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Editorial: Epidemiology and management of pome fruit diseases

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Editorial on the Research Topic
Epidemiology and management of pome fruit diseases

In this Research Topic a series of articles is dedicated to research efforts on important pome fruit diseases. These articles discuss complex disease problems that require interventions at different stages of disease development. Such a systems intervention approach requires a deep understanding of the epidemiology of the causal agents in the orchard, tree, and fruit defence mechanisms, and the molecular biology of host-pathogen interactions in order to develop effective disease management practices, including physical treatments, natural compounds, and biocontrol agents as alternative measures to fungicide treatments.

European apple canker, caused by *Neonectria ditissima*, is a damaging disease of apple in many production regions worldwide. The pathogen infects apple trees through artificial or natural wounds. The most damaging phase of the disease is that cankers on main stems post-planting, most likely originating from infection in nurseries, can result in tree death in young orchards. Apple cultivars differ in their responses to the pathogen, which may be additionally affected by specific site factors and cold storage conditions prior to planting (Xu et al.). *N. ditissima* can produce two spore types year round, with seasonal peaks: i.e. ascospores from perithecia (sexual spores) and conidia from sporodochia (asexual spores). Knowledge of the distance that splash droplets can travel and the associated variability is useful for determining the nature of disease spread from a focal point (Campbell et al.).

Detecting the bacterium *E. amylovora*, causal agent of fire blight, in apple rootstocks is essential because this pathogen also causes asymptomatic infections. Molecular PCR-tests are helpful in detecting *E. amylovora* in symptomatic and a-symptomatic rootstocks. This article elucidates the role and importance of rootstock infections for tree survival, the presence of latent infections, and the application of molecular detection methods (Aćimović et al.). Currently, there are no pear varieties completely resistant to fire blight. To control a bacterial plant disease a combination of control approaches is necessary. Foliar spray and trunk injection applications of extract of giant knotweed, *Reynoutria sachalinensis* (RSE), might act as a plant resistance activator and was tested in comparisons to antibiotics. This RSE application may be a valuable tool to prevent sudden outbreaks of shoot blight during summer and pear tree death from fire blight cankers with no risk for pathogen resistance (Borba et al.).

Venturia inaequalis is the fungal pathogen causing apple scab. Within integrated apple scab control there is a focus on reducing *V. inaequalis* primary inoculum (ascospores) in the spring. This review summarizes and discusses the geographical distribution, overwintering, dissemination, and management of the asexual stage (conidiospores) of *V. inaequalis*. Important conclusions from the review are that the incidence and quantity of overwintering in the asexual stage are dependent on the amount of scab in the previous season, growth characteristics, and cultivar susceptibility. In orchards with limited options for fungicide control and/or in orchards with loss of scab control in the preceding season, conidia of *V. inaequalis* should not be underestimated as a source of primary inoculum in the spring (Rancāne et al.). For short-term disease management a reduction of inoculum size, (i.e. potential ascospore dose) is most important. In the long-term fungicide-insensitive isolates would be less likely to survive the winter to infect in the spring, if inoculum (i.e. in fallen leaves) has been removed. This study describes that the impact of sanitation treatments, i.e. leaf shredding, also contributes to fungicide resistance management (Meitz-Hopkins et al.).

Bull's eye rot (BER), caused by *Phlyctema vagabunda*, is an important postharvest rot of apples and originates from infections in orchards. Other postharvest diseases are associated with postharvest handling processes (e.g. blue mold (*Penicillium* spp.), and gray mold (*Botrytis cinerea*)). The control of postharvest decay begins in orchard with sanitation and fungicide applications, and continues with careful fruit handling practices before and during cold storage. *Botrytis cinerea* and *Penicillium expansum*, are major pome fruit postharvest pathogens and their control often relies heavily on the use of fludioxonil. This study evaluated the efficacy of cyclolipopeptides (CLPs), from *Bacillus amyloliquefaciens*, as an alternative biofungicide. The results indicate that CLPs are effective and can be used for the control of *B. cinerea* on pome fruit, especially if formulation and application are improved and optimized (Magwebu et al.). A combination of laboratory and field trials were conducted to examine the relationship between BER infection and status of apple lenticels. This research showed for the first time that hydration increased the size of lenticels, and this in turn increased the susceptibility of fruit to *P. vagabunda*. Dehydration resulted in a concomitant decrease in lenticel size. Preharvest application of compounds that close lenticels, such as gibberellic acid, could provide some control of BER without the need for fungicides (Everett et al.).

Author contributions

MW: Writing – original draft. CL: Writing – review & editing.

Conflict of interest

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