TITLE: *AUSTROPUCCINIA PSIDII* USES BIPOLAR MATING AND PRODUCTION OF MEIOTIC SPORES INCREASES WITH AGE OF INFECTION

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ABSTRACT

Austropuccinia psidii is the causal agent of myrtle rust, a fungal disease that infects approximately 480 species in the Myrtaceae. *A. psidii* is a biotrophic pathogen that reproduces sexually and asexually. Sexual reproduction has been shown uniquely on *Syzygium jambos* and little is known about its reproductive biology on other hosts or whether populations that were formerly structured by host range can outcross on universal hosts. We determined if mating genes in three biotypes of *A. psidii* (from South Africa, Australia and Brazil) were under selection as a proxy for whether different strains can reproduce sexually on a shared host. We examined contigs that contained three homologs of the *STE3.2* gene, which were near-identical in the three genomes, and the homeodomain locus, which contained two alleles of two homeodomain genes in each genome. The lack of variation in *STE3.2* genes may indicate *A. psidii* uses bipolar mating, and there are implications for biosecurity if different strains are sexually compatible based on variation in the homeodomain locus. We aimed to identify the core meiotic genes in genomes of *A. psidii*,
four species of *Puccinia*, and *Sphaerophragmium acaciae* through comparative genomics based on 136 meiosis-related orthologous genes modeled from *Mycosarcoma maydis*. We found core genes related to meiosis in rust fungi were conserved at family rank. We analyzed the expression of two meiotic and four mitotic genes of *A. psidii* on *E. grandis* over a 52-day time course to validate that identified meiotic genes were upregulated in teliospores. Three mitotic genes were significantly downregulated in samples collected 28 days after inoculation (DAI) compared to 14 DAI. Expression of meiotic genes was significantly up-regulated in samples collected 28 DAI compared to 14 DAI, indicating a temporal switch from production of uredinia (mitotic stage) to telia in the life cycle, which we hypothesize may be in response to leaf ageing.

Keywords: sexual reproduction, myrtle rust, meiosis, teliospore, time course

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