Fruit morphological diversity and productivity of baobab (*Adansonia digitata* L.) trees from Kilifi and Kitui Counties, Kenya

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1. Introduction/Background

Baobab (*Adansonia digitata* L.) is an indigenous wild fruit tree (Fig. 1) of great importance in African drylands. Baobab products have many nutritional and health benefits and contribute to food security and income of local communities [1]. The fruit pulp (Fig. 2), high in vitamin C and minerals [2], is considered a 'superfood' in Europe and the USA, but in Kenya, the species' potential is not fully utilised and domestication could help in increasing its use. Individual baobab trees are variable in morphological fruit traits, nutrient content of pulp and tree productivity. To select superior baobab mother trees for domestication, evaluation of this phenotypic diversity is needed

Study objective ➔ To assess the variability in morphological fruit traits and productivity of baobab trees in Kilifi and Kitui Counties, Kenya

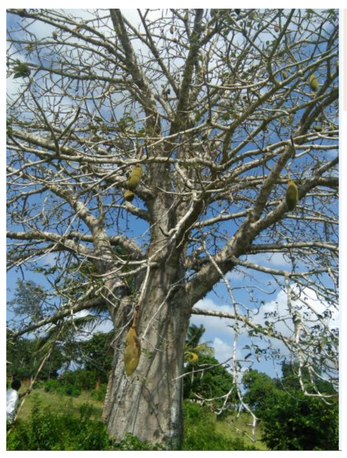


Fig. 1: Baobab tree with mature fruits in Kilifi County, Kenya

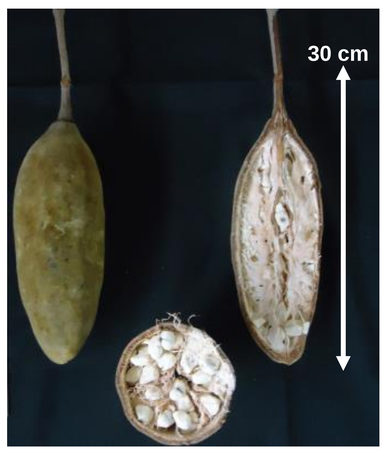
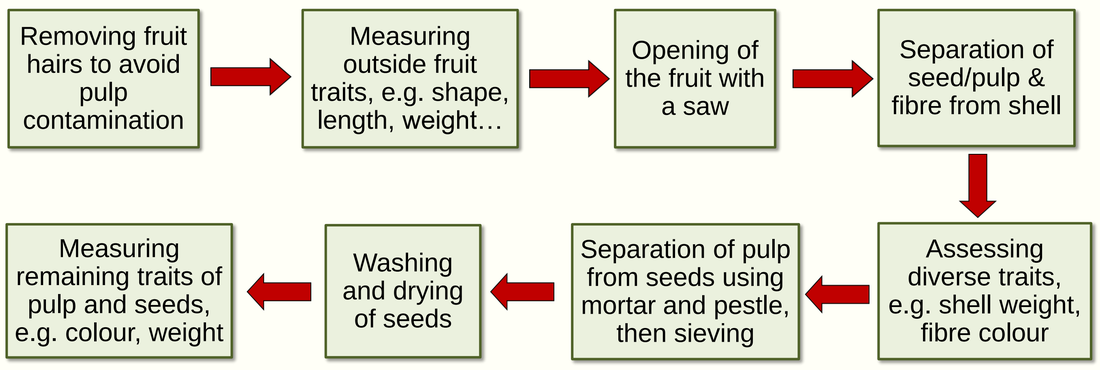


Fig. 2: Whole and opened baobab fruit with seeds covered with the naturally dry, whitish fruit pulp of sweet-sour taste

2. Methodology

- Study is part of the larger Baofood project (www. baofood.de)
- Regions selected in areas with different agro-ecological zones (Fig. 3)
  - Kilifi County: along Mavueni – Mariakani road (C107) and
  - Kitui County: along Kitui – Kibwezi road (B9)
- Quadrats measuring 0.5 x 3 km randomly selected in the two study regions, → 11 in Kilifi and 16 in Kitui, all fruiting trees within quadrats documented
- Fruits per tree counted to determine productivity
- 10 representative mature fruits per tree collected for morphological characterization according to the 'Descriptors for Baobab' [3], following the below steps:



- Statistics: correlation analysis, Chi^2-tests, U-tests to check for significant differences between samples from the two counties

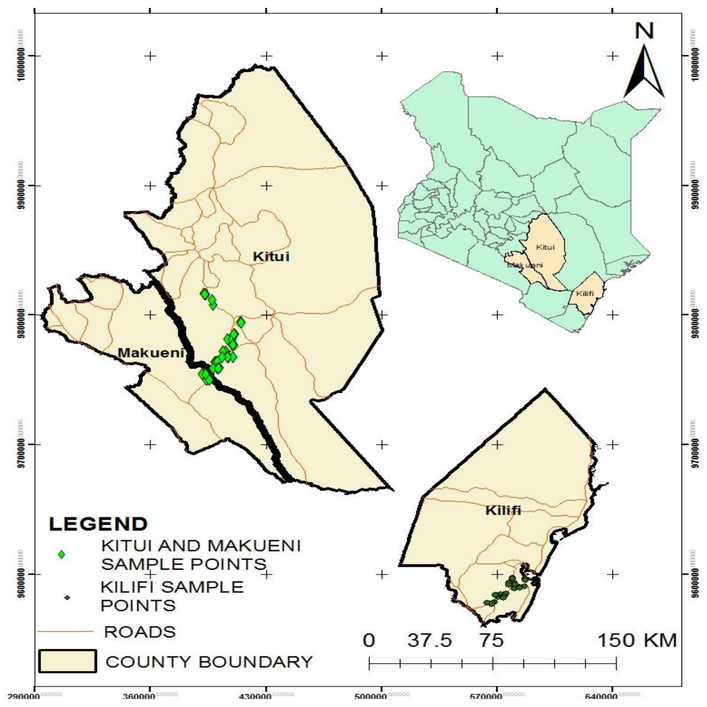


Fig. 3: Baobab sample collection locations in the two counties in Kenya (Kilifi n=33; and Kitui n=38)

Fig. 4: Fruit characterization and pulp extraction in the lab

3. Results and Discussion

a) There was high variation among the surveyed 71 trees e.g. of fruit shapes (Fig. 5). The most frequent **fruit shape** was ellipsoid (about 60% of all accessions), followed by obovate (32%) in Kilifi and oblong (21%) in Kitui. Pulp was more often rated as '**sweet**' in samples from Kitui than in those from Kilifi ($p<0.001$)

Fig. 5: Diversity of fruit shapes of baobab accessions from Kitui and Kilifi Counties, Kenya

b) Fruit **length** as well as fruit, pulp and seed **weight** were significantly higher in accessions from Kilifi, while pulp proportion did not differ between the regions (Table 1). As expected, fruit weight correlated significantly with pulp weight ($r = 0.937***$), but not with pulp proportion

c) Fruit number per tree was highly variable among individuals with no mean differences between the two study regions (Table 1). However, due to the different fruit weights, the **productivity** of trees in kg fruit per tree was significantly higher in accessions from Kilifi than from Kitui ($p<0.001$)

d) Superior mother trees for **domestication** could be identified (Fig. 6)

Table 1: Medians (ranges in brackets) of selected fruit characteristics and productivity data of 71 baobab accessions sampled in Kilifi and Kitui Counties, Kenya

Characteristic	Kilifi (n=33)	Kitui (n=38)
Fruit length (cm)	22.1^a (18-49)	14.2^b (9-21)
Fruit weight (g)	376.1^a (220-696)	154.8^b (73-343)
Pulp weight (g)	61.3^a (40-147)	26.9^b (11-52)
Seed weight (g)	132.0^a (81-232)	66.5^b (11-154)
Pulp proportion (%) from total fruit	16.5^a (13-24)	17.8^a (13-23)
Fruit number per tree	223.0^a (118-309)	200.0^a (101-405)
Productivity (kg fruit per tree)	92.6^a (26-160)	39.5^b (7-109)

Similar letters within one row indicate no significant differences between the respective medians according to U-test

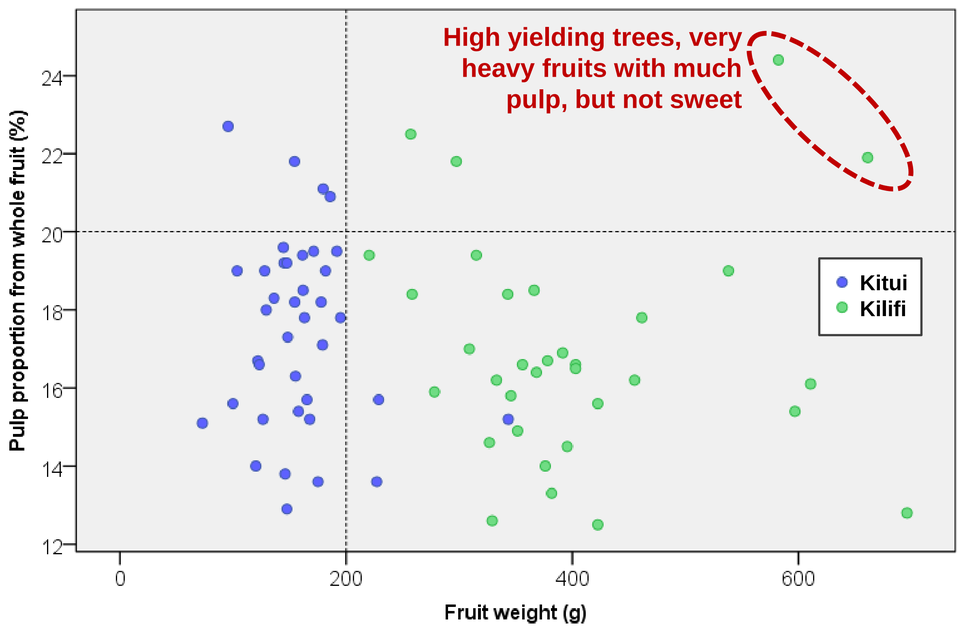


Fig. 6: Scatterplot of mean fruit weight and pulp proportion of 71 baobab trees sampled in Kitui & Kilifi Counties, Kenya. The minimum fruit weight (200 g) and pulp proportion (20%) for selecting superior mother trees for domestication are given as dotted lines

4. Conclusions

- Significant differences of baobab fruit morphological traits and productivity exist between accessions from Kilifi (heavy fruits, high yields) and Kitui Counties (sweet fruit pulp)
- Superior baobab trees can be selected to enable domestication and increased utilization of this important wild fruit tree in Kenya

References

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