



Research article

Transpiration, CO₂ assimilation, WUE, and stomatal aperture in leaves of *Viscum album* (L.): Effect of abscisic acid (ABA) in the xylem sap of its host (*Populus x euamericana*)

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Received 11 December 2006; accepted 25 July 2007

Available online 31 July 2007

Abstract

Leaves of the mistletoe *Viscum album* (L.) show a high rate of transpiration, even when the host is under severe drought stress. The hypothesis that a strong control of ABA influx from the xylem sap of the host into the mistletoe prevents stomatal closure in mistletoe leaves was tested under the following conditions: sections of poplar twigs carrying a mistletoe were perfused with artificial xylem sap that contained different ABA concentrations and both transpiration and ABA levels were analysed in mistletoe leaves. Despite variation by a factor of 10⁴, the ABA content of the host xylem did not affect ABA levels, leaf transpiration, CO₂ assimilation, WUE, or the degree of stomatal aperture in mistletoe leaves. These observations support the hypothesis of a strong control of ABA influx from the host of the xylem into the mistletoe, although degradation of ABA before it enters the mistletoe leaves cannot be excluded. This mechanism may ensure a water and nutritional status favourable for the mistletoe, even if the water status of the host is impaired.

Despite the lack of short-term sensitivity of ABA levels in mistletoe leaves to even strong changes of ABA levels in the xylem sap of the host, ABA levels in mistletoe leaves were relatively high compared to ABA levels in the leaves of several tree species including poplar. Since significant transpiration of the mistletoe leaves was observed despite high ABA levels, a diminished sensitivity of the stomata of mistletoe leaves to ABA has to be concluded. The stomatal density of adaxial *Viscum* leaves of 89 ± 23 stomata per mm is lower than those reported in a study performed at the end of the 19th century.

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Keywords: ABA; Abscisic acid; Assimilation; Stomatal aperture; Transpiration; Xylem sap

1. Introduction

One of the most striking features of the mistletoe *Viscum album* (L.) is its high rate of transpiration, even when the

host is under severe drought stress [23,54]. As a consequence, twigs of the host that are distal to the insertion of a mistletoe often dry out completely and die [53]. For several reasons, this observation is surprising. Excessive water loss of leaves under drought stress is usually prevented to some extent by regulating the degree of stomatal aperture [40,52] and abscisic acid (ABA) produced in the roots and allocated to the leaves with the transpiration stream is a central component of the

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