Nitrogen concentration of phototrophs at different successional stages in a High Arctic glacier foreland, Ny-Alesund, Svalbard

Atsushi Kume[1]; Yukiko Bekku[2]; Hiroshi Kanda[3]

[1] Environ Biol & Chem, Univ Toyama; [2] Tsuru Univ.; [3] NIPR

http://www.sci.u-toyama.ac.jp/env/kume/index.html

Low soil nutrient concentration and low water holding capacity because of undeveloped soil are important factors of growth restriction in the High Arctic. We investigated the effects of soil condition on the nitrogen concentration of photosynthetic parts (Np) of two morphs of *Saxifraga oppositifolia* and other phototrophs in a glacier foreland in the High Arctic at Ny-Alesund, Svalbard. At this site, soil nitrogen concentration (Ns) increased along with the progress of primary succession within a small area. When Ns was lower than 0.05 %, the mean Np of plot increased sharply with Ns. However, when Ns was exceeded 0.05 %, the increase in Np was not significant and Np showed stable values, about 1.5 %. *Salix polaris* showed the highest Np of all the measured species, and moss and lichen showed lower Np than vascular plants. The soil mass water contents varied from 10% to 140% and highly correlated with the vegetation cover. On the other hand, the average delta^{13}C values of the sites were constant regardless of the vegetation cover. These facts suggested that the transpiration from the ground surface is increased with vegetation cover and most of the phototrophs were strictly regulating their water use efficiency and nitrogen concentration regardless of the growth conditions.

We compared two morphs of *S. oppositifolia*, the prostrate form (P-form) and the cushion form (C-form). Regardless of the successional stage and the growth form, Np showed similar values. The current results and previous studies suggested that *S. oppositifolia* and most of plants growing in the study area kept a constant Np and a water use efficiency regardless of the soil conditions.

P-form adapted to grow under moist environment and covered large ground surface area with small biomass and it might be beneficial to absorb nitrogen from the soil surface, where the highest concentration. It performed high photosynthetic production and growth with much transpiration with less nitrogen per ground surface area. C-form adapted to water restricted environment and covered small ground surface area with concentrated biomass. It performed high photosynthetic production with less transpiration with high nitrogen per ground surface area. Suppressed height competition in the High Arctic is important to explain these phenomena.