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The water regime of silver (Betula pendula Roth) and Karelian (Betula pendula var. carelica) birches under sufficient and limited soil moisture conditions.

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The sensitivity of the silver (*Betula pendula* Roth) and Karelian (*Betula pendula var. carelica*) birches to different soil moisture conditions was investigated using results of field measurements provided in 2008-11 at forest experimental sites of the Forest Research Institute of Karelian Research Center of RAS in Karelia, Russia. Karelian birch is a specific form of the silver birch and it is characterized by structural abnormalities of trunk tissues (thickenings on the trunk, the marble-like pattern and figured wood) that results in considerable reduction of number of xylem vessels and increase of parenchyma cell number (Novitskaya, 2008). For experimental study several three-, five- and seven-year old trees of the silver and Karelian birches were selected.

The transpiration rate of the leaves (E) was determined using the portable photosynthesis system Li-6400XTR (Li-Cor, USA). Leaf water potential of photosynthesizing leaves (Ψ) was measured using the pressure chamber. Amount of available water in leaves (WC_f), water deficit (*WSD*) and saturating leaf water content (WC_s) were calculated using the following equations: $WC_f = (W_f - W_d)/\, W_d$ ($g_{water} g^{-1}_{dryweight}$), *WSD* = $(W_s - W_f)/(W_s - W_d)$ (%), $WC_s = (W_s - W_f)\, /\, W_d$ ($g_{water} g^{-1}_{dryweight}$), where W_f and W_d – fresh and dried leaf biomass, W_s – weight of the leaves at saturation.

Comparisons of three and five years old birches showed that the differences between WSD and WC_s of the Karelian and silver birch increased with tree age. It can be explained that the Karelian birch has increased parenchyma and significant amount of water can be additionally stored there. Comparisons of *WSD* and WC_s of silver birches of both forms show that the differences between forms increase with growth of water deficit in plants. It was observed in both seasonal and daily patterns. The largest differences were indicated at the afternoon and at the end of growing season (from middle of August until September). These results also show that *WSD* and WC_s of the Karelian birch were some smaller than the silver birch values probably due to some additional "water source" that has the Karelian birch in the bark parenchyma. Analysis of seasonal pattern of E of seven years old birches showed that the daily E of the silver birch is some higher than E of Karelian ones. Comparisons of E of both forms under stressed soil moisture conditions showed a higher decrease in E and leaf water content at the afternoon for the silver birch. It also indicates that the Karelian birch can store more water due to some specific features of assimilation mechanisms and xylem structure. Comparison of water potentials of both birch forms didn't reveal any significant differences. However, it was shown that the Karelian birch has usually lower values of Ψ than the silver birch.