南極陸生光合成生物の光障害リスクに見る生理学特性と生育環境の関連性

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Research about connection between physiological feature and habitable area from a point of view against risk of photoinhibition in terrestrial photosynthetic organisms in Antarctica

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Photosynthetic organisms growing in terrestrial region of continental Antarctica are facing severe stresses. Clarifying their adaptation strategy may permit predictions of future responses of organisms and the effects of recent climate changes occurring in Antarctica. We aimed for evaluating the physiological feature of photosynthesis by focusing on photoinhibition at ambient light energy condition.

Three photosynthetic organisms, *Prasiola crispa* (green algae), *Umbilicaria decussata* (lichen), and *Ceratodon purpureus* (bryophyte) harvested from a study site in East Antarctica, were used as test organisms. We used OKAZAKI large spectrograph (NIBB, Aichi, Japan) for monochromatic-light irradiation treatments, and measured wavelength dependency of photoinhibition by calculation of reaction factor, k_{pi}. On the other hand, we set micro meteorological observing system at the study site in Yukidori Zawa of Langhovde at the Sôya Coast in East Antarctica and had continued monitoring of their photosynthetical condition.

A green-alga, *P. crispa* has high sensitivity of photoinhibition by strong light exposures especially in UV dose, whereas a test lichen showed high resistance in any wavelength. Bryophyte showed sensitivity only in 320 nm. Dehydrated *P.crispa* showed one-tenth smaller reaction constant than hydrated condition. Difference of physiological feature of photoinhibition emerged as the difference of habitable areas at continental Antarctica.

Mathematization of photoinhibition permitted prediction under ambient Antarctic light condition. *P. crispa* may need to pay large cost in repairing of photosystems for adapting to grow in continental Antarctica rather than lichen or bryophyte. Climate change will affect their energy balance and the ecological effect might be very different in each organism having different adaptation strategy.