Baobab fruit

The upside down tree that could turn around the drinks industry

Dr John Wilkinson and Dr Matt Hall explore the benefits of baobab.

While there is possibly 100,000 different edible plants in the world, so few are commercialised due to incomplete safety assessments, poor shelf life and the unavailability of the material for commercial production. Recently a new botanical to the West seems to have found a reasonable solution to these problems with its use being imminent into the EU and the USA market place (Wilkinson 2006).

The baobab tree, *Adansonia digitata*, is a member of the Bombacaceae family which consists of around 20 genera and around 180 species (Heywood, 1993). This deciduous tree was originally located in South Africa, Botswana, Namibia, Mozambique and Zimbabwe (Keith & Palgrave, 2000), but can be found in most countries within the African continent. Export by traders means the baobab tree is also common in America, India, Sri Lanka, Malaysia, China, Jamaica and Holland (Sidibe & Williams, 2002).

The baobab tree has many names including the monkey bread tree, the cream of tartar tree, and the "upside down tree". This last reference is due to the striking silhouette that the baobab tree forms at sunset which gives the appearance of the tree being uprooted and stood on end.

The heavy white flowers of the baobab tree are pollinated by fruit bats at night. The resulting large green or brownish fruits resemble gourd-like capsules that around 6-8 inches in length. These capsules contain a soft whitish fruit pulp that has the appearance of powdery bread and kidney shaped seeds. The baobab fruit is wild harvested by collecting from the trees or from the ground. The hard shells of the fruit are cracked open and the powdery fruit pulp is separated from the seeds and shell before use. The resulting free flowing creamy white powder, melts in the mouth when sampled and has a unique pleasant flavour with a mild slightly acidic after taste which can easily be masked with sweeteners or other flavourings for incorporation into drink products.

Nutritional composition

Airan and Desai (1954) first highlighted the presence of organic acids in the baobab fruit pulp. These included citric, tartaric, malic, succinic, and ascorbic acid. A later report from Nour et al (1980), confirmed the observations of Airan and Desai when they showed that the pulp contained ascorbic acid, tartaric acid, mainly water soluble pectins, and the elements of iron and calcium.

Nutritional analysis of baobab fruit pulp has shown that the fruit is an excellent source of pectins, calcium, vitamin C and iron. Vitamin C content of baobab fruit pulp has been compared with oranges by Manfredini et al (2002), and shown to be at least at least three times higher (150-499 mg/100g vs 46mg/100g). Nour et al (1980) reported that the vitamin C content of baobab fruit pulp was 300 mg/100g whereas data from Wilkinson (2006) shows vitamin levels ranging from 74 to 163 mg/100g. The current EC RDA value is given as 60 mg/day and so 10g of fruit pulp would give at least 25% the recommended daily amount of ascorbic acid.

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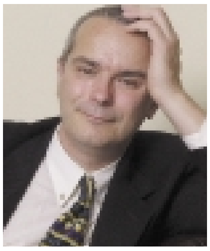

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Trace elements	Data from Kalenga Saka et al (1994) (mg/kg)	Data from Glew et al (1997) (mg/kg)	Wilkinson (2006) (mg/kg)
P	450	733	561-733
Ca	1156	3410	2570-3700
Mg	2090	2090	1260-1790
K	28364	-	20100-23900
Na	188	54.6	7-31
Fe	-	17	39.5-91

Table 1: Comparison of trace element content of baobab fruit pulp

The baobab fruit pulp contains a high level of pectins, and has been found to contain up to 56% water soluble pectins by weight (Nour et al, 1980). Recent analysis by Wilkinson (2006) revealed the pectin content to range from 23.4 to 33.8 g/100g of baobab fruit pulp. Although not as high as other reported values, these indigestible but soluble fibres are an important component of our diet.

Trace element analysis (see Table 1) shows that baobab fruit is a good source of calcium with 100g of baobab fruit providing 116 to 370 mg depending on the source (RDA for calcium is 500 mg/day). Iron content per 100g of fruit pulp is 1.7 to 9.1 mg (RDA for iron is 17 mg/day) and sodium content is very low.

Traditional food uses

The pulp of the baobab fruit is reported to have numerous uses by the indigenous people of Africa. Bosch et al (2004) reported that the fruit is eaten as a sweet and used to make ice-cream. In Sudan, a refreshing drink called 'gubdi' is made from the fruit pulp and cold water to preserve the vitamins (Bosch et al, 2004). Amongst the Hausi farmers, the baobab fruit juice mixture is a popular drink and is available during the hot times of the year (Nicol, 1957).

The baobab fruit pulp is reported to be used in cooking, the dried pulp can be used in baking as alternative for cream of tartar (Bosch et al, 2004).

Diop et al (1988) reported that the pulp was rich in calcium and this was the main reason that the baobab was largely consumed by pregnant women and children in Senegal. A study of pregnant women in Gambia, by Prentice et al (1993), reported that eating the fruit pulp in season (December to April) without the seeds once a day, contributed 30 mg/day calcium to the diet.

Use of baobab in the EU and the rest of the world

There are several reports in Europe of baobab fruit being used within the EU. In the early 1900's, there was a report that several tonnes were imported into the UK for use in the preparation of tea cakes (Kerauden, 1963). Later, during the First World War, the fruit pulp was used as a leaven for baking bread (Watt and Breyer-Brandwijk, 1962).

Unsurprisingly in Paris, the immigrant communities from West and central Africa, are reported to use the baobab in the traditional manner of their forebears. Most recently, an Italian media outlet reported that baobab fruit supplements have been endorsed by Italian cyclists, a Formula one driver, and AC Milan football players.

There are numerous reports from across the globe regarding the use of baobab fruit pulp. In the USA dispensaries from 1860 to 1947, there are reports regarding use of baobab fruit (Woods et al, 1880, 1907, 1932, 1943). In Canada, baobab fruit was listed as a substance in cosmetics and care products between between January 1, 1987 and September 13, 2001. In India, the baobab tree is widely distributed and the fruit is regularly consumed. Finally, in Australia, fruit from Adansonia gregorii, a close relation of Adansonia digitata, was considered by the Australian Food Standards agency as "not novel" and given food status in March 2005.

Traditional medicine use of baobab fruit

All parts of the baobab tree are reported to have medicinal properties according to traditional folklore (Watt and Breyer-Brandwijk 1962).

Of particular interest is the use of baobab fruit and seeds to treat dysentery as reported by Watt/Breyer-Brandwijk (1962). Recently, Tal-Dia et al (1997) compared the efficacy of a local solution, "pain de singe", made from baobab fruit against the WHO standard solution for treatment of dehydration. The results showed that both solutions were equally effective..

Baobab fruit is reported to have febrifuge (antipyretic) properties in traditional medicine. Ramadan et al, (1994) showed that whilst baobab fruit pulp may lower elevated body temperature, normal body temperature is not affected.

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There are very few new novel foods and exotic fruits now being introduced into the EU because of the high costs of getting approval.

BAOBAB FRUIT – continued

PhytoTrade Africa's business focuses on the commercial development of exotic fruits and medicinal plants that are wild harvested in a sustainable manner from non-cultivated plants growing wild in selected areas of Southern Africa (www.PhytoTradeafrica.com). PhytoTrade focuses on species that are abundant and that can be collected with minimal environmental impact.

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Conclusion

Baobab dried fruit pulp is the latest novel food that could soon be available in the EU if regulatory approval is forthcoming. The intended use for baobab dried fruit pulp will mainly be in fruit bars and smoothies. Of more interest to manufacturers is the high nutritional value of the baobab dried fruit pulp which has been found to contain high levels of pectins, calcium, vitamin C and possibly iron.

There are very few new novel foods and exotic fruits that are now being introduced into the EU because of the high costs of getting approval as a food. Baobab is a land mark case in that if it is approved (the application by the baobab producers, PhytoTrade Africa was filed in June 2006), its approval will have been obtained by paying close attention to the real and justifiable concerns of the regulators, and finding innovative ways to achieve the safety objectives whilst avoiding inappropriate and unnecessary costs. Pending success with this approach, could inspire other exotic food producers in areas such as South America, Asia and Africa, to once again, bring new botanicals into the EU for consumers to enjoy without the millions of pounds of investment which has been needed in the past for novel foods to get approved. ■

References

Airan TW, Desai RM (1954) J. of Univ. Bombay 22 pp 23-27; Bosch, C., Sie, K. and Asafa, B. (2004) Adansonia digitata L. [Internet] Fiche de Protabase; Grubben, G.J.H. & Denton, O.A. (Editeurs). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Pays Bas; Carr, W. R. (1955) Ascorbic Acid Content of Baobab Fruit. Nature, 176 (4496): 1273. Government Analyst's Laboratory, Salisbury; Diop, P. A., Frank, D., Grimm, P., Hasselmann, C., (1988) High Performance Liquid Chromatographic Determination of Vitamin C in Fresh Fruits from West Africa. Journal of Food Composition and Analysis, 1: 265-269; Glew R H, VanderJagt D J, Lockett C, Grivetti L E, Smith G C, Pastuszyn A and Millson M (1997) Amino acid, fatty acid, and mineral composition of 24 indigenous plants of Burkina Faso. J. Food Comp. and Anal., 10(3): 205-217; Heywood V (1993) Flowering Plants of the World; Kalenga Saka JD, Msonthi JD (1994) Nutritional value of edible fruits of indigenous wild tress in Malawi, Forest Ecology and Management 64 pp245-248; Keith P & Palgrave MC (2000), Everyone's Guide to Trees of South Africa, 4th Edition; Keraudren, M. (1963) Pachypods et baobab à Madagascar. Science and Nature, 55: 2-11; Manfredini S, Vertuani S, Braccioli E, Buzzoni V, (2002), Antioxidant capacity of Adansonia Digitata fruit pulp and leaves, Acta Phytotherapeutica 2 pp2-7; Nicol, B. M. (1957) Ascorbic Acid Content of Baobab Fruit. Nature, 180 (4580): 287; Nour et al., (1980) Chemical composition of baobab fruit. Trop. Sci 22, 4 p383 - 388; Prentice, A., Laskey, M.A., Shaw, J., Hudson, G.J., Day, K.C., Jarjou, L.M.A., Dibba, B., Paul, A.A., (1993) The calcium and phosphorus intakes of rural Gambian women during pregnancy and lactation. British Journal of Nutrition, 69: 885-896; Ramadan A, Harraz FM, El-Mougy SA (1994), Anti-inflammatory, analgesic, and anti-pyretic effects of the fruit pulp of Adansonia digitata, Fitoterapia 65(5) pp418-421; Sidibe, M. and Williams, J. T. (2002) Baobab. Adansonia digitata. Book published by the International Centre for Underutilised Crops, Southampton, UK; Watt J.M. and Breyer-Brandwijk, M.G., (1962) Medicinal and poisonous plants of southern and eastern Africa. Livingstone, Edinburgh & London; Wilkinson, JA (2006) Baobab Dried Fruit Pulp Novel Food Application, http://www.acnfp.gov.uk/assess/; Wood, G. and Bache, F. (1880,1907,1932) The US dispensatory, Philadelphia.