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Effect of tar spot disease on photosynthetic production of *Salix polaris* in the Norwegian High Arctic

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In accordance with GCM predictions, average Arctic temperatures have increased rapidly, at almost twice the global average rate in the past 100 years. It has been predicted that the climate change will influence not only plant but plant pathogen. However, little is known about ecophysiological characteristics of plant pathogen and effect of pathogen on plant in the Arctic terrestrial ecosystem. In this study, we aimed to clarify the effect of plant disease on net production of vascular plant in the Arctic ecosystem.

Study site was situated in polar semi desert in Ny-Alesund, Spitsbergen Island, Norway. In summer of 2009 and 2010, distribution, incidence, growth rate of a pathogen (tar spot disease) and ecophysiological characteristics of a vascular plant (*Salix polaris*) were investigated. In order to know effect of the disease on net production of *S. polaris*, we estimated the net production of the infected and uninfected leaves using a model.

Distribution of tar spot was widespread but the incidence was very low. Tar spot symptom emerged after the leaves attained full size. The symptom extended its area for a month and finally covered 16-58% (average 25%) of a leaf. There was no significant difference between the photosynthetic activity of infected leaf and uninfected leaf. Tar spot covered area in itself had no photosynthetic activity. In contrast, photosynthetic activity of green part of infected leaf was similar level with the activity of uninfected leaf. It was calculated that net production per leaf decreased about 5-13% (average 7%) by infection of tar spot disease.

In leaf level, it was estimated that small but significant effect of the disease on the net production of *S. polaris*. However, in community level, the effect would be negligible because of low incidence of the disease.

Keywords: Arctic, plant pathogen, net primary production, *Salix polaris*, tar spot disease