

An Experimental Study of the Effects of Increased CO₂(g) on the Production and Concentration of Biomacromolecules of Plants

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With impending lunar settlement, atmospheric CO₂ concentration should be examined to observe the effects on the growth of plants for food production. The purpose of this experiment is to discover the effect of elevated CO₂ levels on the concentration of biomacromolecules in plants. Microgreens were soil and hydroponically grown in a nano-nursery that simulated an eCO₂ atmosphere and in a nano-nursery with ambient CO₂ conditions. After growing the microgreens for 7 days, the plants went through 7 rounds of vortexing and centrifugation to prepare a sample solution. These samples were then tested for their concentration of carbohydrates using a spectrophotometer and the Benedict test. It was hypothesized that the glucose production of the microgreens would be higher in the eCO₂ atmosphere, because the eCO₂ would increase the rate of photosynthesis in plants. The theoretical glucose yield supported the hypothesis, showing that the microgreens grown in eCO₂ would have a 261.83% higher production of glucose (C₆H₁₂O₆) compared to the microgreens grown in ambient CO₂. The experimental spectrophotometrical results also supported the hypothesis showing that the glucose concentration in eCO₂ was 42.76% higher than that in the ambient CO₂ when grown in soil and 19.7% higher when grown hydroponically. It was concluded that eCO₂ levels increased the photosynthesis rate in plants, ultimately causing a greater production of glucose and other biomolecules and nutrients produced using glucose. This is significant because it will help space program researchers cultivate crops for food production more efficiently to support settlement on the moon.