

Sustainable forest management of miombo woodlands in Niassa National Reserve, northern Mozambique: a multidisciplinary approach of fire resistance analysis



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Introduction

Miombo is the Swahili word for *Brachystegia*, a genus of trees comprising a large number of species, often interspersed with open savanna (40%), and wetlands (5%).



It is **the** most important type of vegetation in southern Africa:

- 80% of rural households depend on it for land and products;
- Main source of highly valued timber and non-timber species;
- Global impact through emissions of trace gases from fires, soils, vegetation and animals, and by sequestering carbon and biomass.
- **Consequently:** key role in the regional, and probably the global, energy, water and carbon balances, but also in terms of rural development strategies.

Aim

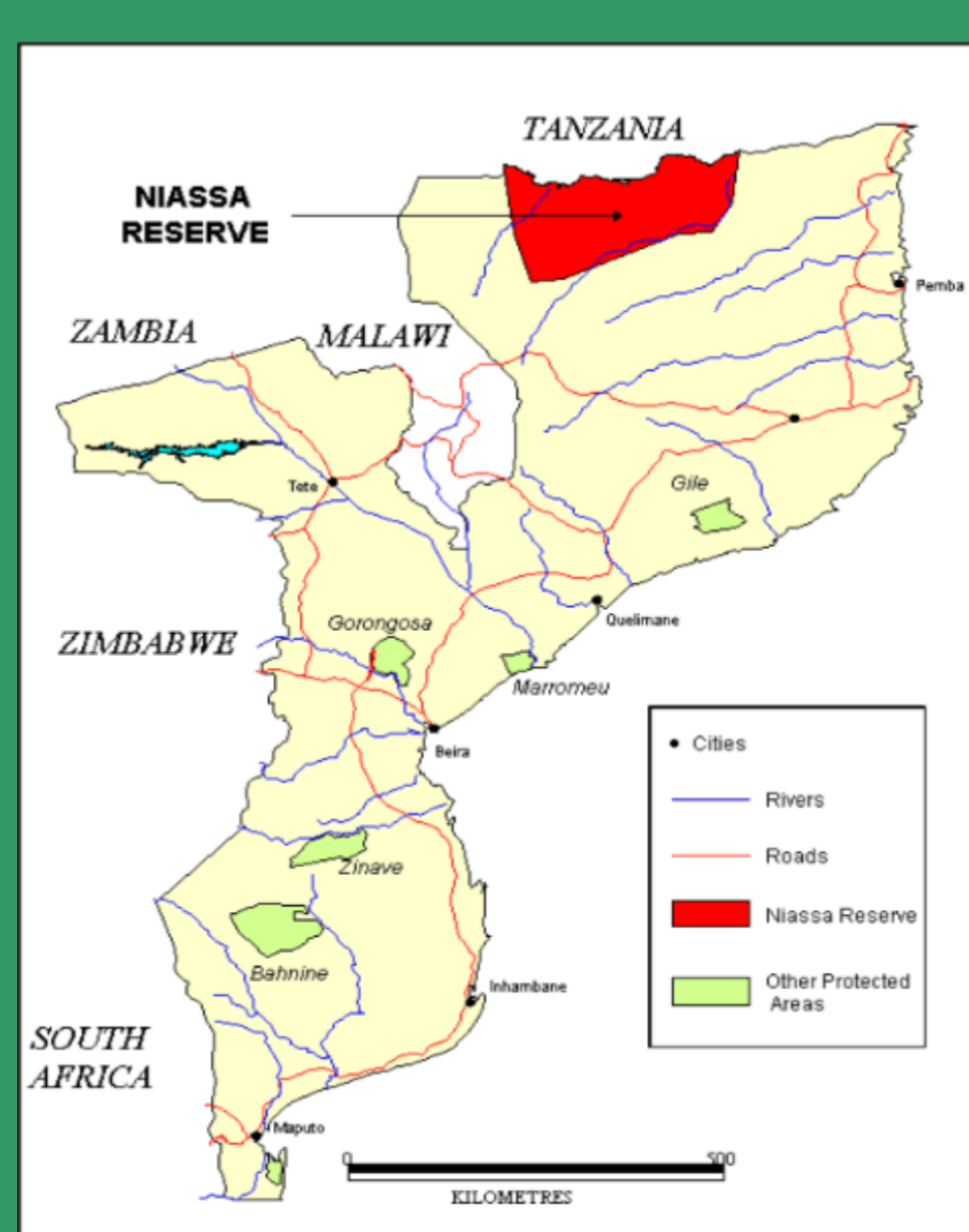
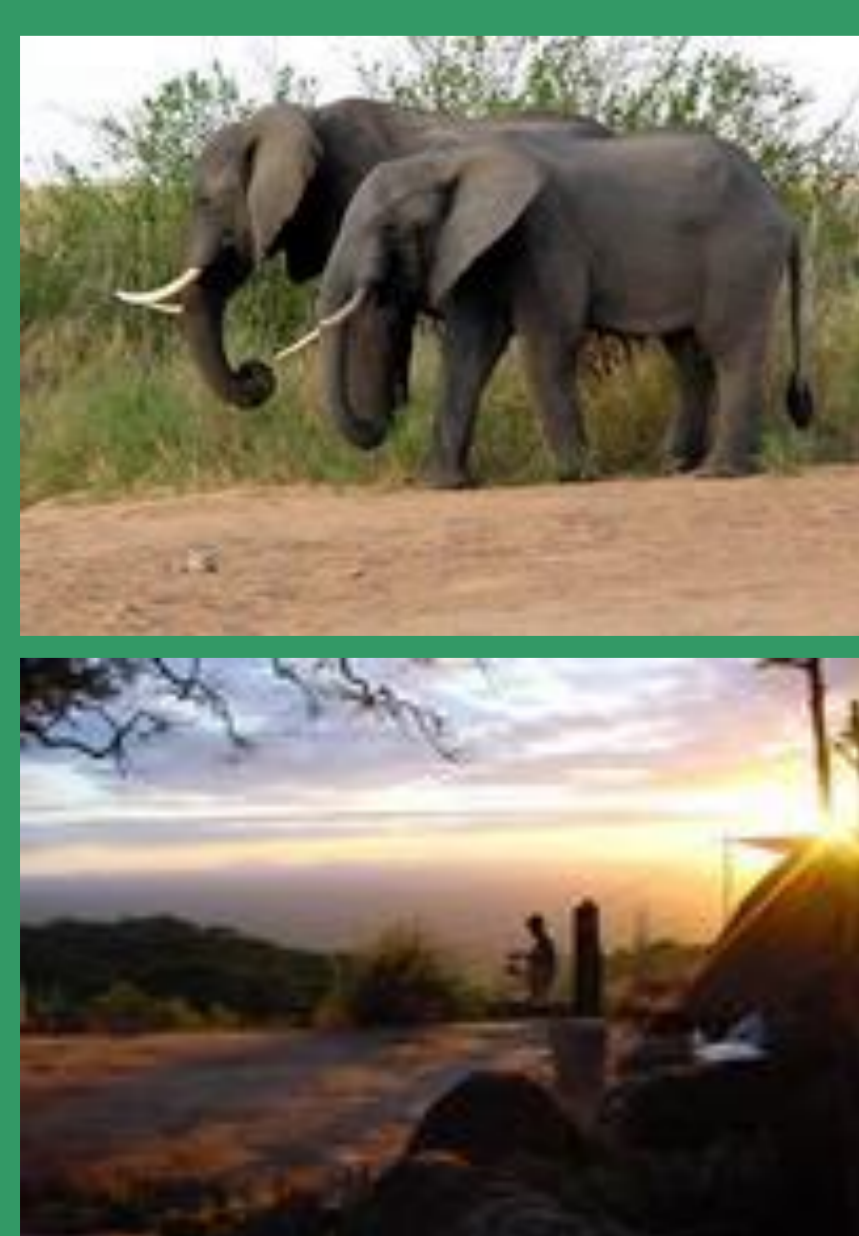
To promote the sustainable management of miombo woodlands in NNR

Components:

1. Fire monitoring and management;
2. **Genetic and phenotypic variability of selected species**
3. Tree resources availability and conservation (ex-situ and in-situ)

Study Site: Niassa National Reserve (NNR)

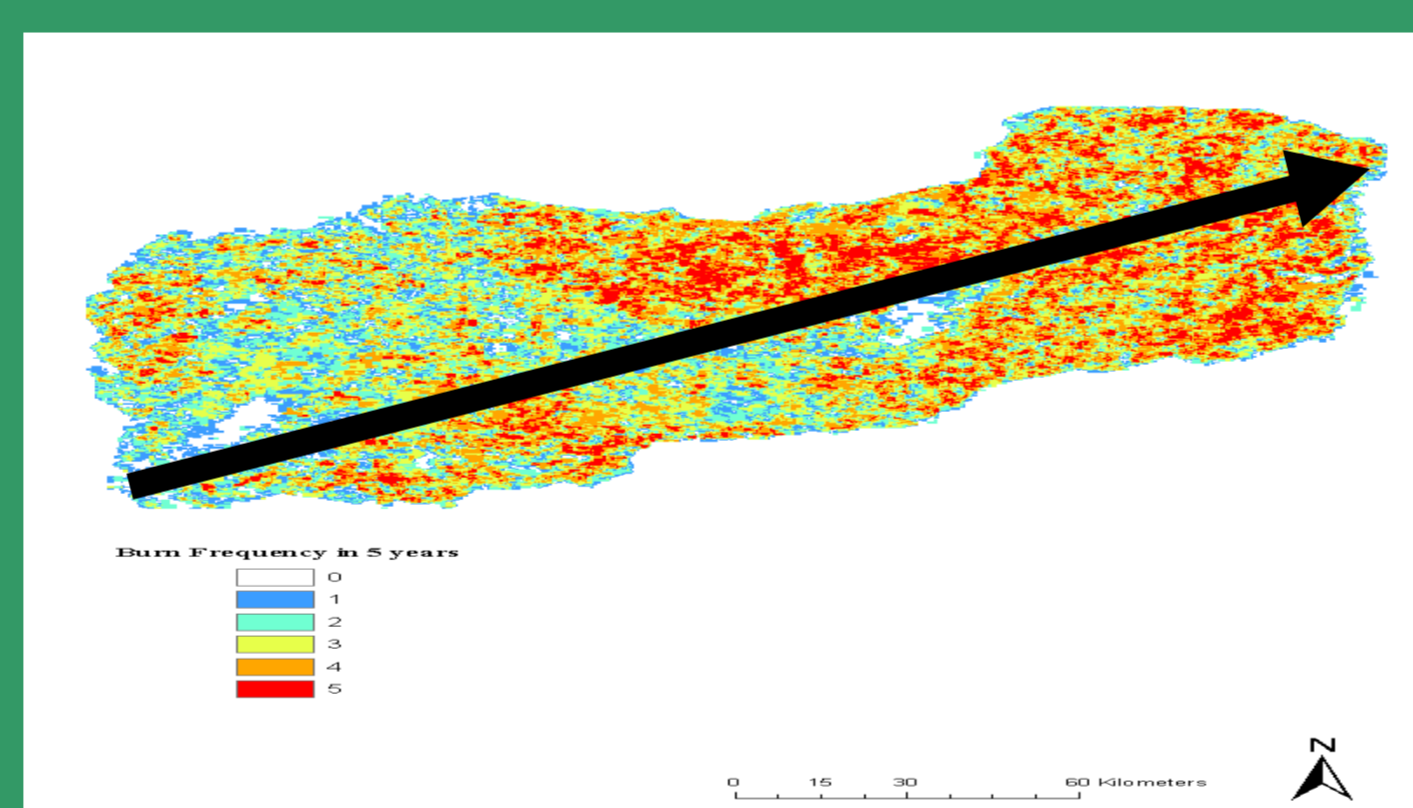
NNR embodies the largest and most pristine conservation area of miombo woodlands in Southern Africa, being the largest and wildest conservation area of miombo woodlands in the world.



Methods

Selected species: *Brachystegia boehmii*, *Pseudolachnostylis maprouneifolia*, *Terminalia sericea*, *Pterocarpus angolensis* and *Burkea africana*

Field data Collection: phenotypic traits (height, bark thickness, leaves thickness, height of ramification, natural regeneration) and genetic material (leaves and seeds) along the fire frequency gradient

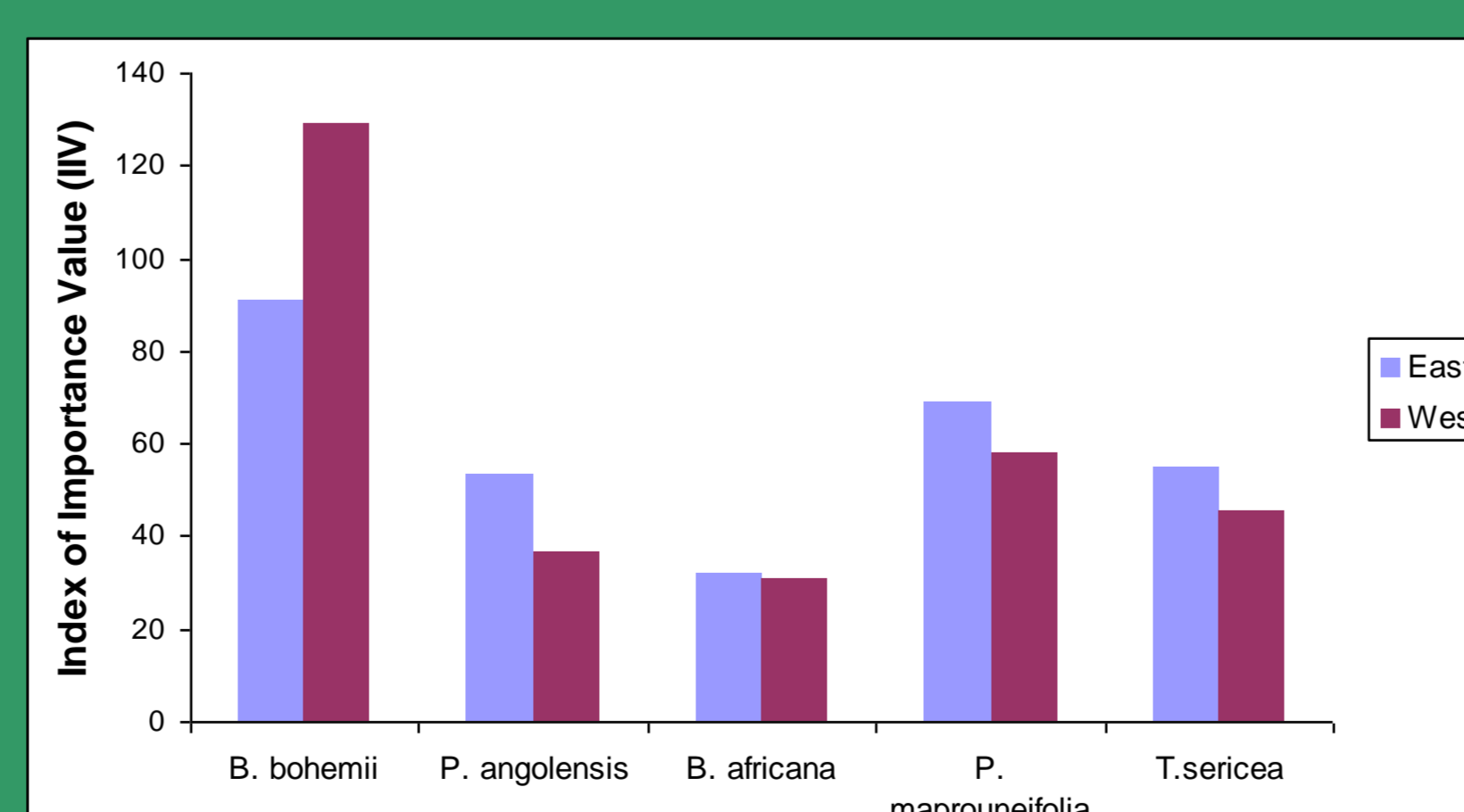


Data analysis:

- ✓ Index of Importance Value (IIV) and DBH distribution
- ✓ Statistical *t*-test (5%)
- ✓ Lab germination tests (different according to species)
- ✓ DNA extraction
- ✓ Development of microsatellite markers (in progress)

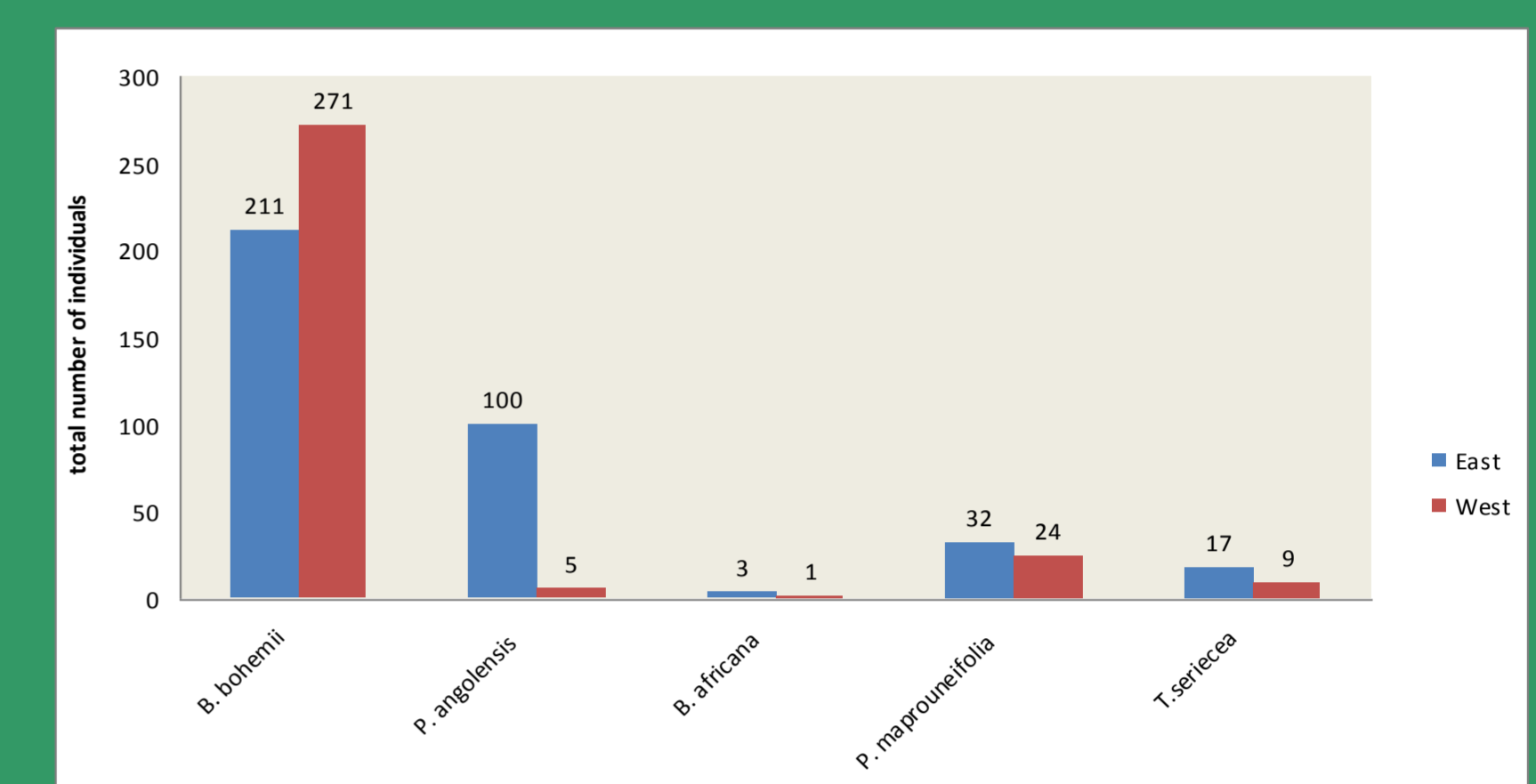
Preliminary Results

Index of Importance Value



- *B. boehmii* (a typical miombo species) is better represented in the west (lower fire frequency)
- fire resistant species are better represented in the east side of NNR (*P. angolensis* and *T. sericea*)

Natural regeneration



- *B. boehmii* is better represented in the west (< fire frequency)
- *P. angolensis* and *T. sericea* (fire resistant species) have higher regeneration in the east (higher fire frequency)

Seed germination

Table 1. Mean percentage germination of *T. sericea*, *B. africana* and *P. angolensis*

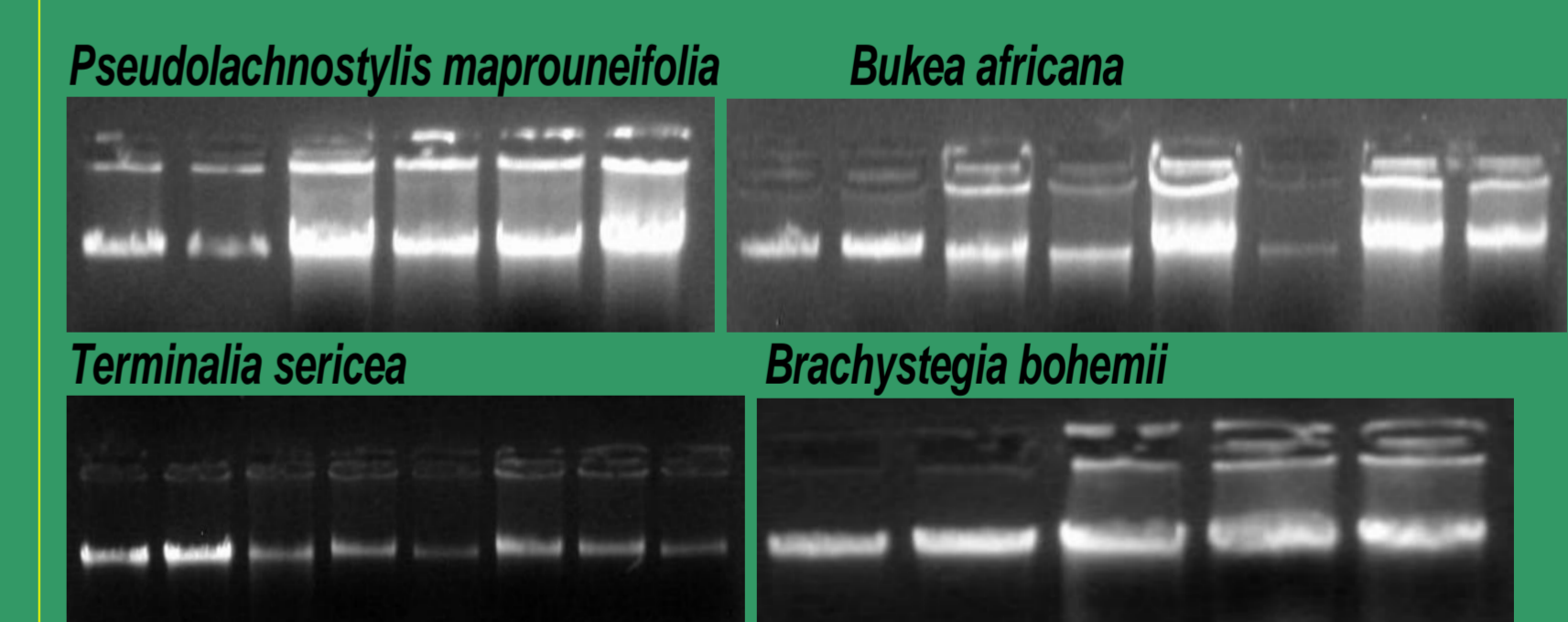
Species	Treatment	Germination % (mean±s.d.)	NR*	NSR**
<i>T. sericea</i>	Control	6.25 ± 4.79	4	20
	Chemical scarification	6.25 ± 2.50	4	20
	Mechanical scarification	6.25 ± 4.79	4	20
<i>B. africana</i>	Control	0.00 ± 0.00	4	20
	Mechanical scarification	0.00 ± 0.00	2	17
	Unburned fruits	23.53 ± 0.00	2	17
<i>P. angolensis</i>	Burned fruits	55.00 ± 7.07	2	10
	Unburned fruits	80.00	1	10

*Number of replicates
**Number of seeds per replicate

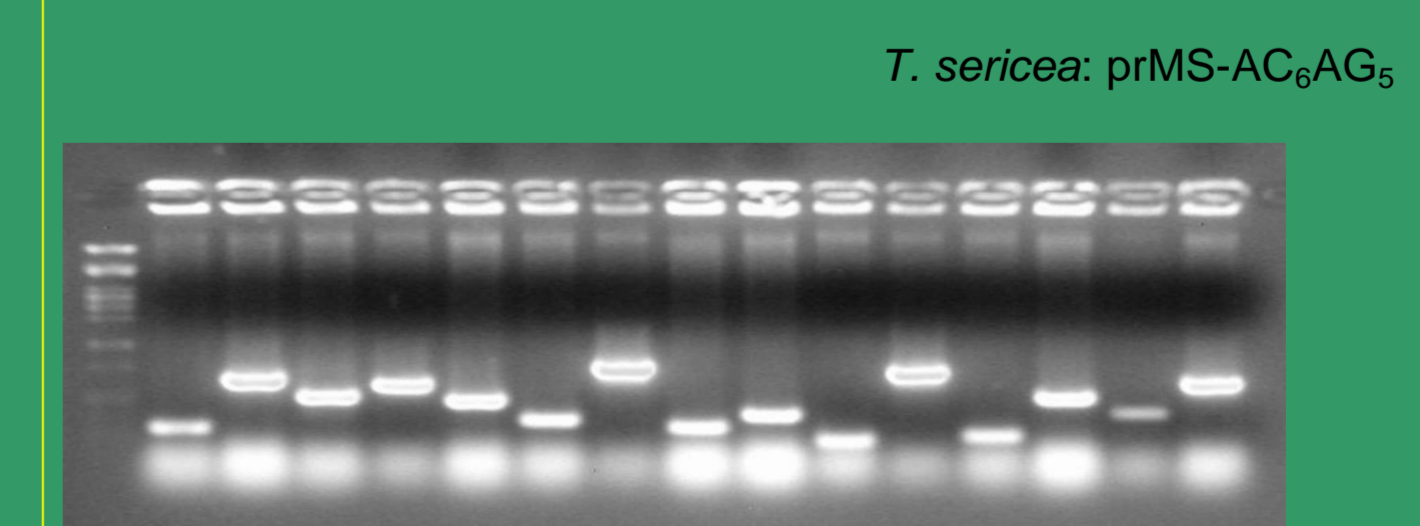
Mechanical scarification significantly increased *B. africana* germination

- *T. sericea* presents very low germination (0-6%)
- seeds of *P. angolensis* removed from unburned fruits had higher germination percentage

Molecular analysis



DNA Extraction (Doyle & Doyle 1990, modified)



Microsatellite amplification (Gleen and Schable, 2005)

Conclusions

- ✓ West side have better representation of miombo typical species **at both adult and young stages**
- ✓ GERMINATION
- ✓ The development of molecular markers will be an important tool to assess the genetic diversity among and between populations and to help the development of conservation strategies;

References

- Doyle JJ and Doyle JL (1990) A rapid total DNA preparation procedure for fresh plant tissue. Focus 12:13-15.
Gleen TC and Schable NC (2005) Isolation Microsatellite DNA Loci.