Preliminary Investigation of the Effects of Phosphate Concentration on Arsenic Content in *Eucheuma*

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Introduction

- It has been well documented that seaweeds accumulate relatively high intracellular levels of toxic inorganic As^{3+}. We propose that the chemical similarity between arsenate and phosphate is a key factor driving this elevated arsenic uptake. To test this hypothesis, we varied phosphate concentrations in seawater and examined their effects on arsenic accumulation in seaweeds.
- We selected the economically important red seaweed *Eucheuma perplexum* as a model species to investigate this interaction. Cultures were maintained in seawater media with varying phosphorus concentrations for 7 days. Following cultivation, the samples were harvested, freeze-dried, digested, and analyzed.

Eucheuma perplexum

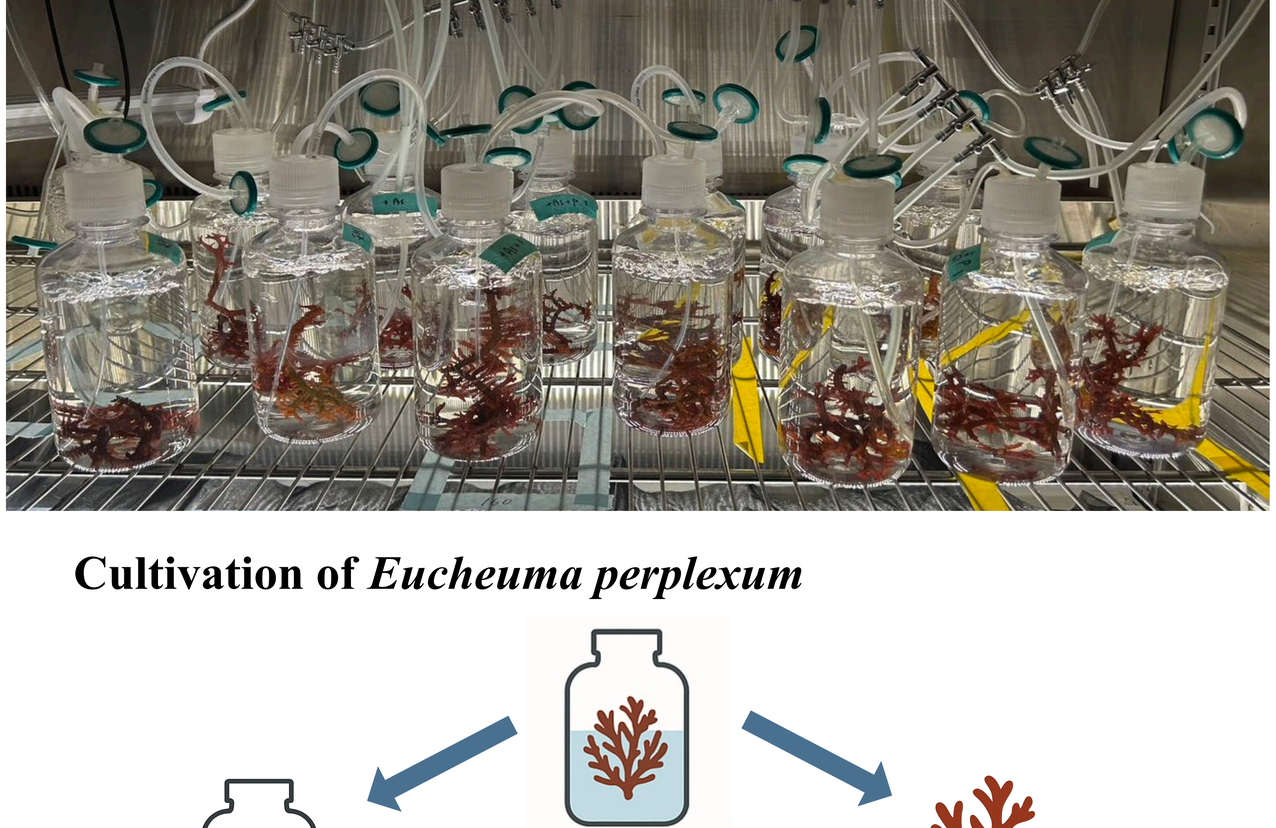
Materials and Methods

Growth conditions

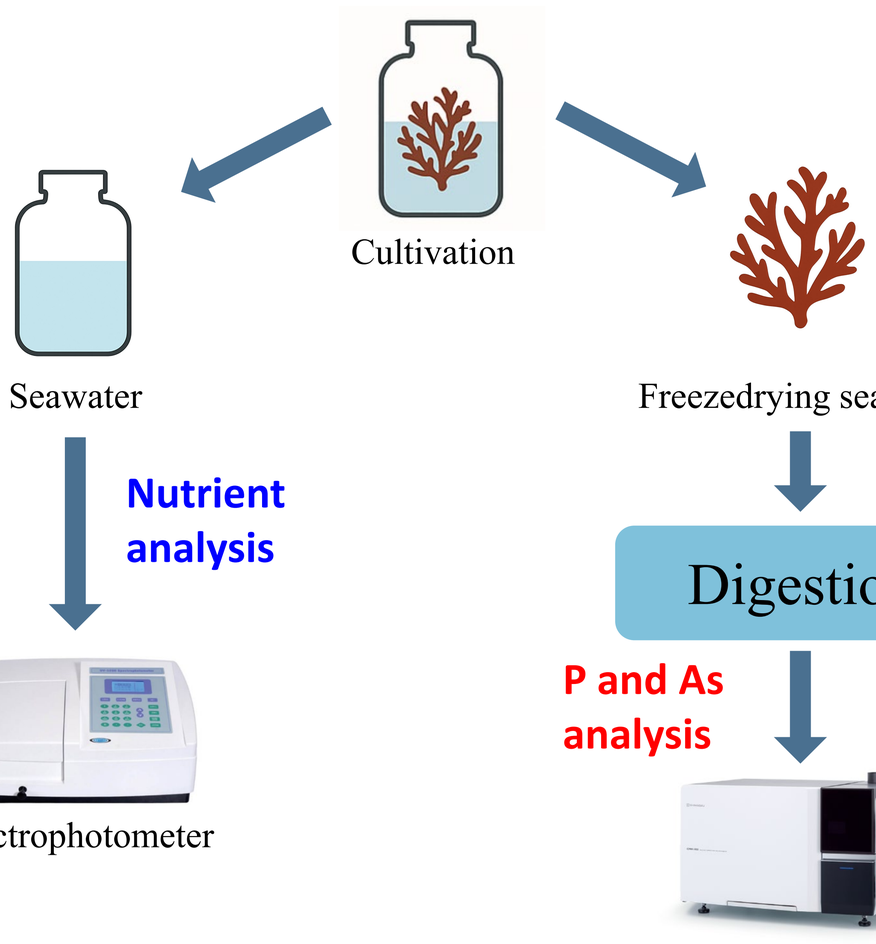
Eucheuma perplexum	growth conditions
Seaweed source	from NTOU
Culture water	natural seawater
Photoperiod	12/12 h
Temperature	26℃
Experiment time	7 days
Water change frequency	2 days

Treatment with varying P and As concentrations

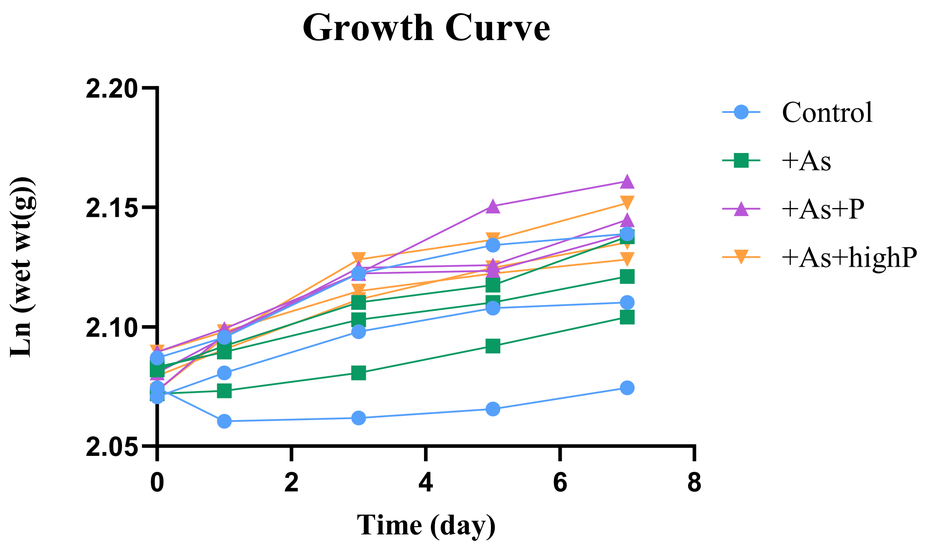
Treatment (n=3)	Phosphate concentration (μM)	Arsenic concentration (nM)
natural sw	0.21	x (n.d.)
+As	0.21	x+100
+As +P	1.21	x+100
+As +high P	2.21	x+100



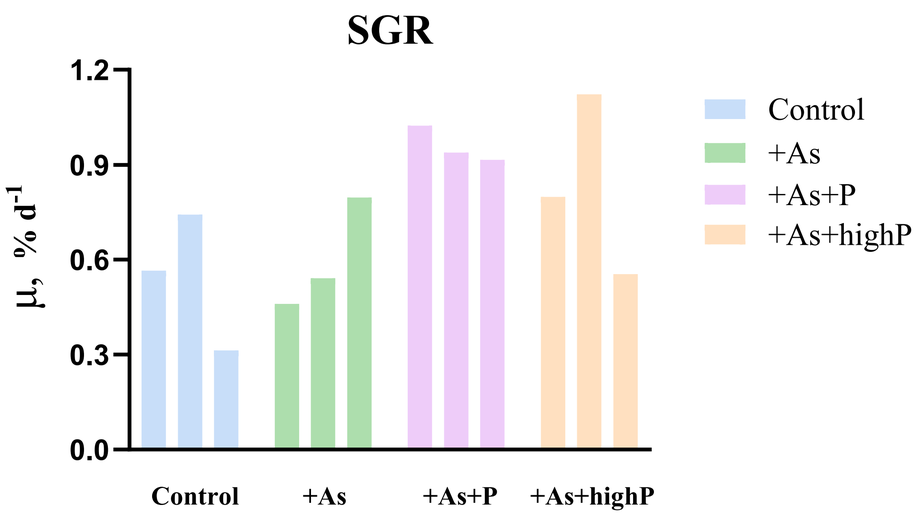
Cultivation of *Eucheuma perplexum*



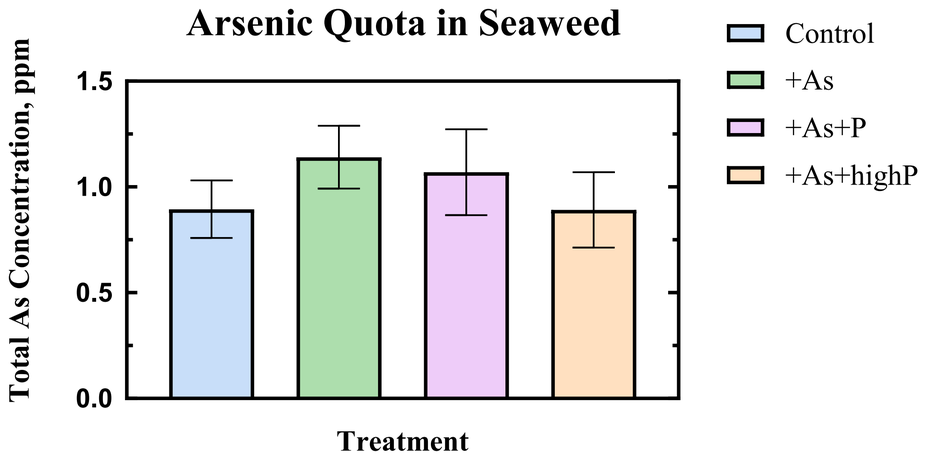
Results



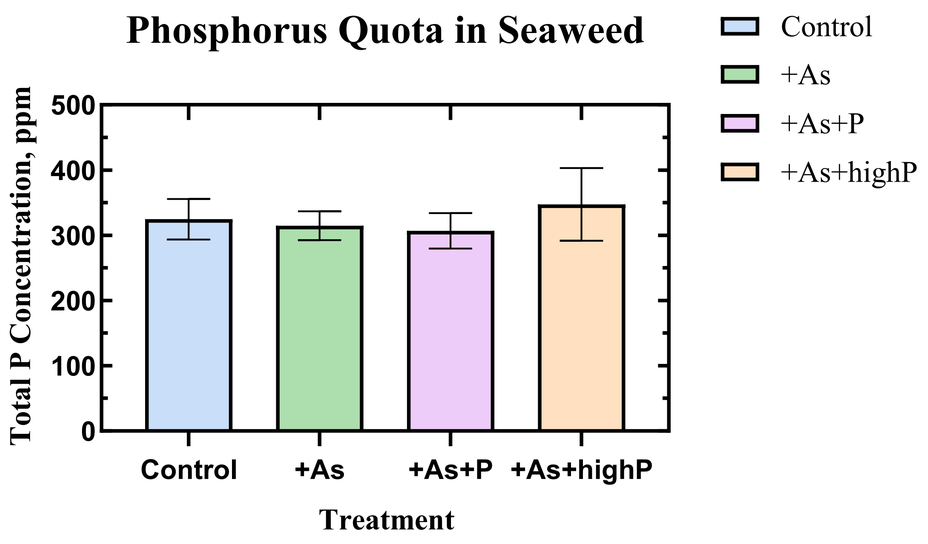
Individual growth curve of *E. perplexum* under different treatments



Specific growth rates of *E. perplexum* under different treatments



Arsenic concentration in *E. p.* under different treatments



Phosphorus concentration in *E. p.* under different treatments

Conclusions

As shown in the above results, we observed a slight increase in As uptake under relatively low phosphorus conditions; however, statistical analysis indicated no significant differences among the treatments. This outcome may be explained by the limited number of replicates, individual variability, and the short cultivation period.

Another potentially important factor is the arsenic speciation used in this study. Since we applied inorganic As^{5+}, its chemical similarity to phosphate may have influenced the uptake pattern. We therefore recommend future studies with longer cultivation durations and different arsenic species to better assess how phosphate availability affects arsenic uptake in seaweeds.