

# EFFECT OF *VISCUM ALBUM* L. INFESTATION ON GAS EXCHANGE AND WATER POTENTIAL SEASONAL DYNAMICS OF ITS HOST *TILIA CORDATA* MILL.

Roman Plichta, Roman Vitásek, Libor Joura, Tatiana Nikitina, Roman Gebauer

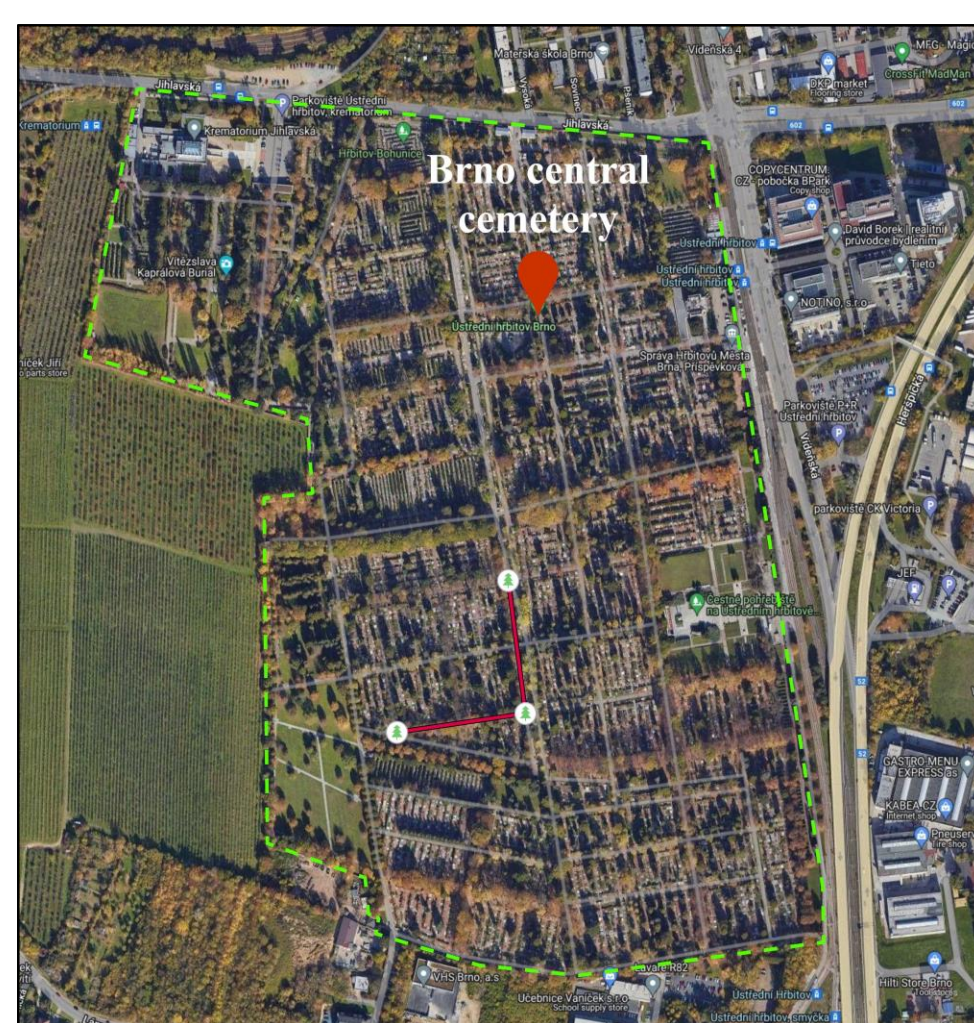
Mendel University in Brno, Faculty of Forestry and Wood Technology, Brno, Czech Republic

## Introduction

European mistletoe (*Viscum album* L.) utilizes xylem sap of its host also during drought period, inflicting higher water stress by lower water potential in host branch regardless on host stomatal regulation. Contrary, isohydric host tree species, like a lime tree (*Tilia cordata* Mill.), reduce water stress by sensitive stomatal control, limiting intrinsic photosynthesis. The magnitude and seasonal dynamics of this relationship are, however, poorly understood.

**We specifically anticipated:**

- Lower water potential in host twigs during whole season
- Lower stomatal conductance and net photosynthesis of host leaves during whole season
- Levels of twig water potential close to embolism formation during drought



LI-COR 6400-Portable System



Scholander pressure chamber (PMS 1505D-EXP)

## Methods

- Brno cemetery, CZ
- Sunny days, monthly, 2024 season
- 5 heavily infested lime trees (*Tilia cordata* Mill.) by mistletoe (*Viscum album* L.) and 5 control lime trees
- Mid-day leaf and twig water potential (WP) using Scholander pressure chamber (PMS 1505D-EXP)
- Leaf stomatal conductance ( $g_s$ ) and net photosynthesis ( $A_{net}$ ) simultaneously using LI-COR 6800

## Results

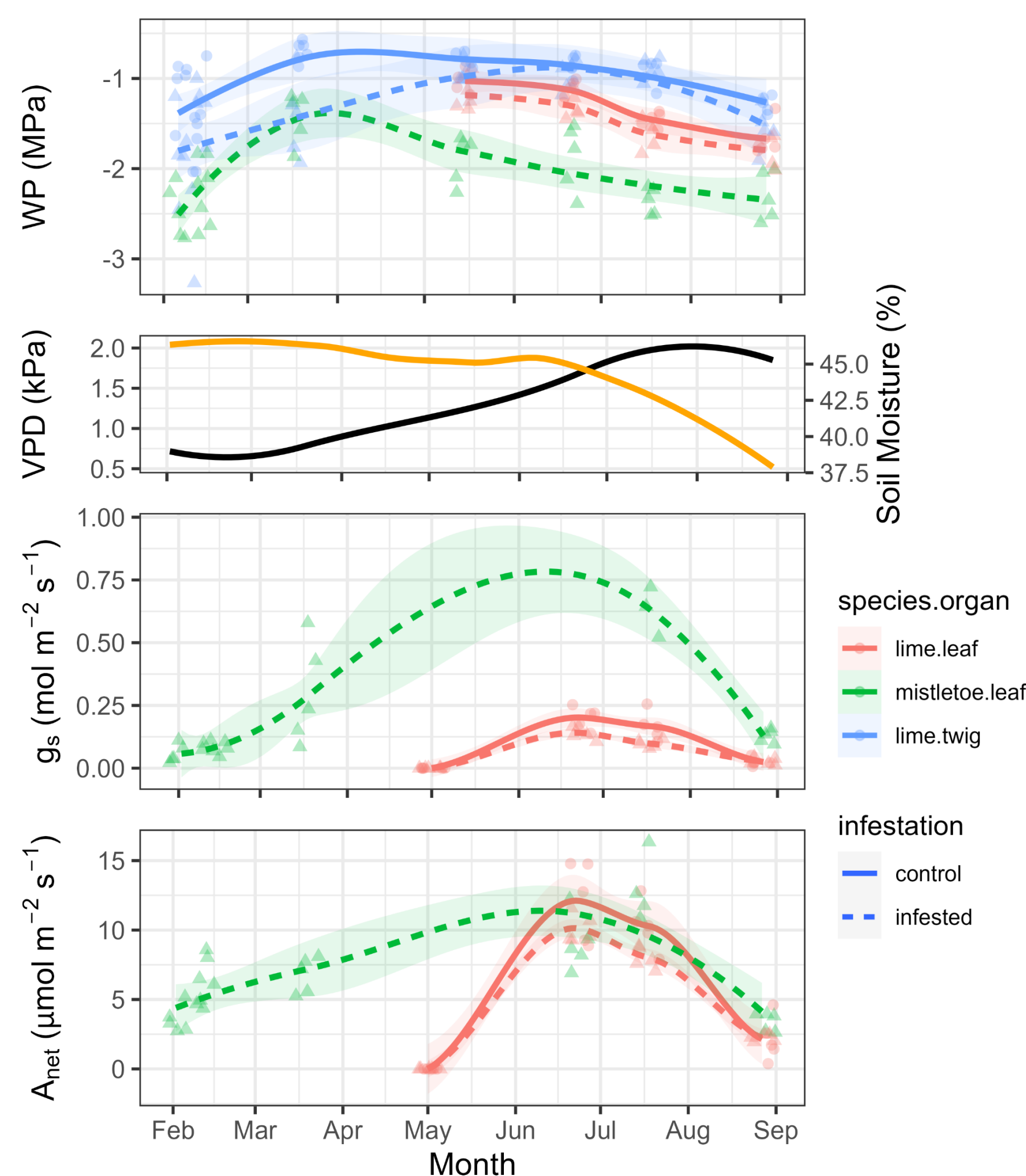


Fig.1: Seasonal dynamics of water potential (WP), stomatal conductance ( $g_s$ ) and net assimilation rate ( $A_{net}$ ) of the *Viscum album* leaves (green), *Tilia cordata* twigs (blue) and leaves (red), affected by infestation (dashed lines) and control (solid line). Vapor pressure deficit (VPD; black) and soil moisture (orange) depict soil and atmospheric conditions during measurements.

### Early Spring (February-May):

- Twig water potential (WP) in infested lime trees was lower by  $0.5 \pm 0.3$  MPa compared to control trees, likely due to mistletoe transpiration and low soil water availability (Fig. 1).
- This decrease in WP was still above the embolism threshold for lime branches ( $P_{50} \sim 3.5$  MPa).

### Growing Season (May-September):

- Infested lime trees had lower leaf WP by  $0.16 \pm 0.02$  MPa, but did not exceed the isohydry threshold of 2 MPa.
- Twig WP in infested trees was only slightly lower ( $0.12 \pm 0.13$  MPa) than control trees (Fig. 1).

### Photosynthesis and Stomatal Conductance:

- Lower leaf WP in infested trees resulted in a  $21 \pm 27\%$  decrease in stomatal conductance ( $g_s$ ) and an  $11 \pm 14\%$  reduction in net photosynthesis ( $A_{net}$ ) compared to control trees (Fig. 1), supporting the hypothesis of long-term effects on carbohydrate starvation.

### Mistletoe Observations:

- Mistletoe exhibited the expected trends of lowest leaf WP and highest  $g_s$  rates (Fig. 1).
- Surprisingly,  $A_{net}$  rates were similar to those of lime trees, but with a vegetation season that was 3 months longer (Fig. 1), contradicting the generally assumed low  $A_{net}$  rates in mistletoe.

## Conclusions

Our study demonstrates that mistletoe (*Viscum album* L.) infestation in lime trees (*Tilia cordata* Mill.) leads to reduced twig and leaf water potential, with slight impacts on stomatal conductance and photosynthesis. While the water stress from mistletoe is not severe enough to cause embolism or immediate mortality, it may contribute to long-term carbohydrate starvation in the host trees. Surprisingly, mistletoe showed similar photosynthesis rates to its host with a significantly longer vegetation period.

**ACKNOWLEDGEMENTS** The research was financed by Internal Grant Agency MENDELU reg. IGA-LDF-22-TP-007

This project was made possible with the support of Správa hřbitovů města Brna