Microfungi associated with *Salix* spp. in Arctic and Antarctic tundra

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Willows (*Salix* spp.) are dominant dwarf shrubs in arctic tundra of the northern hemisphere. In contrast, no indigenous vascular plants, including *Salix* spp., were encountered in continental Antarctica, but willow saplings originating from Hokkaido were transplanted at an experimental site near Syowa station. This provided a unique opportunity to investigate the diversity and ecology of fungi associated with willow remains on continental Antarctica and to compare them with those of the Arctic. The purposes of the present study were to examine the abundance, diversity, and succession of fungi and their relationship with chemical changes in dead leaves and stems of *S. arctica* in the Canadian Arctic (80˚50' N) and dead stems of exotic *S. pauciflora* and *S. reinii* in Lutzow-Holm Bay area, east Antarctica (69˚00' S) (Osono et al. 2019). A total of 15, 14, and 18 fungal species were isolated from dead leaves and stems of *S. arctica* and dead stems of exotic *Salix* spp. in Antarctica, respectively. No fungal taxa were found common to dead remains of the Arctic and Antarctic willows. No turnover of fungal species was found in dead leaves and stems of *S. arctica* during either primary succession on moraines in different stages of ecosystem development or during decomposition of either leaves or stems in the Arctic; however, only minor changes in the frequencies of occurrence were detected for major fungal taxa between dead leaves at different stages of decomposition. Mean values of total hyphal lengths measured by direct observation using an agar film method were 4,068 and 1,970 m/g in leaves and stems of *S. arctica*. Total hyphal length increased with the decomposition of leaves, whereas it was not significantly different between moraines in different stages of ecosystem development. In the Arctic, the amount of holocellulose relative to recalcitrant compounds (as AUR) decreased with the decomposition of *S. arctica* leaves, indicative of selective decomposition of holocellulose. Pure culture tests indicated that the major fungal species (*Comoclathris* sp., *Rhizoctonia* sp., and an unidentified Dothideomycete) were capable of decomposing holocellulose selectively in sterilized leaves of *S. arctica*, consistent with the pattern of changes in organic chemical components in decomposing leaves. In contrast to the chemical changes in the leaves, in Arctic dead stems there were no obvious chemical changes, no significant increase in hyphal length, and no turnover of fungi, which suggests that there was low biological activity of decomposition processes in the dead stems. No data about fungal succession, hyphal length, and decomposition were available for dead stems of exotic willows in Antarctica. *Cadophora luteo-olivacea* is a presumably indigenous fungal species detected in exotic *Salix* stems in Antarctica, suggesting that exotic willow remains serve as substrata for the colonization by indigenous fungi.

Fig. Photographs of dead willow materials. Left: *Salix arctica* in the Arctic. Right: location where *Salix* spp. were planted in Antarctica.

References

Osono T., Matsuoka S., Hobara S., Hirose D. & Uchida M. Diversity and ecology of fungi in polar region: comparisons between arctic and Antarctic plant remains. In: Fungi in Polar Regions (eds. by M. Tsuji & T. Hoshino), CRC Press, 2019, 17-29.