

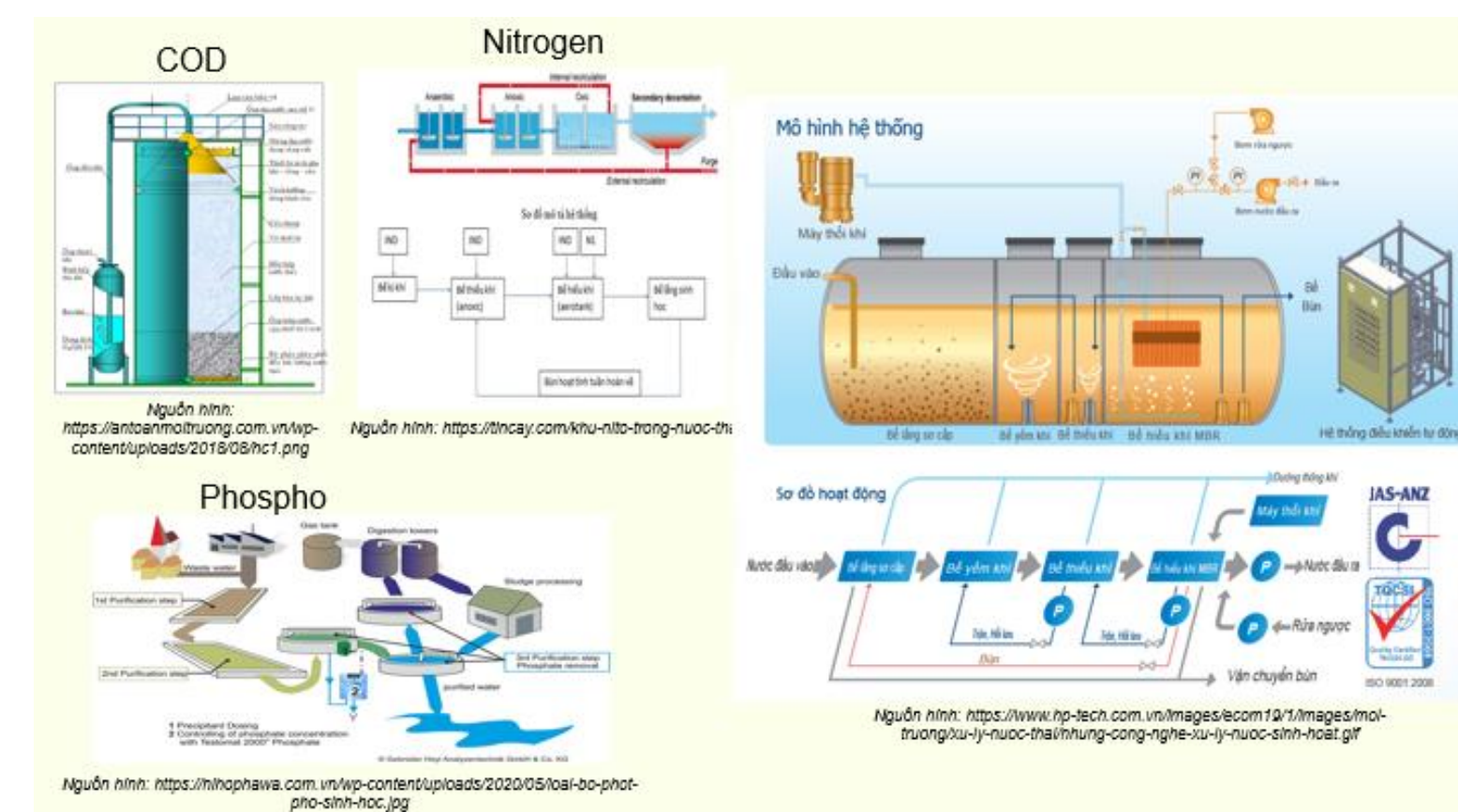
Abstract

Algae is a versatile resource with high value applied in various fields such as food, pharmaceuticals, cosmetics, biofuels, and wastewater treatment. In current wastewater treatment technology, the use of algae in the treatment process is being emphasized. This research aims to cultivate *Chlorella Vulgaris* algae in a suitable environment to help the algae adapt and grow rapidly during the wastewater treatment application. In two photobiological model systems HRAPs and PMBR combining microalgae *Chlorella vulgaris* and bacteria in shrimp aquaculture wastewater treatment showed that both model systems have good treatment efficiency. The removal efficiency of COD, nitrate N-NO₃⁻, nitrite N-NO₂⁻, ammonia N-NH₄⁺, total nitrogen and P-PO₄³⁻ reached 27.4%, 58.7%, -35%, 92.2%, 77% and 93.5, respectively % in HRAPs and 29.7%, 24.5%, 26%, 83.9%, 75% and 93.4% in PMBR model.

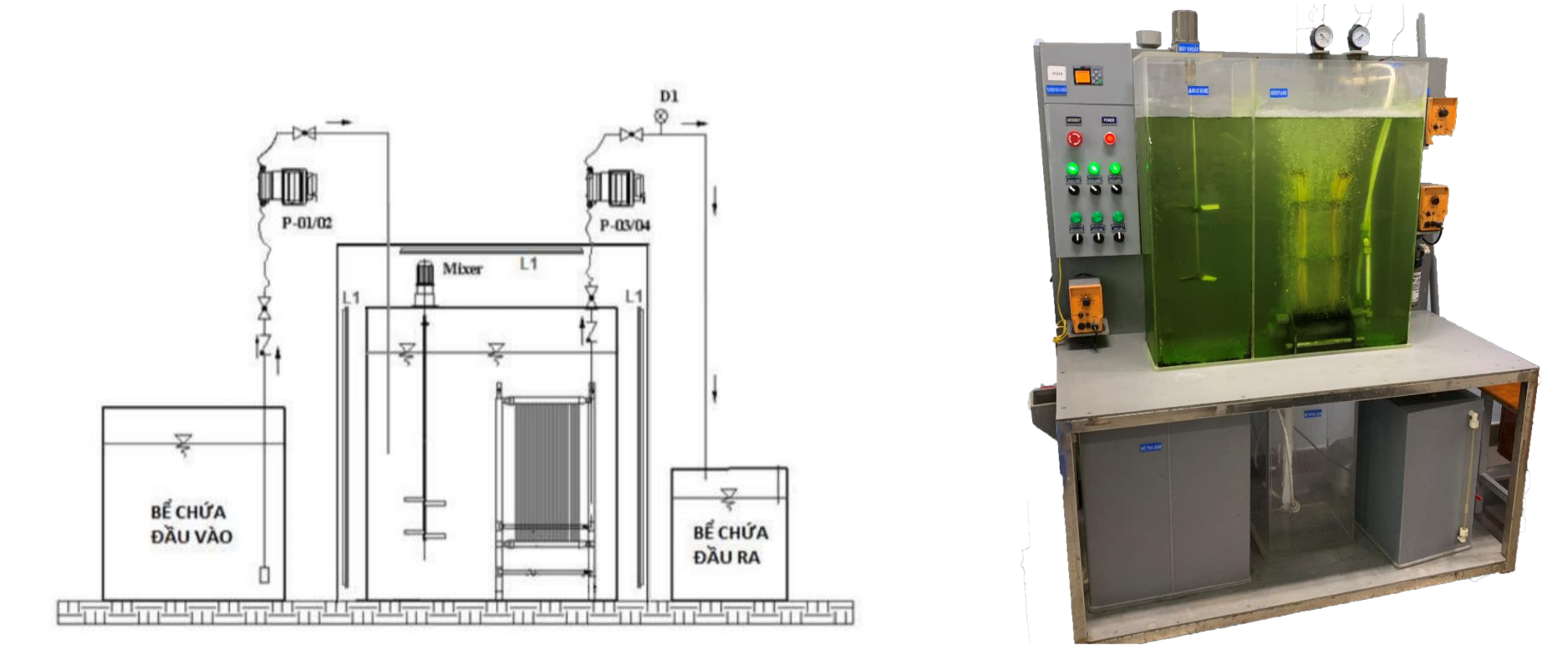
Introduction

Technology Expectations:

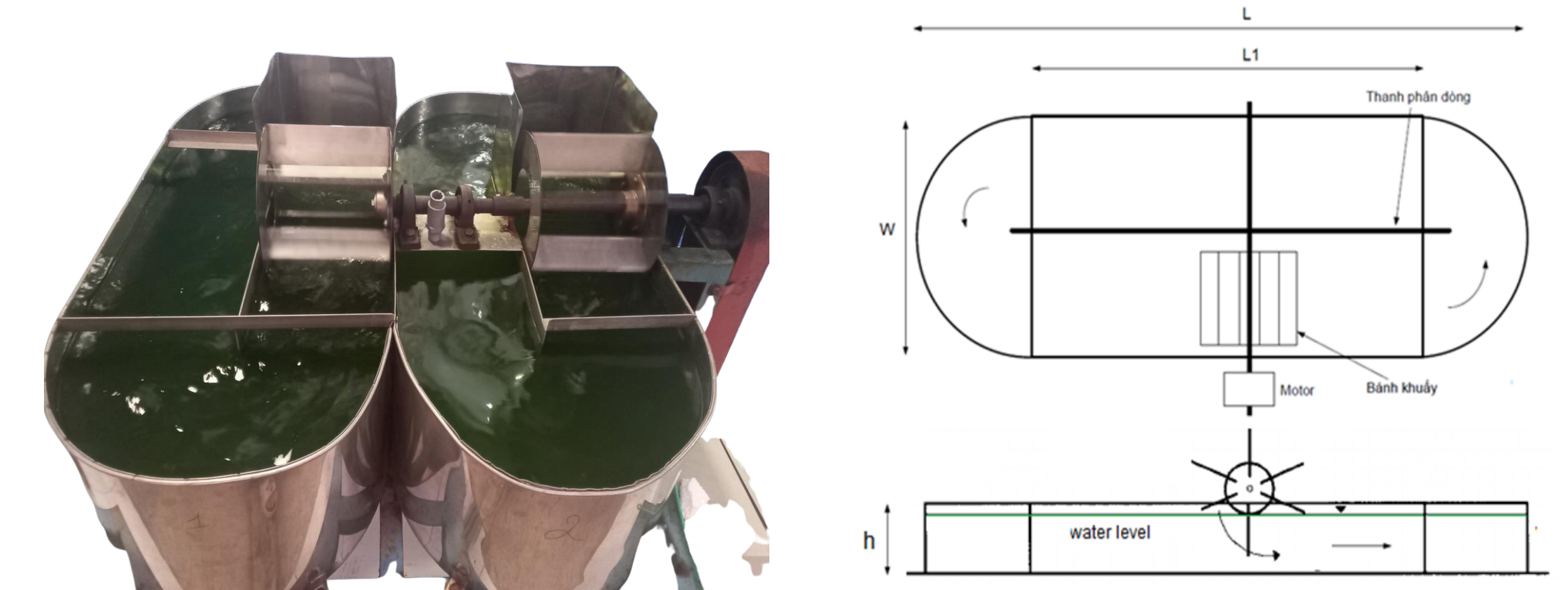
- ✓ Dealing with environmental problems, the main pollutants. (environment)
- ✓ Energy saving. (economy)
- ✓ Get economic value. (economy)



Shrimp farming wastewater treatment technologies

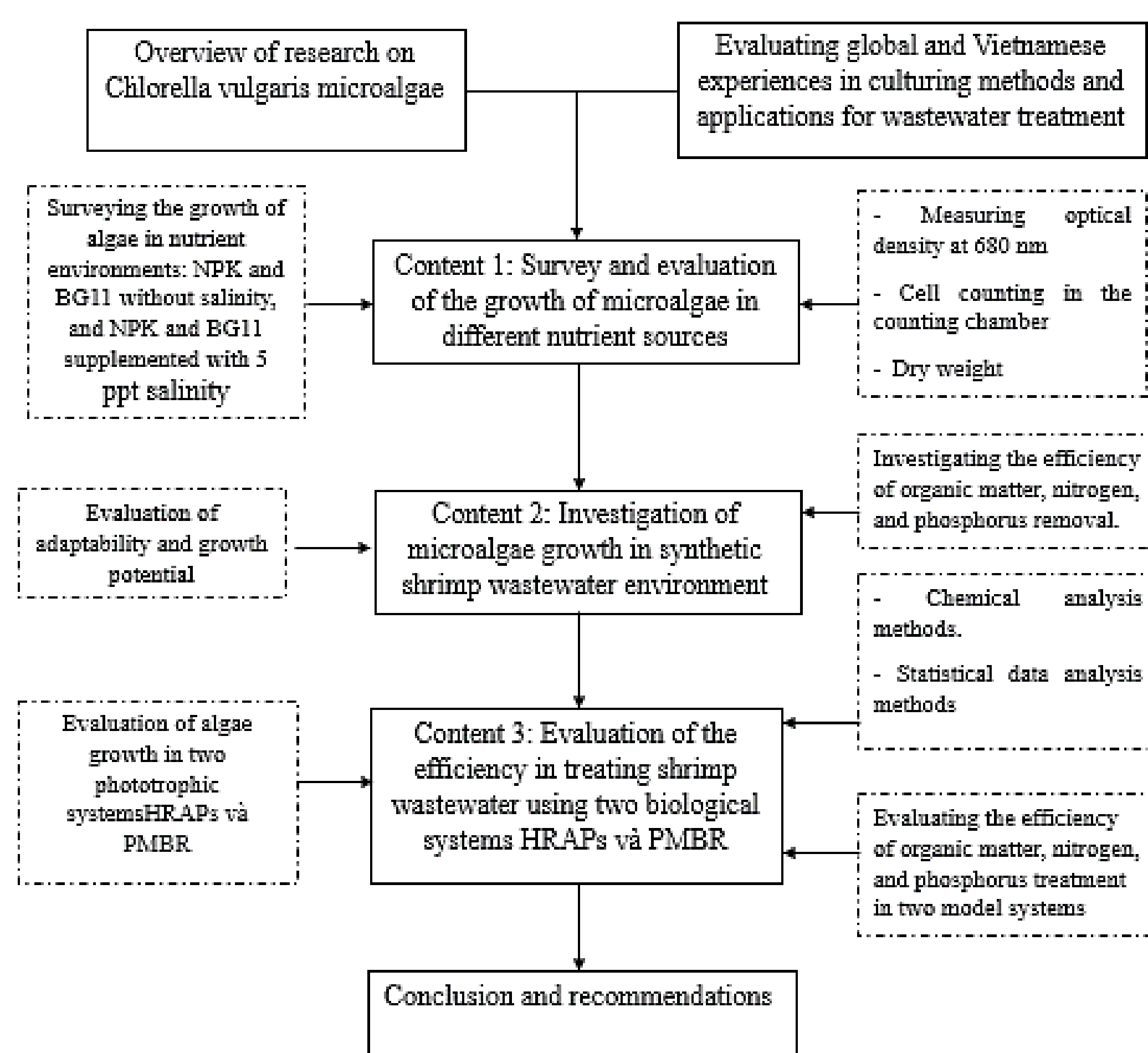


Photobiological model of PMBR membrane combined with microalgae



High-Density Algae Cultivation Model HRAPs

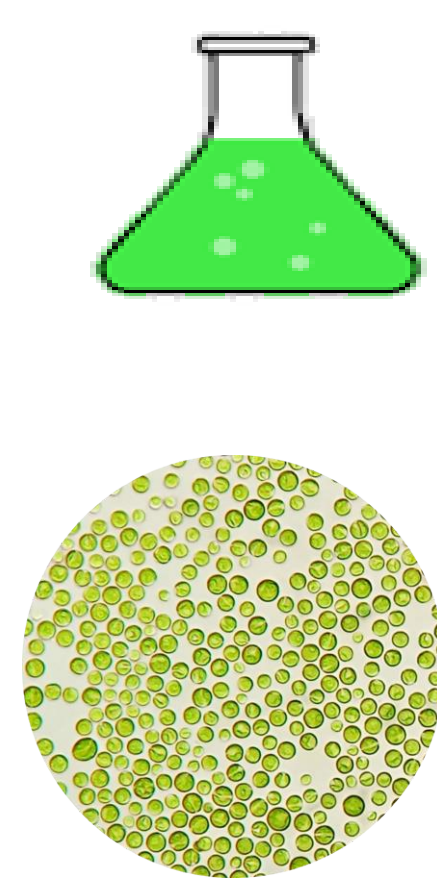
Methods and Materials



Evaluating The Water Quality Parameters In Shrimp Farming Areas And The Treatment Efficiency Of The Model

Chỉ tiêu/nt	Đơn vị	HRAP/ PMBR	Đơn vị	Tên viết tắt mẫu
pH	✓	✓	✓	3 lần/biên
DO	✓	✓	✓	3 lần/biên
Độ kiềm	✓	✓	✓	3 lần/biên
COD	✓	✓	✓	3 lần/biên
TN	✓	✓	✓	3 lần/biên
N-NO ₃ ⁻	✓	✓	✓	3 lần/biên
N-NO ₂ ⁻	✓	✓	✓	3 lần/biên
N-NH ₄ ⁺	✓	✓	✓	3 lần/biên
P-PO ₄ ³⁻	✓	✓	✓	3 lần/biên
MLSS	✓	✓	✓	3 lần/biên
MLVSS	✓	✓	✓	3 lần/biên
Profil sinh khối	✓	✓	✓	3 lần/biên
Chlorophyll	✓	✓	✓	3 lần/biên

STT	Thông số	Phương pháp phân tích
1	pH	HJ 9811-1
2	DO	HJ 9143
3	COD	TCVN 6186:1996 - ISO 8467:1993 (E)
4	TN	SMEWW 4500 - N B&C
5	N-NH ₄ ⁺	SMEWW 4500 NH3 B&C
6	N-NO ₃ ⁻	SMEWW 4500 - NO3 E:2012
7	N-NO ₂ ⁻	SMEWW 4500 - NO2 E:2012
8	P-PO ₄ ³⁻	SMEWW 4500-P B&E:2012
9	MLSS	SMEWW 2540 D:2012
10	MLVSS	SMEWW 2540 D:2012



Results

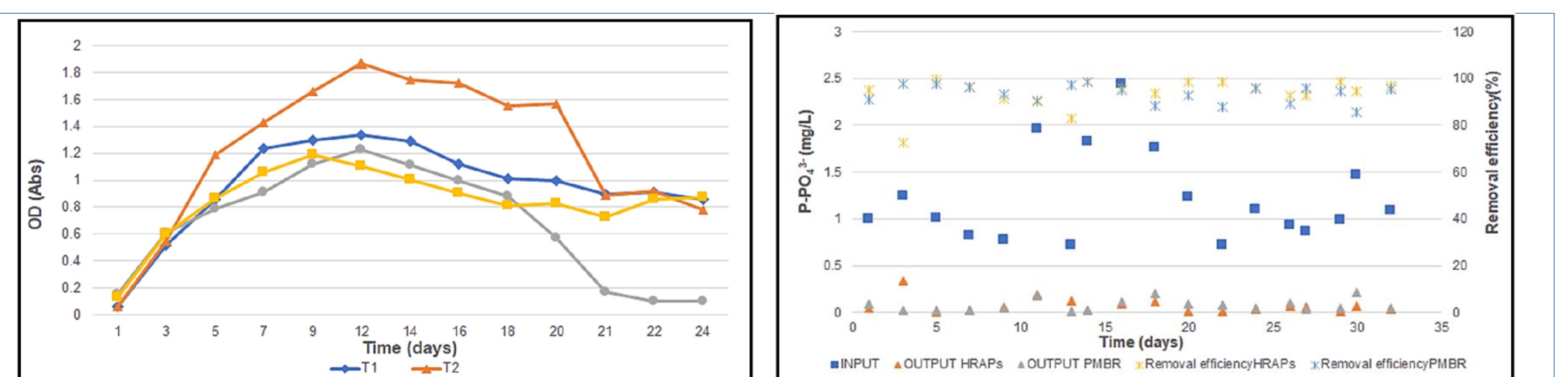


Figure 1. Growth curve of microalgae in different culture media

Figure 2. Phosphorus removal efficiency

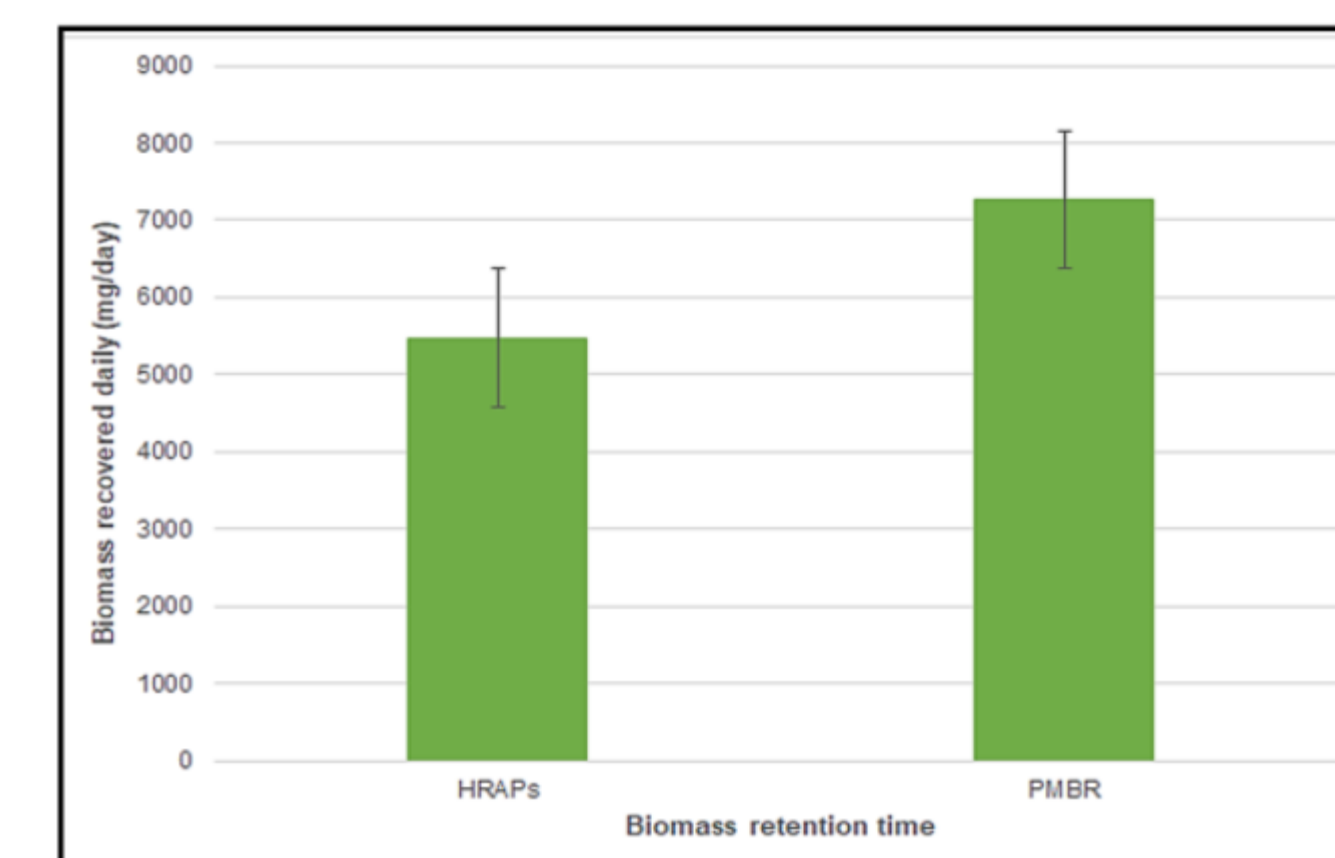


Figure 3. Daily biomass recovery of HRAPs and PMBR

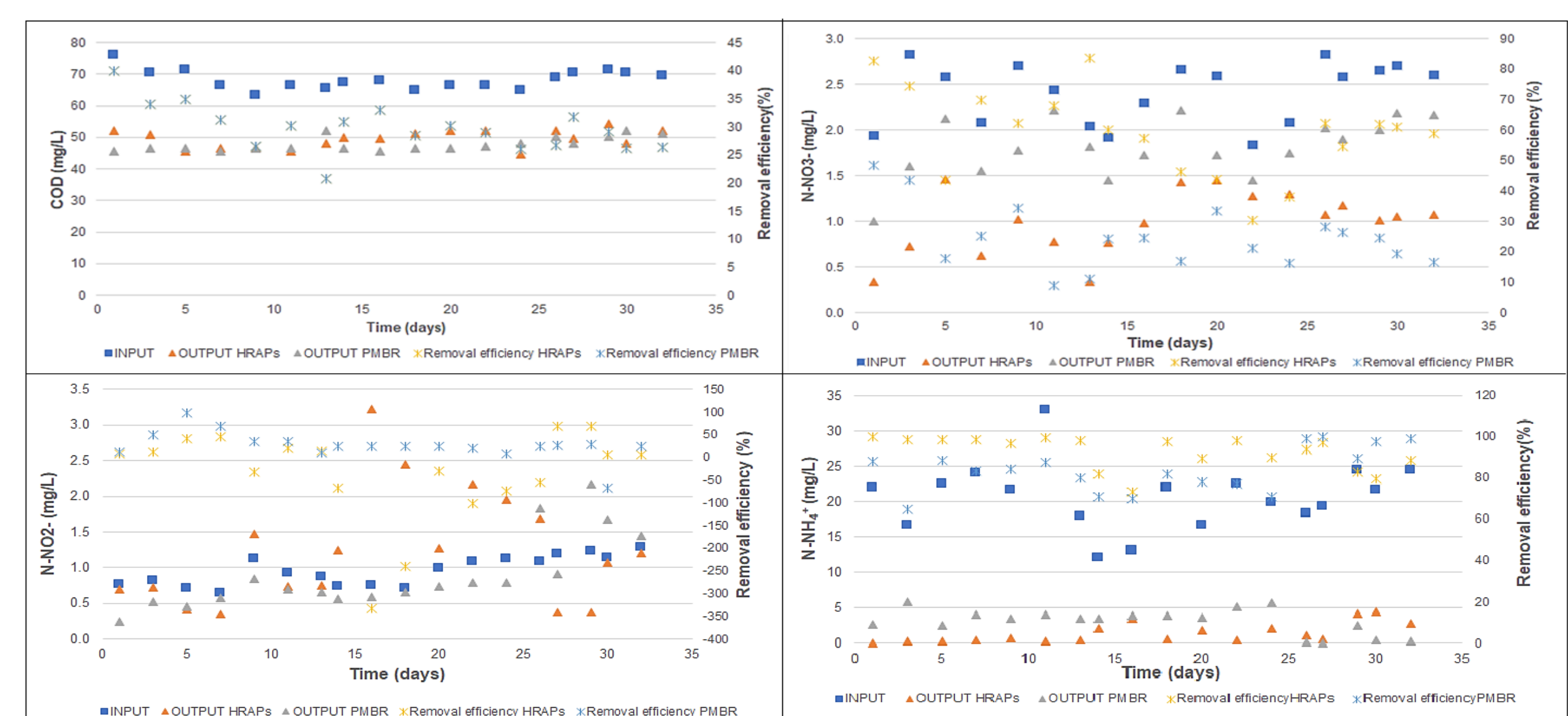


Figure 4. Removal efficiency COD, N-NO₃⁻, N-NO₂⁻, N-NH₄⁺

Conclusions

Microalgae *Chlorella vulgaris* has the ability to grow well in saline environments. When microalgae cultured in BG11 and NPK with added salinity of 5ppt, it was shown that microalgae grown in BG11 medium with added salinity of 5 ppt developed best and then NPK with salinity of 5ppt. In two photobiological model systems HRAPs and PMBR combining microalgae *Chlorella vulgaris* and bacteria in shrimp aquaculture wastewater treatment showed that both model systems have good treatment efficiency. The efficiency of COD, N-NO₃⁻, N-NO₂⁻, ammonia N-NH₄⁺, TN and P-PO₄³⁻ were: 27.4%, 58.7%, -35%, 92.2%, 77%, 93.5%, respectively in tissues. In HRAPs model and 29.7%, 24.5%, 26%, 83.9%, 75%, 93.4% in PMBR model. In HRAPs tank, the amount of algae biomass recovered daily was 5474 mg/day, while in PMBR tank, the amount of algae biomass recovered was 5474 mg/day. biomass recovered 7265.3 mg/day. This shows that the algae cultured in PMBR has the ability to recover more biomass than HRAPs.

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