Alteration in Concentration and Spatial Distribution of Selenium, Copper, and Essential Physiological Micronutrients in Saccharina latissima in a Dose Response to Carbon Dioxide

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Climate change, ocean acidification, and decreased pH are causing detriment to kelp in our marine ecosystems. This decrease in pH is known to change the solubility of essential micronutrients in kelp tissue. Climate change may cause concentrations of these micronutrients to alter, causing inefficient functioning of kelp. This decrease in effectiveness will minimize the climate change combating properties of kelp. An experiment was designed to determine a dose-response effect of increasing concentrations of CO2 on the distribution and concentration of these nutrients in kelp. Samples were cultured in five varying concentrations of CO2: 400, 800, 1200, 1800, and 2000 uATM for two weeks. Once the samples were grown, analysis was performed using three techniques: Submicron Resolution X-Ray Spectroscopy (SRX), X-Ray Absorption Near Edge Structure (XANES), and Atomic Fluorescence Spectroscopy (AFS). After analysis, it was concluded that when comparing the 400 uATM and 1200 uATM samples, concentrations of Mn, Cu, and Se decreased, which can cause a loss in the effectiveness of kelps' climate change combating properties. Concentrations of Pb and Cd also decreased; this decrease is beneficial for kelp growth rates. The data from SRX showed a direct relationship between concentrations of As, Br, and Zn and micro atmospheres of CO2. There was also an increase in the homogeneity of these elements. These changes in elemental composition can lead to the detriment of the marine ecosystem since decreases in essential heavy metals can lead to the inability to reproduce and the inability to grow and capture carbon.

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