

# Effect of Herbicide Monuron on Carbon Metabolism in Cyanobacterium *Nostoc Muscorum* Meg 1 is Mediated via Repression and/or Degradation of D1 Protein and the Calvin Cycle Enzyme RuBisCO.

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**Abstract**—Spraying of herbicides during cultivation results in excess herbicides reaching soil effecting non-target organisms like cyan bacteria that have known beneficial effects on soil and crop plants. The sensitivity of cyan bacteria towards herbicides varies, depending on the species and the kind and the dose of herbicide being used. Anything that affects these primary producers can be expected to affect the ecological balance of rice fields. In this sense, the aim of this study was to investigate in details, the effects of herbicide monuron on various aspects of carbon metabolism in a dominant cyan bacterium isolated from a rice field.

The consequences of monuron exposure on growth, photosynthetic pigments, PSII activity, carbohydrate and biomass production in the cyan bacterium *Nostoc muscorum* Meg 1 were studied using different doses ranging from 20 ppm to 100 ppm. The expression of D1 protein (the host for PSII complex of photosynthetic electron transport chain) and RuBisCO (the key enzyme for CO<sub>2</sub> fixation) were estimated using western blot analysis. Apart from carotenoids content and expression of RuBisCO activity that increased upon treatment with 20 ppm and 40 ppm monuron, all the other parameters studied showed enhancement only at 20 ppm, above which (40-100 ppm) the detrimental effects were visible. This in turn reflected in reduced growth and biomass production of the organism. The light, scanning and transmission electron microscopic study further exposed various negative changes due to herbicide treatment in the morphology and ultra structure of treated organism.

**Keywords:** Cyan bacteria, rice field, pigments, PSII, carbon fixation, D1, RuBisCO.