Horticultural Principles for establishment and maintenance of *Rhodomyrtus psidioides* (Native Guava) meta collection

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There are many horticultural considerations when establishing *ex situ* collections of species severely impacted by Myrtle Rust. These include availability of appropriate growing and quarantine facilities, selection of accessions informed by genetic analysis, along with staff availability and experience. For insurance collections susceptible to Myrtle Rust, intended for long-term conservation of genetic diversity, the level of care required is particularly intensive, requiring robust backup systems, multiple staff able to identify and treat Myrtle Rust, and continual attention to propagation, maintenance and record keeping. Treatment and control of Myrtle Rust can maintain plant health, but requires commitment to an ongoing, potentially indefinite, programme (Stanley and Bodley, 2020).

Development of horticultural knowledge

Horticultural knowledge relating to vegetative propagation of Native Guava and the establishment of highly susceptible species in cultivation was initially scarce and developed incrementally as *ex situ* collections accumulated (Sommerville et al., 2019). Due to the extent of Myrtle Rust in the surviving wild populations, the condition and

quantity of material (of variable health and often infected), and the initial lack of genetic and horticultural information, it was difficult to meet accepted horticultural ideals during sampling and propagation (Sommerville et al., 2019; Viler and Offord, 2020). The receipt and processing of infected wild propagation material into the nursery requires great care to ensure other Myrtaceae collections are not adversely impacted. Careful management of plant material and associated data is essential to ensure lineage integrity is maintained.

Rhodomyrtus psidioides can be vegetatively propagated by stem cuttings or excavated whole sucker ramets (Viler and Offord, 2020). and grows quickly in cultivation. Note that excision of sucker ramets may affect the viability of distal portions of the surviving root system radiating from a now stem-dead adult. This species requires frequent repropagation to maintain plant health and ensure a manageable size for spraying. *Rhodomyrtus psidioides* are robust plants that readily sucker. Even if a plant suffers a severe infection or substantial loss of biomass, they are often able to recover in cultivation. The techniques and timing for cutting propagation have been established, along with a sequence of re-potting and re-propagation depending on intended use (e.g., indefinite maintenance on site versus dispersal and planting out). Plants of a suitable size for transport and dispersal can be produced in approximately 14 weeks from cutting or 12 weeks from seed, depending on the time of year and availability of suitable material.

Successful flowering and fruit/seed set has been observed within two years of propagation, which is encouraging for prospects of selection and breeding in future (Viler and Offord, 2020). Seed production has also allowed 8,500 seed to be used for seed biology and conservation studies at the Australian PlantBank.

Nursery space and labour constraints are likely to apply in projects of this sort, as is the case at both the NSW and Queensland project hubs. To accommodate 76 genetically distinct lineages, only three to five ramets per genet are retained in the NSW ‘master’ collection. These retention figures consider ease of propagation, vigour in cultivation and mitigation of unforeseen mortalities, while being within available space and labour

limitations. Additional ramets of 34 genetic lineages were dispersed to partner locations as part of the metacollection strategy.

Appropriate *ex situ* horticultural management practices reduce the need for chemical control of Myrtle Rust in susceptible species (Stanley and Bodley, 2020). Where possible, irrigation that avoids moisture on the leaf is the best option. Irrigation that delivers water directly to the root zone or hand watering in the nursery environment and soaker hoses rather than impact sprinklers for in-ground plantings. Morning watering allows for faster evaporation of moisture, and increased air flow between plants enables foliage to dry quickly after rain, ensuring less favourable conditions for the germination of ambient Myrtle Rust spores and other moisture-related diseases. Undercover nursery areas are ideal for potted plants, if available, although some shade house designs may also restrict pollinator access.

Within suitable climatic ranges, many Myrtle Rust impacted species are fast growing, and whether in ground or in pots need to be pruned regularly to keep them at a manageable height and proportions for spraying and monitoring. Sound hygiene such as disinfecting tools between plants when pruning, and regular removal of infected fallen leaves will also reduce the risk of infection. Consideration should be given to grouping Myrtle Rust-susceptible species together to facilitate spraying and management.

Myrtle Rust monitoring and control

Plants must be monitored frequently for the presence of Myrtle Rust, as well as other pests and diseases (Stanley and Bodley, 2020). Plants in the nursery should ideally be inspected every couple of days, with a focus on new growth and both the top and underside of leaf surfaces to detect any Myrtle Rust pustules or lesions.

If Myrtle Rust is present, small amounts of infected material can be carefully removed, bagged and disposed of in landfill. Plants and weather conditions should then be closely monitored to determine if chemical treatment is necessary. If required plants may then be sprayed with a systemic, curative fungicide.

Greenlife Industry Australia (GIA) is the peak body for Australia's nursery industry. GIA provides detailed technical information on managing Myrtle Rust susceptible species in the nursery environment through the Australian Plant Production Standard (APPS) incorporating a dedicated Biosecurity plant protection program, Biosecure HACCP. The Australian Myrtle Rust Management Plan 2013 (https://nurseryproductionfms.com.au/biosecurity/) provides advice on fungicide rotation, monitoring and cultural considerations depending on environmental conditions and stage of growth. Potted *ex situ* conservation collections pose unique challenges due to the length of time they are retained in comparison to usual nursery production where plant turnover is generally rapid. Several fungicides and pesticides can only be used once per season, so planning and diligent record keeping is needed to ensure an effective and compliant rotation program. The Australian Pesticides and Veterinary Medicines Authority (APVMA) is the Australian Government Regulator for agricultural and veterinary (agvet) chemicals up to, and including, the point of sale. The APVMA website has current, searchable databases for fungicides registered for use in the treatment of Myrtle Rust and off label Minor Use Permits for use under specific circumstances (https://www.apvma.gov.au/registrations-and-permits/search-registered-chemical-products-and-permits). Some fungicides are not registered for use in both the nursery and open spaces. State and Territory governments are responsible for controlling the use of agvet chemicals beyond the point of sale and each have their own relevant legislation.

Only suitably trained and qualified staff should undertake spraying. The type of qualification required is determined by the type of work being carried out or by specific application methods. Safe use of chemicals and correct use of personal protective equipment (PPE) are critical. In Australia nationally recognised training and certification is available in AQF3 Chemical Accreditation (https://www.chemcert.com.au). Spray equipment should be chosen considering the number of plants, size and whether they are inground or in pots.

The Australian Myrtle Rust Management Plan 2013 was developed for production nurseries and retailers. It includes examples of fungicide rotation based on Mode of Action (MOA) to prevent disease resistance. Many of the recommended actions and

procedures remain relevant for *ex situ* collections today, with several active constituents still available under different product trade names. Minor Use Permits issued by the APVMA provide detailed information for each chemical on application rates, with critical use comments and additional conditions of use, including how often a chemical can be used on a crop, in a season or over a year.

The main considerations when planning a spray event are current and expected weather conditions, the presence or absence of infection, plant growth stage and previous MOA used. For example, an actively growing plant with a flush of new growth during a wet spring is at a higher risk of ongoing infection than older plants during a hot, dry summer. Conditions of individual microclimates should also be considered. Any adjacent, similarly susceptible species should be monitored and treated simultaneously.

Distribution of plants

For the *ex situ* dispersed collection of *Rhodomyrtus psidioides*, planting sites were selected and prepared in each location, taking a risk management approach. The factors for microsite selection included placement of *R. psidioides* in relation to other Myrtaceae, proximity to public areas, access for spraying and maintenance, and microsite suitability for the plants.

Distributed *R. psidioides* plants were sprayed with a systemic fungicide shortly before dispatch to recipient sites and were then quarantined at those sites for at least four weeks before planting. *R. psidioides* is susceptible to thrips, whitefly, scale and mites, particularly in spring and summer, and may require treatment for these as well as periodic Myrtle Rust. In some instances, fungicides and pesticides may be combined, but approach with caution seeking manufacturer's advice, following labels and testing both physical compatibility and potential phytotoxicity on a small number of plants before applying more broadly.

Transport was arranged via a specialist contractor, with staff at the originating and recipient locations briefed on the timing of plant departure and arrival. Consideration was given to the duration in transport, particularly interstate, and the period that plants might go without watering. 90 mm forestry tubes and 200mm pots were considered the safest options. Care was also taken to ensure plants were not in transit or arriving on or near public holidays or weekends.

References

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