

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



The project aims to build capacity for sustainable agriculture among rural communities in Cinzana and Katiena.

Agronomic Research in Mali Identifies Local Sources of Micronutrients

New results from research into the micronutrient content of local plant species in Mali have shown that applying very simple measures may enhance nutrient bio-availability. Over the last three years, Malian agroforesters, in collaboration with the Novartis Foundation and Roche's Sight and Life Task Force, have discovered that the simple practice of drying baobab leaves in the shade doubles the pro-vitamin A content of the baobab powder. Furthermore, the choice of small leaves (which is tree specific) also increases pro-vitamin A levels by 20%. The combination of small leaves and shadedrying result in a pro-vitamin A content of up to 27mg retinol equivalents (RE) per gram of dried leaf powder, a very high level (see graph; reference 1). These results are particularly important for a country such as Mali, classified as having 'clinical' or severe vitamin A deficiency by WHO (1995)¹, and where few vitamin A-rich foods are consumed on a regular basis. An exception to this are locally gathered baobab leaves, which are typically sun-dried, pounded into powder, and cooked in the daily family sauce.

SOME DEFINITIONS...

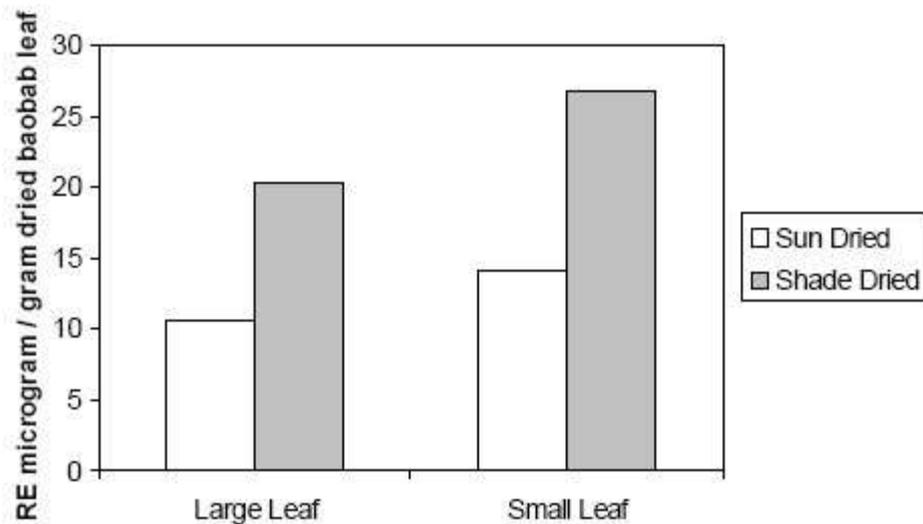
Agronomy: a branch of agriculture dealing with food crop production and soil management

Agroforestry: land management for the simultaneous production of food, crops and trees

Malian agroforesters and collaborators from the Novartis Foundation and Roche's Task Force Sight and Life, have also discovered a remarkable tree-to-tree variability in vitamin C content in the fruit of baobab trees (2). This variation ranges from 150 to 500mg vitamin C per 100g fruit and remains stable from one year to the next. Baobab fruit pulp is known to be rich in vitamin C, and across West Africa baobab fruit pulp is consumed in cool drinks and warm gruels. It has also recently become a popular ingredient in iced products in urban areas. Researchers have grafted branches from trees with a high content (500 mg/100g) of vitamin C onto over 100 young baobab trees at the Cinzana Research Station in the Ségou region of Mali. It is hoped that this 'vitamin C' orchard may serve as important graft stock for Sahelian vitamin C orchards in the future (3).

Both iron and zinc are lacking in foods eaten by Malian children. Although the mineral content has been characterised for many trees and plants in Mali (4), little is known about the genetic variability of the mineral content within different species. To this end, an iron and zinc survey of *Zizyphus mauritania* fruits, and of *Amaranthus viridis* (borronboulou) and *Adansonia digitata* (baobab) leaves is planned for the 1999 season. Plant materials will be gathered from a large number of individual plants sampled from several diverse agroecological zones. In order to respect full comparability of results, the analyses will be carried out at Waite Analytical Services in Adelaide, Australia.

Graph: Baobab leaf content of pro-vitamin A carotenoids as retinol equivalents (RE)



Lessons Learned

Experience in the measurement of nutrients from local plant species has brought to light three findings worth sharing with others seeking to undertake similar efforts:

1. Genetic diversity. The reporting of mean values of numerous samples, or the values of bulked samples, can mask the enormous diversity that may exist between individual plants. In the Malian studies, the baobab fruit measurements of bulked samples from many trees consistently resulted in vitamin C values of around 220 mg/100g. It was only when researchers measured bulked fruit from individual trees that a threefold range of values from 150 to 500mg/100g vitamin C was discovered.

2. Distinguishing between sun and shade drying. Pro-vitamin A is very sensitive to sunlight. With baobab leaves, it was 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 at least report how plant samples are dried, and where possible, to compare pro-vitamin A or RE values from sun-dried versus shade-dried plant samples.

3. Beware of market samples. We have measured many market samples of baobab leaves and fruits. b-carotene and vitamin C levels were far inferior to any samples that were gathered directly from trees. We have been repeatedly told that market samples are commonly extended with innocuous material such as cereal stalk pulp. However, in the literature, nutrient levels are commonly reported from plant samples obtained in local markets rather than directly from original plant sources.



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Since 1979, the Malian agronomic research institute (IER), through the continued support of the Novartis Foundation for Sustainable Development, has been addressing various aspects of child nutrition through agronomics, grain storage technology, food technology, and agroforestry. 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 - as described in this article - to obtain high levels of vitamin A and C from baobab leaves and fruit. It is now time to put all this research into action. In 1999, village-level feeding programmes are planned. These will combine increased caloric density and protein quality in children's foods, as well as increase intake of vitamins A and C from Baobab sources. This work will involve the active inputs from agronomists, nutritionists, and anthropologists.

Nutrition Activities in Micronesia

The Federated States of Micronesia (FSM) is located in the North Pacific and is made up of four states - Pohnpei, Chuuk, Kosrae, and Yap. Evolving from the U.S. Trust Territories, FSM became a new nation in 1986. The population is estimated at 111,000. Difficulties involved in nutrition programmes there, include the dispersed location of the four island states, the eight different languages, different cultures, as well as changes in the diet that have evolved in recent years. However, some exciting progress has been made, including projects supported by UNICEF, in conjunction with the FSM Department of Health, Education and Social Affairs.

Baby Friendly Hospital Initiative (BFHI)

The smallest state of Kosrae is preparing for external assessment for Baby-Friendly status. Its Breastfeeding Mothers Support Group, has been described as "the first of its kind in the Pacific" by the regional UNICEF breastfeeding officer, because of the group's enthusiasm and determination to reach every mother on the island. In Kosrae's internal BFHI assessment, it was

revealed that the local hospital was denying the group the right to enter the delivery room for assistance to mothers. The Hospital Chief of Staff admitted that he had not realised how important the group was, and the hospital regulations were changed. New badges for the support group mothers provide identification, and the group will now be able to provide support to mothers. Chuuk and Pohnpei are also actively preparing for Baby Friendly status, and the National Congress is considering the first FSM legislation on