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National Research Foundation
NRF

An Assessment of the anatomical and genetic diversity of *Themeda triandra* Forssk.

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Masters Degree
2017

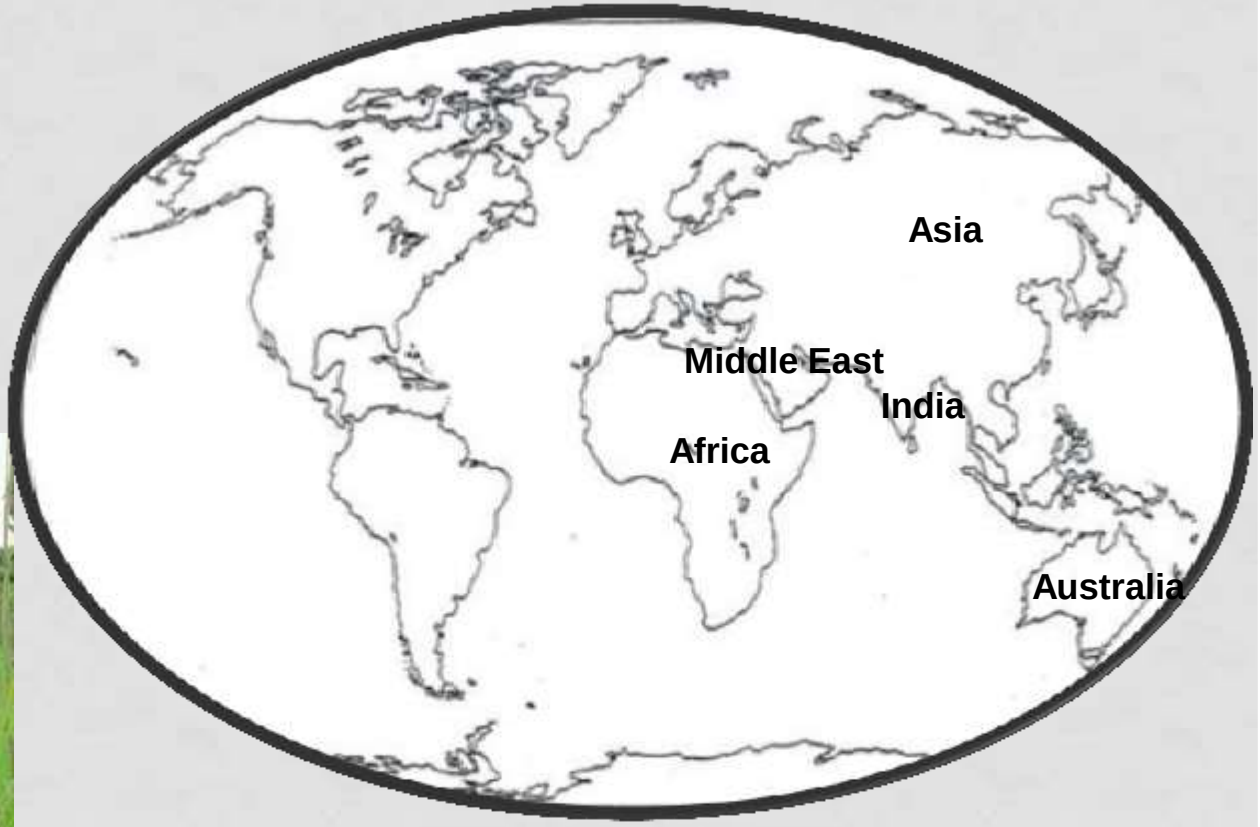
13/02/2016 13:35

Introduction

- **Family: Poaceae, tribe: Andropogonae, subtribe: Anthistiriinae.**
- **Commonly known as Redgrass/ Rooigras.**
- **C4 grass.**
- **Perennial.**
- **Colour ranges from blue-green, yellow, red with age.**
- **Grows up to 2m.**
- **Flowers from September/October to July.**

Introduction cont'd

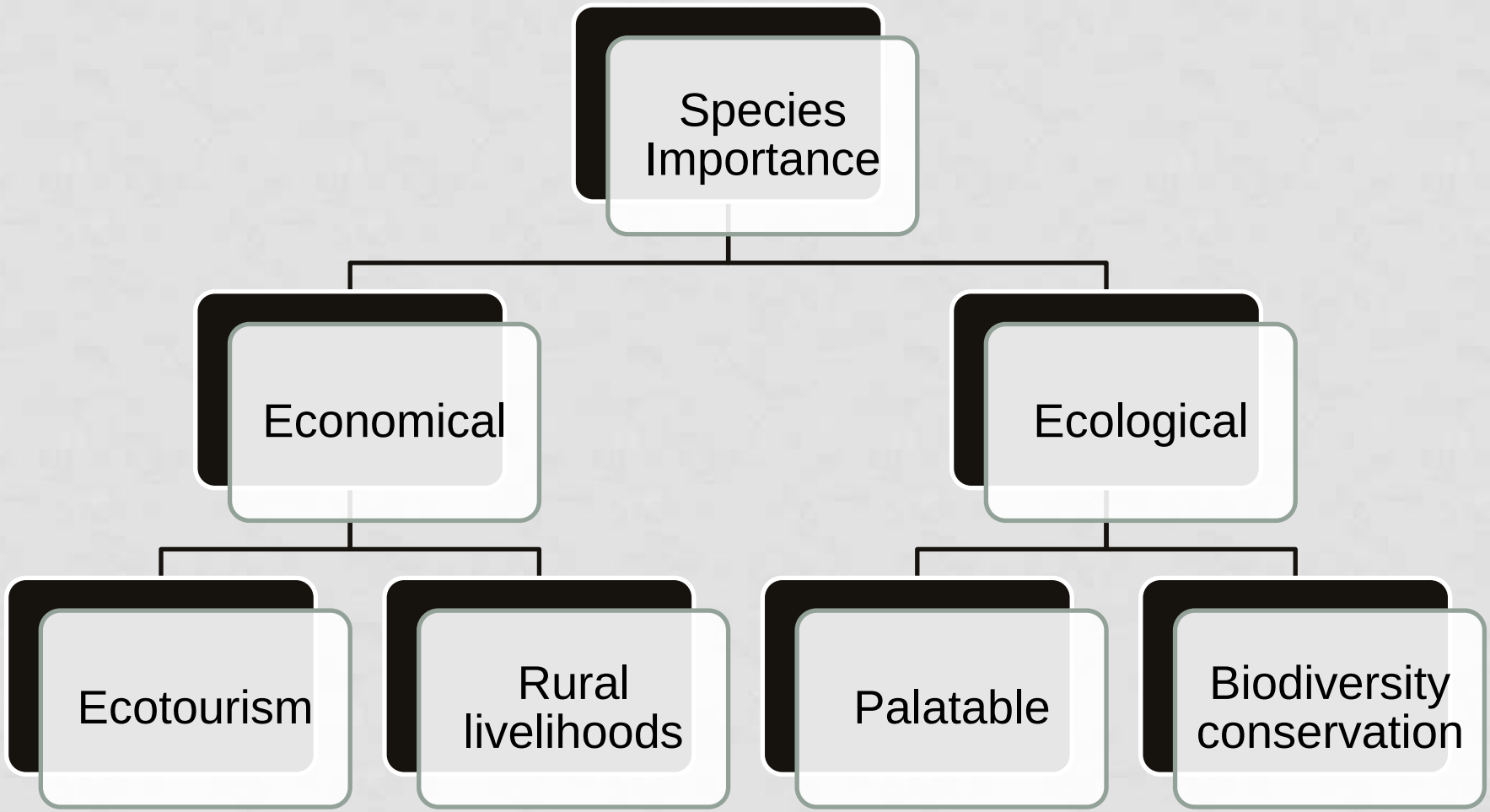
Distribution



(Sinethemba Ntshangase)

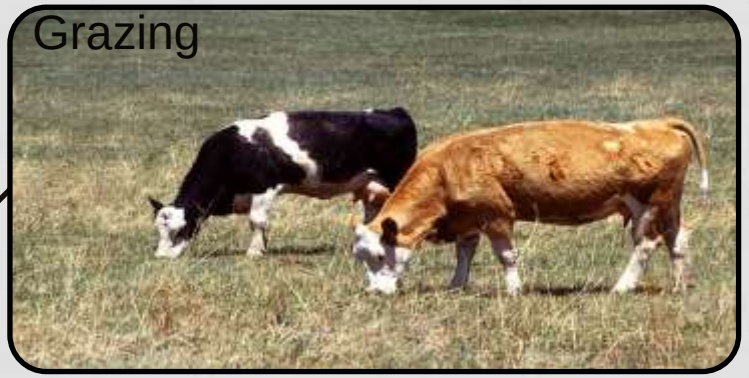
(Google images)

Introduction cont'd



Introduction cont'd

Species Management



Introduction cont'd

Literature Review

Morphological development and flowering

- Studies show a variety of sizes.
- Begins developing in Spring and Summer.
- Flowering times range from Early Spring to Late Winter

***Article* (briske1991developmental)**
Briske, D.
Developmental morphology and physiology of grasses
Grazing management: an ecological perspective. Timber Press, Portland, **1993**, 85-108

Cytology

- Ploidy levels vary. 2n=20-80.
- Increased apomixes.
- No geographic or any other pattern.

***Article* (liebenberg1986cytotaxonomic)**
Liebenberg, H.
Cytotaxonomic studies in Themeda triandra. I. Chromosome numbers and microsporogenesis
South African Journal of Botany, Elsevier, **1986**, *52*, 413-420

Literature Review cont'd

Seed biology

- Seed are larger than any other grass seeds, but are slow spreading.
- Seeds have an awn for hygroscopic movements.
- Seeds can stay dormant for up to 12 months.
- Germinate in the presence of high temperatures.

Genetics

- Not many studies done molecularly.
- One study showed that *T. triandra* is an actively evolving agamic species.

Ecophysiology

- Photosynthesis is highly affected by the amount of inorganic nitrogen ions infiltrated into the leaves.
- The most important carbohydrate reserves (sugar and starch) are found in the rhizomes.

Introduction cont'd

Study Background

- Gaps in the literature (genetics and anatomy).
- The importance and benefits of such an assessment.

Aim

- To investigate the variation in leaf anatomy and genetic diversity across southern African populations.

Objective

- To run Scanning Electron Microscopy and Light Microscopy of the leaves.
- To run molecular analysis of the species.

Methodology

Study material

126 Herbarium specimens

92 Fresh specimens

Methodology cont'd

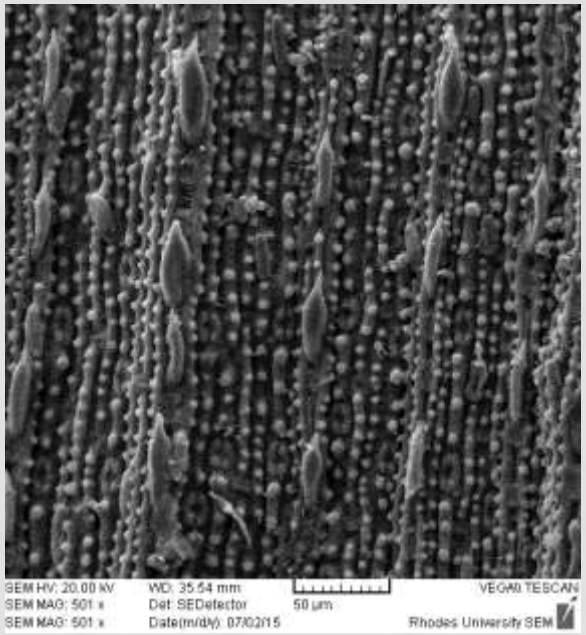
Anatomy

Scanning Electron Microscopy

- 45 characters.

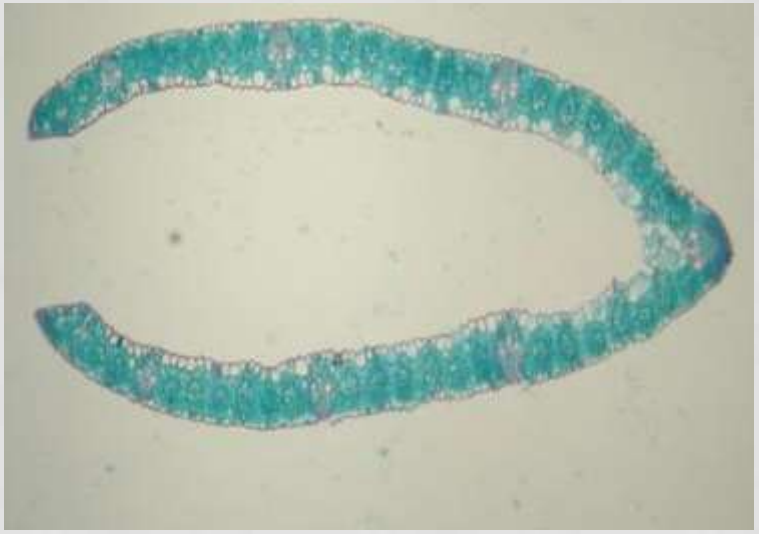
Light Microscopy

- 59 characters.



Analysis

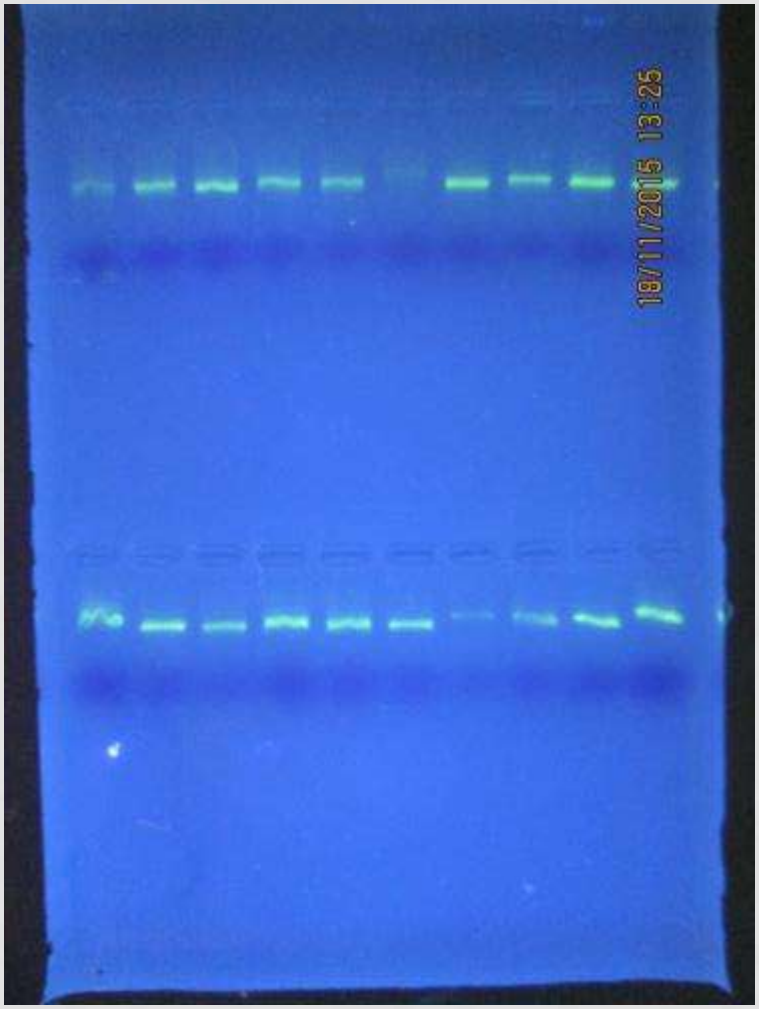
- Numerical Taxonomic System (NTSys).
- Euclidean and Simple Matching distance measures



Methodology cont'd

Genetics

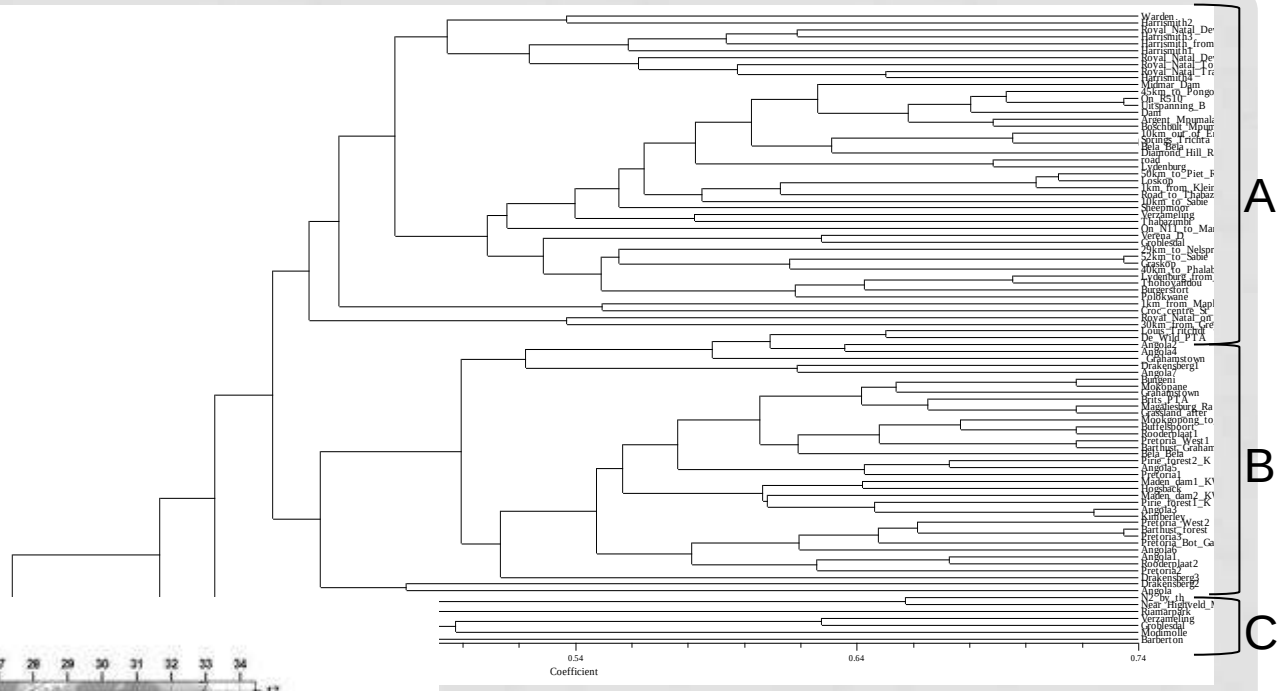
- Only the fresh specimens (92) were used.
- CTAB extractions
- DNA amplification with Internal Transcribed Spacer (ITS) gene.



Analysis

- Data cleaning with Sequencher.
- Molecular Evolutionary Genetics Analysis (MEGA V.6)
- Mr Bayes.
- Splits Tree
- TCS analysis

Results



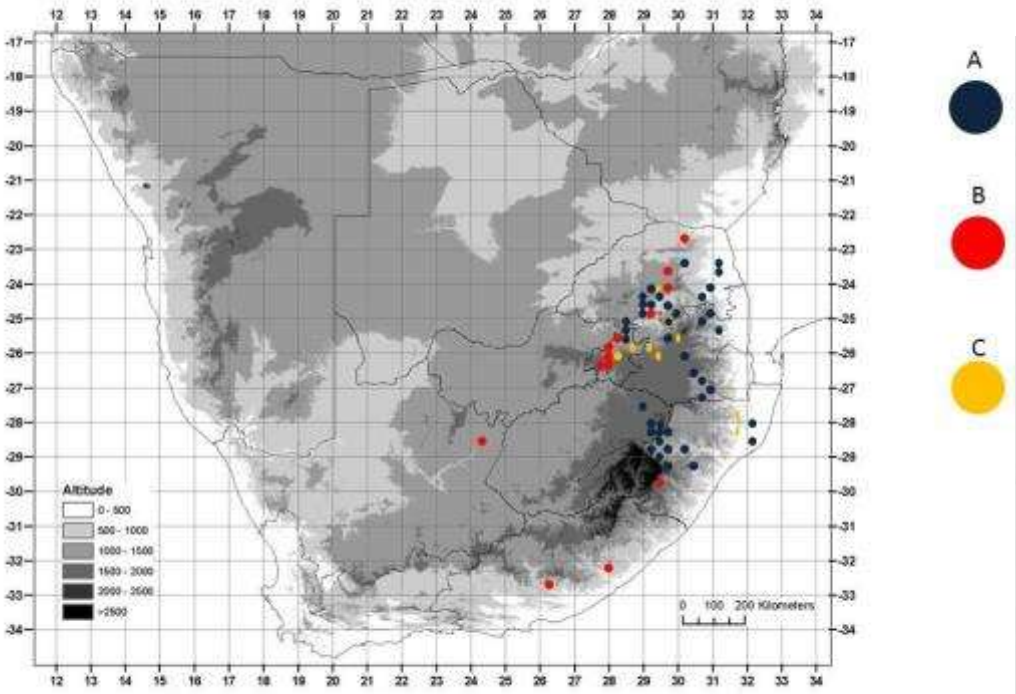
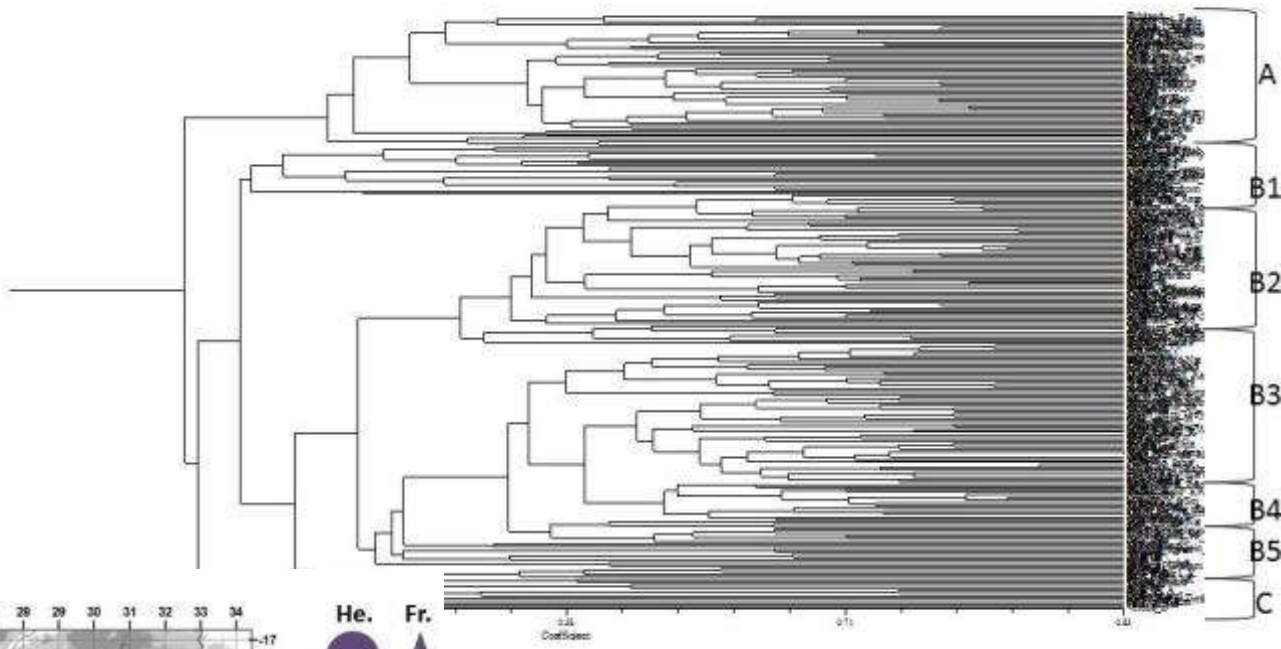


Figure3.1: Tree showing UPGMA of the SEM for the Fresh specimens with simple matching

Results cont'd



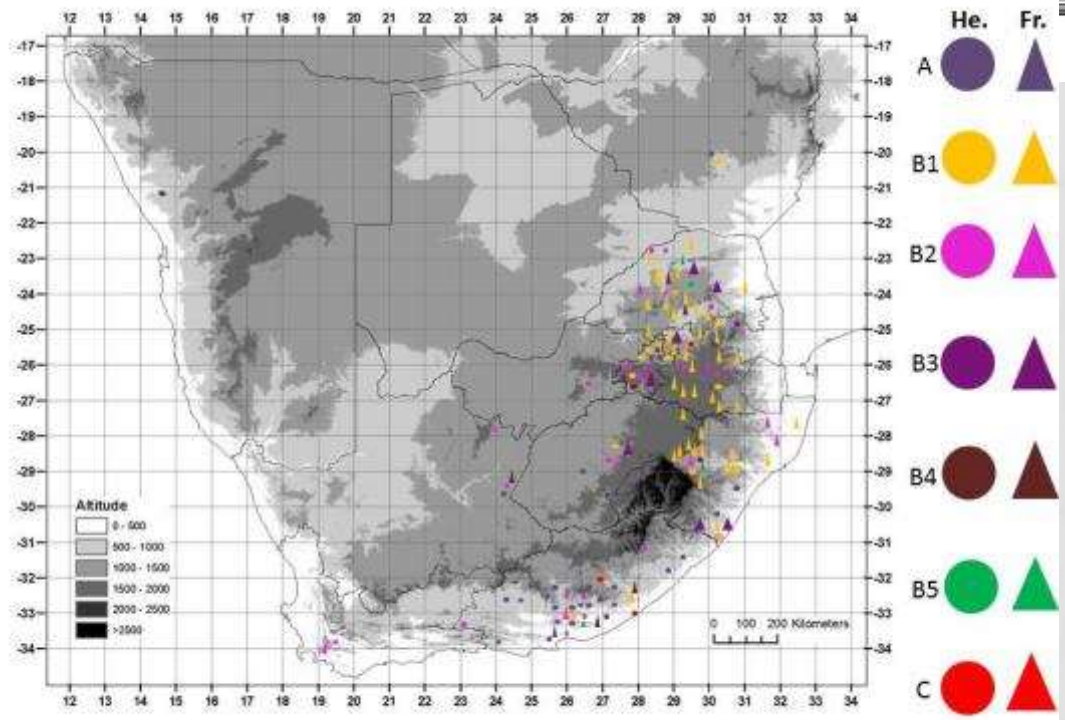
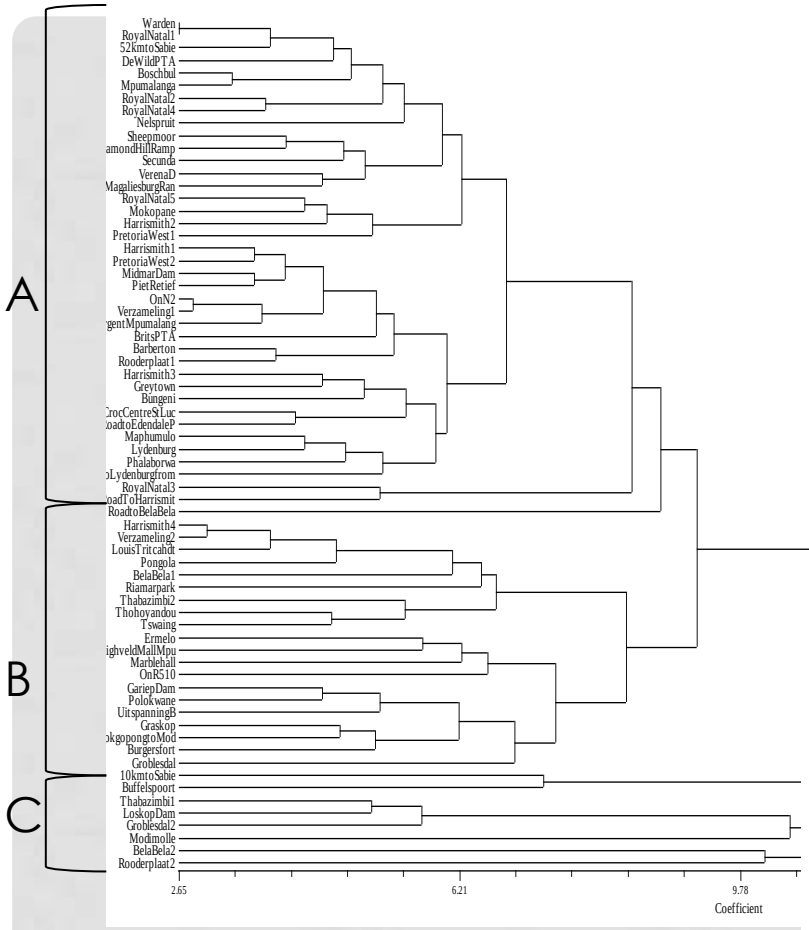


Figure3.2: Tree showing UPGMA of the SEM for the Fresh and herbarium specimens with simple matching

Results cont'd



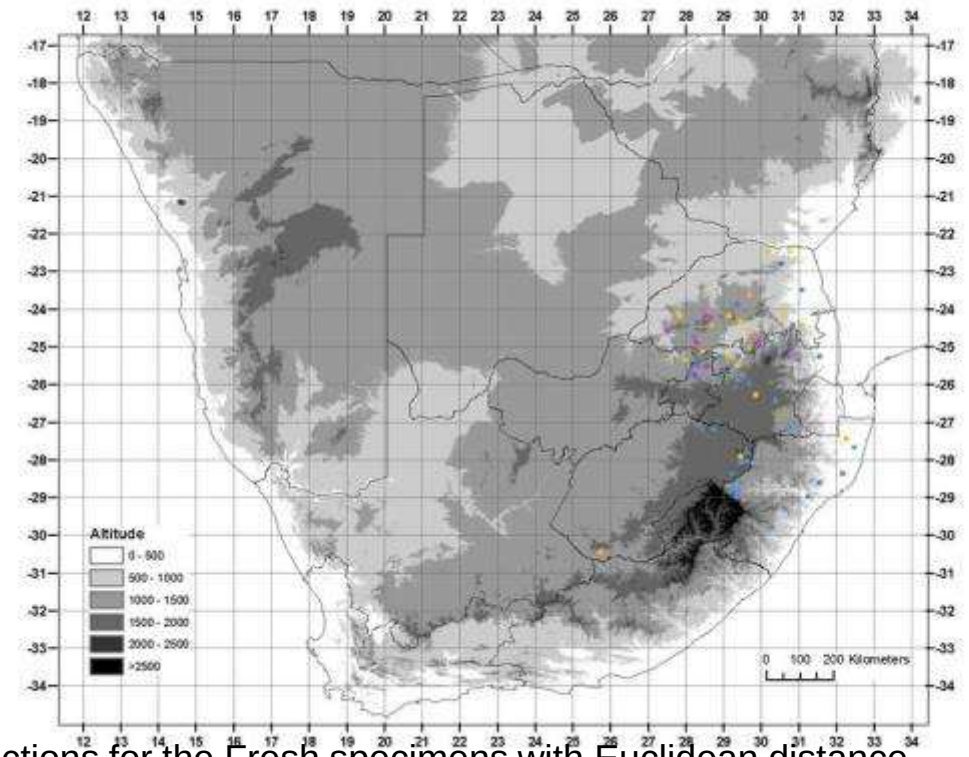


Figure3.2: Tree showing UPGMA of the cross sections for the Fresh specimens with Euclidean distance

Results cont'd

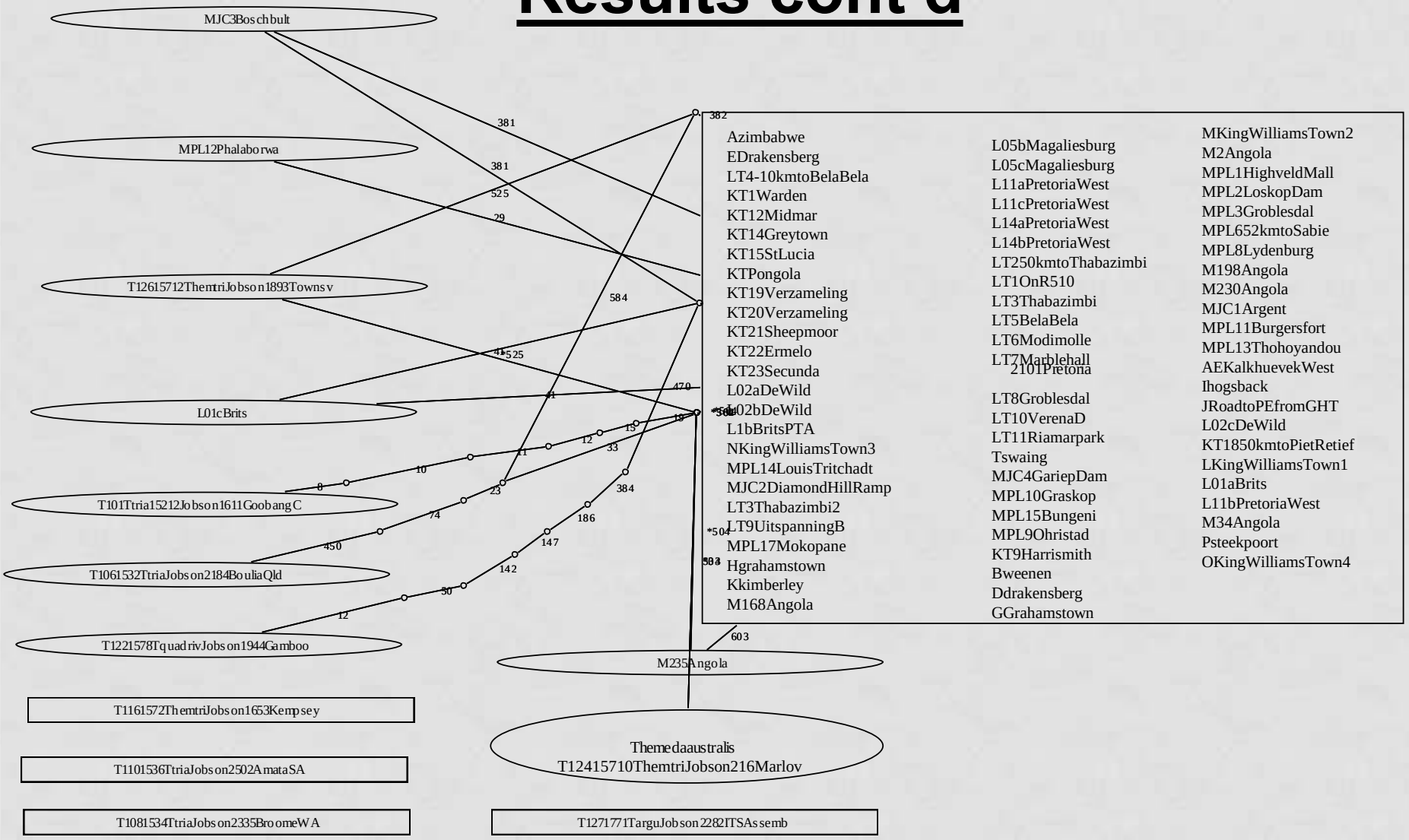


Figure 3.3: Results from the TCS analysis with gaps missing

Discussion

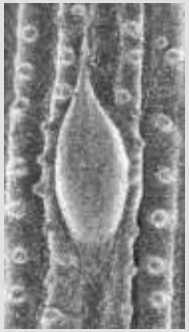
- There was no major geographic pattern among the species for both the anatomic and genetic data.

- Four characters from scanning electron microscopy related to the clusters.

Micro-hairs

Stomata

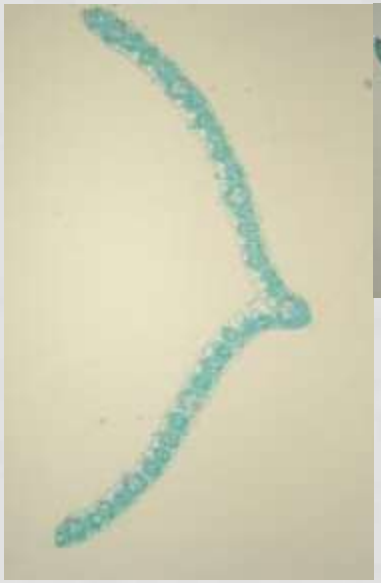
Long-barb prickles



Large Prickles

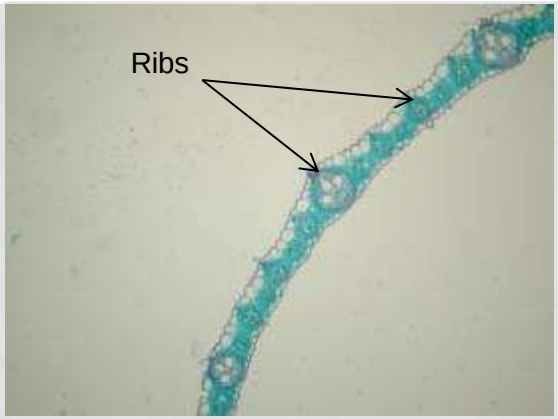
Discussion cont'd

- From the transverse section data, six characters caused the clusters.

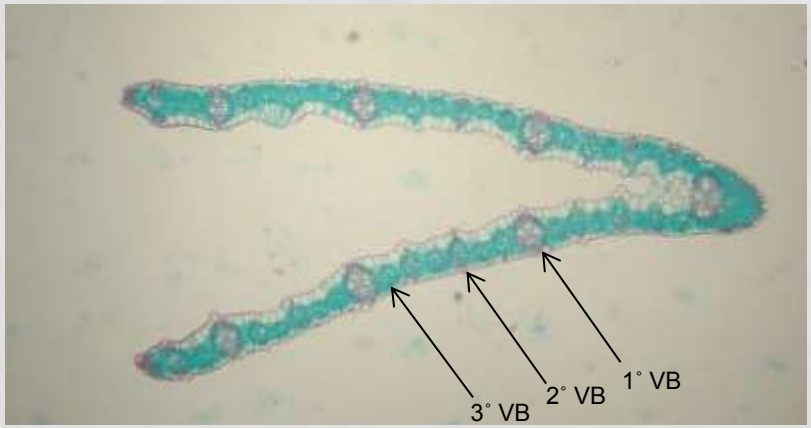


Openness of leaves

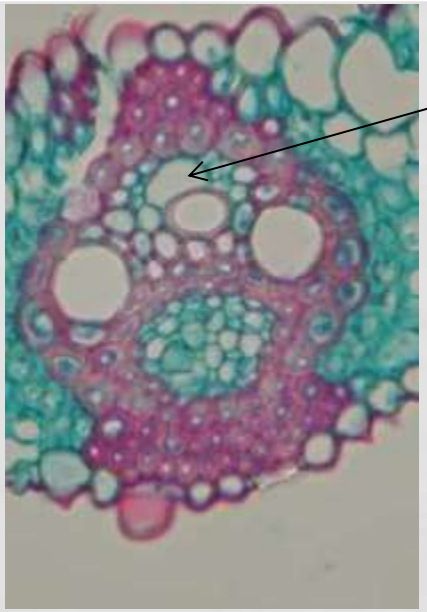
Whether they were wavy/not



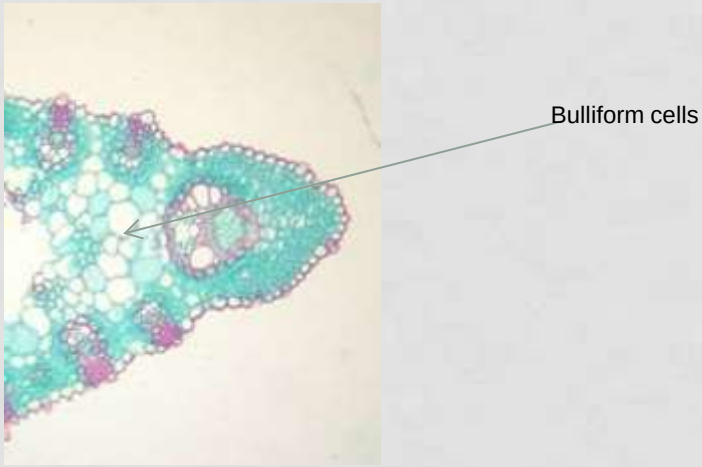
The presence and position of ribs



Shape, position and number of vascular bundles



The presence/Absence of the lysigenous cavity



Bulliform cells

Conclusion and Recommendations

- There is no visible anatomical and genetic diversity among the southern African specimens of *T. triandra.*
- There was no geographic pattern observed.
- However, anatomically there were characters that affected the clusters.
- These characters may have been influenced by whether it was during a drought/rainy season, age of the plant and possible hybridization.
- The most likely explanation is that the morphological differences observed are due to adaptation to environmental changes (phenotypic plasticity).
- Compare the anatomy and genetics data with cytology data from previous studies to see if there is any other pattern.
- Lastly, more studies need to be conducted on the species to further understand this complex.

Acknowledgements

- National Research Foundation (NRF)
- Prof Nigel Barker
- Sue van Rensberg
- Constance Mothwa
- Dalton Masia
- Dr Michael Cunningham
- Australian team

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Thank You