

SCRIPTIES, DOCTORATEN
THESES, DOCTORATES
MEMOIRES, DOCTORATS

**SOCIO-ECONOMIC IMPORTANCE
AND STUDY OF THE ECOLOGICAL,
MORPHOLOGICAL, GENETIC AND
BIOCHEMICAL VARIABILITY OF
BAOBAB (ADANSONIA
DIGITATA L.) IN BENIN**

**Achille Ephrem Assogbadjo, Brice Sinsin
& Patrick Van Damme**

*Vakgroep Plantaardige Productie
Universiteit Gent
Coupure Links 653
9000 Gent
Belgium*

e-mail: assogbadjo@gmail.com

SUMMARY

The present study explores the ecological, genetic and biochemical characteristics of African baobab (*Adansonia digitata*) in Benin and aims at contributing to the species domestication in this country. In order to reach this main objective, socio-economical and ethno-

botanical surveys, fieldwork for the ecological and morphological characterization of the species, laboratory analyses for its genetic and biochemical characterization and finally seed germination tests were performed.

The study showed that *A. digitata* is a multipurpose tree species used by local people of Benin for food, medicine, cultural and economic purposes. Local people have an outstanding knowledge on the species and use several criteria to differentiate baobab individuals in traditional agroforestry systems. A five months market investigation in Malanville (north of Benin), showed that 200 tons of baobab seeds coated with pulp, 10 tons of baobab pulp and 1 ton of baobab leave powder were commercialised and generated up to 15 millions FCFA (US \$ 30,000), 400000 FCFA (US \$ 800) and 200000 FCFA (US \$ 400) for 139 rural populations involved in that business.



The study also revealed that the density of baobab varies from one climatic zone to another in Benin. The morphology and productivity of individual baobabs varies significantly from one zone to another ($p < 0,001$). The correlation between environmental and biotic characteristics (production and dendrometric variables) showed that the zones with high values of potential evapotranspiration, rainfall, relative humidity, temperature, percentage of clay and fine silt are associated with a low seed and fruit pulp production. In contrast, high values of C/N (Carbon / Nitrogen) ratio were shown to be negatively associated with pulp and kernel production as well as with the development (morphological traits) of baobab individuals.



In addition, genetic studies showed a clustering of all genotypes sampled in three climatic zones of Benin into six gene pools. Generally, samples collected in the same climatic zone belong to the same gene pools indicating that the genetic structuring of the sampled individuals is correlated with their geographic origin. A two-level AMOVA revealed 82.37% of the total variation within (intra) populations and 17.63% among (inter) populations. Correlation between

morphological diversity and genetic diversity was not globally significant ($r = 0.036$; $P = 0.327$). However, when analyzing each morphological characteristic individually, statistically significant correlations ($p < 0.05$) were detected between the observed patterns of genetic variation and three morphological features: (1) height of the trees, (2) number of branches, and (3) thickness of the capsules.

Concerning the biochemical characterization of baobab organs, the study showed that the biochemical composition of the organs does not vary according to the provenance of the trees, except for the vitamin C content. On the other hand, it was shown that the physico-chemical characteristics of the soil have an influence on the nutritive value of baobab organs. Highly basic soils (high pH value), rich in carbon, clay, fine silt and organic matter positively affect the organs contents in iron, potassium, vitamin C, carbohydrates, zinc, proteins and lipids and negatively affect their contents in magnesium, calcium, vitamin A and fibers.



In contrast, soils rich in crude silt and sand have an opposite effect on these same biochemical parameters of the organs.

Germination tests allowed comparing baobab seeds from the three climatic zones. In general, the analysis showed that the best mean percentage of seed germination was obtained with the seeds scarified before sowing. Moreover, it was shown that a storage duration of more than 3 months negatively affects seed germination whatever their provenance.

