SEX CONTINUUM OF BAOBABS – REPRODUCTIVE TRAITS AND FRUIT DISPARITY IN AFRICAN BAOBAB POPULATIONS

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Adansonia digitata L. (the African baobab) is an iconic African mega-flora of exceptional value in African communities. Communities across Africa depend on baobab fruit for domestic and medicinal needs. Locals collect and sell baobab fruit, generating an income that contributes significantly to households. Though the baobab's value has been recognised in rural areas for hundreds of years, the commercial demand for baobab fruit has grown rapidly over recent years with increasing global awareness of the baobab's nutritional value. With an increase in the demand for the baobab and the effects of climate change becoming more severe, baobab populations may not be sustainable and locals may be at risk of losing a source of income. By understanding factors that influence fruit production, we can work with locals to establish sustainable strategies to maintain stable baobab populations.

Locals and researchers alike have noticed differences in fruit production in African baobab populations. Some trees bear between 50 and 200 fruit per year (also known as producers, referred to as females by locals) while others bear less than five fruit per year (known as poor producers and referred to as "males"). This phenomenon to date has not been recorded in other baobab species. From previous work, we know that the fruit disparity within populations is not due to differences in sexes (baobabs are hermaphroditic, having bisexual flowers), environmental factors (both tree types grow in the same conditions) or species (both tree types are *A. digitata*). We also know that baobabs do not self-pollinate and thus, self-pollination is not causing the low fruit sets we see in poor producers. Despite extensive research on the African baobab, the reasons for the fruit disparity remain unresolved. Thus, we investigated whether there was variation in reproductive traits between producers and poor producers and if the observed variation relates to fruit disparity within African baobab populations.

We identified three aspects of reproduction and investigated:

1) the female organ (stigma characteristics – stigma angle, colour, moistness and receptivity),
2) the male organ (stamens – pollen number and viability produced by stamens),
3) factors influencing interactions between male and female organs to allow for successful pollination (nectar-pollinator interactions, optimal pollination time, and reproductive success indicated by fruit set and number of pollen tubes present 24h after pollination).

Changes and differences in these factors were compared over time and between producers and poor producers. Fieldwork for this project was conducted in November 2017 over five weeks in Vhembe, Limpopo as baobabs begin flowering in early summer and Vhembe is home to South Africa's largest baobab population.

We investigated reproductive traits in flowers of 14 baobab trees (seven producer and seven poor producer trees). Each trial was repeated three times during the flower's lifecycle – between 20h00 and 06h00 as baobabs flower at night, for one night only. Thus far, our findings show striking differences in the morphology and behaviour of reproductive traits between producers and poor producers.


Flowers from a producer tree (left) and poor producer tree (right) taken at 06h00. Photos by Alekzandra Szewczuk, November 2017.

Producers have large, highly receptive (to pollen) stigmas but smaller, waxy stamens – suggesting low pollen production, whilst poor producers have small, non-receptive stigmas but larger, fluffy stamens – indicative of high pollen production. Reproductive traits thus differ between tree types. Analyses of pollen tube growth and fruit set data will serve as indicators of reproductive success, which will provide further evidence of whether these differences in reproductive traits influence fruit disparity and ultimately reproductive fitness.

Our findings suggest that the African baobab, a well-known hermaphroditic species, is evolving towards dioecism, where the producers are taking on the role of functional females and poor producers are acting as functional males. The African baobab is the first of the baobabs to exhibit this trend. These findings are exciting and relevant, as producers are deemed more valuable than poor producers because of their high fruit production. Yet, poor producers serve as pollen producers and donors, and without their contribution, producers would very likely not yield high fruit sets. Therefore, both tree types should be conserved to maintain stable baobab populations. We plan to communicate this valuable information to locals to establish effective conservation strategies for South African baobab populations.