

Phytohormone Supplementation for Nutrient Removal from Mariculture Wastewater by *Oocystis borgei* in Sequential Batch Operation

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Table S1 Chemical composition and concentration of Zhanshui 107-13 medium and artificial seawater.

	Chemicals	Concentration (g·L ⁻¹)
Zhanshui 107-13 medium	NaNO ₃	8
	K ₂ HPO ₄	80
	FeC ₆ H ₅ O ₇	10
Artificial seawater	NaCl	21.994
	Na ₂ SO ₄	3.550
	MgCl ₂ ·6H ₂ O	9.592
	CaCl ₂	1.014
	KCl	0.599
	KBr	0.086
	H ₃ BO ₄	0.023
	SrCl·6H ₂ O	0.022
	NaF	0.003
	NaHCO ₃	0.174

Note: Artificial seawater is prepared for immediate use after autoclaving sterilization and sodium bicarbonate filtration for decontamination.

Table S2 Chemical composition and concentration of artificial aquaculture wastewater.

Chemicals	Concentration (g·L ⁻¹)
NaAc	0.077
KH ₂ PO ₄	0.013
NH ₄ Cl	0.023
CaCl ₂	0.006
FeSO ₄ ·7H ₂ O	0.001
MgSO ₄ ·7H ₂ O	0.001
CuSO ₄ ·5H ₂ O	0.008
MnCl·4H ₂ O	0.186
ZnSO ₄ ·7H ₂ O	0.220
NaMoO ₄ ·2H ₂ O	0.390
Co(NO ₃) ₂ ·6H ₂ O	0.005
H ₃ BO ₃	0.286

Table S3 Effect of phytohormones on the Nutrient Removal Rate of *O. borgei*.

Group	Day Nutrient	1	2	3	4	5	6	7	8	9	10	11
Control	NH ₄ ⁺ -N	0.24±0.09	0.30±0.06	0.42±0.09	0.47±0.06	0.51±0.13	0.51±0.14	0.46±0.06	0.45±0.06	0.42±0.13	0.39±0.11	0.33±0.1
	NO ₂ ⁻ -N	1.55±0.09	0.80±0.29	0.58±0.04	1.59±0.08	1.31±0.14	1.25±0.16	1.58±0.08	1.73±0.06	1.35±0.09	1.31±0.12	1.32±0.06
	NO ₃ ⁻ -N	0.16±0.11	0.10±0.15	0.24±0.15	0.09±0.08	0.14±0.40	0.13±0.16	0.89±0.05	0.91±0.07	0.83±0.04	0.89±0.6	0.85±0.06
	PO ₄ ³⁻ -P	0.25±0.03	0.49±0.10	0.57±0.12	0.57±0.11	0.59±0.07	0.38±0.09	0.25±0.02	0.31±0.09	0.38±0.14	0.44±0.07	0.49±0.06
IAA	NH ₄ ⁺ -N	0.70±0.04**	0.74±0.09**	0.77±0.12**	0.79±0.14**	0.85±0.10**	0.86±0.11**	0.73±0.10**	0.73±0.12**	0.72±0.16**	0.78±0.07**	0.69±0.07**
	NO ₂ ⁻ -N	1.89±0.18**	1.83±0.08**	1.84±0.10**	2.08±0.08**	1.84±0.11**	1.83±0.07**	2.21±0.08**	2.28±0.13**	2.18±0.11**	2.16±0.08**	1.92±0.23**
	NO ₃ ⁻ -N	2.06±0.05**	2.07±0.06**	2.06±0.07**	2.51±0.13**	2.60±0.08**	2.61±0.06**	2.70±0.06**	2.70±0.07**	2.69±0.06**	2.70±0.06**	2.70±0.06**
	PO ₄ ³⁻ -P	0.97±0.07**	1.48±0.09**	1.40±0.05**	1.38±0.11**	1.32±0.15**	1.37±0.04**	1.10±0.02**	1.14±0.07**	1.31±0.08**	1.39±0.04**	1.43±0.26**
GA3	NH ₄ ⁺ -N	0.75±0.01**	0.77±0.03**	0.80±0.05**	0.77±0.17**	0.86±0.08**	0.90±0.08**	0.81±0.19**	0.67±0.13**	0.70±0.16**	0.71±0.08**	0.70±0.08**
	NO ₂ ⁻ -N	1.86±0.15**	1.87±0.11**	1.92±0.08**	2.14±0.11**	1.81±0.08**	1.86±0.07**	2.05±0.09**	2.19±0.11**	2.15±0.09**	2.09±0.08**	1.79±0.12**
	NO ₃ ⁻ -N	2.08±0.07**	2.06±0.07**	2.07±0.08**	2.63±0.07**	2.61±0.07**	2.62±0.06**	2.70±0.06**	2.70±0.06**	2.70±0.06**	2.70±0.06**	2.69±0.06**
	PO ₄ ³⁻ -P	0.97±0.01**	1.37±0.23**	1.43±0.08**	1.22±0.35**	1.47±0.07**	1.30±0.16**	1.02±0.05**	1.14±0.03**	1.25±0.11**	1.22±0.16**	1.53±0.02**
ZT	NH ₄ ⁺ -N	0.73±0.16**	0.76±0.09**	0.79±0.12**	0.81±0.13**	0.82±0.01**	0.89±0.07**	0.71±0.10**	0.74±0.10**	0.74±0.10**	0.71±0.02**	0.79±0.12**
	NO ₂ ⁻ -N	1.84±0.06**	1.83±0.08**	1.86±0.10**	2.05±0.11**	1.80±0.06**	1.85±0.09**	1.98±0.07**	2.07±0.07**	2.07±0.07**	2.05±0.10**	1.75±0.06**
	NO ₃ ⁻ -N	2.06±0.05**	2.06±0.05**	2.05±0.03**	2.62±0.07**	2.61±0.06**	2.62±0.06**	2.70±0.06**	2.70±0.06**	2.70±0.06**	2.70±0.06**	2.69±0.06**
	PO ₄ ³⁻ -P	0.97±0.09**	1.31±0.16**	1.43±0.20**	1.44±0.28**	1.39±0.15**	1.26±0.14**	1.07±0.09**	1.18±0.07**	1.10±0.06**	1.28±0.20**	1.45±0.09**

Note: Data presented are the mean ± standard error (SE) of three independent experiments. Statistically significant differences in nutrient removal were observed between the phytohormone-treated groups and the control group at $p < 0.05$ (*) and $p < 0.01$ (**).

Table S4 Effect of phytohormones on photosynthetic pigments and chlorophyll fluorescence parameters of *O. borgei*.

Treatment		Control	IAA	GA3	ZT
Total Chl (ng·cell ⁻¹)	2 d	3.977±0.092	4.081±0.102	3.840±0.275	3.766±0.117
	4 d	4.087±0.077	5.393±0.014*	5.021±0.175*	4.776±0.176*
Carotenoids (ng·cell ⁻¹)	2 d	0.896±0.025	0.917±0.023	0.844±0.081	0.835±0.03
	4 d	1.033±0.02	1.348±0.002*	1.25±0.049*	1.219±0.022*
Chla (ng·cell ⁻¹)	2 d	3.544±0.095	3.648±0.098	3.408±0.272	3.339±0.117
	4 d	3.784±0.143	5.052±0.014*	4.690±0.182*	4.452±0.179*
Chlb (ng·cell ⁻¹)	2 d	1.752±0.025	1.783±0.038	1.709±0.087	1.680±0.035
	4 d	1.654±0.025	2.062±0.012*	1.937±0.044*	1.899±0.021*
φPSII	2 d	0.804±0.013	0.896±0.017*	0.850± 0.024*	0.863±0.025*
	4 d	0.848±0.018	0.905±0.006*	0.904± 0.015*	0.892±0.010*
Fv/Fm	2 d	0.783±0.027	0.908±0.013*	0.862±0.011*	0.864±0.075*
	4 d	0.809±0.002	0.905±0.009*	0.905±0.012*	0.893±0.02*

Note: Data presented are the mean ± standard error (SE) of three independent experiments. Statistically significant differences were observed between the phytohormone-treated groups and the control group at *p* < 0.05 (*).

Table S5 Effect of phytohormones on activities of NR, GS, SOD and CAT in *O. borgei* after 4-day stimulation.

Activity	NR (μmol·g ⁻¹ FW·h ⁻¹)	GS (μmol·g ⁻¹ FW·h ⁻¹)	SOD (U·g ⁻¹ FW)	CAT (U·g ⁻¹ FW)
Control	0.056±0.039	0.021±0.005	80.196±28.735	1.898±0.543
IAA	0.202±0.043*	0.082±0.007*	132.441±2.613*	29.471±5.257*
GA3	0.209±0.024*	0.078±0.009*	149.856±13.405*	29.776±1.728*
ZT	0.149±0.034*	0.077±0.005*	142.020±8.398*	29.614±0.321*

Note: Data presented are the mean ± standard error (SE) of three independent experiments. Statistically significant differences were observed between the phytohormone-treated groups and the control group at $p < 0.05$ (*).