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.