Soil seed bank persistence of two South African geophytes

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Background

The Iridaceous geophytes from the Cape Province of South Africa are one of the most serious groups of invasive plants in south-west Australia. They threaten the natural biodiversity of plant communities across the region, invading relatively undisturbed habitat and displacing native flora. The biology of individual species is not well studied but observations suggest dispersal into bushland is mainly by seed that is highly viable, germinates rapidly and does not form a persistent soil seed bank. There is also evidence that seedling recruitment and population expansion in natural populations occurs in a small window following fire. Our study investigated seed viability and the persistence in the soil seed bank of two of the most serious invasive geophytes in south-west Australia, *Freesia alba* x *leichtlinii and Sparaxis bulbifera.* Seed was collected from naturalised populations of both species over summer and was placed in mesh bags and buried in replicated plots across field sites in late February. Samples were retrieved and assessed in the following May, July and September.


The site chosen for the burial of Freesia seed was a disturbed *Banksia attenuata*, *B. menziesii* woodland on the highly leached sands of the Bassendean Dune System. These woodlands are species rich with an understorey of shrubs, herbs, sedges and grasses.

Naturalised populations of Freesia were invading the understorey at the site. The Sparaxis seed burial site was located in on the eastern side of the Swan Coastal Plain on the heavy alluvial soils of the Pinjarra Plain. These soils support seasonal wetlands with a rich native geophyte and annual flora that grows and flowers sequentially over spring/summer as water levels fall and the wetlands dry. The seed burial site was located in disturbed *Melaleuca rhaphiophylla* woodland where Sparaxis had become naturalised.

Findings

- Seed from naturalised populations of both Freesia and Sparaxis have high viability, with germination occurring relatively rapidly both under controlled glass house conditions and under natural conditions in the field.

- In the field most of the seed had germinated by winter (July), within four months of burial, and the seed bank of both species was completely exhausted by early spring (September).

- The seed of Freesia and Sparaxis buried at both 10 cm and 1 cm was found to persist in the soil for less than nine months. The implications are that while seed plays a crucial role in the recruitment of individuals and expansion of populations, it has a limited role in the persistence of populations. Instead persistence of these geophytes over time is reliant on underground storage organs.
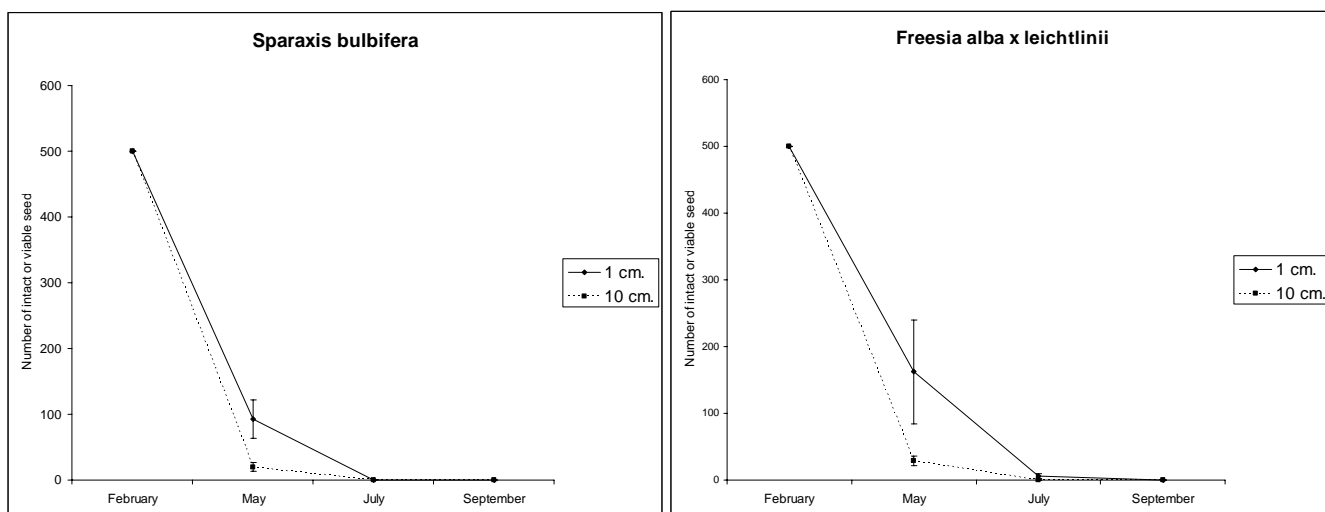
Management Implications

The lack of a persistent soil seed bank has important implications for management of invasive geophytes. Selective herbicide control of adult plants and seedlings is possible and carefully targeted control in one or two growing seasons should result in effective control of populations.

Such a control strategy may be particularly applicable following fire. The geophytic life form is highly capable of surviving fire. Also, fire is one of the conditions reported to particularly favour flowering and then seedling recruitment of Iridaceous geophytes where they occur naturally. The prolific amount of seed produced germinates readily, leading to mass recruitment in the post fire environment. With a short lived soil seed bank, the growing season following a summer fire could be a crucial time to control and prevent expansion of existing populations of both Freesia and Sparaxis where they are invading native plant communities.

This information sheet is based on continuing research into management of remnant bushland by the Urban Nature Program, DEC Swan Region