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Technical guideline for top cleft grafting of African baobab tree (*Adansonia digitata* L.)

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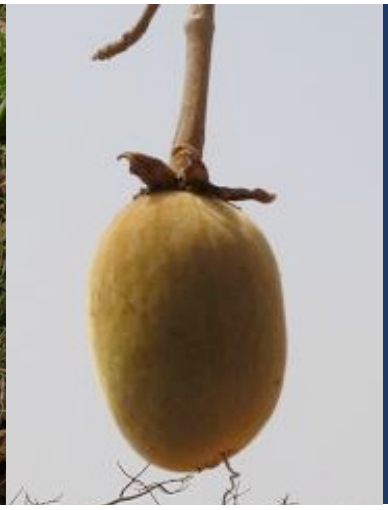
Preamble

African baobab tree (*Adansonia digitata* L.) is a multi-purpose non-timber forest product (NTFP). The increasing demand for products from baobab, added to its low natural recruitment, increases its vulnerability. The fruit pulp is essential in production of nectar and juices, whereas the leaves are harvested as vegetables. The overharvest of these two products are seriously threatening its natural stands and raises several questions about its conservation. The cultivation of baobab for its pulp and leaves are possible to meet consumers' needs. However, when the species is propagated by seeds, the first flowering takes place at 10 – 15 years old; which is considered too delayed and hence a major constraint for its domestication.

Grafting is a vegetative propagation technique that joins a rootstock and a scion. It is an alternative to the problem of the relatively long time needed for reproduction to start. Grafting can shorten the reproduction time to less than 5 years. Grafting also ensures complete transfer of the characters of mother plants to new individuals from grafting, allowing to fix interesting traits. This technique can therefore offer quite interesting alternatives for baobab plantation and its early fruiting. Two grafting techniques are common, the top cleft grafting and the side veneer grafting. This third technical guideline of our series on *Agroforestry* aims at illustrating how top cleft grafting can be effectively practiced.

1. Description of Baobab



♣ Common names Baobab

Language	Common name
English	African baobab, baobab, monkey bread tree, Ethiopian sour gourd, cream of tartar tree, senegal calabash (fruit), upside-down tree
French	Baobab, pain de singe (fruit), arbre aux calebasses, arbre de mille ans, calebassier du Sénégal
Fon/ Goun	Kpassa
Yorouba/ Nagot	Osché
Dendi	Kôô
Bariba	Sônbu
Ditammari	Moutomu

Other names can be found in Assogbadjo and Loo (2011)

♣ Botanical description of Baobab

African baobab tree (*Adansonia digitata* L.) is known as Kpassa, Osché, Kôô, Sônbu, Moutomu respectively in local languages Fon / Goun, Yoruba / Nagot, Dendi, Bariba and Ditammari in Benin (Assogbadjo *et al.*, 2008). It occurs naturally in the Sahelian, Sahelo-Sudanian and Sudanian zones, where average annual precipitation is between 300, 500 and 800 mm respectively. Baobab tree begins producing flowers between 8 and 23 years old (Assogbadjo *et al.*, 2005). The flowers are pendulous, grow singly or in pairs in the axils of the leaf and are perfect, that is, both male and female. Flowering time varies greatly and flowers may appear at any time of the year, except at height of the dry season, whether leaves are present or not. Baobab is pollinated by bats (*Edelon helvum*, *Epomophorus gambiensis* and *Rousettus aegyptiacus*), like other species of Bombacaceae. It's thought that baobab tree is also pollinated by nocturnal insects and by wind.

2. Uses & nutritional importance of baobab leaves and pulp




♣ Uses and nutritional importance of Baobab

Baobab is termed "superfood" because of its nutritional profile (e.g., vitamin, fatty acid, minerals) (Gruenwald, 2009). For example, consuming 40 g of pulp provides 100% of recommended daily intake of vitamin C in pregnant women (19-30 years) (Chadare *et al.*, 2009). A survey revealed that 73% of the German population would buy foods and beverages with antioxidant properties (CENUCED, 2005). However, the fruit pulp is a very highly rich in vitamin C (up to 500 mg / 100 g dw, about ten times more than orange and three times than chocolate milk) reason of high antioxidant properties. The pulp is used for manufacturing many drinks that are very rich in nutrients for health. Baobab leaves are an excellent source of protein and contain all the essential amino acids, as well as most non-essential amino acids. They also have a high content of minerals and vitamins A and C (Chadare *et al.*, 2009; Chadare *et al.*, 2014). These micronutrients are also bioavailable to human organisms (Chadare *et al.*, 2009). In addition, the seeds are transformed into oils. These different products are sold and provide significant income for the population (Assogbadjo *et al.*, 2011). Because of this exceptional nutritional value, baobab was also recognized as a new food by the European Union in 2008 (European Parliament Regulation No 258/97) and also accepted as a food ingredient in the United States (Addy, 2009).

♣ Domestication of baobab

Baobab populations are highly threatened because of their low recruitment. Baobab can be propagated by seeds but germination is often slow. It can also be reproduced by grafting. Grafting ensures that the young trees will have the same qualities as the mother tree. In addition, this process is shorter, which facilitates fruit harvesting. Grafting also reduces the first flowering time: seed-bearing trees bloom at least eight years later, while grafting trees can bloom after only three years.

3. Technical process for baobab grafting



♣ Materials and equipments

Grafting is an operation that requires use of the following equipment: pruning shears, a knife, sachets tapes, scions and rootstocks.


Pruning shears


Plastic tabs

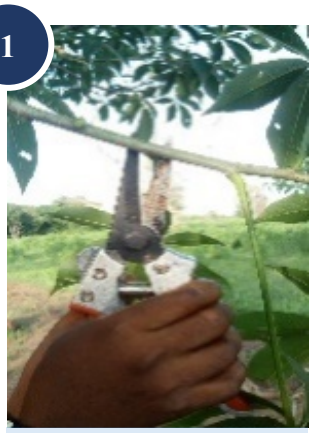

Grafting knife


Rootstock


Scions

♣ Grafting steps

1



Preparation of the budding of the grafts on the tree 2 to 3 days before the operation

2

Collect scions 10 cm long on the day of grafting

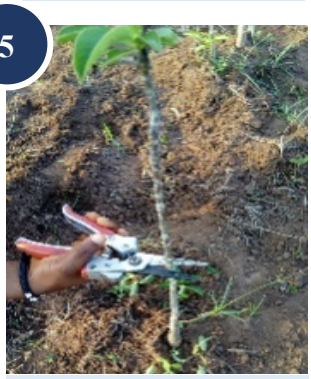
3

Create two opposite wounds on the graft: a small and a large

4

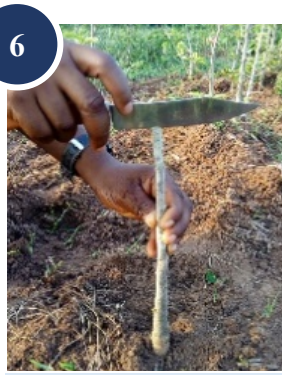
The large wound affects only the sapwood and the small wound must touch the spinal cord

5



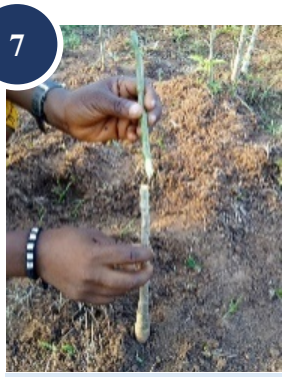
Pollard the rootstock

6



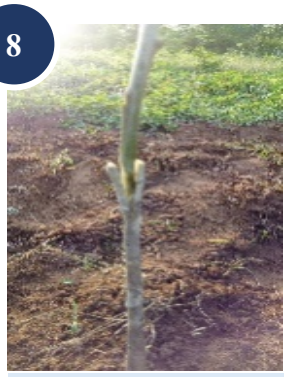
Using the grafting knife, make a 4 to 5 cm split in the middle of the spinal cord

7



Take scion to insert it into the rootstock slot

8



Insert scion correctly into the slot

9

Using the plastic tabs, attach the slotted part that has received the graft from the bottom to the top to prevent the ingress of water and rain.

10

Successful operation

11

Create a microclimate suitable for the graft by covering it with a plastic bag and tying it down. 02 weeks after, remove the bag.

12

Top cleft grafting ready to be transplanted

Research experiments on grafting indicate a success rate of 85% (Kalinganire *et al.*, 2007) ; 71% (Anjarwalla *et al.*, 2016) ; 66.6% (Jenya *et al.*, 2018) ; 50% (Agbohessou, 2019)

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