Modulation of the Photosynthetic Source:Sink Relationship in Cultures of the Cyanobacterium Nostoc Rivulare

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Abstract:

Nostoc rivulare was grown in batch cultures under controlled CO2 and NO3 – concentrations to modulate the photosynthetic source:sink relationship. Increasing CO2 supply accelerated the accumulation of chlorophyll (Chl) a, i.e., supplemental CO2 combined with double concentrations of NO3 – more than doubled the amounts of Chl a relative to those of the original medium. Photosynthetic oxygen evolution and respiratory oxygen uptake were both enhanced by elevated CO2 and NO3 –. Contents of soluble sugars and starch (total non-structural saccharides) as well as insoluble saccharides (structural fraction) were affected by altering CO2-NO3 – combinations. Uptake as well as reduction of either NO3 – or NO2 – was inhibited by CO2 deprivation. Expanding the sink size via increasing NO3 – supply enhanced photosynthesis and thus the sink (NO3 –) acted as a feed forward stimulator of the source (photosynthesis). The regulatory role of nitrate on photosynthesis was most influential in CO2-deprived cultures since it could enhance photosynthesis to higher levels than CO2-supplemented, nitrate-free cultures.

Keywords:

CO2 enrichment - nitrate - photosynthetic oxygen evolution - respiration

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