Adaptation strategy of aerial green alga, *Prasiola crispa* growing in Antarctica

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Lichens, bryophyta, algae and cyanobacteria have a critical role as primary producer in terrestrial ecosystem of Antarctica. They are surviving the severe condition exposed to low temperature, desiccation, strong wind and high light stresses. *Prasiola cirspa* is one of the dominant terrestrial green algae in Antarctic region, and often constitutes a large sheet-like colony on the soil surface. We set up a year-round micrometeorological observing system at the habitats of *P. crispa*, *Umbilicaria decussate* (lichen) and *Bryum argenteum* (bryophyta) in the Yukidori Zawa of Lnghovde, and obtained data every 10 min for five years (from Jan. 2013 to Feb. 2018). The observing items were temperature, relative humidity (RH), PAR around organisms and organisms' temperatures. On the other hand, for the analysis of physiological aspect, we studied the dependence of wavelengths from 320nm to 750nm against photodamage in photosystem by using the Okazaki Large Spectrograph (National Institute for Basic Biology, Okazaki, Japan)[a].

During the observation period of five years, the monthly RH and PAR showed high variety in summer season (January to March) but temperature showed similar trend except for January. January 2013 was warmest month and the precipitation was so limited. The monthly average temperatures around organisms were higher than 5°C and maximum temperature of organisms over 25°C, whereas the monthly average and the maximum temperatures in general years were approximately 2 and 17°C, respectively. Water availability and light intensity in summer season are expected to have a big impact to net photosynthetic production. We predicted active periods and photo damage risk in the three photosynthetic organisms by using physiological experimental data. As a result, risk of photodamage in *P. crispa* is highest in January and low light condition such as cloudy day is suitable for photosynthesis. On the other hand, in our recent study, it was revealed *P. crispa* had a unique light-harvesting chlorophyll binding protein (Pc-frLHC) which absorbed far-red light and enable to excitation of photosystem II[b]. Pc-frLHC is expressed in the lower side of layer of colony and is contributing to increase net photosynthetic production inside of colony. We mention about adaptation strategy of *P. crispa* growing Antarctica from ecological and physiological aspects.

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References

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