Calotropis procera: A New Investment for African Drylands

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Introduction

Calotropis procera is a fibre-producing shrub that grows in Africa's drylands. Traditionally, the plant is used for medicinal purposes and for fuel wood. However, analysis has shown that fibre produced from its mature fruit may also be suitable for the manufacture of textiles, hence has potential to be developed as a cash crop for industrial use. The development of a *Calotropis*-based industry has the potential to improve livelihoods of communities that live in the drylands. These communities often experience crop failures and high livestock mortality due to the adverse effects of the climate change, rendering them vulnerable in a fragile ecosystem. *Calotropis* thrives with minimal soil moisture and in some regions of the Sahel, it is the only plant that survives the harsh conditions. For a sustainable *C. procera*-based fibre industry, it is necessary to domesticate the species to ensure optimal fibre quality and quantities. This will involve identifying superior propagation material and the development of suitable on-farm management techniques that will lead to high yield and good quality fibre. Scientists have been conducting preliminary evaluations to understand the genetic diversity of *Calotropis* and growth performance of different provenance.

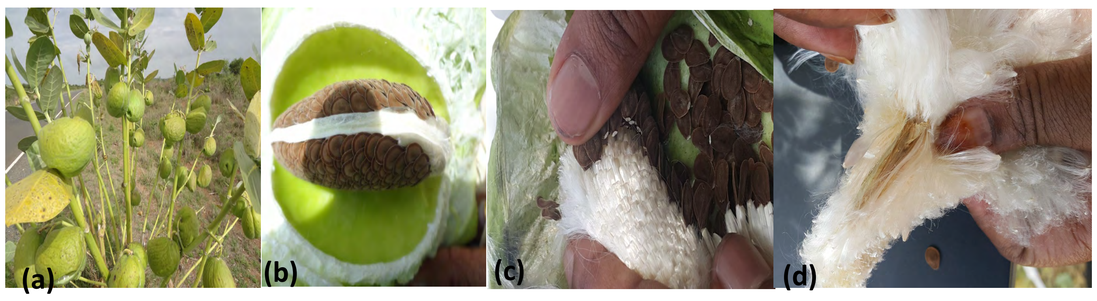

Figure 1 : *Calotropis procera* (a) plant with mature fruits (b) opened fruit (c) Seeds removal to access fibre (d) fibre extraction.

Evaluation of growth performance

Method:

Field trials of provenances of *Calotropis* from Kenya (Kibwezi, Baringo and Tharaka) and one from Mali are being conducted at South Eastern Kenya University (SEKU).
Growth parameters such as number of branches, height and diameter are monitored monthly. Phenology events including time of flowering and fruiting as well as fruit and fibre yield are monitored seasonally.

Figure 3: Nine month old *C. procera* at the South Eastern Kenya University, Kenya

Key findings:

- Trial fields had over 97% survival and Tharaka provenance gave the highest growth parameters.
- Flowering occurs throughout the year but fruiting mainly takes place during the rainy seasons. Heavy fruiting develops in the short rainy season of October-December.
- There were significant variations in fruit and fibre yield among and within populations.
- Pests noted include aphids (*Aphis nerii*), lady bird beetle (*Menochilus sexmaculatus*) and fungus (yet to be identified).

Conclusions

1. Proper timing and handling of fibre is critical to ensuring good quality
2. Species can be easily managed on farms and early optimal production can be established through proper plant management.
3. Populations with high genetic diversity and admixtures should be considered as a source of germplasm for domestication.
4. Further analysis to establish if significant genetic diversity found in the selected populations infer variation in fibre quality.

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Figure 2: (a) Local communities sorting out harvested *Calotropis* fibre. (b) *Calotropis* fibre products

Genetic diversity

Method:

Transcriptome Sequence was carried out from which, 20 expressed sequence tags–simple sequence repeats (EST-SSR) markers were developed and used for genetic diversity and structure of six populations of *C. procera*

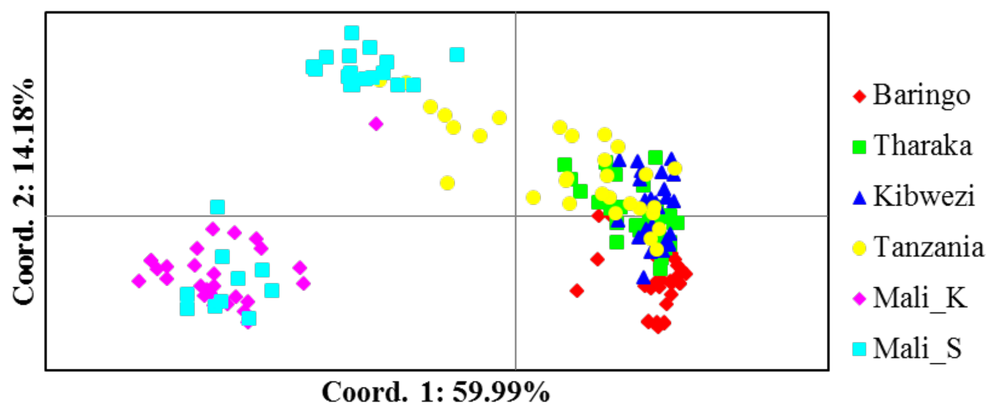

Figure 4: PCoA analysis of 173 individuals of *C. procera* from six populations based on 20 EST-SSR markers.

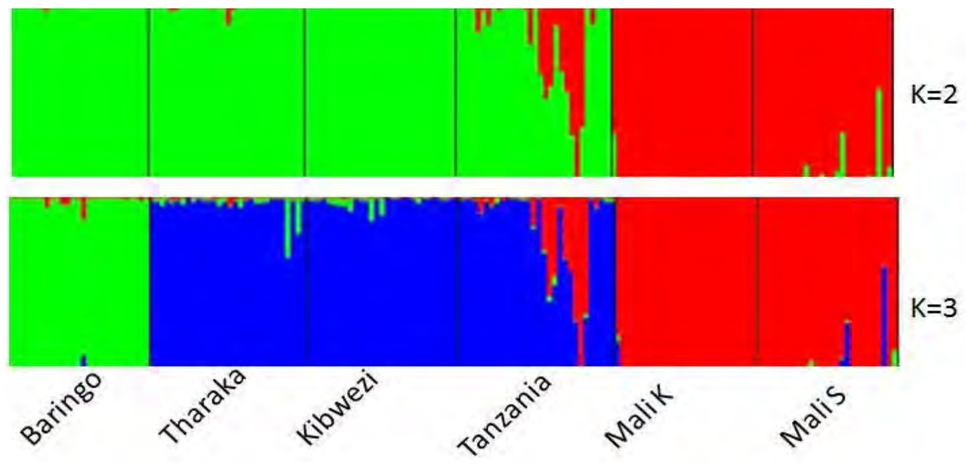

Figure 5. STRUCTURE bar plot based on probabilities for 173 individuals of 6 populations of *Calotropis procera*. Black vertical lines separate populations. K value –optimal genetic groups among populations.

Key findings:

- Moderate genetic diversity, with Mali showing highest genetic diversity among the sampled populations
- *C. procera* showed high "within individual" partitioning of genetic variance
- Strong structure exists in *C. procera* populations
- Populations structured according to their geographical locations in Kenya, Mali and Tanzania showed admixtures
- Sequence revealed genes that are linked to fibre biosynthesis such as Cellulose synthase gene (*CesA*).

Key references

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