THE ONLY ONE: ONE AFRICAN BAOBAB SPECIES (NOT TWO)!*

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The iconic baobab tree, *Adansonia digitata* L. is well known across Africa as much for its unusual shape, which has resulted in its common name the 'upside down tree', as for its usefulness. The African baobab is of great value to the local communities who depend on it for many products and in some instances, it contributes significantly to their livelihood and/or income.

Until recently, eight species of baobab were known – six endemic to Madagascar and one in the north-western (Kimberley) region of Australia (*Adansonia gregorii*), as well as the well-known *Adansonia digitata* from the more arid regions of Africa. It was with great interest, therefore, that botanists around the world read the publication in December 2012 announcing that a second African baobab species had been identified and described.

This baobab was called *Adansonia kilima* and was reported to occur mostly at higher altitudes than *A. digitata* in eastern and southern Africa, i.e. from 650 – 1500 m above sea level (a.s.l.) but usually above 800 m a.s.l., whereas *A. digitata* commonly occurs below 800 m a.s.l., but the two species do overlap in places. *Adansonia kilima* was also said to differ from *A. digitata* in the number of sets of chromosomes (ploidy) it possesses and also in the size and orientation of some of its floral features.

Figure 1. African baobab (*Adansonia digitata*) in flower in Venda region. (Photo credit: ETF Witkowski, December 2006)

It was noted to have only two sets of chromosomes (i.e. be diploid, like the Madagascan species), rather than the four sets known to occur in the African *A. digitata* (which is therefore tetraploid). In addition, the flowers of the new species, *A. kilima,* were described as much smaller (about half the size) than those of *A. digitata*, as was the pollen grain size. Stomatal sizes and numbers on the leaves were also reported to differ, being larger and fewer in the diploid species, *A. kilima*, than in the tetraploid *A. digitata*.

A relatively small sample size (6 trees per species) was used to compare these two species, with the bulk of the measurements being taken from trees in east Africa, viz. from the Central Highlands of Tanzania and the coastal region around Mombasa, Kenya.

The type of the new species *Adansonia kilima* (i.e. the specimen to which the name of the species is linked) was described from a tree in Venda, Limpopo Province in South Africa. The baobabs of this region are very well known to Dr. Sarah Venter, who studied them for her PhD under the supervision of Prof. Ed Witkowski at the University of the Witwatersrand and she has continued to monitor fruit production in these trees to ensure their sustainable utilisation (Dr. Venter has a small commercial interest involving the local communities who collect and sell her the baobab fruits and seeds).

It was therefore very important to know which of the other trees in the region could be identified as *A. kilima* – and more particularly, how to reliably tell them apart. We therefore set up a team of researchers, including Professor David Baum and his PhD student Nisa Karimi from the University of Wisconsin Madison, USA, who aimed to investigate not only our Limpopo baobabs, but also the trees across Africa – both morphologically and genetically (using DNA sequences).

After measuring floral features from 133 specimens of African baobabs borrowed from herbaria around the world, we could find no clear link between floral size and altitude. Although many of the baobabs at lower altitudes did have large flowers, especially those from coastal regions, this was not a consistent feature amongst these baobabs. Similarly, there was a range of flower size amongst baobabs from higher lying regions of Africa.

We were also unable to find differences in the size and number of stomata (openings) on the leaves of the baobabs which consistently matched the inferred ploidy level of trees at lower and higher altitudes. The phylogeny (‘evolutionary tree’ showing relationships) produced from 78 DNA sequences did not show two distinct lineages that could be matched to *A. kilima* and *A. digitata* – as the type specimen grouped with trees known to be *A. digitata*.

Finally, a chromosome squash from a germinated seedling from the tree from which the type specimen was obtained revealed that the tree has four sets of chromosomes and is therefore tetraploid and not diploid, as reported for *A. kilima*.

The conclusion from our combined studies therefore, is that there is only one baobab in Africa, it is tetraploid (has four sets of chromosomes), and is very variable in many of its features, including flower size. Huge variation in fruit shape and size has been seen previously in baobabs across Africa, and the conclusion has been and still is that there is only one widespread, variable species of baobab in Africa – *Adansonia digitata*.

Reference:

Cron, G.V., Karimi, N., Glennon, K.L. Udeh, C.A., Witkowski, E. T.F., Venter, S.M., Assogbadjo , A.E., Mayne, D.H. & Baum, D.A. (2016). One African baobab species or two? Synonymy of *Adansonia kilima* and *A. digitata*. *Taxon* 65(5): 1037-1049.

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