CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)

Su F. Ong

Project Number

S1318

Project Title

Effects of Atmospheric CO(2) on the Nitrogen Production Capabilities of Trichodesmium

Abstract

Objectives/Goals

As a consequence of the rising levels of anthropogenic (human generated) carbon dioxide in the atmosphere, the world ecosystems are undergoing unforeseen changes. The nitrogen cycle constitutes as one of the most important processes within the biological world, with nitrogen being one of the twenty-five necessary elements for life. Therefore, it is essential to understand of future marine ecosystems in regards to organic nitrogen influx. Here, the effects of increased atmospheric carbon dioxide on the nitrogen production capabilities of Trichodesmium, a marine cyanobacterium responsible for the majority of the nitrogen supply in its ecosystems, are measured.

Methods/Materials

By taking advantage of the inverse relationship between pH and CO2 absorption, Trichodesmium cultures were designed to grow in CO2 conditions of the pre-industrial era, the current era, and predicted levels for the years 2060, 2180, and 2250. Nitrogen fixation rates were measured using the acetylene reduction method, in which acetylene is substituted for nitrogen and is broken down into ethylene. 10 mL of culture and 1 mL of acetylene gas were pipetted into gas tight serum vials and allowed to incubated for an interval of 2 hours. Following this, gas samples were withdrawn and ethylene levels were measured using a gas chromatographer.

Results

Per trichome, nitrogen fixation rates were found to sharply decrease by 2060 and level out for the future. However, rates per mL were found to be in direct opposition, with rates increasing linearly from 2060 onward. It can, therefore, be concluded that as CO2 levels rise, nitrogen production per trichome will decrease, but this decrease will be more than compensated by a higher growth curves.

Conclusions/Discussion

Therefore, an increase in organic marine nitrogen influx can be expected to occur in the future if anthropogenic CO2 continue to rise unabated. The consequences of this augmented nitrogen supply are unknown. The results from this particular research represent only one piece of the huge puzzle that constitutes the question of the effects of anthropogenic carbon dioxide on marine nitrogen cycles.

Summary Statement

Exploration of the impact of anthropogenic carbon dioxide on the influx of nitrogen in marine ecosystems.

Help Received

Used lab equipment at the University of Southern California under the supervision of Jill Sohm.