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RESEARCH ARTICLE

Effect of solar ultraviolet-B radiation on growth and enzymes of nitrogen assimilation in *Cylindrospermum* sp.

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SUMMARY : A study was undertaken, under controlled laboratory conditions to investigate the influence of ultraviolet-B (UV-B) radiation on the growth, nitrate uptake, nitrate reductase (NR) ammonium uptake, glutamine synthetase (GS) and nitrogenase enzyme of cyanobacterium, *Cylindrospermum* sp. Test alga was isolated from rice field soils of Allahabad, India and grown in BG-11 culture medium. Culture of log phase was treated with UV-B (0-120 min exposure) which showed inhibitory effect on growth (chlorophyll-a) and found to be dose dependent. Ammonium uptake and GS were also inhibited by UV-B treatment but there was no total loss of these activities. Among the various parameters, nitrogenase enzyme was most sensitive for all the doses of UV-B and was not detected beyond 90 min exposure. In contrast, a significant increase in nitrate uptake and nitrate reductase following exposure of *Cylindrospermum* sp. to UV-B was also observed.

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There is mounting evidence that the solar flux of UV-B radiation (280-320 nm) has increased at the earth's surface due to the depletion of the stratospheric ozone layer by anthropogenically released atmospheric pollutants such as chlorofluorocarbons (Callaghan *et al.*, 2004; Cen and Bornman, 1990). As a result, UV-B reaches the earth's surface directly which is harmful to living organisms. This created interest on the study of UV-B radiation induced effects and its recovery on the living system (Dohler,1985; Gao *et al.*, 2007).Although only a small fraction of the electromagnetic spectrum, UV-B light is sufficiently actinic to evoke a wide range of damaging photobiological effects because of its absorption by biomolecules *i.e.* nucleic acids and proteins (Sinha and Hader, 2008). The fluence rates of UV-B radiation reaching to the green plants is of major concerns specially cyanobacteria. Since cyanobacteria were among the early photosynthetic prokaryotes, thus it seems probable that during their evolutionary history, they might have faced more intense ambient solar UV-B radiation than others and may have acquired the ability to accumulate UVA/UV-B screening pigments to attenuate UV-B induced damage (Sinha and Hader, 2008). Cyanobacteria with a cosmopolitan distribution are the most common photosynthetic prokaryotes on earth playing an important role as a atmospheric nitrogen fixers in both aquatic as well as terrestrial ecosystems. The role of cyanobacteria as natural biofertilizers in rice paddy fields is well documented (Sinha and Hader, 1996). According to an assumption cyanobacteria fix 15-18 kg N ha^{-1} yr^{-1} through the process of biological nitrogen fixation with the help of enzyme nitrogenase. Cyanobacteria also posses nitrate reductase and nitite reductase enzyme which convert nitrate to nitrite and nitrite to ammonia (Sinha and Hader, 1996). In cyanobacteria, after transport by specific permeases, ammonium is incorporated into carbon skeletons by the sequential action of glutamine synthetase (GS) and glutamate synthetase (GOGAT) enzyme. Enhanced level of UV-B radiation has been reported to cause severe inhibition of growth as well as nitrogen fixation in legumes (Cen and Bornman, 1990) and inhibition