

Objectives and Rationale

Apple replant disease (ARD) is caused by a complex of biological agents that reduce tree growth on replanted apple soils. Semi-selective chemicals, which also include fenamiphos, has potential for managing ARD. Fenamiphos has been removed from the market. Objectives of the study are to (i) evaluate cost-effective and sustainable alternatives for the management of ARD, (ii) determine the efficacy of fluopyram as a semi-selective chemical and (iii) develop quantification methods for additional ARD causative agents.

Methods

Five orchard trials were established from 2017 to 2018 to evaluate various treatments by measuring tree growth and quantifying ARD causative agents in tree roots. Two glasshouse trials were conducted to investigate the efficacy of fluopyram by determining the relative percentage increase in seedling growth and ARD causative agents.

Key Results

Fumigation only significantly improved tree growth in two of the five orchard trials. *Pratylenchus* spp. root densities were the highest in fumigated plots in two orchards where fumigation was ineffective. A compost + mulch + oomycetocides (mefenoxam and phosphonates) treatment was effective in one of the ARD soils but not the other. A more cost-effective fumigant (metam sodium) combined with semi-selectives (mefenoxam, fluopyram and phosphonates) as well as the independent application of semi-selectives did not significantly improve tree growth in any of the orchards. Glasshouse trials showed that fluopyram could significantly improve seedling length in moderately severe ARD soils, but not highly severe ARD soils. Fluopyram did not significantly reduce *Pratylenchus* spp. root densities, but significantly increased several *Pythium* spp.

Conclusion and Discussion

Compost + mulch + oomycetocides cannot provide consistent control of ARD across all trial sites. The seemingly inefficacy of fumigation was likely due to some soils not being ARD soils or nursery trees being contaminated with *Pratylenchus* spp. In future it will be important to test orchard trial sites before trial establishment to ensure meaningful results. Fluopyram is not a suitable substitute for fenamiphos.