

# CHAYA

**Botanical name:** *Cnidoscolus aconitifolius* (Euphorbiaceae)

**Location specific common names:** te tiaia (Kiribati), tiaia (Tuvalu), tree spinach

**Plant Characteristics:** Chaya is a large, fast growing perennial shrub originating from the Yucatan Peninsula, Mexico. It is a Euphorbia with characteristic milky sap. It can grow to 3-5 metres in height, and is tolerant of drought, salt and alkaline soil. This, along with its lack of appeal to pathogens and insect pests, makes it an ideal leafy vegetable for atolls.

Chaya was introduced to Kiribati and Tuvalu under the Pacific Regional Agriculture Program (PRAP) Stage 1 in 1993. Its adaptability and good flavour (similar to spinach) made it popular and widely grown in gardens. However, misinformation concerning its supposed toxicity resulted in a widespread belief that it caused hepatitis, so it was relegated to pig feed or considered a weed. Indeed, the opposite is true: one of chaya's health/medical benefits is its ability to protect the liver from toxins (see below). Like cassava leaves, chaya leaves contain small amounts of cyanogenic glycosides (though at lower levels than usually found in cassava). Steaming/boiling for 3 minutes will remove these. They are volatilised (disappear into the air), thus the cooking water, as with all of the leafy vegetables in the factsheets, can be used for soup.

**Uses:** Chaya is cultivated extensively in Mexico for use as a food and medicine. Leaves are best prepared steamed or boiled in a small amount of water, then coconut cream added and cooking continued for 10-15 minutes more.

**Medicinal:** Chaya is traditionally used in Mexico and Central America to prevent and treat such diverse conditions as inflammation, diabetes (there is strong evidence for this benefit), obesity, heart disease (it lowers LDL-cholesterol and high blood pressure), fever, kidney stones, varicose veins, gastro-intestinal disorders, respiratory infections and eye problems. It is also considered to protect the heart, liver and kidneys from toxins, especially under protein-energy malnutrition. Moreover, like drumstick, hedge panax and bele, it stimulates lactation.

Here is a recipe for tasty leaf soup: 3 handfuls of chaya (or hedge panax, ofenga, drumstick, amaranth, kangkong, pumpkin, chili, bele) leaves, 1 cup thinly sliced fish/meat, ½ teaspoon cassava flour, 1 teaspoon soy sauce, ½ teaspoon sugar, 1 tablespoon coconut oil (or 3 tablespoons coconut cream), 1 onion (or several spring onions or a chilli), chopped, 2 teaspoons sliced ginger, 6 cups water, salt, pepper.

**Availability:** Despite the misinformation about chaya referred to above, plants can still be found in Kiribati and Tuvalu, growing healthily.



**Propagation methods:** Healthy chaya plants provide suitable sources of planting material. Although chaya can often be seen flowering, it rarely produces seeds, thus actively growing stems (25-50cm long) are the recommended planting material.

**How to grow:** Ensure the cuttings are grown in composted soil and water well for the first 3 months until established, or longer under drought conditions. Then this plant usually grows well even under tough conditions. Unless being used for agroforestry, the bushes will need pruning to enable easy harvest of leaves.

**Threats:** Chaya is very tolerant of diseases and pests, even more so than amaranth (Factsheet 2) and much less attractive to insects than bele (Factsheet 10).

**Harvesting:** Once established, leaves can be harvested regularly. As with most of the featured vegetables, ensure that the plant retains at least two-thirds of its foliage at any time, otherwise it may not recover from heavy leaf removal, especially during a drought.

**Post harvest and storage:** Leaves should be washed carefully with water of drinking quality or clean seawater. Like amaranth and bele, they can be bundled with their stems trimmed and stood upright in a small amount of clean fresh water. If covered with a clean plastic bag and kept cool, they should store for a day or two. If placed in an airtight container in a refrigerator they can last for up to a week. Leaves are firm and can be stored frozen.

**Project findings/nutritional value:** Samples were collected in Kiribati (see table below) and Tuvalu. Like amaranth, chaya is a nutritious all-rounder, but especially notable for protein and iron. It has even been described as a “Mayan green superfood”. In this study, we analysed a range of minerals, including nitrogen. About two handfuls (100 grams) per person for a meal serving will provide very useful nutrition.

One chaya sample collected at Eita, Tabiteuea North atoll, Kiribati was technically deficient in copper, manganese and potassium but appeared healthy, with no deficiency symptoms. This suggests that chaya is efficient for these nutrients, which would partly explain its excellent growth on high pH atoll soils.

Chaya is strong in protein, iron and carotenoids:

**Protein:** This is important in forming muscle, cell membranes, enzymes, blood components, antibodies, DNA and RNA. The mean nitrogen analyses of our chaya samples indicated an excellent protein level of around 23 %, similar to that of most legumes, which are nitrogen-fixers.

**Iron:** Important for healthy blood and energy.

**Carotenoids:** Although we did not measure carotenoids in this project, other studies have found chaya to be a good source of vitamins A, B and C. Serrano *et al* (2005) found high levels of lutein (1,922 mg/kg) and b-carotene (515 mg/kg) in chaya leaves. Lutein is important for eye health (e.g. reducing risk of cataracts) and b-carotene (pro-vitamin A) is important for vision, immunity and bone health.

This table compares selected mineral nutrients in leaves of chaya, cassava and noni grown together at Betio, South Tarawa, Kiribati, and English cabbage (average of samples bought from Honiara market, Solomon Islands and Nukualofa market, Tonga in 2012) (concentration in mg/kg dry weight, except N: % dry weight).

	Fe	Mn	Zn	Ca	Mg	K	P	S	N%
Chaya	<b>97</b>	12	32	<b>16000</b>	5600	18100	3600	3500	<b>5.2</b>
Cassava	<b>98</b>	25	<b>89</b>	12300	5100	<b>16100</b>	4100	3500	<b>5.4</b>
Noni	<b>95</b>	9	24	11900	3700	11100	1470	2200	3.0
Cabbage	40	23	20	5700	1450	<b>29000</b>	3750	3750	2.8

Fe: iron; Mn: manganese; Zn: zinc; Ca: calcium; Mg: magnesium; K: potassium; P: phosphorus; S: sulphur; N: nitrogen  
Analyses conducted by Waite Analytical Services and the Mares Laboratory, University of Adelaide, South Australia

This fact sheet is one of a series produced for the Australian Centre for International Agricultural Research (ACIAR) funded activity “Improving soil health, agricultural productivity and food security on atolls: SMCN2014/089”.

Compiled by G. Lyons, G. Dean, R. Kiata, Layout by S. Tukidia

