (Q_{in} \cdot N_{in,liquid}) - (Q_{out} \cdot N_{out,liquid}) - (\frac{\%N_{biomass.}}{100} \cdot TSS_{RW} \cdot Q_{out}) \tag{4}$$

$$P = (Q_{in} \cdot P_{in,liquid}) - (Q_{out} \cdot P_{out,liquid}) - (\frac{\%P_{biomass.}}{100} \cdot TSS_{RW} \cdot Q_{out}) \tag{5}$$

where $C_{in,liquid}$, $N_{in,liquid}$ and $P_{in,liquid}$ and $C_{out,liquid}$, $N_{out,liquid}$ and $P_{out,liquid}$ represent the concentration of total carbon, nitrogen and phosphorus present in the influent wastewater and treated effluent during steady state operation in the RWs, respectively (mg L^{-1}), and C-CO_2 refers to the total C mass transferred from flue gas or air to the liquid phase (mg d^{-1}), respectively; % $C_{biomass}$, % $N_{biomass}$ and % $P_{biomass}$ stand for the C, N or P content in the harvested biomass, respectively, and TSS_{RW} corresponds to the TSS concentration in the cultivation broth (mg L^{-1}).

d) The areal biomass productivity (W) expressed in g m^{-2} d^{-1} was determined according to equation (6):

$$W = \frac{TSS_{RW} \cdot Q_{out}}{S} \quad (6)$$

where S is the illuminated surface in the RWs (8.33 m^2).

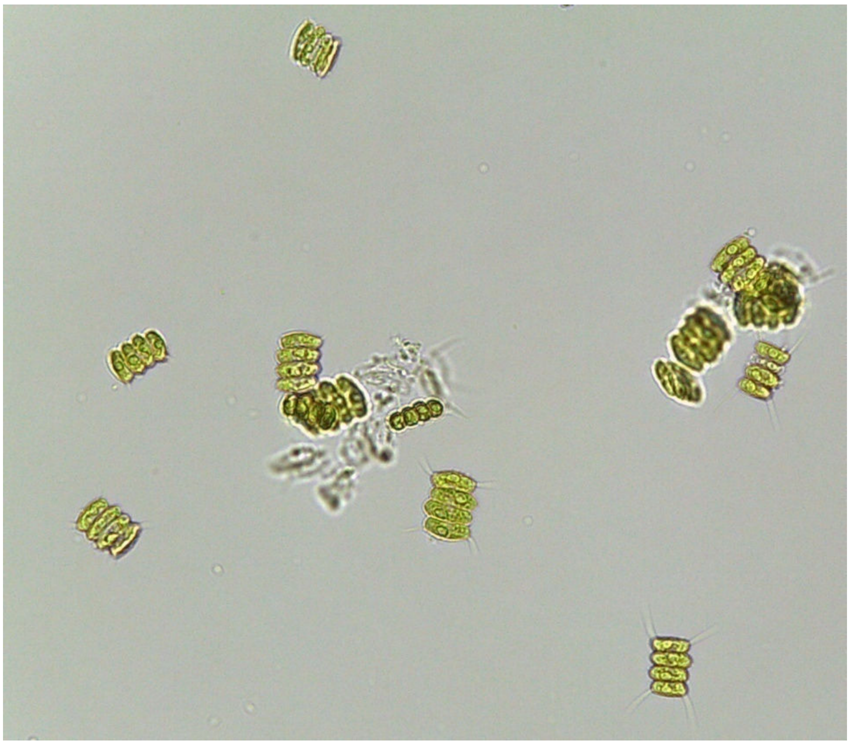
e) The biomass extinction coefficient (K_a) was determined according to equation (7):

$$K_a = \frac{\overline{Abs}}{TSS_{RW} \cdot P} \quad (7)$$

where $\overline{Abs}$ represents the average culture absorbance in the visible spectrum (400-800 nm) and P the light path of the cuvette (m).

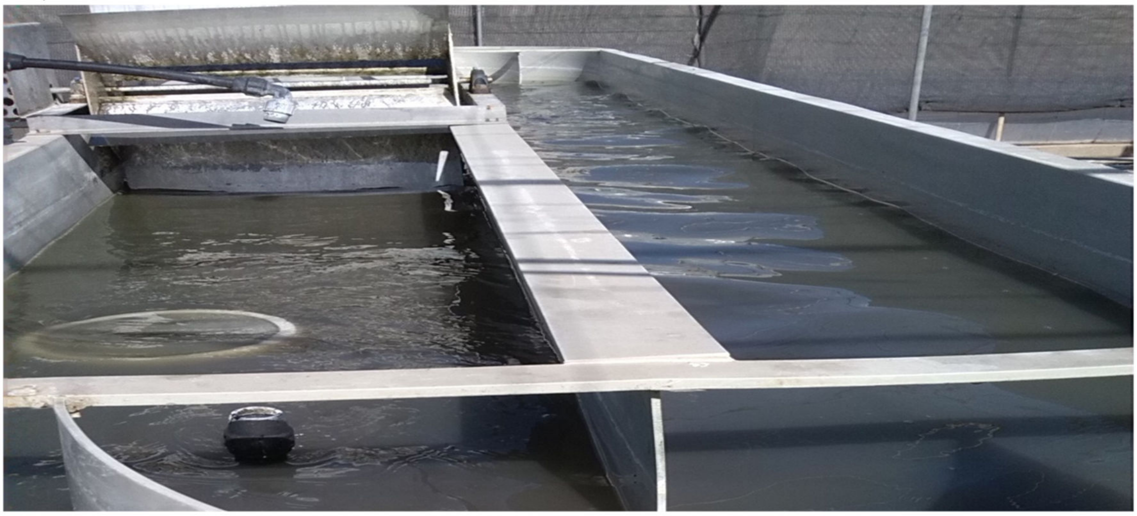
2. PHOTOGRAPHS

Photograph 2a. *Scenedesmus* microscopic view (microalgae used as inoculum)



Photograph 2. Outdoor raceways pilot plants. **b)** RW1 before inoculation and **c)** continuous microalgae cultivation.

b)



c)

Table S1

Specific consumption rates of TN and TP in each RW under steady state operation in the four experimental stages.

Stage	RWs	TN (mg TN $gTSS^{-1}$ d^{-1})	TP (mg TP $gTSS^{-1}d^{-1}$)
I	RW1	44±6	3±1
	RW2	41±6	3±0
	RW3	48±2	3±0
II	RW1	28±5	5±2
	RW2	29±3	5±1
	RW3	26±5	6±0
III	RW1	21±4	2±0
	RW2	19±6	2±0
	RW3	17±4	2±0
IV	RW1	32±8	3±0
	RW2	37±3	3±0
	RW3	33±7	3±0