Malian agronomic research identifies local baobab tree as source of vitamin A and vitamin C

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Introduction

Since 1979, the Malian agronomic research institute (Institut d'Economie Rurale, IER), through the continued support of the Novartis Foundation for Sustainable Development, has been addressing various aspects of infant nutrition through agronomics, grain storage technology, food technology, and agroforestry. In this ongoing effort, the Task Force SIGHT AND LIFE has assisted with vitamin analyses. Locally available technologies have been developed to enrich the amino acid quality of millet foods with cowpea, to increase caloric density of infant gruels with malt and, most recently, to obtain high levels of vitamins A and C from baobab leaves and fruit.

We will summarise here the work which has been done and is currently in progress regarding the finding of local baobab sources of vitamin A and vitamin C.

The baobab tree on which the fruits with the highest vitamin C content were grown (5000 ppm).

The baobab tree *(Adansonia digitata)* grows extensively in semi-arid Africa; from Senegal east to Kenya and throughout southern Africa and Madagascar. As the baobab has many uses, young trees are kept alive and encouraged in and around village sites. Baobab trees are also found in spontaneous-growth forests, with concentrated clusters of mature trees growing on abandoned village sites.

Baobabs are deciduous trees. Flowers, fruit and leaves develop during the rainy season; leaves fall and fruits mature in the dry season. Both fruit and leaves are consumed on a regular basis.

The vitamin A contribution

Baobab leaves are typically sun-dried, pounded into powder and cooked in the daily family sauce.

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The proud owner of the tree shown on page 21 with part of his family.

In rural Mali we have measured consumption to be at 40 g dried-leaf powder per person per day.

It was found that the simple practice of drying baobab leaves in the shade doubles the provitamin A content of the baobab powder. The choice of small leaves (which is tree-specific) further increased provitamin A by 20%. The combination of small leaves and shade drying pushes the provitamin A content up to 27 µg Retinol Equivalents per gram of dried-leaf powder; a nutritionally very rich level indeed (Sidibé et al, 1998). The use of leaves of old or young trees does not seem to have an effect on the level of provitamin A.

Branches from the tree on the previous page were taken to graft on an orchard of young baobab trees.

In Mali, baobab leaves are harvested in great abundance at the end of the rainy season in late October, before the leaves become brittle and fall off. In mid October 1998 there were a series of announcements made over Radio Mali in the local Bambara language to inform the people of the importance of drying the leaves in the shade rather than the open sun in order to preserve the provitamin A levels.

The vitamin C contribution

Baobab fruit pulp is used in cool and hot drinks in rural areas and recently has become a popular ingredient in iced products in urban areas of Mali. Baobab fruit pulp is known to be rich in vitamin C.

The analyses revealed a remarkable baobab tree-to-tree variability for vitamin C content in the fruit pulp, ranging from 1500 to 5000 mg/kg. It was found to be quite stable from one year to the next.

Branches from the tree with the highest vitamin C content have been grafted onto an orchard of young baobab trees on the Cinzana Research Station in the Ségou region of Mali. This 'vitamin C' orchard may serve as important graft stock for Sahelian vitamin C orchards of the future (Sidibé et al, 1996, 1998).

Lessons learned and to be shared

Our experience in the measurement of nutrients from baobab leaves and fruit has brought to light three realisations worth sharing with others seeking to undertake similar efforts:

1. Sample genetic diversity. The reporting of mean values of numerous samples or the values of

bulked samples can mask the wonderful diversity that may exist between individual plants. Our baobab fruit measurements made on bulked samples from many trees consistently resulted in values around 2200 mg/kg. Only when we measured bulked fruit from individual trees did we discover a threefold range of values from 1500 to 5000 mg/kg vitamin C.

2. Distinguish between sun and shade drying of samples. β-carotene is very sensitive to sunlight. With baobab leaves, we found that shade drying can double the RE values compared to sun drying, even though sun drying is the common local practice. It is important to report at least how samples are dried and, wherever reasonable, to compare β-carotene values from sun vs shade drying.

3. Beware of market samples. We have measured many market samples of baobab leaves and fruits with β-carotene and vitamin C levels far inferior to any samples we have gathered directly from trees. We have been repeatedly told that market samples are commonly extended with innocuous material such as cereal stalk pulp, etc.

Baobab leaves from small-leaf trees and large-leaf trees.

A baobab fruit; the pulp surrounding the seeds is rich in vitamin C.

The dried leave samples were analysed at Roche in Basel, Switzerland. Vitamin A in the human diet is usually estimated in terms of Retinol Equivalent (1µg RE = 6 µg β-carotene or 12 µg α-carotene).

	Young trees with small leaves			Young trees with large leaves			Old trees with small leaves			Old trees with large leaves		
	α µg/g	β µg/g	RE µg/g	α µg/g	β µg/g	RE µg/g	α µg/g	β µg/g	RE µg/g	α µg/g	β µg/g	RE µg/g
Sun-dried	5.7	74.5	12.9	6.7	54	9.3	9.9	87	15.3	4.1	69	11.8
Shade-dried	12.9	156.5	27.2	5.1	130	22.0	19.4	147.5	26.2	7.1	107	18.5

Conclusions

Efforts will be made to put all this research findings into action. In 1999 village level feeding programmes are planned. This will include the supplemental intake of vitamins A and C from baobab sources.

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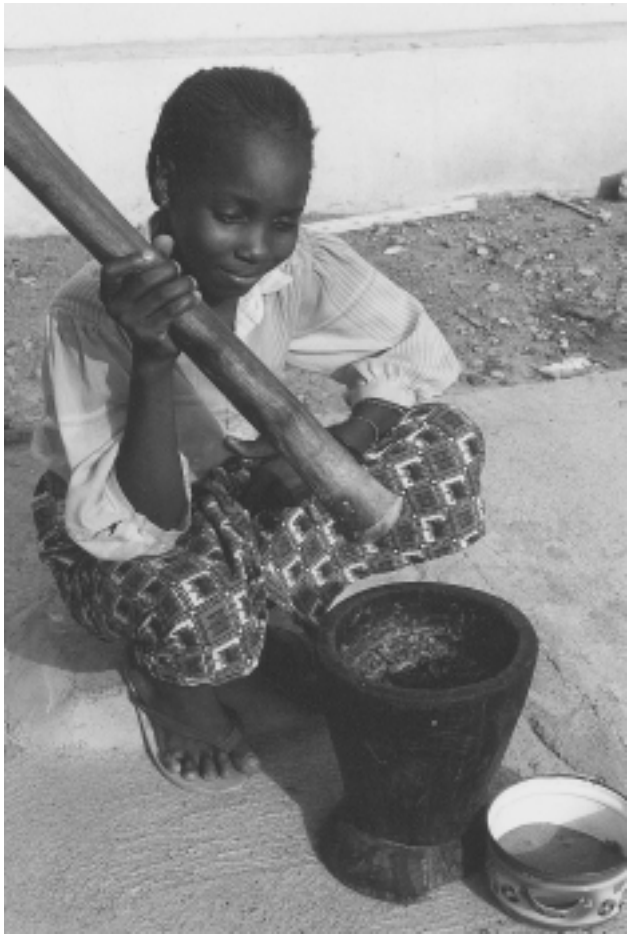

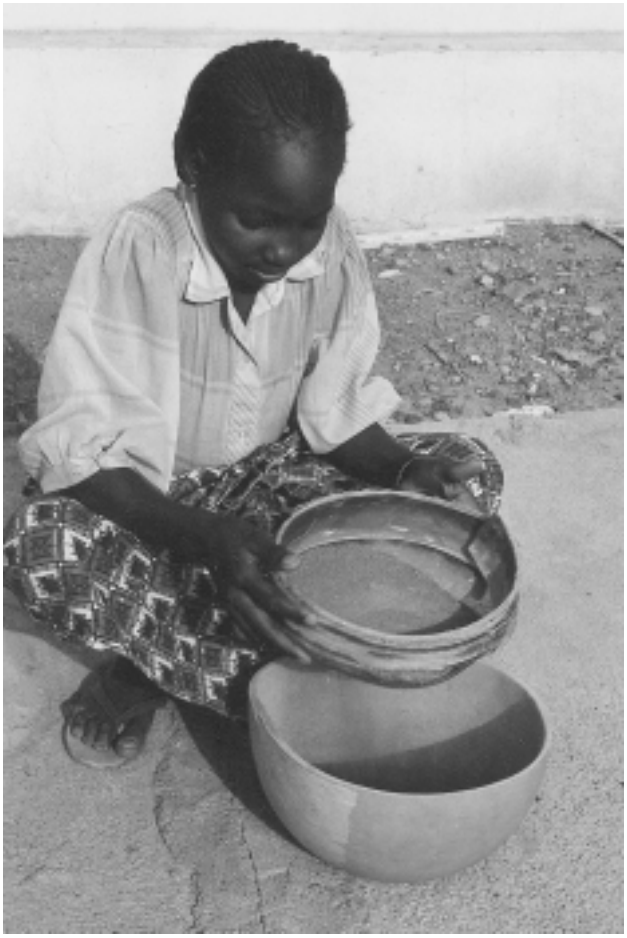

Preparing dried baobab leaf powder.