

# Myrtle rust infection reduces photosynthesis of pōhutukawa seedlings

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## Introduction

Myrtle rust is a fungal disease caused by *Austropuccinia psidii* and affects Myrtaceae<sup>(1)</sup>, such as pōhutukawa. Pōhutukawa (*Metrosideros excelsa*) is a native species and has significant cultural and ecological importance to New Zealand.

Myrtle rust infection may cause significant changes in leaf characteristics and functions of the host plant<sup>(2)</sup> (Figure 1).

To address the question “**What are the effects of myrtle rust on photosynthesis**” we measured leaf photosynthesis of pōhutukawa seedlings at different time points after infection and its relationship to disease severity.

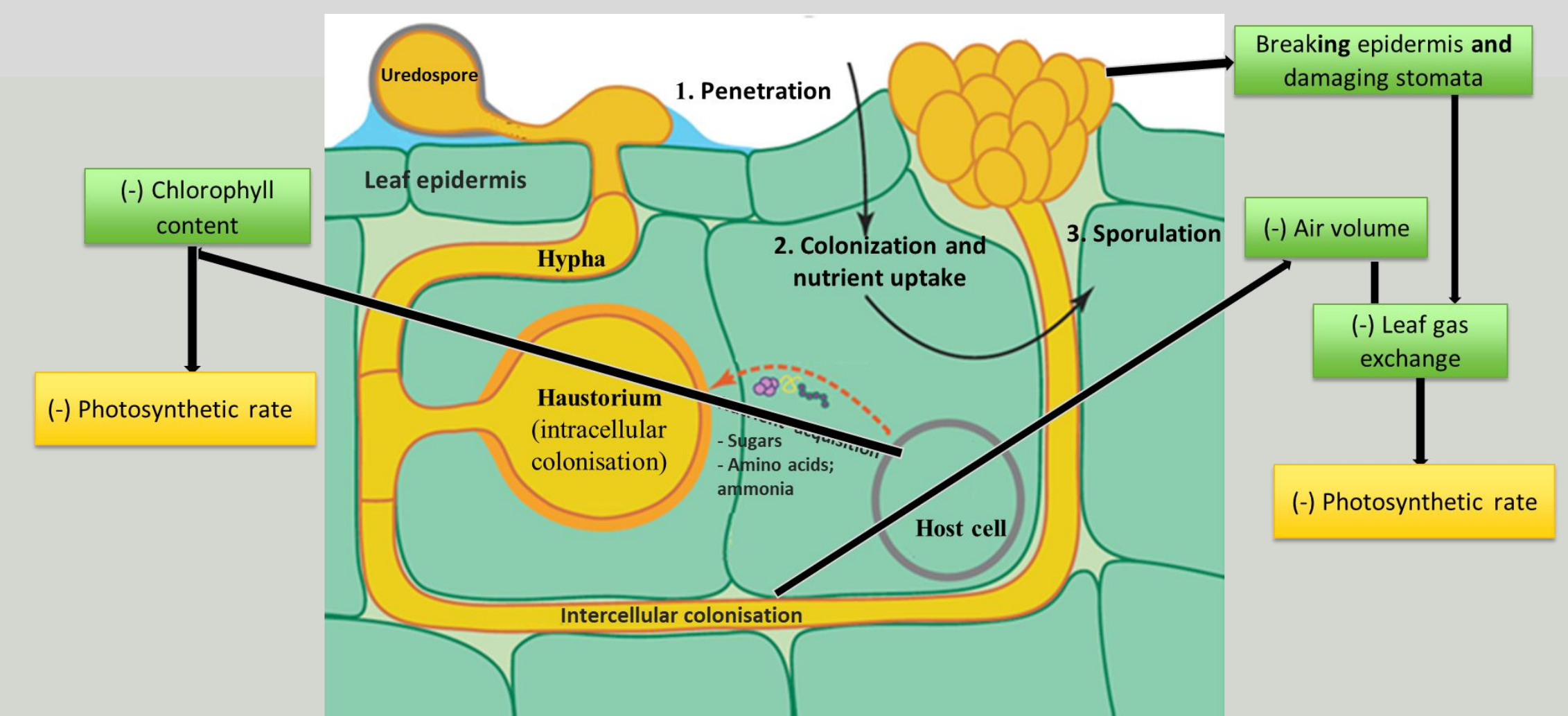


Figure 1: Myrtle rust's potential effects on photosynthetic rate. Edited from <sup>(3)</sup>



Figure 2: Myrtle rust on pōhutukawa seedlings. Photo: Hoa Nguyen

## Methods

- Glasshouse experiment with two treatments (infected vs. control).
- Measurement was made with a portable CO<sub>2</sub>/H<sub>2</sub>O analyzer.
- Disease severity was quantified as percentage of leaf area with myrtle rust symptoms.



Figure 3: Measuring leaf photosynthesis

## Results

### Disease severity

- Disease severity increased significantly over time ( $p < 0.001$ ), ranging from 8 to 78% (Figure 4A).
- Infected leaves turned chlorotic and necrotic from week seven after inoculation (Figure 4B).

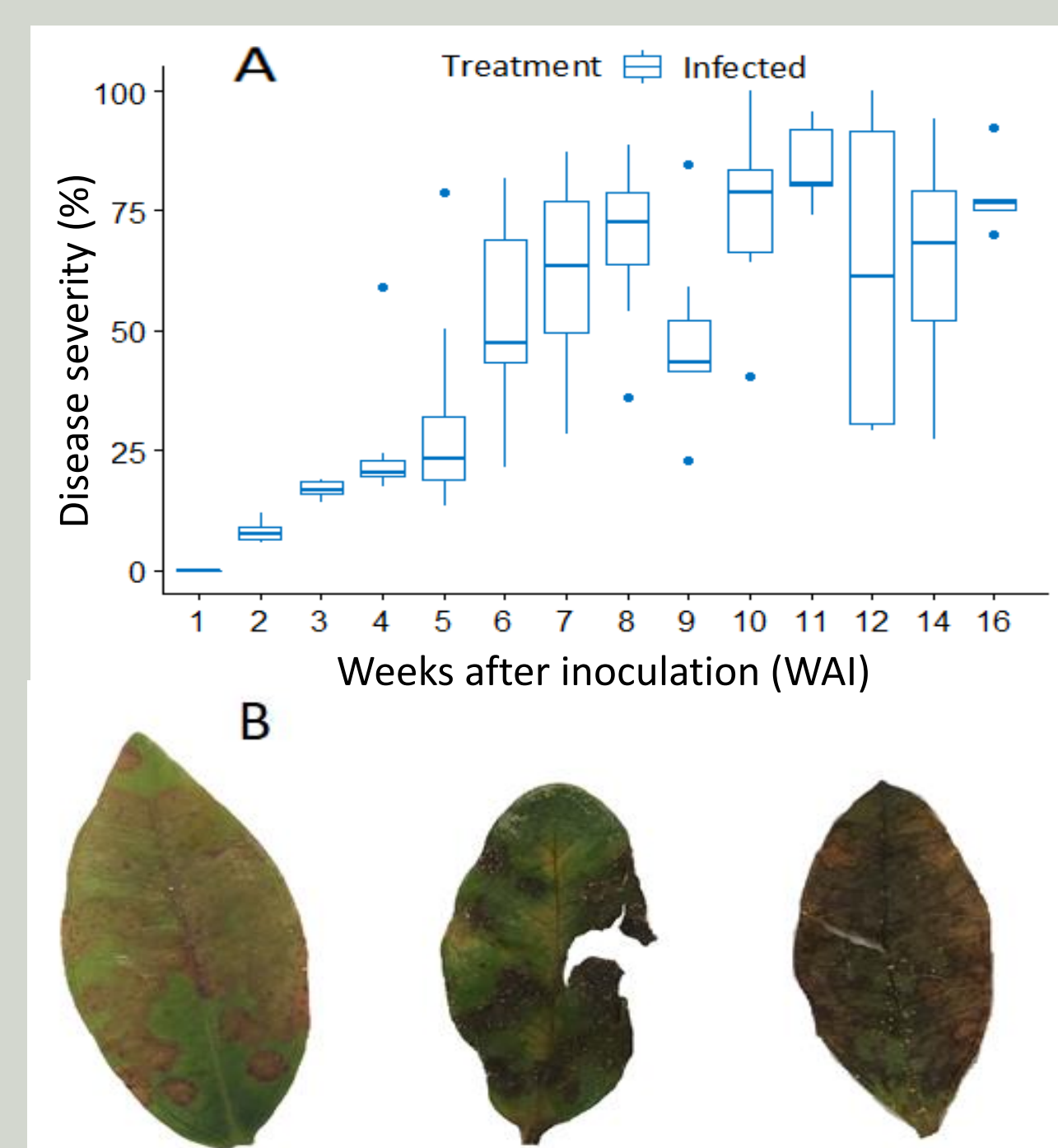


Figure 4: Disease severity (A); chlorotic and necrotic pōhutukawa leaves (B)

### Leaf photosynthesis

- The effect of *A. psidii* infection on leaf photosynthesis was significant ( $p < 0.001$ ).
- Photosynthesis of infected leaves was reduced by 26% in the first week after inoculation and was close to 100% at the end of experiment (Figure 5).
- Photosynthesis showed a significant negative correlation to disease severity ( $p < 0.001$ ,  $r = -0.91$ ) (Figure 6).

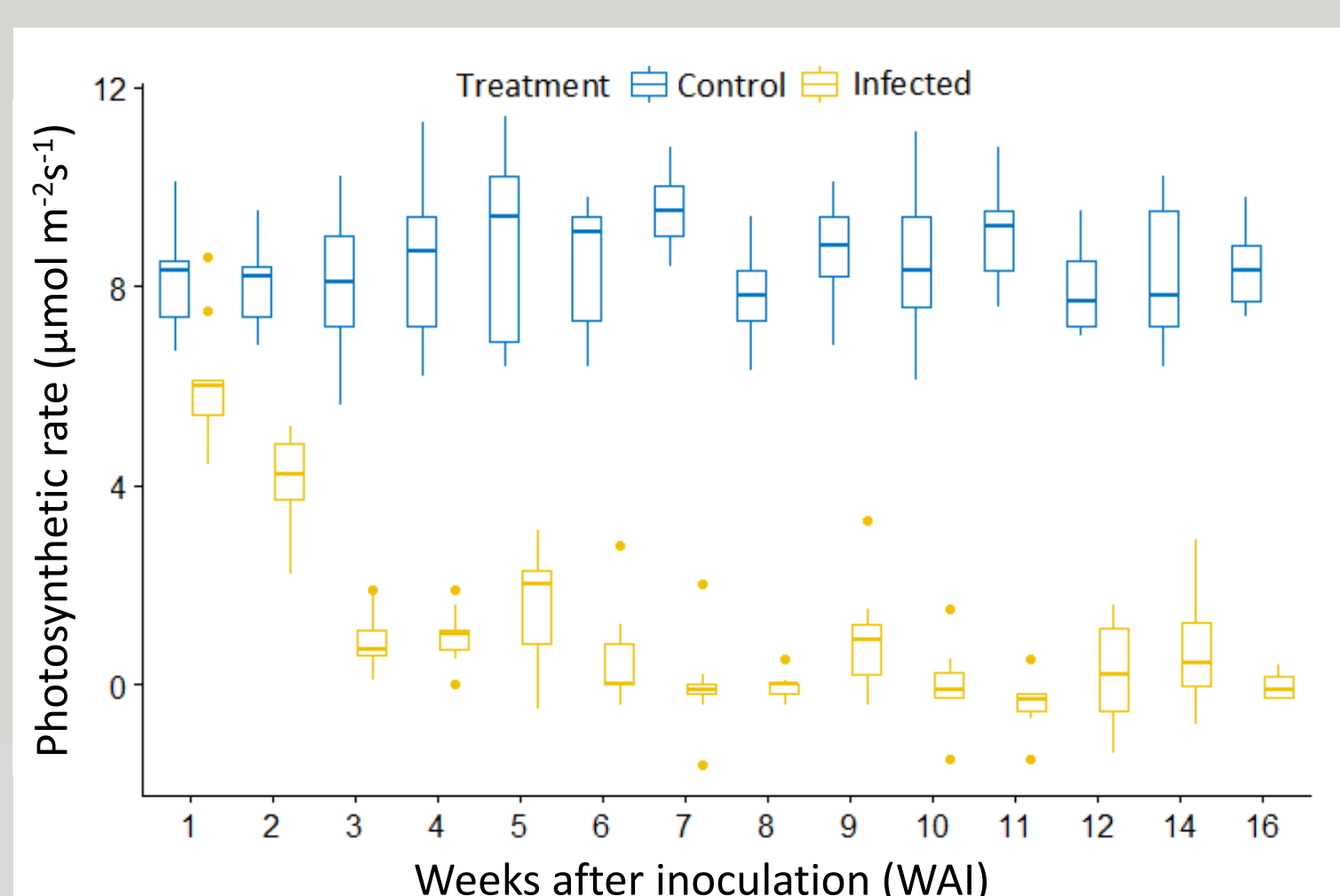


Figure 5: Time courses of photosynthetic rate in infected plants and controls

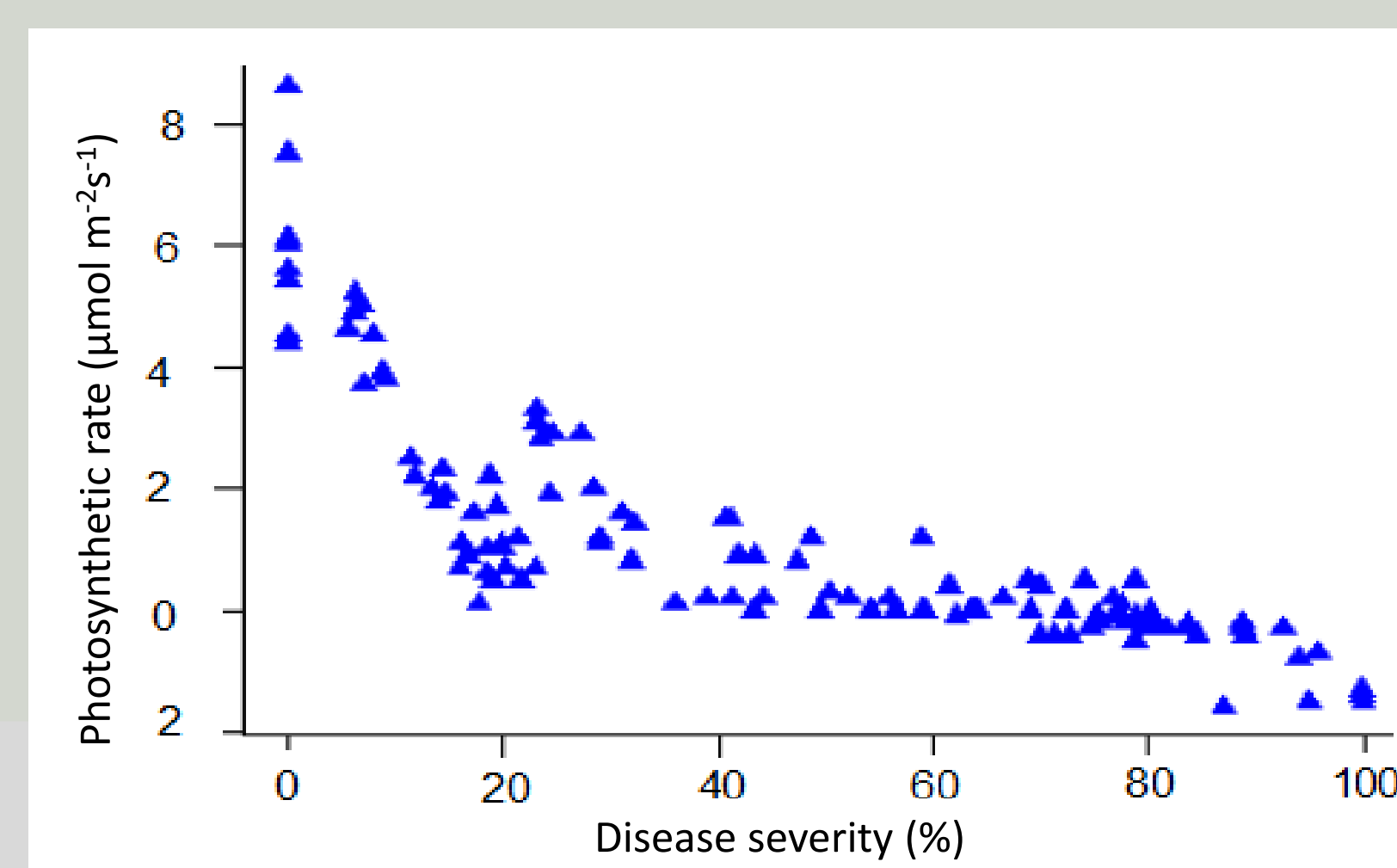


Figure 6: Relationship between photosynthesis and disease severity

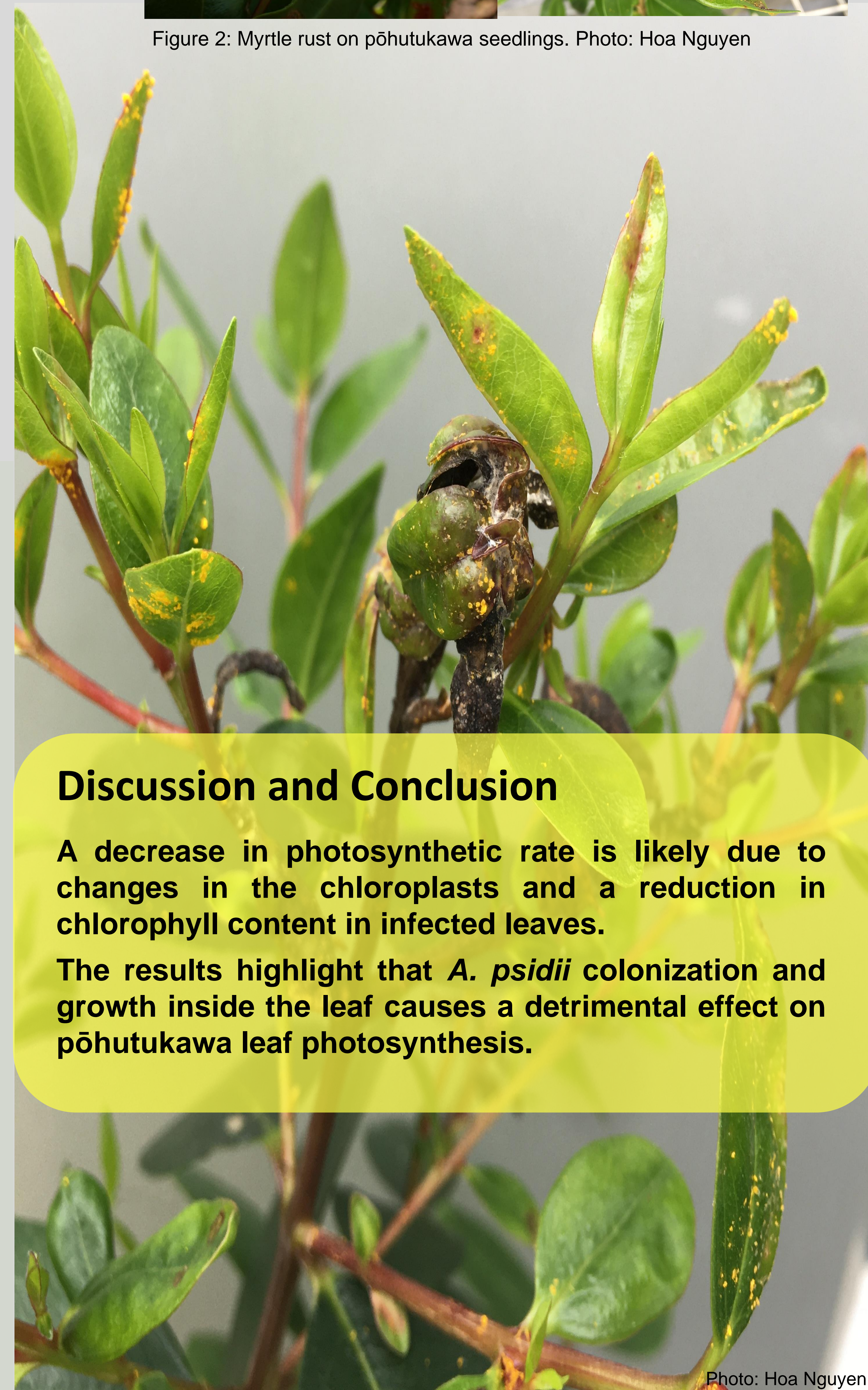


Photo: Hoa Nguyen

## Discussion and Conclusion

**A decrease in photosynthetic rate is likely due to changes in the chloroplasts and a reduction in chlorophyll content in infected leaves.**

**The results highlight that *A. psidii* colonization and growth inside the leaf causes a detrimental effect on pōhutukawa leaf photosynthesis.**

## Acknowledgements

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## References

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- (3) Chock, M. J. C. P. (2020). The global threat of Myrtle rust (*Austropuccinia psidii*): Future prospects for control and breeding resistance in susceptible hosts. *Crop Protection*, 136: 105176.