Understanding an un-described symbiosis; implications for resilience, evolution and conservation of Oxalis in the Cape flora biodiversity hotspot

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Abstract

The unique biogeographic region located at the southwestern tip of the African continent, the Cape Floristic Region (Cape), is globally renowned for its extremely species-rich and diverse flora. Current models of climate change predict shorter, drier winters for the Cape, which may directly affect the future success of many species. Research on the important role of endophytic microbes in generating and maintaining plant species diversity has largely been neglected in this hyper-diverse region and to date there is very little known about micro-organismal community composition within and between Cape plant species, and we risk losing complex interactions before they have been documented.

Our research is focused on the indigenous plant genus *Oxalis,* which is the largest eudicot geophytic lineage in the Cape (ca. 230 species). Our work has revealed that *Oxalis* species possess an extraordinary diversity of endophytic associations with fungi and bacteria (119 bacterial morphotypes and 29 fungal genotypes isolated from only five plants each of six *Oxalis* species; metabarcoding results pending) distributed across different storage, vegetative and reproductive plant organs.

Thus far we have identified an average of 20 bacterial and 7 fungal endophytes per plant, which is an order of magnitude higher than the number commonly encountered in angiosperms. Interestingly, 11 of these endophytic species occur in the seeds, which suggest that the endophytes are vertically transmitted from one generation to the next. More than 80% of the endophytes found in *Oxalis* seeds are microbes with known beneficial effects for plant hosts, for example microbes capable of nitrogen fixation and phosphate solubilisation. *Oxalis* appears to host a rich and diverse endobiota, which may play critical roles in plant germination, survival and evolutionary success that allows this genus (and possibly other plant lineages) to tolerate, persist and thrive in such a wide range of environments across the Cape.

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