

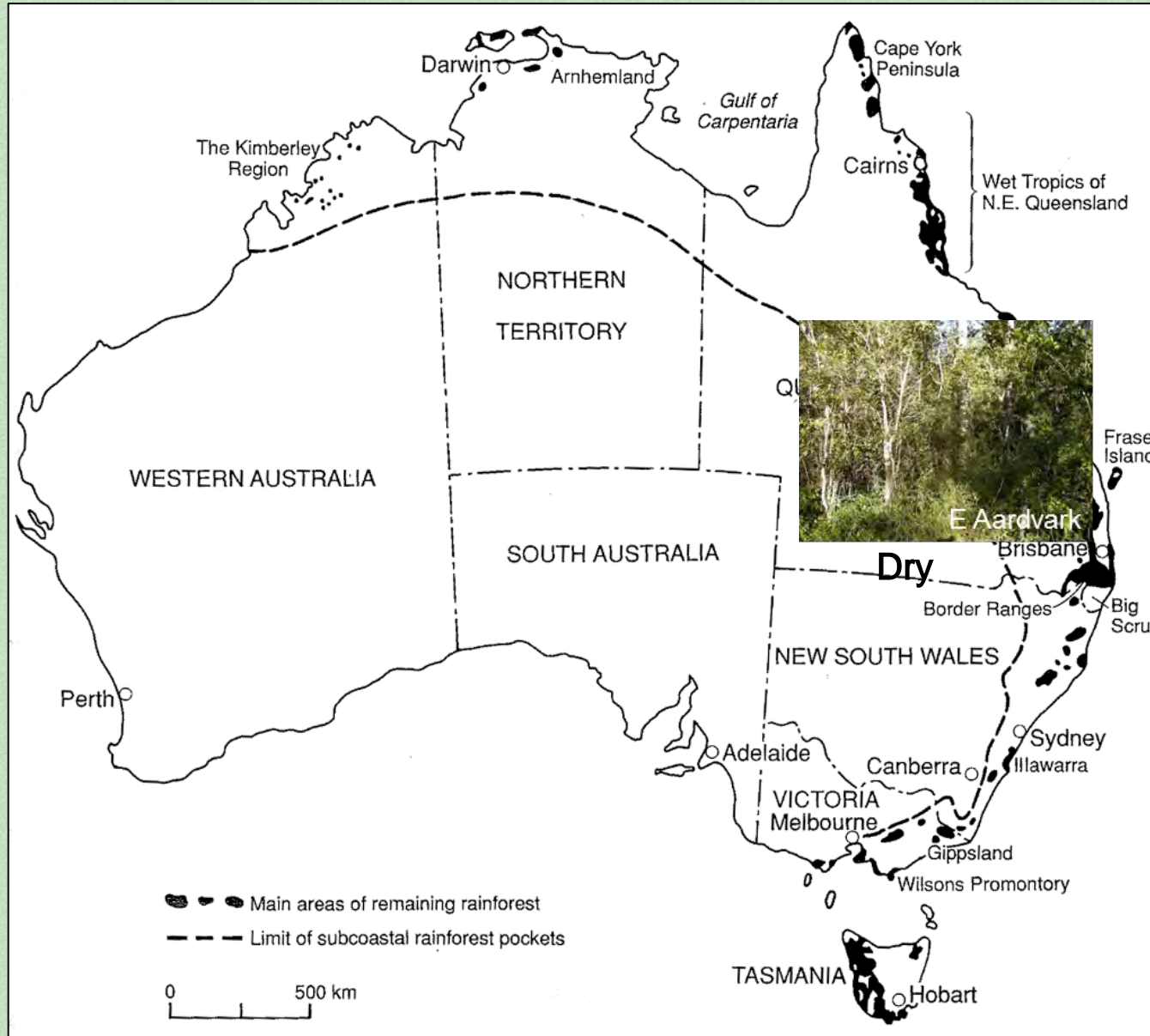


Seed dormancy research on Australian rainforest species: enhancing conservation options

Ganesha Liyanage
The Australian PlantBank



Australian rainforest profile



Tropical



Subtropical



Warm temperate



Cool temperate

Seeds with 3 -7% moisture content in sub zero (-20 °C) temperature



-20°C ex situ seed bank storage

Ex situ seed conservation – seed banking

Fresh seeds germination

Seed dormancy?

Dried seeds germination

Alternative ex situ storage methods

Freezer stored seeds germination

Ex situ seed banking

✗

✗

✗

✓

✓

✓

Seed Dormancy

Seed dormancy

Seed trait → impede germination unless seeds experience dormancy alleviation cues

Ecologically ✓

prevents seed germination during unfavourable environmental conditions where subsequent seedling establishment is likely to be unsuccessful

Conservation ?

constrain implementation of ex situ seed banking and in situ restoration practices

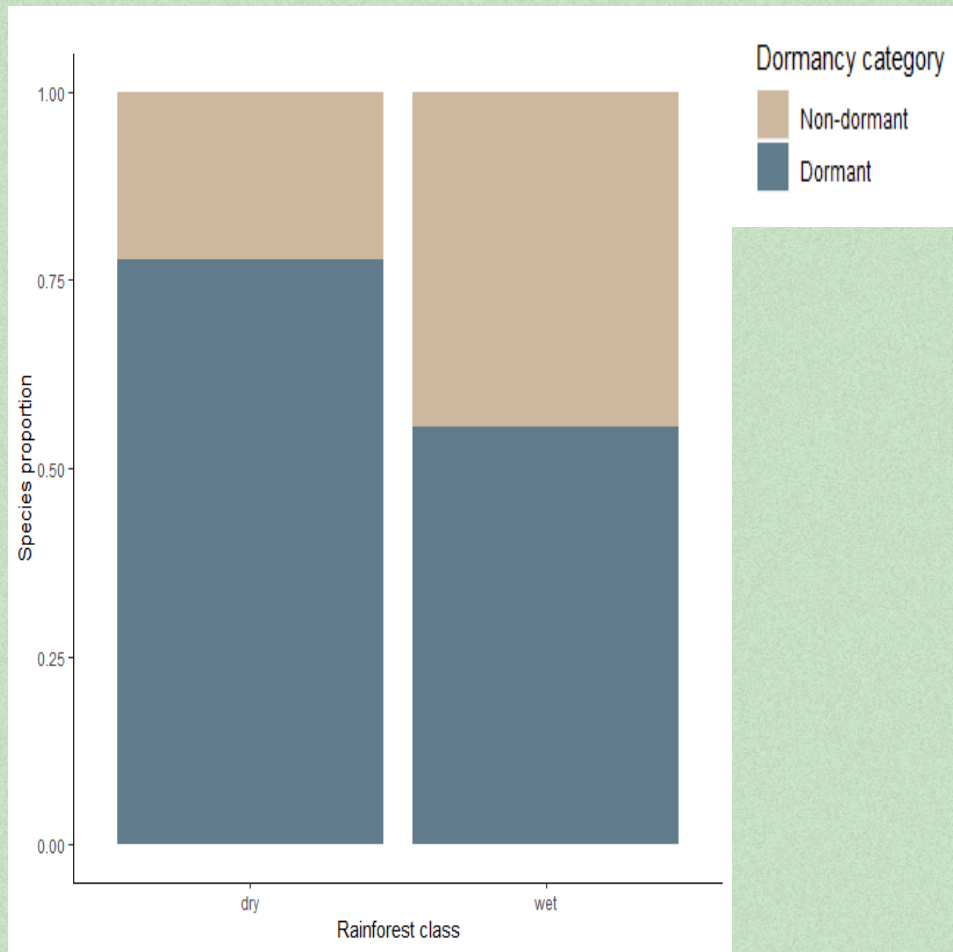
e.g. standard seed banking involves drying (MC 3 -7%) and storing them in freezer conditions (-20 °C). Testing how species respond to this drying and freezing involves a series of germination tests.

How seed germination niche drives dormancy in rainforests?

- Local climate and vegetation structure
- Dry (distinct dry period) and wet (wet conditions throughout the year) rainforests

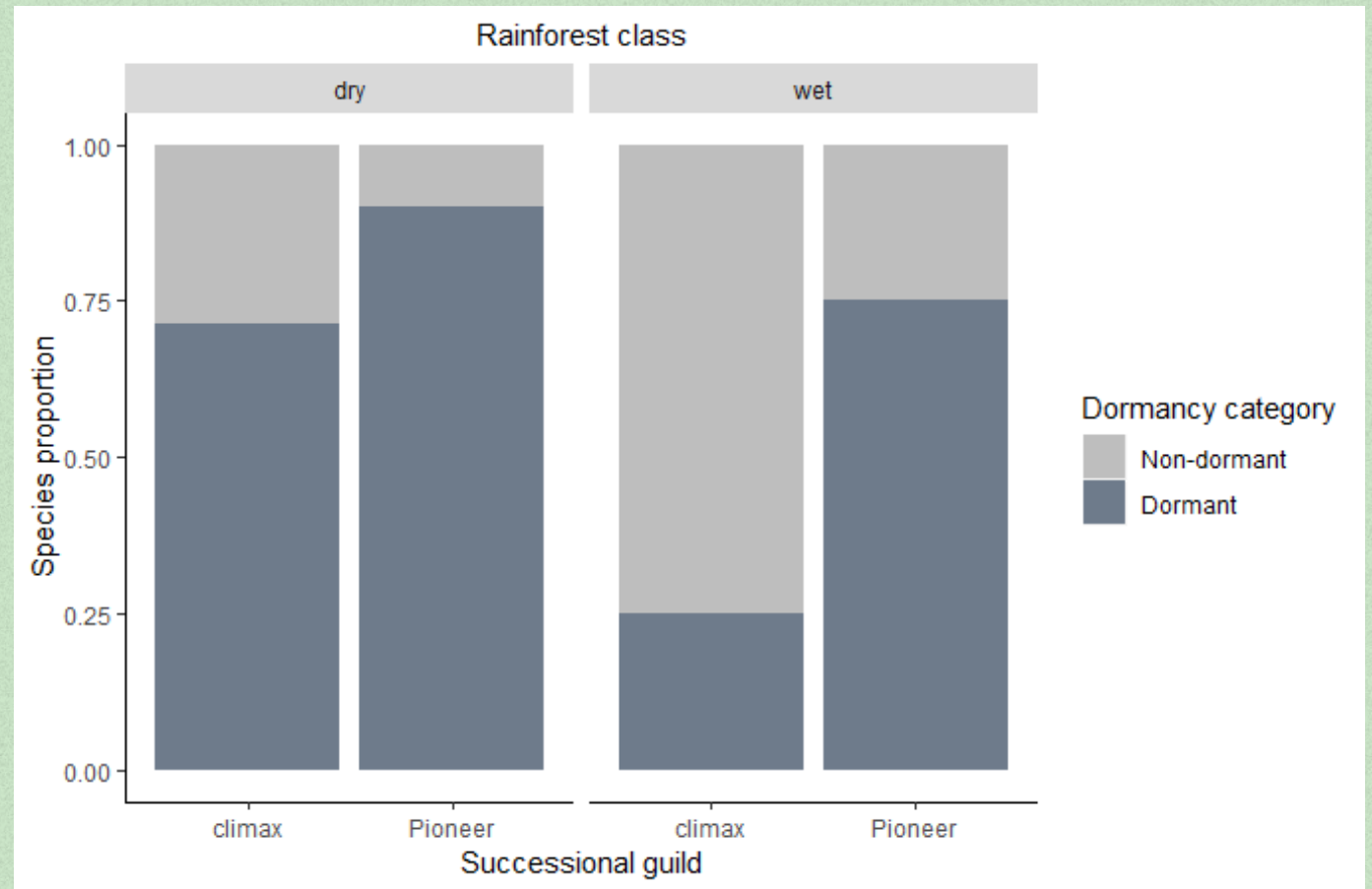
Rutaceae family

- 44 species from Australian rainforests
- Relationship with dormancy, rainforest types and successional guilds – data compiled from experiments and literature



The proportion of dormant species,

- 'dry' > 'wet' rainforest distribution class



The proportion of dormant species,

- pioneer species > climax species in both 'dry' and 'wet' rainforest classes

The difference was greatest in the 'wet' class

Summary

- A global dataset compiled for presence/absence of dormancy in rainforest species of evergreen/semievergreen rainforests from tropical and evergreen/semievergreen rainforests from subtropical regions showed 52 - 57% species with seed dormancy (Baskin and Baskin 2014).
- Patterns often assumed for rainforest species, perhaps indicative of the large number of tropical rainforest studies, are not applicable to Australian rainforests. Overall, the proportion of species with dormancy is higher for Australian rainforests.

Seed dormancy and storage behaviour studies on three rainforests genera: *Acronychia*, *Geijera*, *Zieria* from Rutaceae family and how that understanding can contribute to advance ex situ seed conservation actions



Acronychia oblongifolia

- Grows in all types of Australian warmer rainforests and their margins



Geijera parviflora

- Distributed in dryland ecosystems including dry rainforests

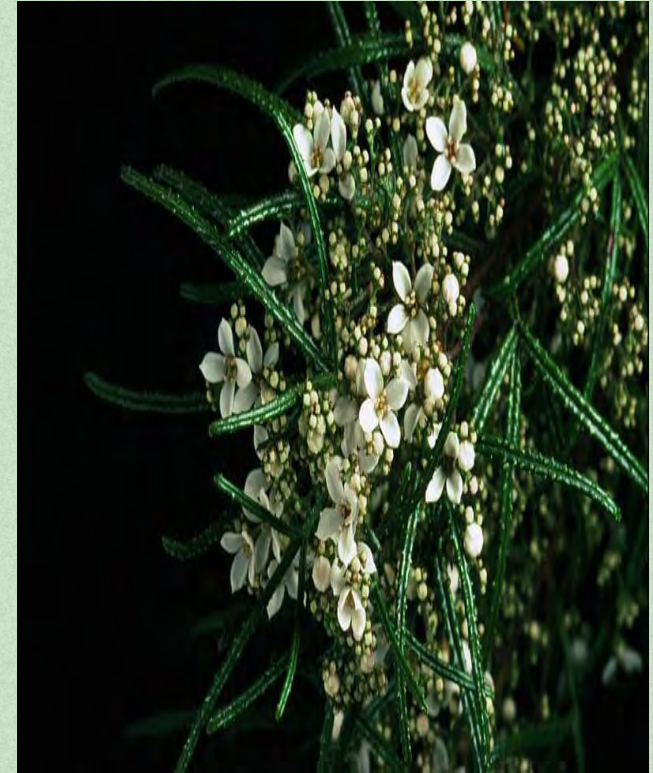
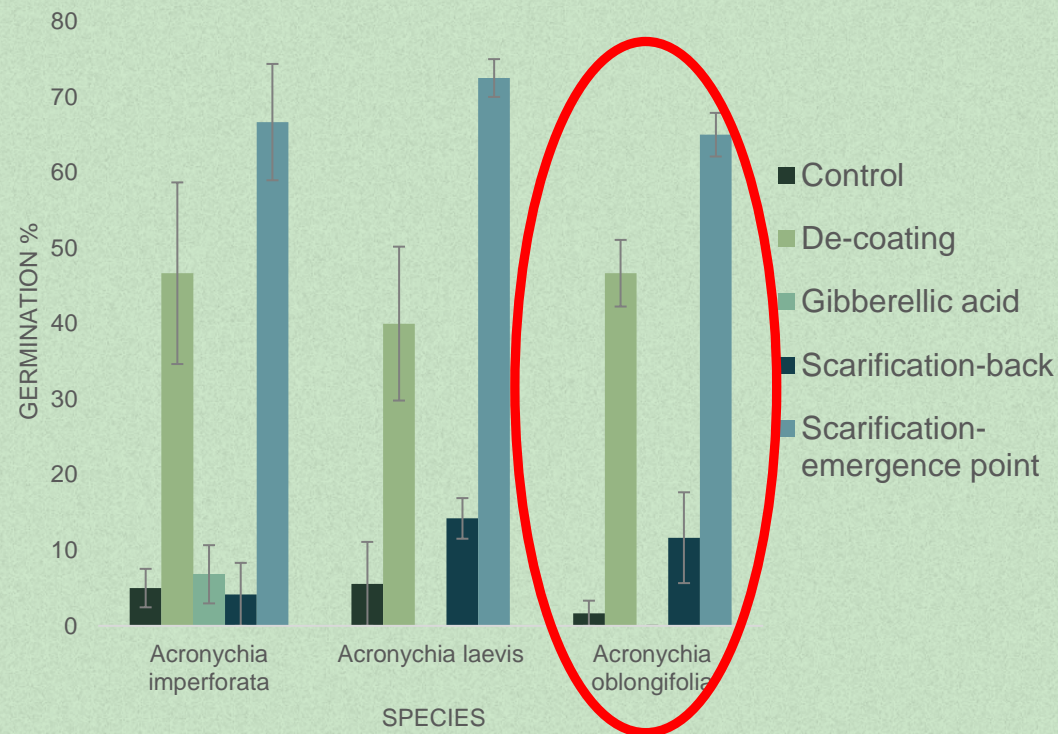


Photo: J. Plaza, Botanic Gardens of Sydney

Zieria granulata

- Grows on rocky ridges in sclerophyll forest to subtropical rainforests margins

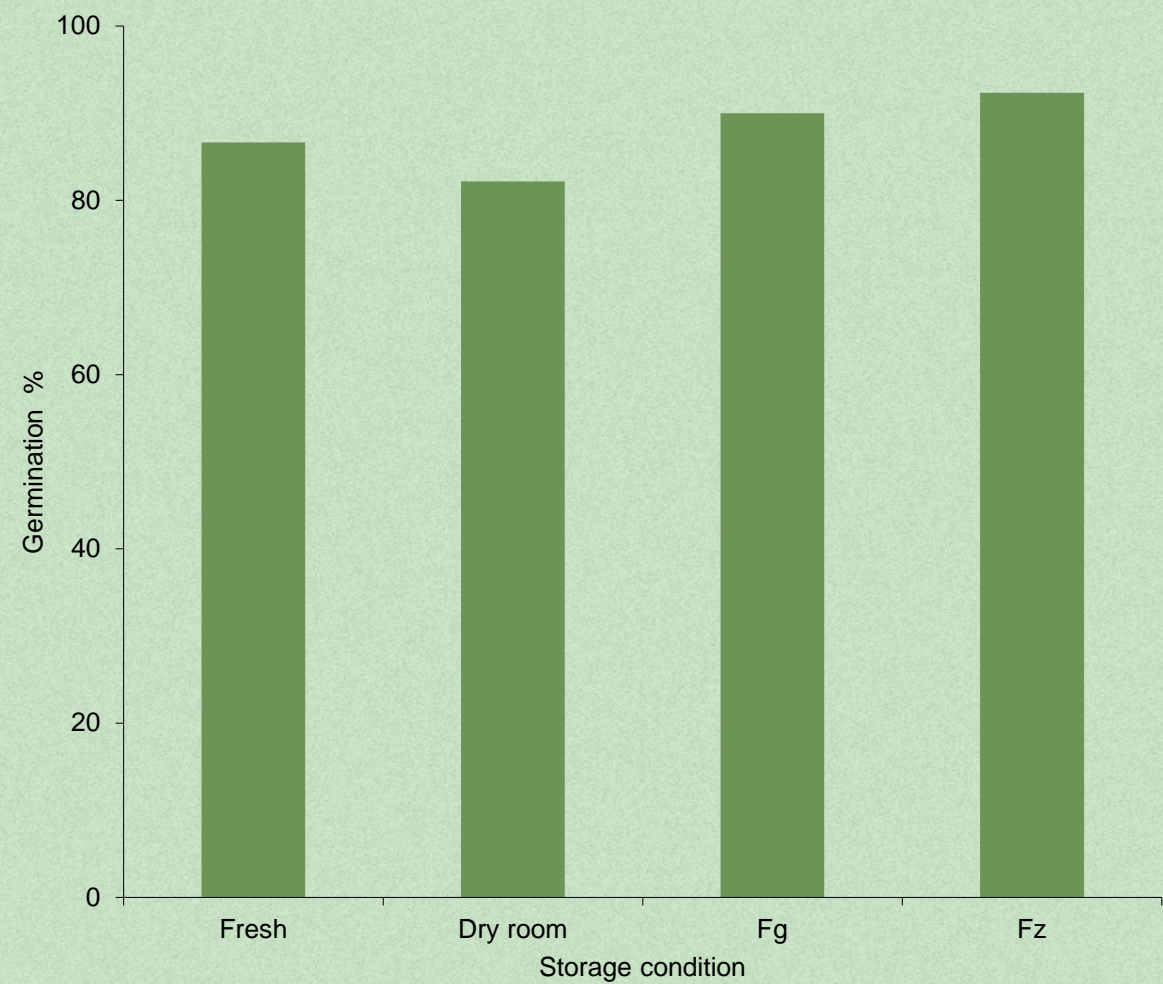
Germination responses to dormancy breaking treatments: *Acronychia oblongifolia*



- Highest germination – de-coating and scarification-emergence point
- Low germination – scarification back

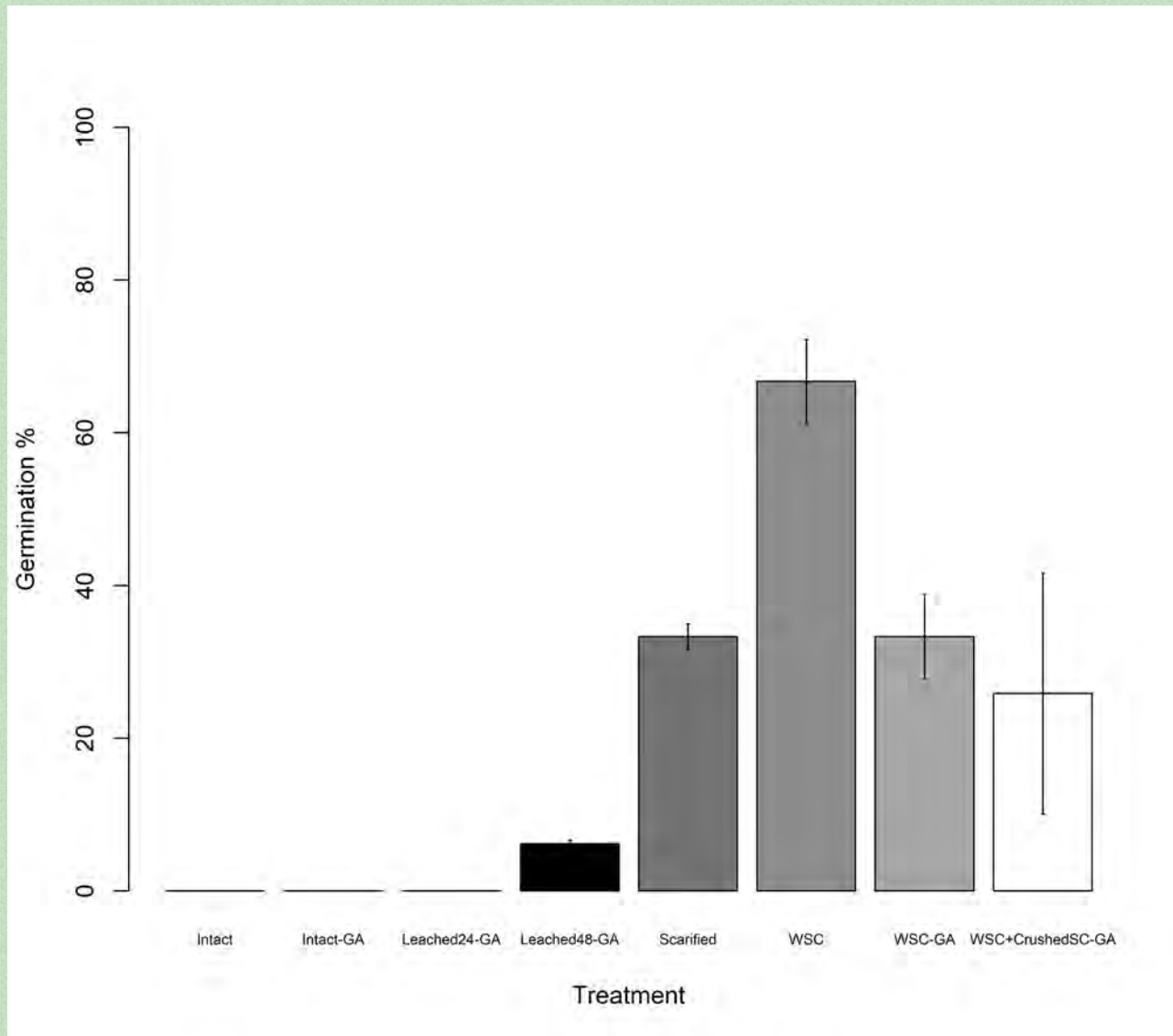


Seed storage behaviour: *Acronychia oblongifolia*



Germination percentages,
• fresh = stored seeds

Germination responses to dormancy breaking treatments: *Geijera parviflora*

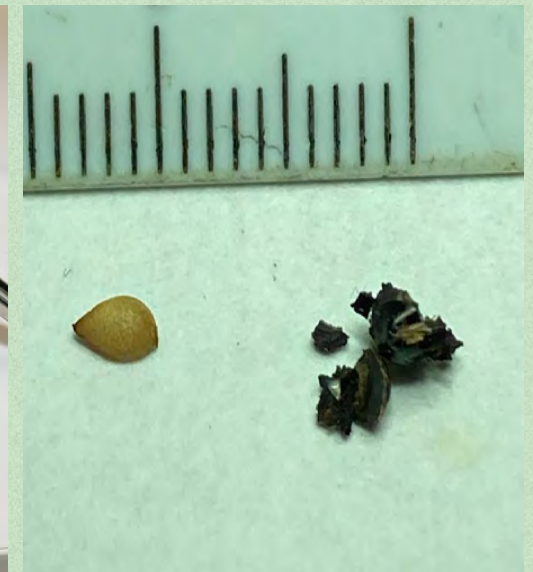


Germination percentage,

- ↑ seed coat removal

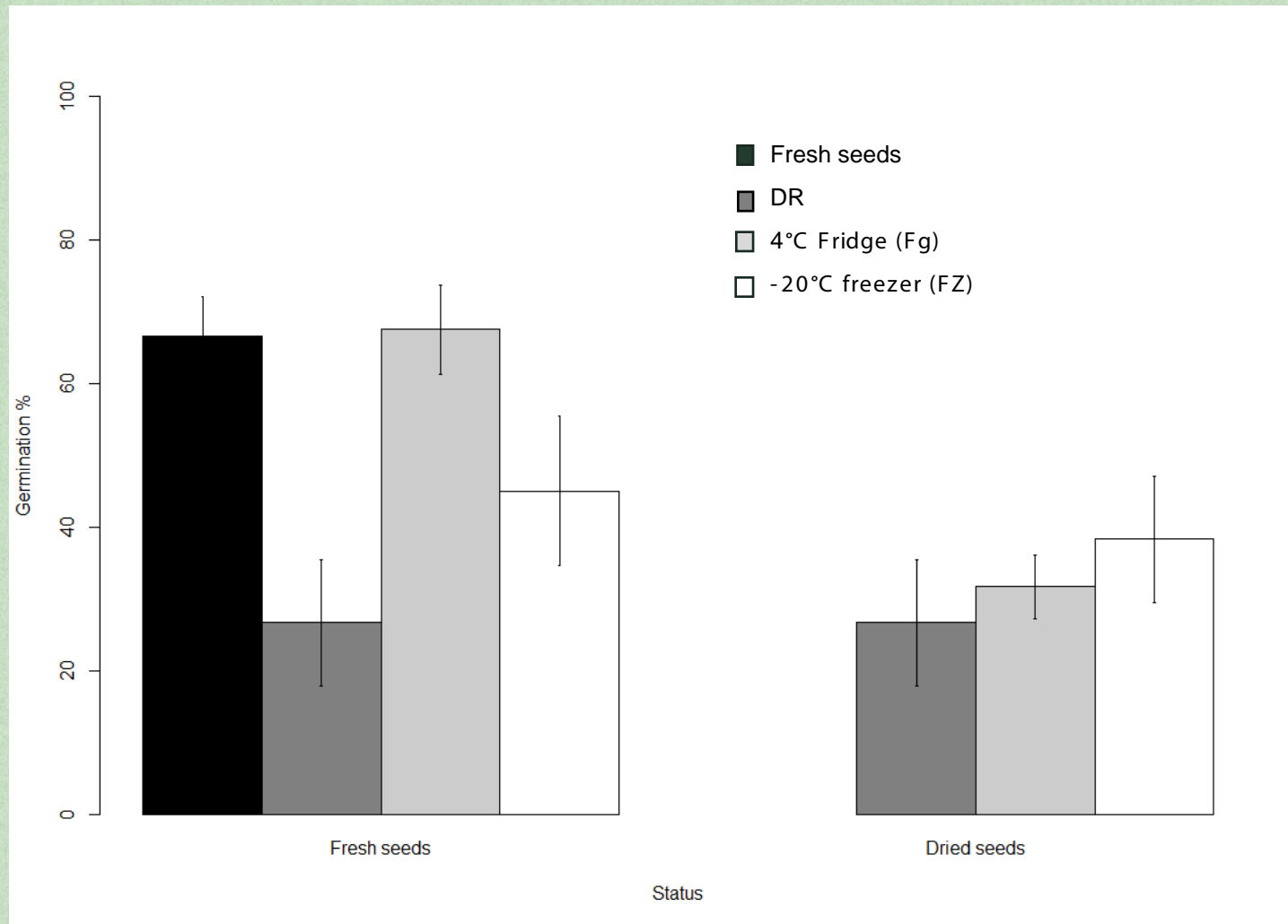


Use of vice to remove seedcoat



Endosperm containing embryo separated from the seedcoat

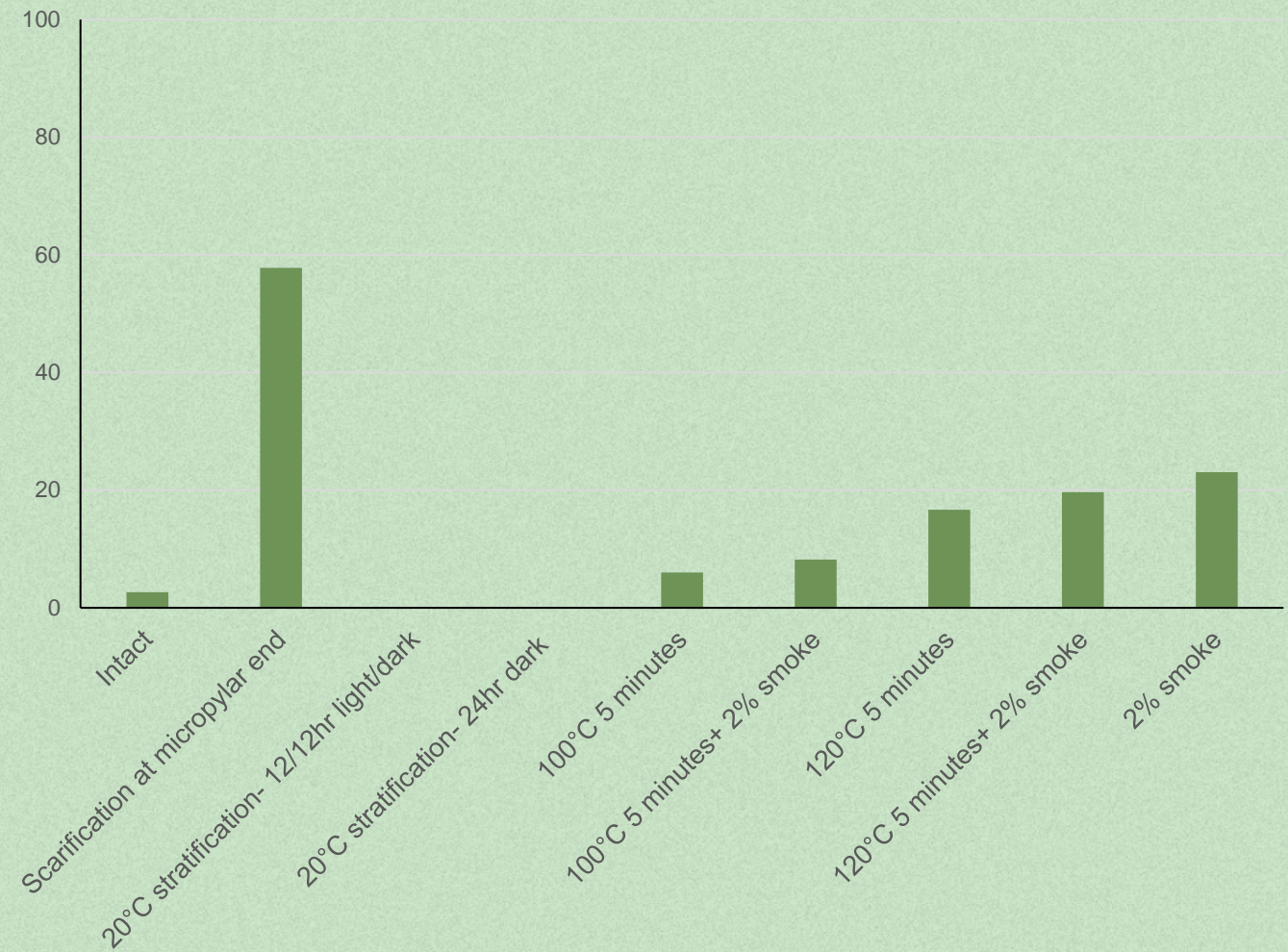
Seed storage behaviour: *Geijera parviflora*



Germination percentage,

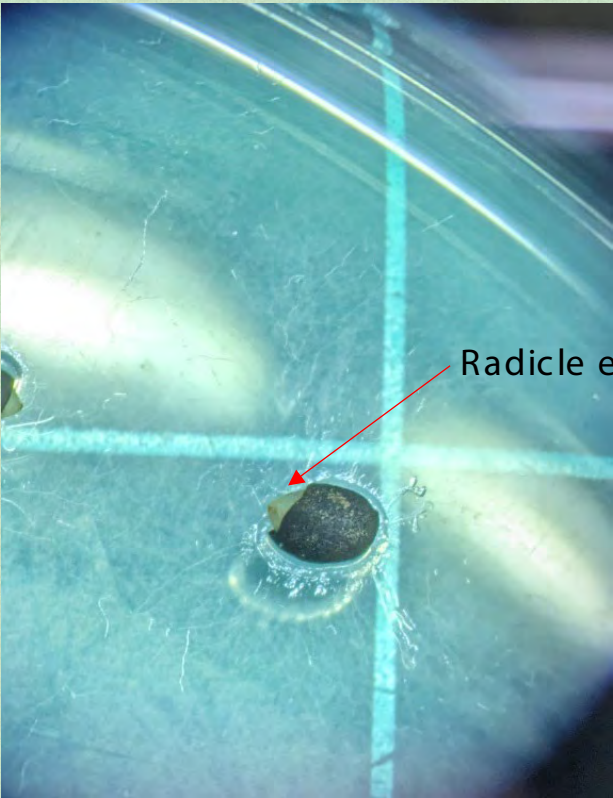
- dried < fresh (reduced by 40%)
- dried = FZ storage
- dried = Fg storage
- fresh = FZ = Fg when stored without drying

Germination responses to dormancy breaking treatments: *Zieria granulata*



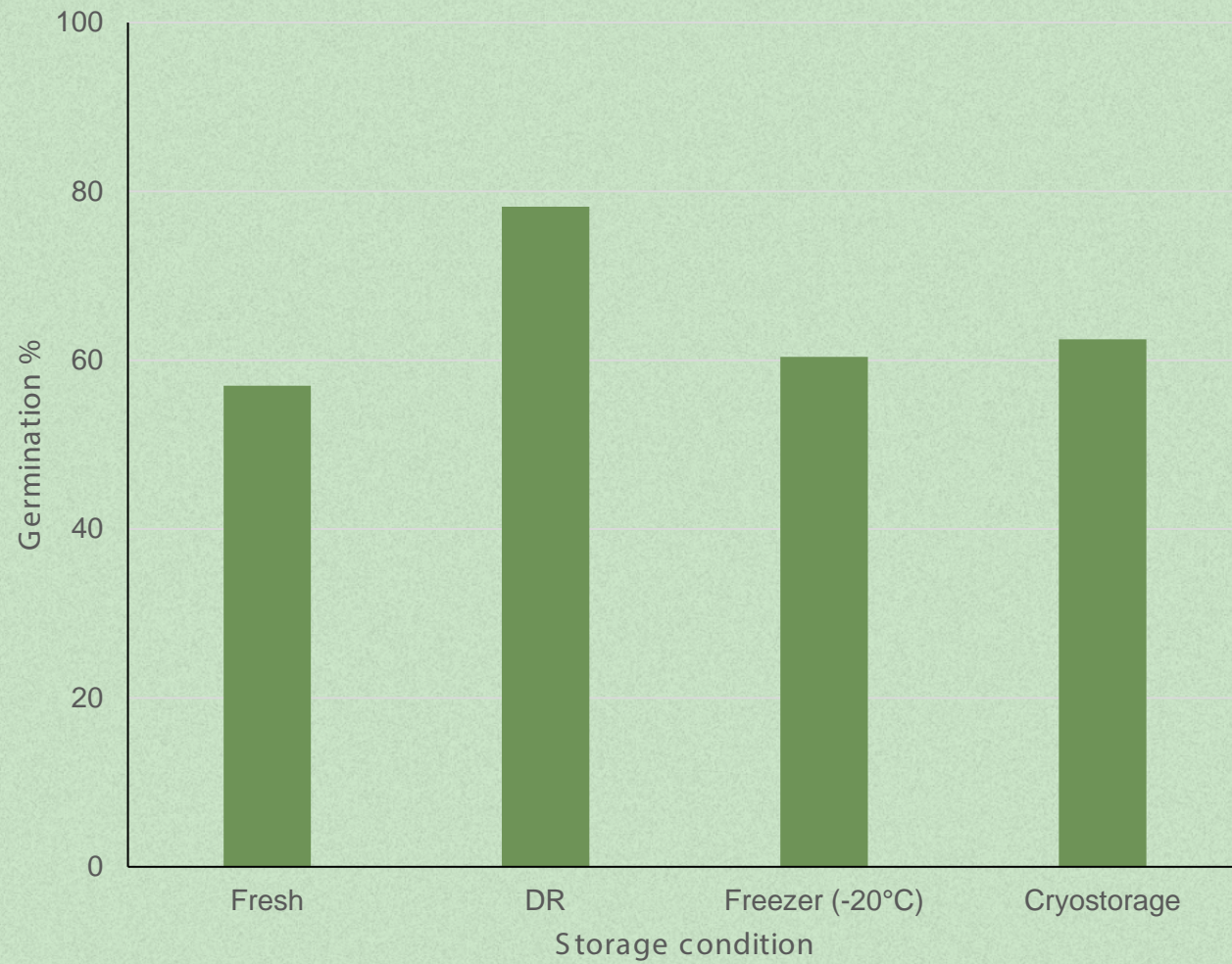
Germination percentages

- ↑ scarification at micropylar end



Scarification - emergence point

Seed storage behaviour: *Zieria granulata*



Germination percentages,

- Fresh = stored seeds

Summary

- Precision nicking treatment that cleared the **seed coat near micropylar** end enabled **>60% germination** in *A. oblongifolia* and *Z. granulata*.
- *Geijera parviflora* only responded well to **full seed coat removal** – microbial contamination from seedcoats.
- Storage behaviour tests confirmed that both *A. oblongifolia* and *Z. granulata* are **suitable** to store in **conventional seed bank** storage conditions (-20°C).
- However, *G. parviflora* showed significant reduction in germination after storage in -20°C for a month - **other germplasm conservation techniques** should be considered for *G. parviflora* if long-term storage is necessary. In the meantime, we can recommend **short-term storage** in **fridge conditions** , or regular seed collections to ensure that fresh seeds are used for germination.



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Thank You

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