INVESTIGATION OF THE EFFECTS OF *PHYTOPHTHORA ALNI* SUBSP. *ALNI* COLLAR INOCULATION ON CO_2 UPTAKE, TRANSPIRATION AND CARBOHYDRATE CONTENT OF *ALNUS GLUTINOSA* SAPLINGS

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Three-year-old *Alnus glutinosa* trees were single or double-inoculated at the stem basis with *Phytophthora alni* subsp. *alni* under natural climate conditions to clarify local and systemic pathogenic effects on young alder saplings. Lesion formation on the bark showed a biphasic pattern with moderate extension rate in spring and strong development during late-summer. However, large variability was encountered in pathogen development within the collective of the infected plants, ranging between high susceptibility and almost resistant. Infection resulted in strong growth retardation, and finally 75% of all inoculated trees had died after two years of infection. During disease development, rates of CO_2 uptake and transpiration were significantly reduced. Consequently, minimum levels of leaf water potential were less negative in infected than control trees, reflecting stomatal narrowing under infection. A linear regression was found, when all girdling values of the single and double inoculated saplings were plotted versus the corresponding mean values of photosynthesis measured in 2004, proving the inhibitory systemic effect of stem girdling on leaf photosynthesis. In the second year of infection the amount of girdling of all surviving saplings decreased to values below 50 per cent. All these saplings did no longer differ from controls in terms of photosynthesis, transpiration and water use efficiency (WUE). Starch levels of leaves of infected trees were significantly increased relative to control trees, possibly indicating destruction of the bark tissue by the pathogen to cause blockage of phloem transport from leaves to roots. Given such a syndrome scenario, stomatal closure appears to result from product-inhibited photosynthesis upon phloem disruption, preventing WUE to decline. Hence, the found gas exchange responses are systemic responses of the local pathogen infection at the stem basis.