Does waterlogging influence phosphite protection of *Banksia* species against *Phytophthora cinnamomi*?

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INTRODUCTION

Parts of the southwest of Western Australia are subject to periodic flooding in areas that are also devastated by *Phytophthora* dieback caused by *P. cinnamomi*. Phosphite has been shown to be effective in controlling this pathogen (Hardy *et al.* 2001). Waterlogging induces many physiological dysfunctions in plants, but it is unknown what impact waterlogging has on uptake, distribution and efficacy of phosphite in controlling *P. cinnamomi*. We tested effects of waterlogging before and after a phosphite spray of *Banksia* species on:

- Uptake and distribution of phosphite in the plant, and
- Effectiveness of phosphite to protect plants from *P. cinnamomi*.

METHODS

- 2 *Banksia* species (ca. 1 m high) susceptible to *P. cinnamomi*.
- One phosphite spray 7 days after (Exp. 1) and one 21 days before (Exp. 2) waterlogging for 0, 3 and 6/8 days in the greenhouse.
- Leaf water potentials and leaf gas exchange were measured.
- *P. cinnamomi* colonisation in stems and phosphite concentrations in leaves, stems, and roots were assessed: 1 week, 1 month and 4 months after phosphite (Exp. 1) or after completion of waterlogging (Exp. 2).

RESULTS

Physiology

- *B. attenuata* was more sensitive to waterlogging than *B. baxteri* based on transpiration rates, stomatal conductance and net photosynthesis.
- *B. baxteri* maintained stomatal aperture and gas exchange under waterlogging conditions.

Tissue phosphite concentration

- Waterlogging did not affect phosphite uptake and distribution when applied before or after waterlogging (Fig. 1).

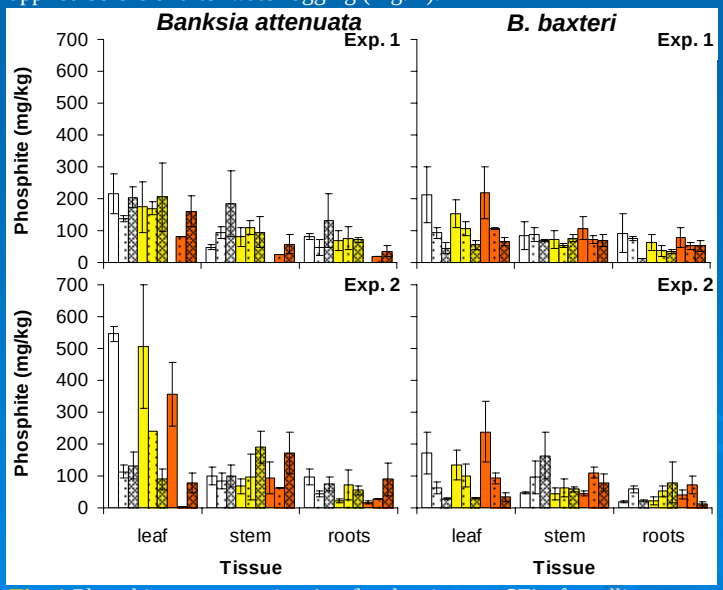

Fig. 1 Phosphite concentration (mg/kg dry tissue; ±SE) of seedlings treated with 24 kg/ha phosphite and subjected to 0 (control ■), 3 (■) or 6/8 days (■) of waterlogging; three bars of each colour set were harvested 2 (■), 5 (■) and 27 (■) weeks after phosphite treatment (Exp. 1) or after completion of waterlogging (Exp. 2). *n* = 3.

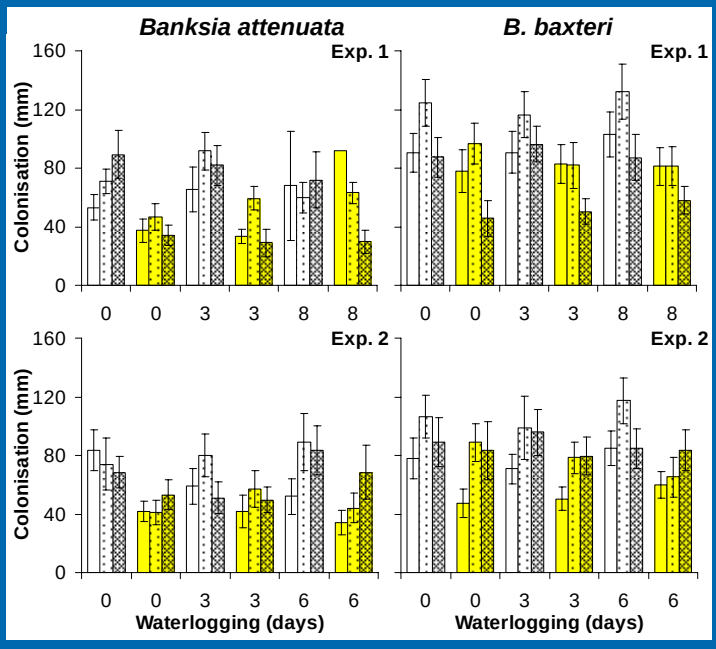

Fig. 2 Colonisation (±SE) of *Phytophthora cinnamomi* in stems of plants treated with 0 (■) or 24 kg/ha phosphite (■) after (Exp. 1) and before (Exp. 2) waterlogging for 0, 3 or 8 days; three bars of each colour set were harvested 2 (■), 5 (■) and 27 (■) weeks after phosphite treatment (Exp. 1) or after completion of waterlogging (Exp. 2). *n* = 10.

P. cinnamomi colonisation

- Waterlogging did not have a significant effect on colonisation.
- Colonisation was contained in phosphite treated plants with the exception of:
  - 2 & 5 weeks harvests of *B. attenuata* subjected to 8 days waterlogging (Fig. 2, Exp. 1);
  - 2 week harvest of *B. baxteri* (Fig. 2, Exp. 1);
  - final harvest (27 week) (Fig. 2, Exp. 2).

CONCLUSIONS

- **Except for severely water-stressed plants (e.g. 8 days waterlogging in *B. attenuata*), waterlogging generally did not markedly affect the ability of phosphite to contain *P. cinnamomi* lesions in stems.**
- **The impact of waterlogging on root infection and lesion extension have yet to be determined.**

REFERENCES

Hardy G, Barrett S, Shearer BL (2001) *Aust. Plant Path.* **30**, 133.

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