

Back to our Pangean origins: An investigation of baobab diseases in Madagascar

The Republic of Madagascar is the oldest island in the world. It originally nestled between what is today eastern Africa and India. Madagascar became separated from Africa approximately 165 million years ago, when Africa started separating from the Madagascar-India-Antarctica plate. Around 130 million years ago the island separated from the Australia-Antarctica plate and from India around 90 million years ago. Having been separated as an island from other larger landmasses for so long has made Madagascar one of the most biologically diverse areas of the world, for example it is home to five percent of the world's plant and animal species. Of these, more than 80% are endemic and amongst the most remarkable of the endemics are the baobabs (*Adansonia* spp.). Remarkably, Madagascar is home to six endemic species of baobab as well as the introduced African baobab, *A. digitata*.

It is quite ironic that despite their iconic status wherever they occur, almost nothing is known regarding the diseases of baobabs. In 2007, because of reports of *A. digitata* trees dying in various parts of southern Africa, the DST/NRF Centre of Excellence in Tree Health Biotechnology (CTHB) launched a project to consider this problem. The fact that many tree species have been devastated by diseases in various parts of the world was a strong motivating factor. The thought of baobabs being lost to disease seemed too dreadful to contemplate. The plan was then to try to understand whether baobabs are dying of unnatural causes and also to generate baseline knowledge pertaining to fungi occurring on these remarkable trees.

Other than determining whether African (and other) baobabs are threatened by disease, the CTHB Baobab Disease Project, will use a "model" fungal pathogen to study the movement of fungi on these trees between different geographic regions. These will include Africa, Madagascar and Australia, which are all areas where baobabs are found as natives. After some pilot studies, the project commenced in July 2007, with Professor Jolanda Roux and Ph.D. student Elsie de Meyer starting field work on these trees in the Limpopo Province of South Africa. This was followed up by two further survey trips in October 2007. One was to Botswana and Namibia, with Elsie and Dr. Diana Maine leading this survey. The other survey was undertaken in Madagascar by Profs. Mike Wingfield and Jolanda Roux.

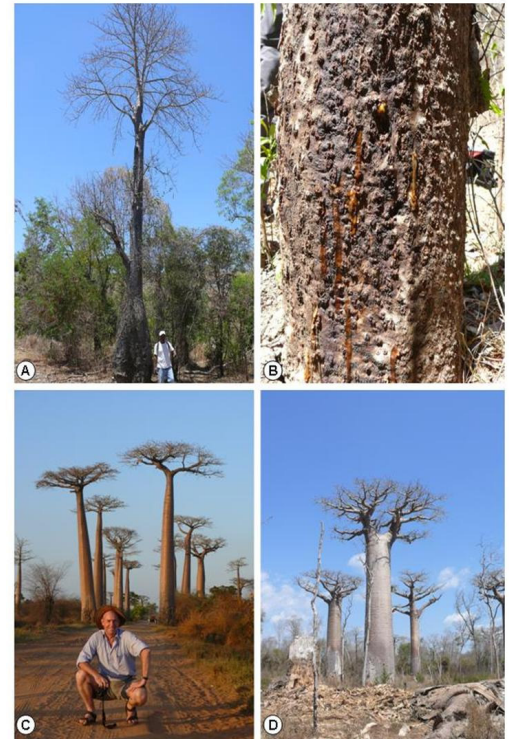


Figure 1: Madagasy *Adansonia* spp. sampled (A) *Adansonia madagascariensis*, (B) *Adansonia madagascariensis* showing signs of disease, (C) *Adansonia grandidieri*, (D) Fire damaged and dying *A. grandidieri*.

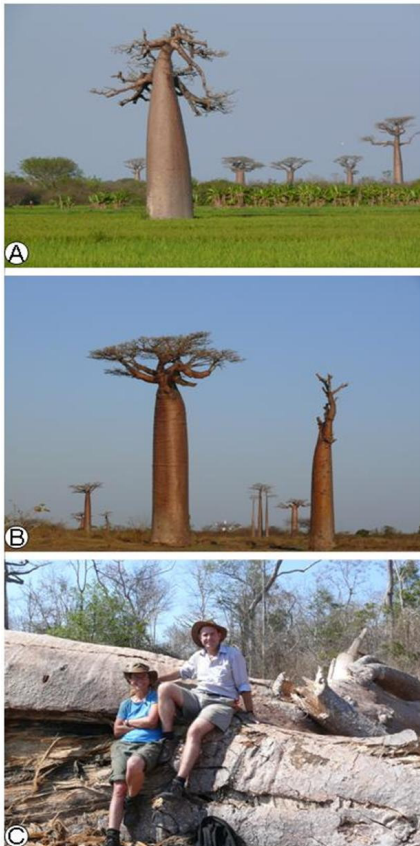


Figure 2: Diseased *Adansonia* spp. (A) *Adansonia grandidieri* growing in a rice field, (B) Dying *A. grandidieri* (right) next to currently healthy one in old rice field, (C) Jolanda Roux and Mike Wingfield with dead *A. grandidieri* tree.

The survey trip to Madagascar provided the CTHB team with valuable contacts and information that will form the foundation of subsequent surveys. Two main regions were visited in the short 10-day period, enabling Mike and Jolanda to collect samples from five *Adansonia* spp. (Fig 1A, B), including the African baobab, *A. digitata*, which was brought to Madagascar by Arab traders. A highlight of the trip was to see the famous avenue of baobabs near Morondava (Fig. 1C). These grand old *A. grandidieri* trees are very aptly named and are totally awe inspiring in size and physical presence. Results of the survey, however, made it perfectly clear that unless something drastic is done, many of these grand old baobab trees will not be around for much longer. This is due to increased pressure for agricultural land with many of the trees now growing in rice paddies (Fig. 2A). Being drought tolerant trees and not accustomed to having wet roots is placing them under incredible stress and leading to widespread mortality (Fig. 2B). Others are damaged by fires (Fig1D) when forests are cleared to produce much-needed agricultural land.

Apart from surveying baobab trees, the collaboration with researchers from Madagascar allowed Mike and Jolanda to collect many other samples of relevance to CTHB projects. The collections from Madagascar will provide valuable information regarding the biogeography of important tree pathogens in Africa and other parts of the world. This is especially important as many international studies include very limited numbers of isolates from the African continent.

No survey of tree diseases can be undertaken without the support of many people and this was especially true for the Madagascar baobab study. We were thus fortunate to have the support of Dr. Pascal Danthu of CIRAD in Antananarivo and his team including Emilson Rakotoarisoa and Voninavoko Rahahanirina. They provided invaluable assistance in obtaining all the necessary permits to conduct the surveys and to collect samples for scientific purposes. Emilson and Voni also travelled long distances, often under difficult circumstances in order to assist Jolanda and Mike, with translation, collecting samples and many other essential forms of support without which the work could not have been done.