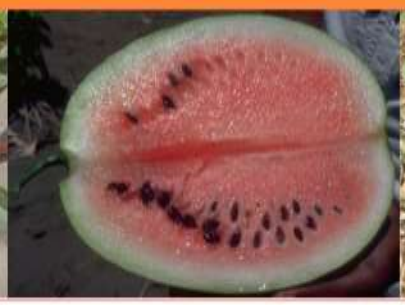
# Potentially Important Food Plants of Angola




FOOD PLANT SOLUTIONS
ROTARIAN ACTION GROUP

*Solutions to Malnutrition and Food Security*

A Project of the Rotary Club of Devonport North, District 9830 & Food Plants International

www.foodplantsolutions.org

# Potentially Important Food Plants of Angola

**Dedication**

This book is dedicated to the 3 billion hard working farmers and families around the world who cultivate these, and other, food plants for their own subsistence, and who help conserve them in their rich diversity for other people to enjoy.

Food Plant Solutions Field Guide – Angola, Version 1, September, 2015

**Preface**

This guide is based on information from the Food Plants International (FPI) database developed by Tasmanian agricultural scientist Bruce French. The source material and guidance for the preparation of the book has been made possible through the support of Food Plants International, the Rotary Clubs of District 9830, particularly the Rotary Club of Devonport North who founded Food Plant Solutions, (previously the Learn♦Grow project), and many volunteers who have assisted in various ways.

The selection of plants included in this guide has been developed by Muhammad Ali working in a voluntary capacity using the selection criteria developed by Food Plant Solutions. These selection criteria focus on the local plants from each of the main food groups with the highest levels of nutrients important to human nutrition and alleviation of malnutrition. It is intended as a **Draft Guide only** to indicate some important food plants that serve as examples for this purpose. Other important nutritious plants may be equally useful, and it is recommended that the FPI database be used to source information on the full range of plants known to occur in Angola. This guide has been developed with the best intention to create interest and improve understanding of the important local food plants of Angola, and on the understanding that it will be further edited and augmented by local specialists with appropriate knowledge and understanding of local food plants.

Food Plant Solutions was initiated by the Rotary Club of Devonport North to assist in creating awareness of the edible plant database developed by Food Plants International, and its potential in addressing malnutrition and food security in any country of the world. In June 2007, Food Plant Solutions was established as a project of Rotary District 9830, the Rotary Club of Devonport North and Food Plants International. The primary objective of the project is to increase awareness and understanding of the vast food resource that exists in the form of local plants, well adapted to the prevailing conditions where they naturally occur, and how this resource may be used to address hunger, malnutrition and food security. For more information, visit the website www.foodplantsolutions.org. More detailed or specific information on plants, including references to material by other authors, is available on DVD on request.

**Disclaimer:** This Field Guide has been produced using information from the "Edible Plants of the World" database compiled by Bruce French of Food Plants International. Although great care has been taken by Food Plants International and Food Plant Solutions, neither organisation, or the people involved in the compilation of the database or this Field Guide:

- makes any expressed or implied representation as to the accuracy of the information contained in the database or the Field Guide, and cannot be held legally responsible or accept liability for any errors or omissions
- can be held responsible for claims arising from the mistaken identity of plants or their inappropriate use
- assume responsibility for sickness, death or other harmful effects resulting from eating or using any plant described in the database or this Field Guide

Always be sure you have the correct plant, and undertake proper preparation methods, by consulting with specialist scientists or local users of the plant. The Food Plants International database, from which the information in this Field Guide is drawn, is a work in progress and is regularly being amended and updated.

# Contents

## *Introduction*

This book is designed as a simple introduction to useful, and sometimes under-utilised, food plants of Angola. It is hoped people will take greater pride and interest in these plants and become confident and informed about how to grow and use them. Many of the local food plants that occur in every country are very good quality foods. Unfortunately, people often reject traditional food plants in favour of introduced varieties. The principle behind Food Plant Solutions is to encourage the use of these local plants.

**Local food plants are often very good**

People sometimes think that local food plants are not very special and that any food plant that is new or comes from another country must be a lot better. While this is sometimes true, it is often not the case. Many of the newer or introduced food plants, such as the round or ballhead cabbages and lettuce, have very little food value. Many traditional tropical green, leafy vegetables and ferns have 10 times or more food value as ballhead cabbage or lettuce. It is important to find out more information about the food value of different foods if we want to eat well. Citrus fruit, such as lemons and oranges, are often grown for vitamin C that helps keep people healthy. These fruits do not grow well in the tropics - the common guava fruit has three times as much vitamin C and is loved by children. This is just one example showing there are often much better choices of local foods with higher levels of important nutrients.

**Growing food**

Growing food to feed a family is, without doubt, one of the most important things anyone can do. The more interest you take in your garden and the more you learn about plants and how to grow them well, the more interesting and fun food gardening becomes.

**A country with very special plants**

The local food plants of most countries have not been promoted and highlighted in the way they deserve. Visiting a local food market will quickly show what a rich variety of food plants can be grown in this country. Good information about these plants is often still in the minds and experience of local farmers, and has not been written down in books. This can make it hard for the next generation of young people to find out how to grow them.

In many countries, some of the traditional food plants are only harvested from the wild and others are only known in small local regions. Others have hundreds of varieties and are the main food for people in different regions. Information on these plants, and in many cases, their food value and the pest and diseases that damage them, is available in the Food Plants International database.

**Getting to know plants**

People who spend time in gardens and with their food plants get to know them very well. It is a good idea to learn from someone who grows plants well. Each plant grows best in certain conditions and there are often special techniques in getting it to grow well. For example, sweet potato will not form tubers if the soil is too wet, but it may still grow lots of green leaves. Taro will grow in light shade, but sweet potato will not. Ginger can grow in fairly heavy shade. Pruning the tips of betel leaf or pepper vines will cause more side branches to grow and therefore, produce more fruit. Stored yam tubers need special treatment if you want them to put out shoots early. Potatoes should be grown from new seed pieces each year to prevent build up of virus diseases. Tomatoes will yield fewer but larger fruit if lower branches are pruned. There are lots of unique things about every plant and learning about these helps a good gardener produce more food.

**Naming of plants**

Many food plants have local names, as well as a common English name. Every type of plant also has its own scientific name. Although the scientific name might not be widely recognised, this is the link by which people in different countries and with different languages can recognise the same plant. We know that many plants are grown in many different countries, but relying on local or common names, we might not recognise the same plant grown in different places. By using scientific names to accurately identify plants, we can get useful information from people in other countries. Wherever possible, plants in this book are named by their common English name and their scientific name.

**An Important Note**

As noted above, a guiding principle behind Food Plant Solutions is to encourage the use of local plants. It is acknowledged that some of these may be major agricultural crops that are already well known, such as:

- Rice
- Wheat
- Oats
- Maize/corn
- Mango
- Banana

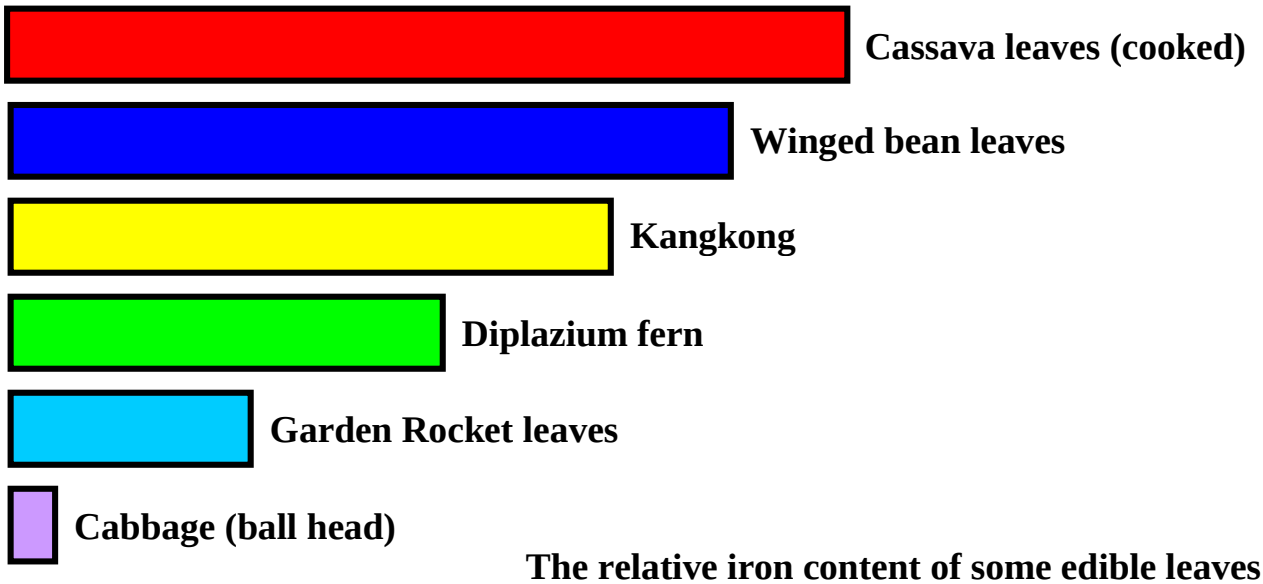
There are others, but these serve as examples.

As a general principle, these types of plants are not included in a field guide, as they are well known, and in some cases (e.g. corn), can be relatively high input crops. However, if they are particularly important in a country, such as rice in many Asian countries, they may still be included. The main purpose of the Food Plants Solution project is to look beyond these types of crops, and focus on plants that are less well known and, as noted above, often have superior food value and lower input requirements.

It is also important to note that while some plants have extremely high levels of some nutrients, many of these are used as flavouring foods (condiments), and are generally used only in small amounts. Therefore, the nutritional contribution they make to the diet will be relatively small. Typical of these types of plants are coriander, parsley etc. Once again, these should not be considered as major food sources. A few may be included in the *Nuts, Seeds, Herbs and other foods* section of the field guide.

**Nutrient Value**

Our bodies need a variety of food plants to enable us to grow, stay healthy and have enough energy to work. Different foods are needed to provide energy, protein, vitamins and minerals. The following diagram highlights the iron content value of some traditional edible, tropical plant leaves, compared with cabbage. Iron is a nutrient that is very important for our bodies and especially our blood. People who are short of iron become anaemic and lack energy.




**The relative iron content of some edible leaves**

**A healthy balanced diet**

Good nutrition, or eating a healthy balanced diet, is really very simple. If people eat a wide range of food plants, their bodies will normally get a balanced amount of all the different nutrients they require. If a nutrient is lacking in one food plant, then they are likely to get it from another plant if they are eating a range of food plants. For this reason, everybody should eat a range of different food plants every day. The food group that is especially important for young people is the dark green leaves. Everyone should eat a good serving of dark green leaves every day. They have many vitamins and minerals, as well as protein. There are many spices or flavouring plants that can improve the taste of foods, but taste should be considered separately from food value.

**Learning to cook well**

Even though some nutrients in food can lose some of their value during cooking, it is normally much safer to cook all food plants, at least for a short time. Bacteria, which cause diarrhoea, can occur in gardens and on food plants. These are killed during cooking. Some plants contain cyanide, a chemical that makes them bitter and poisonous. This happens often with cassava (tapioca, manioc) and beans, but can also occur in many other plants. Boiling the food for two minutes normally destroys cyanide and makes the food safe to eat. Some of the nutrients our bodies need (such as vitamin A for good eyesight) becomes more readily available when food is cooked in oil.

**Learning to grow "wild" food plants**

Many plants grow wild in the bush and are not cultivated by people. We can normally find someone who has taken an interest in them and has learned to grow them. This may be people from a different region. It may be that in their area they have found better types than the ones that simply grow wild.

**Saving better types of plants**

If we simply allow plants to grow from seed, the improvements that have been made in finding sweeter or better types may get lost. Some fruit trees are like this and the fruit produced may not be sweet at all. It is often necessary to take cuttings from a tree to be sure the new plant is exactly the same as the old one. If the plants won't easily grow from cuttings simply by sticking a piece of the branch in the ground, (and keeping it watered), there are other ways of helping these plants to form roots and start to grow. One good way is to make a small cut in the bark of a young branch and then wrap soil around the cut and cover it with plastic. With some plants (like guava), new roots will start to grow from this cut and grow into the soil wrapped around the branch. It can then be cut off and planted. This is called air-layering. A similar method is used with the roots of breadfruit. A shallow root is uncovered and a small cut made from which a new sucker will start to grow. This can be cut off and replanted.

**Growing from cuttings and suckers**

Many food plants are grown from cuttings and suckers. This is very important, as it allows all the different kinds of yams, taros, bananas, sweet potato and sugarcane to be continually grown and ensures the varieties are preserved. Each plant has its own special propagation method. It is important to use healthy planting material, as diseases can be spread in planting material. In many cases, small tubers of yams, taro etc. are stored for planting for the next crop. This is not always good practice, as the small tubers could be the result of diseases (such as viruses) in the plant. A good rule is to take cuttings or save tubers from the best plants for re-planting.

**Saving seed**

Some food plants are grown from seed. Sometimes this is very easy as the seeds are large, store well, grow easily and grow the same as the original plant. It is more difficult with other plants. Many large fleshy seeds, such as breadfruit, need to be planted while still fresh as they do not store easily. Other seeds do not "breed true" or do not grow into new plants that are the same as the original plants. With many of these plants, it may be necessary to find ways of growing them from cuttings or other methods such as grafting. Some plants "inbreed" and get smaller or poorer. This happens when a plant self-pollinates or receives pollen from a close relative. Corn grown in small plots normally does this and the plants grown from seed grown in this situation get smaller and smaller each year. The seed needs to be saved from several different plants with different history and then mixed together before sowing. All the seeds on one cob are related and will inbreed. Some seeds develop a hard seed coat and need to be scratched, soaked in water, or even put into hot water, before they will start to grow. Saving local seeds is often a good idea as they are already adapted to local conditions. For example, seed saved from pumpkins grown locally will produce plants with less pest and disease damage than those grown from imported seed. This is not to say that imported varieties might not be better, but it is worth checking that the new plant will perform as well as, or better than, those currently grown, before going to the trouble of importing seed. *If you can't get seeds or planting material from local gardens, it is probably not a suitable local plant! Once again saving seed from the better plants helps ensure that you have better crops the next time you plant.*

**Growing a garden of mixed plants**

In nature, one variety of one plant never grows alone. There are always lots of different plants of different kinds and sizes, all growing together. Anyone who has ever walked into a tropical jungle will know this very well. Growing plants in a food garden in a way similar to how they grow in nature, as a mixed group of plants, is very good agriculture. Mixing plants in a garden usually gives more reliable food production, as any disease from one plant will wash off in the rain onto a different plant, where it cannot survive. Small plants fill the gaps and reduce the need for weeding.

**Different types of plants for food security**

There is another reason for growing a range of food plants in a local garden or around a village. If something goes wrong, like extreme insect damage to plants, some disease occurring in the garden, or a poor growing season, some plants will be more damaged than others. With a variety of plants, there will still be some food to eat until the other plants recover and grow again. Also, a wide variety of plants will mean that different ones will be maturing at different times, which helps ensure a continuous supply of food. There are shrubs that can be planted as edible hedges around houses, and fruit and nut trees that need to be planted as a gift for your children, several years before they will be able to enjoy them. Some nuts can be stored and eaten when other foods are not available. Most tubers will store well for a few months in the right conditions.

## Crop rotation

Crop rotation involves planting different crops in succession to improve soil fertility and reduce the impact of insect pests and diseases. The crops in the rotation should be selected to reduce the risk of carry-over pests and diseases from one crop to the next. A three-year rotation would normally involve growing a legume to increase soil nitrogen levels, and then two different crops before a legume is planted again. Maximum suppression of diseases and insects should be achieved if the non-legume crops are alternated between grass and broad-leafed plant families. Crops planted in a mixture of two or more species will provide greater diversity, and hence reduce losses due to pests and diseases.

## Looking after the soil

Gardeners in traditional tropical agriculture usually move their gardens often by shifting to a new piece of land. There are usually three reasons for this:

- In the tropical lowlands, weeds can become a very big problem. There are usually a lot fewer weeds in the first year or two after clearing and burning the land, but weeds increase in the following years.
- Some of the nutrients in the soil are used each year and the soil becomes poorer and plants do not grow as well. There are ways of reducing this loss of nutrients.
- Very small worms called nematodes build up in the soil after a few years and get into the roots, especially of annual vegetable plants, and stop their roots working properly. For example, root knot nematode will cause the roots of plants like tomatoes and beans to become twisted resulting in poor growth of the plant.

## Control of soil erosion

Erosion, or loss of soil, occurs when wind or running water carries soil away from cultivated areas. If erosion continues year after year, the land will become unproductive. Trees and shrubs can be planted in strips across the direction of the dominant wind to reduce wind erosion, or across the slope to help slow water that flows over cultivated soils. Growing crops with good leaf cover, or leaving crop residues to cover the soil surface, will significantly reduce soil loss during windy or wet seasons. When possible, any soil disturbance, such as tillage, should occur after the risk of windy weather or wet weather run-off has passed. In steep areas, tillage should be on the contours around hills, rather than up and down the slope. Various techniques can be used to leave ridges or terraces in the tilled soil to help slow water, or reduce the effects of wind, and hence reduce soil loss. Always reduce tillage to the minimum amount possible while still achieving a successful crop.

**Building up the soil**

When a new garden has been cleared, it has lots of leaf mulch and other old plant material. This provides plant nutrients for new plants to grow. There is a simple rule for growing plants and improving the soil - "If it has lived once, it can live again." Any old plant material can provide nutrients for new plants to grow, but it must be allowed to rot into mulch or compost for this to happen. If this plant material is burnt, some nutrients, especially phosphorus and potassium ("potash"), get left behind in the ashes for new plants to use, although it also allows these important nutrients to be lost by being washed away by rain. But with burning, other important nutrients, such as nitrogen and sulphur, get lost in the smoke and disappear from the garden and soil. These last two plant nutrients are especially important for growing green leaves and when their levels are low, plants grow small or pale green. When nitrogen is lacking, the old leaves of the plant go pale and fall off early, and when sulphur is lacking, the young leaves go pale. Wherever possible, old plant material should be covered with some soil to allow it to rot down and not simply dry out or get burnt. Cutting it into small pieces will help it break down more quickly into usable compost.

**Poor soils where crops won't grow**

When soils are very acid (or sour), plants cannot get the necessary nutrients. Natural chemicals in the soil that are toxic to plants when present at higher levels become soluble, get into plants, and stop them growing. Adding limestone to these soils can improve them. Using compost will not make them less acid, but will keep the plant nutrients in the soil in a more readily available form that plants can use.

**Soil nutrients**

Plants need 16 different kinds of plant food or nutrients in different amounts to grow properly. A plant that has already been growing will have these nutrients in them and probably even have them in a balanced amount. That is why composting old plant material is so important. Plants usually show some signs or symptoms if any of these nutrients is running out.

One of the most common and important nutrients for plant growth is nitrogen, which actually comes from the air, but gets into plants through the soil. When plants are short of nitrogen, their older leaves often become yellow or pale. When grass family plants, like corn, are short of nitrogen, the centre of the oldest (lowest) leaves starts to develop a dry or dead V-shape. The plant cannot find enough nitrogen in the soil so it gets it from an old leaf to grow a new leaf. This causes the old leaf to die, forming a characteristic V-shape in the centre of the leaf. The plant does not get any bigger as an old leaf dies each time a new leaf is produced. Village farmers often walk through grassland before they clear it for gardens, looking to see if the grass leaves are dry and dead, because they know gardens on this soil won't grow well. It is necessary to use compost or legumes (such as beans) to put nitrogen back into the soil. Growing plants from the bean family (legumes) is an efficient way to increase the level of nitrogen in the soil.

Corn is a good plant for indicating which nutrients are running short in the soil. If the older leaves go dry along the edges, the soil is running out of potash. If leaves that are normally green develop a bluish colour, the soil is short of phosphorus. Generally, leafy crops need lots of nitrogen, and root crops need lots of potash.

**Making compost**

Compost is old plant material that has been allowed to rot down into a fine, sweet smelling mulch that is full of nutrients that can be put back on the soil to grow new plants. Compost returns nutrients to the soil, improves the soil's ability to retain moisture and also helps improve soils that are acid or saline.

Making good compost is very simple. A simple heap of plant material can be made in the corner of a garden or near a house. Cutting the plant material (especially stems), into small pieces no longer than about the width of a finger, will help it break down quicker. If possible, make layers of plant material, then a small layer of soil, and then scatter fire ash on top. Keep repeating this process to make a heap. A good compost heap should be warm inside. Be careful with diseased plant material. This should be burnt, otherwise the disease may be spread when you use the compost at a later date.

The composting process is carried out by small bacteria that live in the soil and feed on decaying plants. They break down old plant material into compost. These bacteria are living, so they need air, water and food. A good compost heap must have air, so don't cover it with plastic or put it in a container. This makes a foul smelling compost, as different bacteria that don't need air turn it into an acid mixture that preserves it. Good compost must have moisture, so keep the heap damp, but not too wet. The compost bacteria like a balanced diet, which means that both green material and dried material is needed to balance the carbon and nitrogen in the compost pile. If the compost material gets too dry and brown, it will not break down, and if it gets too green, it will go slimy. Using a little bit of compost from an old heap will make sure the right bacteria are there to start the whole process off.

As soon as the plant material is broken down to a fine mulch it can be put onto the garden. It is best if it is dug in, but if it is regularly put onto the surface of the garden, worms will mix it into the soil. A handful of compost placed at the base of each plant can be beneficial.

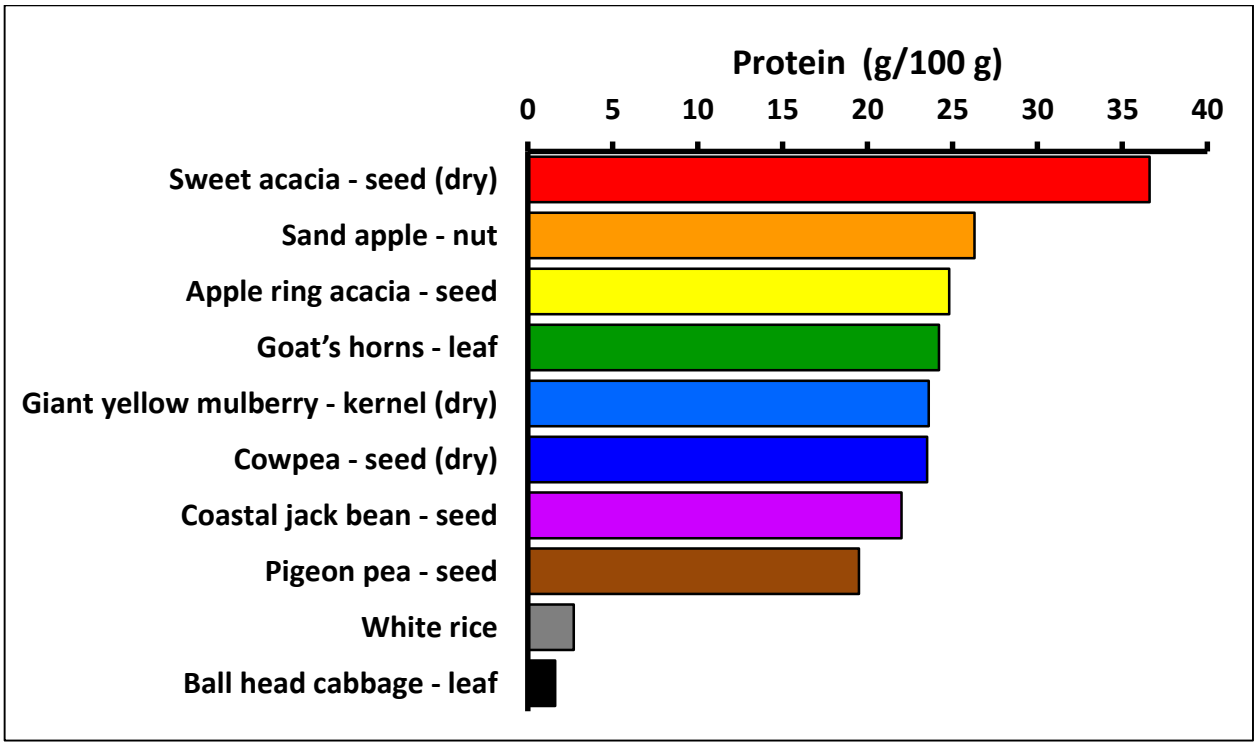
**Pests**

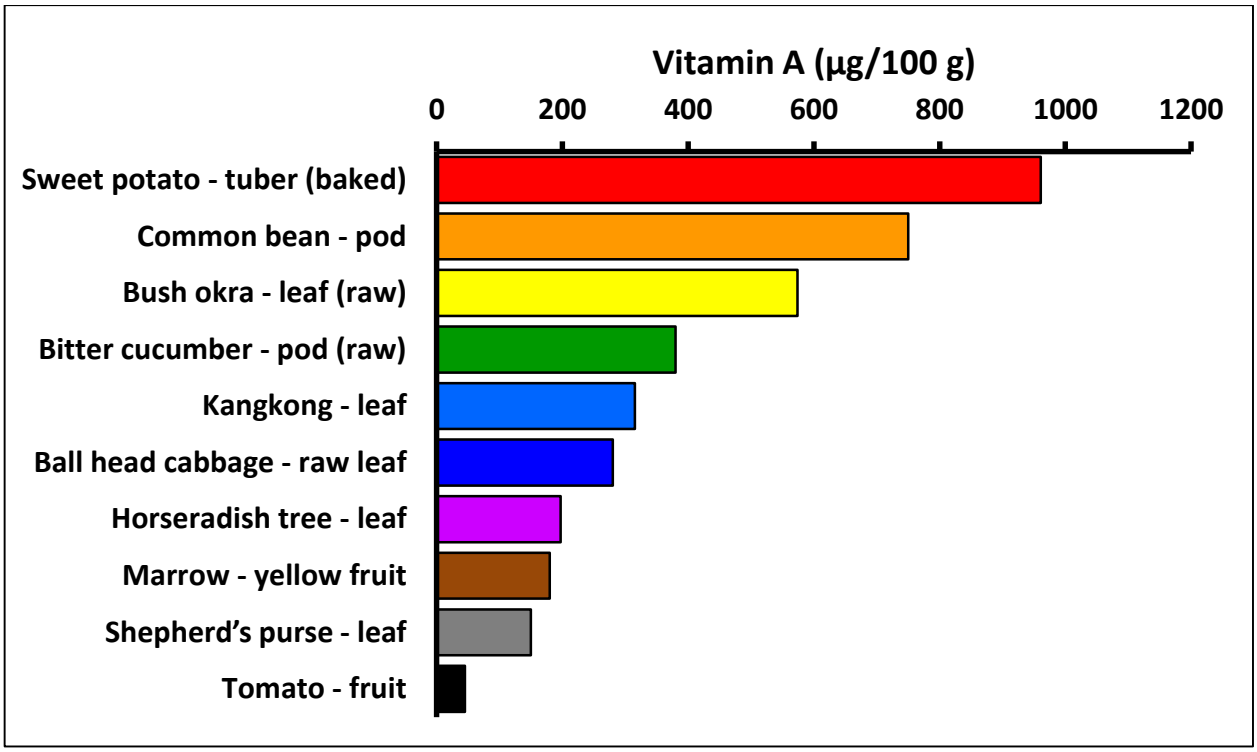
There are a large number of insects that enjoy sharing our food with us! We should not try to kill all these insects as they have an important role to play in keeping everything in nature in balance. What we need to do is to learn to manage these insects so we can all get some food to eat! Some insects are attracted to lights, and if the garden is near village lights some insects can cause a lot of damage. If large areas of one particular crop are planted, insects can breed more quickly and cause a lot of damage. As an example, insects called armyworms can breed up in large numbers on the shade trees of cacao and then move "like an army" into gardens. Some insects are large and breed slowly and can be picked off and removed. The large, green grubs with pointy tips that hide under taro leaves are best controlled by simply picking them off. Some insects, like taro beetles, can be a serious problem, but the young curl grubs of this insect are tasty if you catch and cook them. Some insects do not like sunlight. The very small moth that damages banana fruit is like this. Simply pulling off the leafy bracts over the banana fruit reduces the damage, as this lets sunlight in and the insect flies away. The best rule for reducing pest damage is to grow healthy plants, as they suffer less damage. Spiders, ladybirds, hover flies and many other insects also feed off the insect pests that attack our crops and should be encouraged.

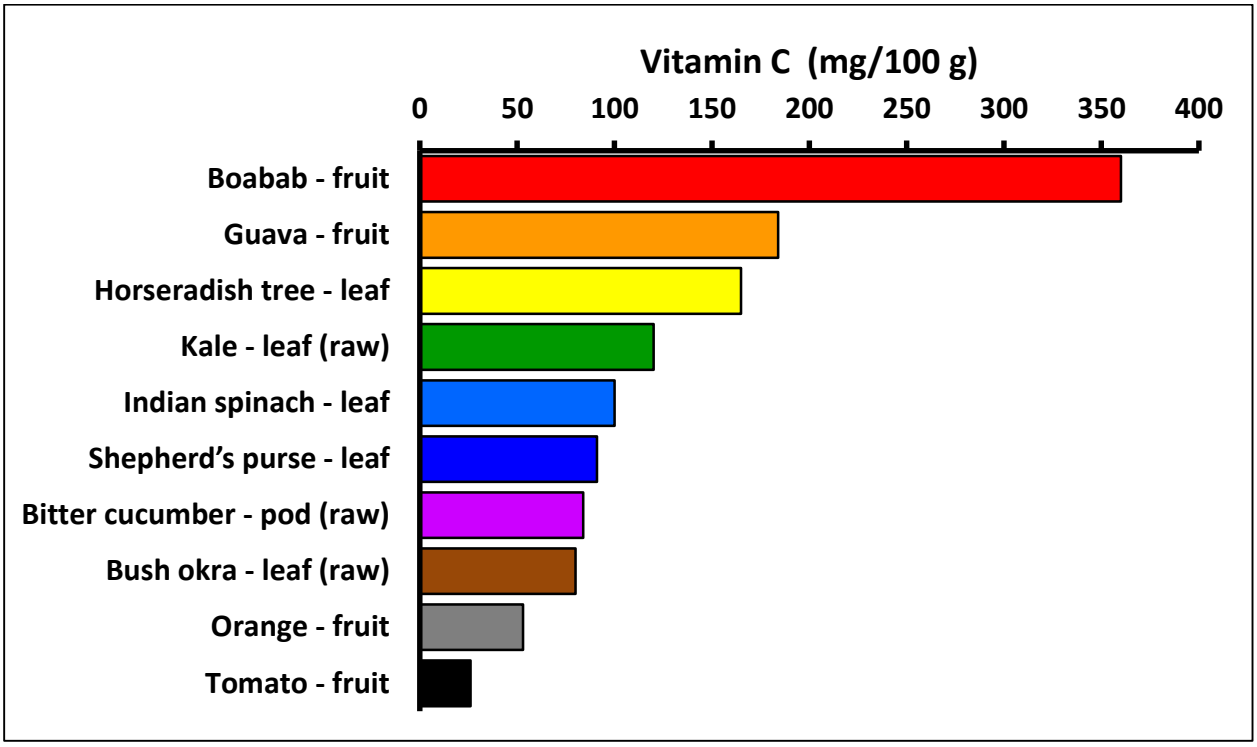
**Diseases**

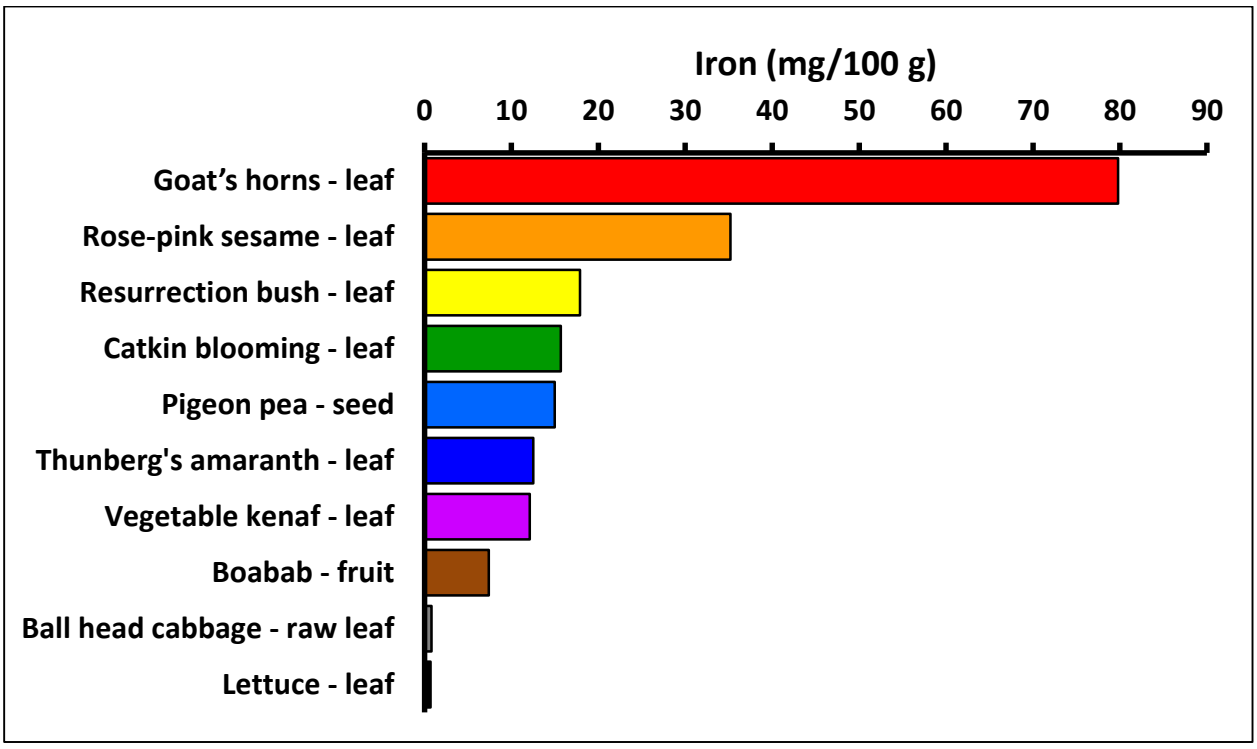
The living organisms that cause disease are much smaller than insects. These disease organisms can often only be seen with a microscope. There are three main kinds of disease organisms - fungi, bacteria and viruses. Fungi are like the mushrooms we eat, only very much smaller. They usually make distinct dry spots on leaves and other plant parts. Fungi have spores that often blow in the wind. Bacteria are often smaller and live in damp places. They usually make plants go soft and squashy, and they may cause a smell. Bacteria are mostly spread with rain and in water. Viruses are very, very small and usually make irregular stripes and patterns on leaves and other plant parts. Viruses usually spread in planting material or in the mouths of small sucking insects. Plants infected by viruses are often yellow, and may be stunted, or have curled or unusual shaped leaves. One common fungus disease on sweet potato causes the leaves to become wrinkled and twisted. It usually gets worse in old gardens and where soils are running out of nutrients. It doesn't affect all kinds of sweet potato to the same extent. The answer is not to stop the disease, but to improve the soil. The general rule is that healthy plants that are growing well will suffer less damage from disease.

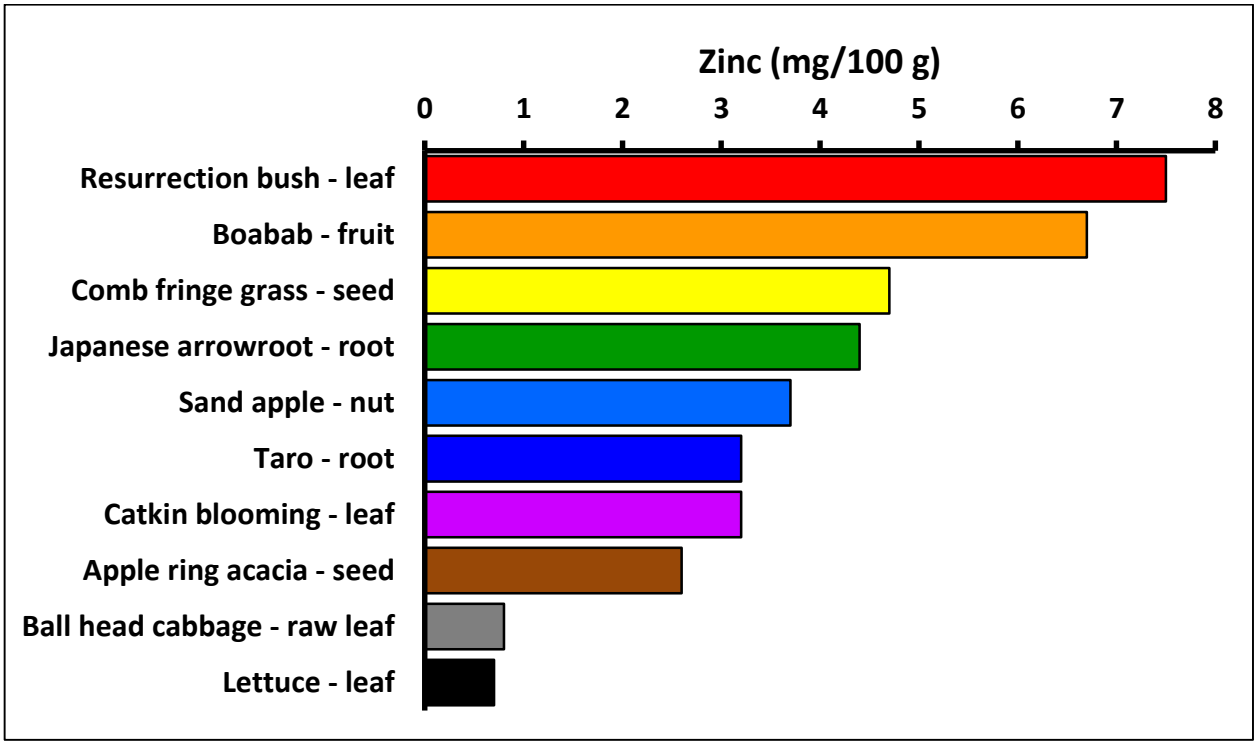
## Food value charts for a selection of plants from Angola




Vitamin C (mg/100 g)
0
50
100
150
200
250
300
350
400
Boabab - fruit
Guava - fruit
Horseradish tree - leaf
Kale - leaf (raw)
Indian spinach - leaf
Shepherd's purse - leaf
Bitter cucumber - pod (raw)
Bush okra - leaf (raw)
Orange - fruit
Tomato - fruit


Iron (mg/100 g)
0
10
20
30
40
50
60
70
80
90
Goat's horns - leaf
Rose-pink sesame - leaf
Resurrection bush - leaf
Catkin blooming - leaf
Pigeon pea - seed
Thunberg's amaranth - leaf
Vegetable kenaf - leaf
Boabab - fruit
Ball head cabbage - raw leaf
Lettuce - leaf




**Note regarding plant selection:** In compiling these field guides, we acknowledge that some staple foods and commercial crops which are grown widely in the target country may be omitted. Such foods are often in the starchy staple category (e.g. rice, corn). This does not mean that they are not useful, but merely reflects a desire for the Food Plant Solutions project to concentrate on plants that are less well known and/or underutilised.

## *Starchy staples*

**English**: Sweet potato
**Local:**

**Scientific name:** *Ipomoea batatas*
**Plant family: CONVOLVULACEAE**

**Description**: This is a root crop which produces long creeping vines. The leaves are carried singly along the vine. Leaves can vary considerably from divided like fingers on a hand to being entire and rounded or heart shaped. Purple trumpet shaped flowers grow at the end of the vine. Under the ground fattened tubers are produced. There are a large number of varieties which vary in leaf shape and colour, tuber shape, colour, texture and in several other ways.

**Distribution**: A tropical and subtropical plant. They grow from sea level up to about 2,700 m altitude in the tropics. Plants can grow with a wide range of rainfall patterns and in different soils. Plants are killed by frost and can't stand water-logging. Plants grow well with temperatures between 21 - 26°C. It can grow with a pH between 5.2 - 6.8. Sweet potato are not tolerant to shading. Under shaded conditions, both foliage growth and storage root production are decreased. Some cultivated varieties can be selected for increased production under mild shade but not heavy shade. The survival of cuttings at planting is also reduced under shaded conditions. Under shaded conditions plant become more climbing and with fewer leaves which are however larger. With increasing shade less tubers are produced and these grow more slowly. Sweet potato tends to be responsive to potassium fertiliser. cultivated varieties are often selected for yield under low fertility conditions. Under lowland conditions in the tropics sweet potato tubers undergo active tuber enlargement from 6 - 16 weeks. Weed control is essential especially during early stages of growth. The rate of ground coverage by foliage varies greatly with growing conditions and cultivar but once ground coverage has occurred weed control is less of a problem. Sweet potato tuber initiation is subject to aeration in the soil. Either heavy clay soils, waterlogged conditions or other factors reducing aeration can result in poor tuber production. For this reason sweet potatoes are often grown on mounded beds. It suits hardiness zones 9 - 12.

**Use**: Tubers are boiled or baked. They can be steamed, fried, mashed or dried. They can be fermented into alcoholic drinks. They can also be used in pies, cakes, puddings and candies and jams. They can be used in noodles. The chopped and dried tubers can be boiled with rice or ground into flour and mixed with wheat flour to make cakes or bread. The young leaves are edible.

**Cultivation**: Vine cuttings are used for planting. In grassland soils it is grown in mounds, ridges or other raised beds. In bush fallow, it is mostly planted in undug loose soils. It needs a sunny position. Tubers won't form if the ground is waterlogged when tubers start to develop. Sweet potato is grown by cuttings of the vine. About 33,000 cuttings are required per hectare. These weigh about 500 kg. Vine lengths of about 30 cm are optimum. As long as the vine is adequately inserted in the soil, the length of vine inserted does not significantly affect yield. Fresh sweet potato seeds germinate relatively easily and lead to continuous production of new cultivars under tropical conditions. Excess nitrogen restricts storage root initiation and therefore excess leaves are produced without significant tuber yield. Dry matter percentage increases with increasing age of the crop. Higher dry matter tubers are normally preferred.

Sweet potato are not tolerant to shading. Under shaded conditions, both foliage growth and storage root production are decreased. Some cultivars can be selected for increased production under mild shade but not heavy shade. The survival of cuttings at planting is also reduced under shaded conditions. Under shaded conditions plant become more climbing and with fewer leaves which are however larger. With increasing shade less tubers are produced and these grow more slowly. Sweet

potato tends to be responsive to potassium fertiliser. Cultivars are often selected for yield under low fertility conditions.

Under lowland conditions in the tropics sweet potato tubers undergo active tuber enlargement from 6 - 16 weeks. Weed control is essential especially during early stages of growth. The rate of ground coverage by foliage varies greatly with growing conditions and cultivar but once ground coverage has occurred weed control is less of a problem. Sweet potato tuber initiation is subject to aeration in the soil. Either heavy clay soils, waterlogged conditions or other factors reducing aeration can result in poor tuber production. For this reason sweet potatoes are often grown on mounded beds. In well drained or high organic matter soils digging or mounding is not as essential. Leaf scab (*Elsinoe batatas*) can significantly reduce yield especially in sites where leaf production is low due to low soil fertility. To reduce sweet potato weevil damage plants need to be hilled or have the tubers well covered with soil. Cracking soils can allow the weevil access to tubers.

**Production**: The time to maturity ranges from 5 months to 12 months depending on the variety planted and the altitude at which it is being grown. Yields range from 6 - 23 t/ha.

**Food Value:** Per 100 g edible portion

| **Edible part** | **Moisture %** | **Energy kJ** | **Protein g** | **proVit A µg** | **proVit C mg** | **Iron mg** | **Zinc mg** |
|---|---|---|---|---|---|---|---|
| tuber (baked) | 72.9 | 431 | 1.7 | 961 | 24.6 | 0.5 | 0.3 |
| tuber (raw) | 70.0 | 387 | 1.2 | 709 | 25 | 0.7 | 0.4 |
| tuber (boiled) | 72.0 | 363 | 1.1 | 787 | 15 | 0.6 | 0.3 |
| leaf | 86.3 | 168 | 3.9 | 105 | 58 | 2.9 | - |

## Starchy staples

**English**: Bullrush millet
**Local:**

**Scientific name:** *Pennisetum glaucum*
**Plant family: POACEAE**

**Description**: An annual grass that grows to 3 m tall. The leaf blades are 20 - 100 cm long by 2 - 5 cm wide. The flower is dense and 40 -5 0 cm long by 1.2 - 1.5 cm wide. They also vary in shape and size. Plants that tiller produce smaller heads. The species varies a lot. There are 13 cultivated, 15 weed and 6 wild races of this grass. It has a cylindrical ear like a bullrush. The grains are small and round and have a shiny grey colour like pearls. There are thousands of cultivated varieties.

**Distribution**: A tropical plant that suits regions with a short growing season. It grows in areas with less than 600 mm of rainfall. It is replaced with sorghum between 600 – 1,200 mm rainfall and then by finger millet or maize above 1,200 mm rainfall. It is important in the drier areas of India and Pakistan. It can grow in arid places.

**Use**: The seeds are eaten like rice. They are also ground into flour and made into bread and cakes. They are used to make alcoholic drinks. They are mixed with other grains and seeds to make fermented foods. Some kinds have sweet stalks that are chewed. The young ears can be roasted and eaten like sweet corn.

**Cultivation**: Plants are grown from seed. It is usually sown directly into the field. The plant density is adjusted to suit rainfall and soil fertility. The spacing is 45 cm apart up to 200 cm apart. It is also intercropped with other crops such as cowpea, sorghum and peanut. Crops are normally weeded 2 or 3 times.

**Production**: It takes from 75 - 180 days to maturity. The heads can be picked by hand or the plant removed. Some types need to be picked 2 or 3 times as heads mature.

**Food Value:** Per 100 g edible portion

| Edible part | Moisture % | Energy kJ | Protein g | proVit A µg | proVit C mg | Iron mg | Zinc mg |
|---|---|---|---|---|---|---|---|
| seed | 13.5 | 1363 | 12.7 | - | - | 3.5 | - |

## Starchy staples

**English**: Potato
**Local:**

**Scientific name:** *Solanum tuberosum*
**Plant family: SOLANACEAE**

**Description**: A branched annual plant up to 50 cm tall. The stems are soft and 4 angled with compound leaves. The leaves are irregular shape and have 6 - 8 pairs of leaflets as well as small irregular leaflets between the others. It has swollen stem tubers under the ground. The tubers can vary in colour from white to red and purple. The tuber shape can also vary greatly. The flowers are white pink or purple. The fruit is a berry. It is smooth, round and green but often striped.

**Distribution**: In the tropics they mostly grow at high altitude above 1,500 m, but they are grown between 900 and 2,800 m. Tubers form best when soil temperatures are 15.5°C. Tuber formation stops with a soil temperature of 30°C and decreases with temperatures above 20°C. Potatoes should have a mean temperature below 18°C. They are damaged by frost but slightly more frost tolerant than sweet potato. Short day length helps tuber production. They can grow with a soil pH of 5.2 - 6.6. It suits hardiness zones 7 - 11.

**Use**: The tubers are cooked and eaten. They are also fried, canned and made into starch. The tubers are boiled, baked, roasted, mashed and used in soups, stews, dumplings, pancakes and potato salads. Potatoes are also use for alcoholic drinks. The tender leaves are also occasionally eaten. **Caution:** The green tubers and leaves contain a poisonous alkaloid solanine.

**Cultivation**: Plants are grown from tubers. Due to virus diseases, it is necessary to get fresh seed tubers each few years. Large tubers can be cut to include a bud or "eye". A seed piece of 40 - 50 g is suitable. It is best to inter-crop as this stops bacterial wilt spreading. The plant is surrounded by dirt when 20 - 25 cm tall. Later the tubers need to be kept covered with dirt. Providing extra light (4 - 5 hours) allows plants to form flowers and true seed to be collected.

**Production**: The time to maturity is between 17 and 24 weeks. Yields of 5 - 12 t/ha can be expected. Higher yields can be obtained with good care.

**Food Value:** Per 100 g edible portion

| Edible part | Moisture % | Energy kJ | Protein g | proVit A µg | proVit C mg | Iron mg | Zinc mg |
|---|---|---|---|---|---|---|---|
| tuber (baked) | 71.2 | 456 | 2.3 | 0 | 12.9 | 1.4 | 0.3 |
| tuber | 77.0 | 344 | 2.0 | 25 | 21 | 0.8 | 0.27 |
| leaf | 86.1 | - | - | 3.4 | - | - | - |

## Starchy staples

**English**: Taro
**Local:**

**Scientific name:** *Colocasia esculenta*
**Plant family: ARACEAE**

**Description**: This plant has large flat leaves on the end of upright leaf stalks. It grows up to 1 m high. The leaf stalk or petiole joins the leaf towards the centre of the leaf. The leaves are 20 - 50 cm long. Near the ground a thickened rounded corm is produced. Around this plant there is normally a ring of small plants called suckers. Many different varieties occur. If left to maturity, a lily type flower is produced in the centre of the plant. It has a spathe 15 - 30 cm long which is rolled inwards. The flowers are yellow and fused along the stalk. There are many named cultivated varieties. Taro comes in two basic forms. The Dasheen type *Colocasia esculenta* var. *esculenta* and *Colocasia esculenta* var. *antiquorum* or the Eddoe type. The basic difference is the adaptation of the Eddoe type to storage and survival in seasonally dry places, while the dasheen type needs to be maintained in a more or less continuously growing vegetative stage.

**Distribution**: It is a tropical plant. Taro grows from sea level up to about 2,300 m altitude in the tropics. It grows well in humid places. It can stand damp soil and grow under light shade. It suits hardiness zones 9 - 12.

**Use**: The corms, petioles and leaves are all edible after cooking. The leaves are also dried and stored. Fresh leaves can be stored for 4 - 5 days. **Caution:** Some varieties burn the throat due to oxalate crystals.

**Cultivation**: Taro can be planted from cormels or from the top of the central corm. Other sections of the corm could also be used but this is not commonly done. Flowering of taro and seed production can lead to new cultivars. Flowering can be promoted by the use of gibberellic acid. The general growth pattern is for an increase in top growth, in terms of leaf number, leaf area and petiole length, to continue for about 6 months under tropical lowland conditions then for each of these to decrease and tuber storage to continue to increase. Corm weight increases significantly from 5 - 11 months. Starch content also increases with time but protein content declines over the corm development period.

Taro can be grown under flooded conditions but root rots develop if the water becomes stagnant. For flooded cultivation, the land is cleared, ploughed, cultivated and puddled. The aim is to get a field that is flat with embankments allowing the impounding of water. Planting is done into 2 - 5 cm of standing water.

For dryland taro, the soil is prepared by digging, unless a fresh bush fallow is used where the natural friability of the soil allows plants to be put into the undug soil in a small hole that is prepared. Plants are put into a hole 5 - 7 cm deep or deeper. Mulching to conserve moisture and reduce weed growth in beneficial. Setts from corms normally give higher yield than that from cormels. The greater leaf area and root production may be responsible for this. Setts of about 150 g are optimum.

The time of planting is primarily determined by the availability of moisture. Planting is done shortly after the rainfall has become regular, if seasonally distinct wet and dry occur. Higher rainfall, higher temperatures, and higher hours of sunlight, enhance production and determine seasonality of production.

Evapotranspiration for flooded taro averages about 4 mm per day, ranging from 1.5 - 7.2 mm, with a total of about 1,200 mm for the crop. Intermittent moisture can result in irregular shaped corms. Flooding has been found to be more effective than sprinkler irrigation, or furrow irrigation. Increased suckering, giving greater leaf area, seems to be the reason for this.

Taro is sensitive to weed competition throughout most of its growth, but it is more critical during early growth up to 3 - 4 months. About 7 - 9 weedings are required, to keep the crop clean under tropical lowland conditions, where flooding is not used. Due to the decrease in height and leaf area towards the end of the growth cycle when starch accumulation in the corms is maximum, weed competition and weed control are again significant. Mechanical weeding needs to be shallow to avoid damaging the superficial taro roots. A range of herbicides have been recommended in various situations.

Taro produces the highest dry matter yield under full sunlight, but it can still grow under moderate shade. Under shaded conditions it grows more slowly and develops fewer cormels. They require good moisture conditions and have little tolerance for drought. Taro residue has an allelopathic factor which can reduce the germination and growth of other plants, for example, beans.

Taro tends to demand high fertility, and is responsive to additional NPK fertiliser. Higher doses of K increases starch content and higher doses of N increases protein content. Both N and K applications increase oxalic acid content of the tubers.

Spacing affects total yield, and marketable, harvestable yield, of corms. Close spacing increases the corm yield per area, and the shoot yield per area, but decreases the corm yield per plant, and the contribution of sucker corms, to the yield. Where spacings of 30 cm x 30 cm are used, giving about 110,000 plants per hectare, a very large amount of planting material is required, which reduces the net return per unit of planting material. A spacing of 60 cm x 60 cm in more common. Wider spacings of 90 cm x 90 cm reduces overall yield.

**Production**: Crops mature in 6 - 18 months. Yields of 5 - 15 tonnes per hectare are probably average.

**Food Value:** Per 100 g edible portion

| **Edible part** | **Moisture %** | **Energy kJ** | **Protein g** | **proVit A µg** | **proVit C mg** | **Iron mg** | **Zinc mg** |
|---|---|---|---|---|---|---|---|
| root | 66.8 | 1231 | 1.96 | 3 | 5 | 0.68 | 3.2 |
| leaf | 85.0 | 210 | 5.0 | 57 | 90 | 0.62 | 0.7 |
| leaf stalk | 93.0 | 101 | 0.5 | 180 | 13 | 0.9 | - |
| leaf (cooked) | 92.2 | 92.2 | 2.7 | 424 | 35.5 | 1.2 | 0.2 |

## Starchy staples

**English**: Japanese arrowroot
**Local:**

**Scientific name:** *Dolichos trilobus*
**Plant family: FABACEAE**

**Description**: A bean plant. It is a twining herb that keeps growing from year to year from root tubers. The leaves are compound with 3 leaflets. The leaf stalks are 2 - 3 cm long. The leaflets are 4 sided and 2 - 6 cm long by 2 - 5 cm wide. The flowering shoots are in the axils of leaves and there are 1 - 4 flowers in a group. The fruit is a pod 6 cm long by 8 mm wide. It is slightly curved. There are 6 - 7 seeds.

**Distribution**: It is a tropical plant that grows in grassland and bushland. It grows from sea level to 1,200 m above sea level in Tanzania.

**Use**: The seeds are edible. They are collected and cooked while fresh or after being dried in the sun.

**Cultivation**: It can be grown from fresh seed.

**Production**: Dried seeds can be stored for several months.

**Food Value:** Per 100 g edible portion

| Edible part | Moisture % | Energy kJ | Protein g | proVit A µg | proVit C mg | Iron mg | Zinc mg |
|---|---|---|---|---|---|---|---|
| root | 72.4 | 1794 | 7.1 | - | - | 0.2 | 4.4 |

Image accessed from: http://www.pittwateronlinenews.com/resources/Dipogon-lignosus1.jpg?timestamp=1398817248961

## Starchy staples

**English**: African yam bean
**Local:**

**Scientific name:** *Sphenostylis stenocarpa*
**Plant family: FABACEAE**

**Description**: A vigorous climbing vine. It grows 1.5 - 2 m high. The leaves have 3 leaflets. They are 14 cm long and 5 cm wide. The flowers are pink, purple or greenish-white. They are 2.5 cm long. They occur on stout stalks in the axils of leaves. The seed pods are smooth and 25 - 30 cm long by 1 - 1.5 cm wide. They are flat but have both edges raised. The seeds vary in shape, size and colour. They can be 1 cm long by 0.7 cm wide. They can be cream or brown. Small narrow tubers grow under the ground. They can be 5 - 7.5 cm long and weigh 50 - 150 g. The flesh is white and watery.

**Distribution**: It is a tropical plant that grows from sea level up to 1,800 m altitude. It grows in grassland and woodland and sometimes in marshy sites. It can grow in arid places.

**Use**: The pods, leaves, seeds and tubers are cooked and eaten. They are used in soups or with maize or rice. The hard seeds need to be soaked in water for 12 hours before cooking and being ground. The tubers are cooked and eaten.

**Cultivation**: It can be grown from seed or tubers.

**Production**: Tubers are ready for harvest about 8 months after planting.

**Food Value:** Per 100 g edible portion

| Edible part | Moisture % | Energy kJ | Protein g | proVit A µg | proVit C mg | Iron mg | Zinc mg |
|---|---|---|---|---|---|---|---|
| seed | 9.0 | 1470 | 19.2 | - | - | - | - |
| tuber | 64.0 | 542 | 3.8 | - | - | - | - |

## *Legumes*

**English**: Common bean
**Local:**

**Scientific name:** *Phaseolus vulgaris*
**Plant family: FABACEAE**

**Description**: There are many bush and climbing varieties of this bean. Climbing forms can be 2 - 3 m tall. Bush types are 20 - 60 cm tall. The leaves have three leaflets, one after another along the stem. The leaf stalk has a groove on the top. The side leaflets are unequal in shape, and can be 8 - 15 cm by 5 - 10 cm. The flowers are in the axils of leaves (where the leaves join the stem) and occur in a loose form. Flowers are white to purple. Pods are smooth, slender and 8 - 20 cm long by 1 - 1.5 cm wide. They are straight or slightly curved with a beak at the end and often have 10 - 12 coloured, kidney-shaped and seeds.

**Distribution**: It is a temperate plant that grows in many temperate and subtropical countries, including Solomon Islands. It mostly grows from 700 – 2,000 m altitude in the tropics. It suffers from pest and disease damage in the lowlands, but can be grown to sea level. It is not suited to the wet tropics. It is shallow-rooted and damaged by excess moisture near the roots. A crop lifecycle needs about 350 mm of water. It is sensitive to frost and high temperatures. Flowers will not form below 9.5°C. Night temperatures above 37°C cause flowers to drop. The best temperature range is 15 - 21°C. It does not suit very acid soils. It suits hardiness zones 8 - 11.

**Use**: The young pods, leaves and mature seeds are edible. Dry seeds are soaked in water and boiled until soft.

**Cultivation**: Plants are grown from seed, preferably sown in raised beds. Seeds remain viable for 2 years. Germination is normally good if seed has been well stored. Climbing types need stakes. Plants are self-fertilised. These beans are intercropped with other plants in many places. If grown on their own, bush types can be spaced at 25 cm x 25 cm. They can be sown closer together in rows wider apart to make weeding and harvesting easier. For dried beans, once the pods are mature and turning yellow, the whole plants are pulled, then dried and threshed. About 50 - 75 kg of seed will sow a hectare. Flowering in most French bean varieties is not affected by day length.

**Production**:

**Food Value:** Per 100 g edible portion

| Edible part | Moisture % | Energy kJ | Protein g | proVit A µg | proVit C mg | Iron mg | Zinc mg |
|---|---|---|---|---|---|---|---|
| seed (dry) | 10.0 | 1386 | 25.0 | 10 | 1 | 8.0 | 2.8 |
| seed (young) | 92.0 | 142 | 3.0 | | 20 | 0.8 | 0.2 |
| pod | 88.0 | 151 | 2.5 | 750 | 27 | 1.4 | 0.2 |
| sprout | 90.7 | 121 | 4.2 | 0 | 38.7 | 0.8 | 0.4 |

## Legumes

**English**: Cowpea
**Local:**

**Scientific name:** *Vigna unguiculata subsp. unguiculata*
**Plant family: FABACEAE**

**Description**: A creeping bean type plant with straight firm pods. There is a deep tap root and many branches occur from it in the surface of the soil. The root nodules are large and round. The leaves have 3 leaflets. The end leaflet can be 12 - 16 cm long. The side leaflets are assymetrical. The stipules at the base of the leaf are large and with spurs at their base. Flowers occur often in pairs on the end of long flowering shoots. Only 2 - 4 flowers in each stalk produce pods. Flowers are white, yellow or blue. They are large and showy. The pods are about 15 cm long. The seeds are white except for a dark scar.

**Distribution**: It grows in tropical and subtropical climates. It grows from sea level to 1,800 metres altitude in the tropics. Plants can stand high temperatures. Some kinds can tolerate drought. They are sensitive to cold and killed by frost. Plants germinate with a temperature between 11.5 - 15.5°C. The best growth occurs between 20 - 35°C. They can grow on a range of soils providing they are well drained. They are a short day plant. They do well in the semiarid tropics. It will not tolerate acid or alkaline soils. It grows in areas with an annual rainfall between 280 - 410 mm. It can grow in arid places.

**Use**: The young leaves, young pods and ripe seeds are all eaten. They can be steamed, boiled, stir-fried etc. The leaves can be dried and stored. The dried seeds are used in soups and stews. They are ground into flour or fermented. The seeds are also used for bean sprouts. Roasted seeds are used as a coffee substitute.

**Cultivation**: It is grown from seeds. Seeds remain viable for several years if carefully stored. A seeding rate of about 20 kg per ha is suitable and seed are sometimes broadcast then thinned.

**Food Value:** Per 100 g edible portion

| Edible part | Moisture % | Energy kJ | Protein g | proVit A µg | proVit C mg | Iron mg | Zinc mg |
|---|---|---|---|---|---|---|---|
| seed (dry) | 11.2 | 1189 | 23.5 | - | 1.5 | 6.4 | - |
| seed (young, boiled) | 75.5 | 406 | 3.2 | 79 | 2.2 | 1.1 | 1.0 |
| leaf | 88.4 | 143 | 4.2 | 36 | 35 | 4.7 | 0.3 |
| young pod + seed (boiled) | 89.5 | 142 | 2.6 | 45 | 17.0 | 0.7 | 0.2 |
| leaf (boiled) | 91.3 | 92 | 4.7 | 29 | 18 | 1.1 | 0.2 |

## Legumes

**English**: Pigeon pea
**Local:**

**Scientific name:** *Cajanus cajan*
**Plant family: FABACEAE**

**Description**: An upright perennial shrubby legume that can live for 3 - 4 years. They can grow up to 4 m tall and spread to 1.5 m wide. It has a bushy appearance and a strong deep taproot. The root nodules are round and sometimes lobed. The leaf consists of 3 narrow, green leaflets which are silvery-green underneath. The end leaflet is larger with a longer leaf stalk. The pea shaped flowers are red and yellow and occur on branched flower stalks which stick upwards in the axils of leaves. Pods are long, straight and narrow, often with 4 - 8 seeds. Seeds vary in shape, size and colour. The pods are slightly hairy. Pods are often 4 - 8 cm long and have a beak at the end. Pods are constricted between the seeds. Many varieties of pigeon pea occur. Some are dwarf and day length neutral.

**Distribution**: A tropical plant that requires a tropical or subtropical climate. Plants grow from sea level up to about 1,800 m in the tropics. They can tolerate drought and are suited to a drier climate. They can grow in places with less than 600 mm rainfall per year. They do less well in the wet tropics. They suffer in waterlogged soils and are damaged by frost. It can also tolerate heat. It will grow on poor soils cannot grow on salty soils. It can grow in arid places and suits hardiness zones 10 - 12.

**Use**: Young leaves, shoots and pods are eaten. The pods can be used in curries. The leaves and shoots as potherbs. Young seeds are cooked and eaten like peas. Ripe seeds are also cooked and eaten in soups and curries. Bean sprouts can be produced and eaten. Preparation of the seeds for dahl is somewhat complicated.

**Cultivation**: They are grown from seeds. It is best to sow seeds where the plants are to grow. Seeds normally germinate easily and well. Before sowing seed it helps to soak them in cold water for one day. Seeds store well if kept cool and dry. A spacing of 1.5 m x 1.5 m is suitable. Plants can be cut back and allowed to re-grow. Plants can also be grown from cuttings.

**Production**: Plants are fast growing. Pods are ready after 5 months. Mature seeds take about 8 months. Plants will often live for 3 - 4 years. Plants are cross pollinated by insects, or self-pollinated.

**Food Value:** Per 100 g edible portion

| Edible part | Moisture % | Energy kJ | Protein g | proVit A µg | proVit C mg | Iron mg | Zinc mg |
|---|---|---|---|---|---|---|---|
| seed | 10.0 | 1449 | 19.5 | 55 | - | 15.0 | - |
| pod (young) | 64.4 | 477 | 8.7 | - | - | 2.0 | - |
| seed (young, boiled) | 71.8 | 464 | 6.0 | 2 | 28.1 | 1.6 | 0.8 |

## Legumes

**English**: Sweet acacia
**Local:**

**Scientific name:** *Acacia farnesiana*
**Plant family: FABACEAE**

**Description**: An evergreen shrub. It grows 5 - 7 m tall and 3 m across. The stem is slender and erect. The crown is open. It is a spreading, densely branched shrub. The bark is smooth and brown. The leaves are branched and green. There are 4 - 6 pairs of larger leaves and 10 - 20 pairs of small leaflets. They have tiny leaflets and thorns up to 2 cm long, occur in pairs. The leaf stalk has a gland at or above the middle. The flowers are large orange balls. They are strongly perfumed. (The oil is used as a perfume in France.) The pods are long and dark brown to black. They are 5 - 8 cm long by 0.5 - 1 cm wide. They are inflated and sausage like. Often they are curved. They are marked with narrow lines. The pods have hard grey seeds imbedded in a pithy substance. The pods do not split open at maturity. The seeds are chestnut brown and 7 - 8 mm long by 5.5 mm wide.

**Distribution**: It is a tropical plant. This tree occurs naturally in Australia, Asia and Africa. It will grow on most soils. It is drought and frost resistant. It most commonly grows naturally on clay soils. In Papua New Guinea the plants are coastal below 60 m altitude. It grows in areas with an annual rainfall between 400 - 4,000 mm. It can grow in acid or alkaline soils. It can grow in arid places. It suits hardiness zones 11 - 12.

**Use**: The pods have been recorded as eaten after cooking. The gum is eaten. The ground up seeds are eaten. The germinated seeds are claimed to be eaten. The gum is used to prepare sweets. The young leaves are used in India as a substitute for tamarind in chutneys.

**Cultivation**: It is grown from seed.

**Production**: It is fast growing. Flowering can occur almost continuously if watering is regular. In northern Australia, flowering is normally May to July, with pods available from September to November.

**Food Value:** Per 100 g edible portion

| Edible part | Moisture % | Energy kJ | Protein g | proVit A µg | proVit C mg | Iron mg | Zinc mg |
|---|---|---|---|---|---|---|---|
| seed (dry) | 8.1 | 1522 | 36.6 | - | - | 6.0 | 0.6 |

## Legumes

**English**: Coastal jack bean
**Local:**

**Scientific name:** *Canavalia rosea*
**Plant family: FABACEAE**

**Description**: A perennial climbing or trailing legume that grows 1.8 - 10 m long. The stems are silky-hairy when young. Leaves have 3 leaflets and the central one is the largest. The leaves are smooth, dark green and slightly leathery. The leaflets are oval or round and often with an indent at the top and 2.5 - 9.5 cm long by 1.5 - 9 cm wide. The leaf stalk is 2 - 7 cm long. The flower cluster can stick upright or hang over. It is 4 - 18 cm long and the flower stalk is 10 - 21 cm long. The main rear petal is pink or purple often with a white area near the base. The fruit or pods are oblong and compressed. They are flattened and woody. They can be 11.5 - 15 cm long by 2.5 - 3 cm wide. Each section of the pod has a rib. The seeds are brown with streaks. The seeds are 1.5 - 2 cm long, 0.9 - 1.4 cm wide and 5 - 11 mm thick. The seed scar is 7 - 9 mm long.

**Distribution**: It is a tropical plant that occurs throughout the tropics and into the subtropics. It is very common along sea shores. It occurs on sandy beaches at high tide mark. It can grow in arid places. They need a well-drained soil and a sunny position. It suits hardiness zones 9 - 12.

**Use**: The seeds are edible after thorough cooking. They are also roasted and ground and used as a coffee substitute. The flowers are used for flavouring. They are used in sauces. The pods are edible when young. **Caution:** The seeds are poisonous when raw.

**Cultivation**: Plants are grown from seed. The seeds need treatment to break the hard seed coat. They can also be grown from cuttings.

**Production**: It takes 2 years to complete its life cycle.

**Food Value:** Per 100 g edible portion

| Edible part | Moisture % | Energy kJ | Protein g | proVit A µg | proVit C mg | Iron mg | Zinc mg |
|---|---|---|---|---|---|---|---|
| fruit | 10.4 | - | 4.3 | - | - | - | - |
| seed | 10.9 | - | 22.0 | - | - | - | - |

Image accessed from: http://www.biolib.cz/IMG/GAL/106582.jpg

## Legumes

**English**: African winged bean
**Local:**

**Scientific name:** *Psophocarpus scandens*
**Plant family: FABACEAE**

**Description**: A climbing herb that continues to grow from year to year. It has long stems which can be slightly hairy. The stems can be 1 - 6 m long. The leaflets are oval or broadly rounded. They are 2.5 - 12 cm long and 1.8 - 10 cm wide. They can taper to a point at the tip. They are rounded or wedge shaped at the base. The leaf stalks are 5 - 18 cm long. The flower cluster is 5 - 12 cm long. The flower stalk is 3 - 40 cm long. The flower petals are pale blue. The fruit are long pods 3.5 - 8 cm long by 6 - 7 mm wide. They are square in cross section. There are 4 - 8 seeds inside. The pods have prominent wings which can have slight teeth along the edge. The seeds are blackish purple. They are 5 - 7.5 mm long and 3.5 - 6 mm wide.

**Distribution**: It is a short-day, tropical plant. In Africa, it grows between sea level and 950 m altitude. It grows in areas with a rainfall of 1,200 - 1,800 mm per year with an average temperature of 25°C.

**Use**: The young leaves and shoots are eaten as a vegetable. They can be dried and stored. The immature pods and ripe seeds are also cooked and eaten.

**Cultivation**: Plants are grown from seed. Seed can be stored. Seeds need to have the hard seed coat broken by scratching before planting. Plants can be allowed to climb over fences or shrubs.

**Production**: Leaves are usually picked before fruit form.

**Food Value:** Per 100 g edible portion

| Edible part | Moisture % | Energy kJ | Protein g | proVit A µg | proVit C mg | Iron mg | Zinc mg |
|---|---|---|---|---|---|---|---|
| leaf | 82.0 | - | - | 7.1 | - | - | - |
| pod | 87.0 | - | - | 3.6 | - | - | - |

Image accessed from: http://www.zimbabweflora.co.zw/speciesdata/images/16/167710-6.jpg

## *Leafy greens*

**English**: Horseradish tree
**Local:**

**Scientific name:** *Moringa oleifera*
**Plant family: MORINGACEAE**

**Description**: A small, soft-wooded tree that grows 9 - 12 m tall. The tree loses its leaves during the year. The bark is grey, thick, corky and peels off in patches. The leaves are pale green and the leaf is divided 3 times. The whole leaf is 30 - 60 cm long and the leaflets are usually oval and 1 - 2 cm long. The leaflets are jointed with a gland near the joint. The flowers are pale yellow. They occur in long sprays 30 cm long. Each flower has 5 petals and of these one is erect and 4 are bent backwards. The fruit is a long capsule 30 - 100 cm long by 2 cm wide. The seed capsules are up to 45 cm long. They are roughly triangular in shape. The seeds have 3 wings. Often the fruiting kinds are grown as annual plants.

**Distribution**: A tropical and subtropical plant. They suit the dry lowland areas and grow up to 1,350 m altitude in the tropics. They are not hardy to frost. They cannot tolerate water-logging. A pH of 6 - 7.5 is suitable. It can grow in arid places. It suits hardiness zones 9 - 12.

**Use**: The young tops and leaves are eaten cooked. They are eaten as potherbs or used in soups and curries. They can be dried and stored for later use. The very young long pods are eaten cooked, especially in curries and soup. They are also pickled. The young seeds are eaten roasted or fried. Sometimes the roots are used as a horseradish substitute. A gum from the bark is used as seasoning. The bark is used for tea. The roots, leaves, flowers and fruits are eaten cooked in water and mixed with salt and chili peppers. The oil expressed from the seeds is used in salads.

**Cultivation**: It is best to grow plants from 1 metre long cuttings but they can be grown from seed. They can be used as a hedge and pruned regularly to produce more leaves. Properly dried seed can be stored for a long time in sealed containers in a cool place. Normally perennial types are grown from cuttings and annual types are grown from seed.

**Production**: Trees are fast growing. They can be pruned or topped. With one variety the tree flowers and fruits continuously while with the other variety there are flowers and fruit once per year. The fruit ripens 3 months after flowering. Annual types produce fruit 6 months after planting. Leaves are best dried in the shade to retain more of their Vitamin A.

**Food Value:** Per 100 g edible portion

| Edible part | Moisture % | Energy kJ | Protein g | proVit A µg | proVit C mg | Iron mg | Zinc mg |
|---|---|---|---|---|---|---|---|
| leaf | 76.4 | 302 | 5.0 | 197 | 165 | 3.6 | - |
| flower | 84.2 | 205 | 3.3 | - | - | 5.2 | - |
| leaf (boiled) | 87 | 189 | 4.7 | 40 | 31.0 | 2.0 | 0.2 |
| pod (raw) | 88.2 | 155 | 2.1 | 4 | 141 | 0.4 | 0.5 |
| seed | 6.5 | - | 46.6 | - | - | - | - |

## Leafy greens

**English**: Indian spinach
**Local:**

**Scientific name:** *Basella alba*
**Plant family: BASELLACEAE**

**Description**: An annual or perennial climbing herb with thick fleshy leaves. The vine is smooth and juicy and can be 10 m long. It branches freely. The vine and leaves can be red or green. The leaves are fleshy and pointed at the tip. They can be 8 - 18 cm long and 8 - 10 cm across. They are carried alternately along the vine. Leaves can be heart shaped or oval. It has white, pink or red flowers in short spikes which are in the axils of the leaves. The fruit are round and soft. They can be red, white or black and are 6 - 8 mm across. The seeds are round and black. They are 3 mm across. (Often the ones with heart shaped leaves are called *Basella cordifolia*, the ones with a red stem *Basella rubra* and the short day flowering dark green kind *Basella alba*.)

**Distribution**: A tropical plant. It occurs mostly in the tropical lowlands and is best below 500 m but will grow up to about 1600 m. in the equatorial tropics. It will grow quite well in the temperature range 15 - 35°C. It does not like water-logging but can survive 4 - 12 weeks drought once well established. It requires adequate water during the growing season. The best pH is 5.5 - 7.0. It cannot tolerate salty conditions. Flowering does not occur when day lengths are over 13 hours.

**Use**: The young shoots and leaves are eaten cooked. They are somewhat slimy. In soups and stews the mucilage can be used as thickening. The purple colour of fruit is harmless and is used to colour vegetables and agar-agar. Some lemon juice added to the dye enhances the colour. The leaves can be eaten raw in salads or cooked like a vegetable. The leaves are used to make tea and can also be dried and stored. The seeds can be crushed to use as an edible dye for jellies.

**Cultivation**: It can be sown from seeds or cuttings. Seeds germinate in a few days. Sticks can be provided for support, or it can grow over fences and stumps. If seeds are used, 3 kg of seed will sow one hectare. They are best sown in a nursery and transplanted. A spacing of 1 m is suitable. Plants grown from seed are more productive than those grown from cuttings. When cuttings are used, 20 - 25 cm long cuttings are suitable. Where the plant grows over light soil it can root at the nodes and continue growing. Partial shade, rich fertile soil and adequate moisture favour abundant leaf production. It is responsive to nitrogen fertiliser. Light shade gives bigger leaves. It requires a trellis to climb over. Frequently picking of the bud encourages branching.

**Production**: It is 4 - 6 weeks until the first harvest. It grows reasonably well on poor soils and is fairly resistant to pest and disease. Leaves will only store for one day at 20 - 30°C. Yields of 40 kg of leaves from a 10 metre square bed is possible over 75 days.

**Food Value:** Per 100 g edible portion

| Edible part | Moisture % | Energy kJ | Protein g | proVit A µg | proVit C mg | Iron mg | Zinc mg |
|---|---|---|---|---|---|---|---|
| leaf | 85.0 | 202 | 5.0 | 56 | 100 | 4.0 | - |

## Leafy greens

**English**: Kangkong
**Local:**

**Scientific name:** *Ipomoea aquatica*
**Plant family: CONVOLVULACEAE**

**Description**: Kangkong is a creeping sweet potato-like plant. It has hollow stems and can float on water. The leaves are green and are normally not divided like some sweet potato leaves, but the shape and size varies a little between different kinds. The trumpet shaped flower looks like a sweet potato flower and is normally white. The runners develop roots at the nodes and also branch. This branching increases when tips are picked off. Some variation in leaf shape can be observed. Leaf shape is less variable than in the related sweet potato, but narrow and broad leafed kinds occur. White and green stemmed kinds occur. Green stemmed kinds have more cold tolerance than white stemmed.

**Distribution**: Kangkong is a tropical plant. It grows best in short day, stable high temperature, moist conditions. Temperatures need to be above 25°C for satisfactory growth. In equatorial regions plants probably grow up to 1,000 m altitude. Below 23°C the growth rate is too slow for economic production, so production is mainly in the lowland tropics. Optimum soil pH is between 5.3 - 6.0. It suits damp places and grows well in swamps. It can grow as a partly floating plant in swamps and lagoons behind the beach along the coast. In some countries they grow the dry land form in gardens.

**Use**: The young tips of shoots are cooked and eaten. They can be boiled, steamed, stir-fried, or added to soups, stews or curries. The young stems can be used in pickles. The young tips can be eaten raw in salads and the roots are occasionally cooked and eaten.

**Cultivation**: Dryland kangkong is normally grown from seed. Sometimes seed are pre-soaked for 12 - 24 hours prior to sowing. Plants can also be grown from cuttings and establishment is rapid. Top cuttings 25 - 40 cm long can be planted beside a pond.

**Production**: Young tips can be harvested 30 days after planting, and subsequent harvests every 7 - 10 days. Production of new shoots probably declines at flowering. Yields up to 60,000 kg/ha have been recorded.

**Food Value:** Per 100 g edible portion

| Edible part | Moisture % | Energy kJ | Protein g | proVit A µg | proVit C mg | Iron mg | Zinc mg |
|---|---|---|---|---|---|---|---|
| leaf | 90.3 | 126 | 3.9 | 315 | 60 | 4.5 | - |
| leaf (boiled) | 92.9 | 84 | 2.1 | - | 16 | 1.3 | 0.2 |

## Leafy greens

**English**: Goat's horns
**Local:**

**Scientific name:** *Sida cordifolia*
**Plant family: MALVACEAE**

**Description**: An erect, woody shrub that grows about 0.4 - 1 m high. It keeps growing from year to year. It is covered with short and long hairs that make the plant feel soft. The leaf stalk is 1 - 2.5 cm long. The leaves are one after the other and heart shaped at the base. They are toothed at the edge and 1.5 - 4.5 cm long. The flowers are yellow and occur in the axils of the leaves. The fruit are about 6 - 8 mm across and have 20 fine bristles on the top.

**Distribution**: A tropical plant that grows in open waste places in the tropics and sub-tropics. It is common and widely distributed in the Philippines. It grows in hot arid places with a marked dry season. It grows in places with an annual rainfall below 520 mm. It grows in dry sandy soils and can grow in salty soils. It grows below 1,100 m altitude. It can tolerate shade and can grow in arid places.

**Use**: The leaves are edible when cooked.

**Cultivation**:

**Production**:

**Food Value:** Per 100 g edible portion

| Edible part | Moisture % | Energy kJ | Protein g | proVit A µg | proVit C mg | Iron mg | Zinc mg |
|---|---|---|---|---|---|---|---|
| leaf | 6.6 | 1296 | 24.2 | - | - | 79.8 | - |

Image accessed from
http://upload.wikimedia.org/wikipedia/commons/f/f4/Sida_cordifolia_(Bala)_in_Hyderabad,_AP_W_IMG_9420.jpg

## Leafy greens

**English**: Catkin blooming
**Local:**

**Scientific name:** *Opilia amentacea*
**Plant family: OPILIACEAE**

**Description**: A shrub or woody climber. It grows off other trees and plants. It grows to 4 - 10 m tall and has stems 20 cm across. The bark is rough and light grey. It has furrows along it and is corky. The aerial branches often hang downwards. The leaves are fairly smooth and leathery. They are 5 - 14 cm long by 2 - 5 cm wide. The midrib is prominent underneath the leaf. The leaf has a pointed tip. The leaf stalk is 0.3 - 0.7 cm long. The new leaves are bright shiny green. The base of the leaves is slightly curved backwards. The flowers are very small and yellow green. They are star shaped. They have a sweet scent. Many flowers occur together on short stalks around a central stem. These occur in the axils of leaves and are 2 - 3.5 cm long. The white-fleshed, edible fruit can occur singly or in clusters and are oval and fleshy. They are 1.5 - 3 cm long by 1.2 - 1.8 cm wide. They are pale yellow or orange when ripe. They have one seed inside. The seed is 21 mm long by 15 mm wide.

**Distribution**: A tropical plant that grows in tropical Asia. They occur near the beach in monsoon areas. They are often on sandy soil. They need fresh water so are often near streams. It can grow in arid places.

**Use**: The fruit are eaten fresh. **Caution.** If eaten in large quantities, the fruit can irritate the lips and tongue. Leaves are cooked as a vegetable.

**Cultivation**: It can be grown from fresh seed. The seed need to be placed on the ground surface, not buried.

**Production**: It fruits in the wet season. In Tanzania, leaves are collected from April to November.

**Food Value:** Per 100 g edible portion

| Edible part | Moisture % | Energy kJ | Protein g | proVit A µg | proVit C mg | Iron mg | Zinc mg |
|---|---|---|---|---|---|---|---|
| leaf | 9.2 | - | 14.8 | - | 3.9 | 15.7 | 3.2 |

Image accessed from:
http://www.westafricanplants.senckenberg.de/images/pictures/opil_opilia_amentacea_rvbli_4_1163_e5e841.jpg

## Leafy greens

**English**: Thunberg's amaranth
**Local:**

**Scientific name:** *Amaranthus thunbergii*
**Plant family: AMARANTHACEAE**

**Description**: An annual herb growing to 50 cm tall. The plant usually sprawls along the ground. The leaves are simple and arranged in spirals. The leaf stalk is 4 cm long. The leaf blade is spoon shaped and 2 - 5 cm long by 1 - 3 cm wide. They are wedge shaped at the base. The flowering shoots are leafy. The flowers have prickly hair-like points. The flowers are green in clusters in the axils of leaves.

**Distribution**: A tropical plant. It suits hot and arid places. It often grows in places with a marked dry season. In Zimbabwe it grows up to 1,400 m above sea level.

**Use**: The leaves are edible when cooked. The seeds are ground into flour and cooked.
**Caution:** This plant can accumulate poisonous nitrates if grown with high nitrogen inorganic fertilisers.

**Cultivation**: Plants can be grown from seeds. Seeds should be sown shallowly and emerge in 3 - 5 days. Repeated harvesting stimulates the continued growth of new shoots.

**Production**:

**Food Value:** Per 100 g edible portion

| Edible part | Moisture % | Energy kJ | Protein g | proVit A µg | proVit C mg | Iron mg | Zinc mg |
|---|---|---|---|---|---|---|---|
| leaf | 83.6 | 147 | 4.3 | - | - | 12.5 | 0.7 |

## Leafy greens

**English**: Vegetable kenaf
**Local:**

**Scientific name:** *Hibiscus cannabinus*
**Plant family: MALVACEAE**

**Description**: A herb that can grow from seed each year, or keep growing from year to year. It grows up to 3.5 m tall. It has a few sharp spines. The leaf stalk is 6 - 20 cm long. The leaf blade has 2 forms. The leaves lower on the stem are heart shaped and those higher on the stem have 4 - 7 lobes arranged like fingers on a hand. These lobes are sword shaped and 2 - 12 cm long by 0.6 - 2 cm wide. They have teeth around the edge and taper at the tip. The flowers are yellow, white or ivory and red at the base. They occur singly in the axils of leaves. They are large and up to 10 cm across. They have very short stalks. The fruit is a capsule about 1.5 cm across. The seeds are kidney shaped.

**Distribution**: A tropical plant. It is cultivated in South China. It can grow in well-drained sandy soils and in dry but seasonally waterlogged places. It grows from 1,500 -2,100 m above sea level. It grows in areas with an annual rainfall of 500 - 635 mm. It can grow in arid places and suits hardiness zones 10 - 12. It grows in many African and Asian countries.

**Use**: The leaves are eaten cooked as a vegetable. They are also used as a substitute for tamarind for curries. They are used in soups. The leaves are cooked with the aid of potashes. The seeds are roasted and eaten. They are also fermented. The seeds yield an edible oil. The flowers are eaten cooked as a vegetable. The bark is sweet and is chewed by children.

**Cultivation**: It is usually grown from seeds but can be grown from cuttings. Seeds will last for about 8 months. Seeds germinate best at 35°C.

**Production**:

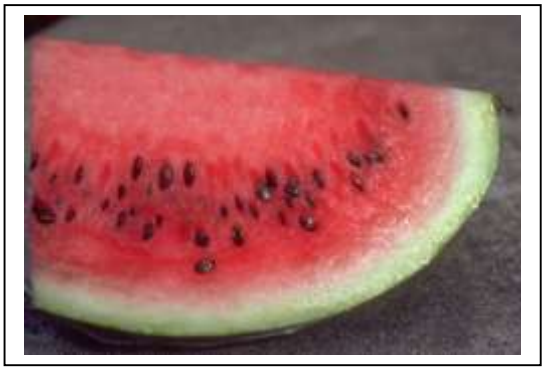
**Food Value:** Per 100 g edible portion

| Edible part | Moisture % | Energy kJ | Protein g | proVit A µg | proVit C mg | Iron mg | Zinc mg |
|---|---|---|---|---|---|---|---|
| seed (dry) | 8.1 | 1785 | 20.2 | - | - | - | - |
| leaf | 79.0 | 280 | 5.5 | 34 | - | 12.1 | - |

# *Fruit*

**English**: Watermelon
**Local:**

**Scientific name:** *Citrullus lanatus*
**Plant family: CUCURBITACEAE**



**Description**: An annual climber, with deeply divided leaves and tendrils along the vine. It trails over the ground and has hairy, angular stems. The leaves are on long leaf stalks. The leaves are deeply divided along their length. These leaf lobes are rounded and can themselves be divided. The leaves are 5 - 20 cm long by 2 - 12 cm across. The tendrils are divided. The plant has separate male and female flowers on the same plant. The flowers are pale yellow and smaller than pumpkin flowers. The flowers occur in the axils of leaves. The male flowers appear first. Fruit are large and round or oval. They can be 60 cm long. Fruit have a hard smooth skin. Several fruit colours and shapes occur. They often have a dark green mottle, or blotches. The fruit has reddish, juicy flesh and black or red seeds. The seeds are oval-shaped and smooth.

**Distribution**: It grows in most tropical and subtropical countries. It grows best on the coast in the tropics, but will grow up to about 1000 m altitude. It will not stand water-logging and does well on sandy soils. Plants are frost-sensitive. Seed will not germinate below 21°C. Temperatures between 24 - 30°C are suitable. Fruit are sweeter in arid warm areas. It suits hardiness zones 10 - 12.

**Use**: The fruit is eaten raw when ripe. Small, unripe fruit can be cooked as a vegetable. The skin is sometimes candied in vinegar and eaten with fish. Seeds are also eaten. They are dried, soaked in salt water, then roasted. Oil is extracted from the seeds. Very young leaves are occasionally eaten. It is a popular fruit.

**Cultivation**: They are suitable mainly for the dry season. A spacing of 1.5 - 2 m is suitable. They grow easily from seed. They do best when fully exposed to the sun. Seed can be dried and stored. If too much vegetative growth occurs, picking out the tip to produce side branches will produce more fruit.

**Production**: Harvesting commences after 4 - 5 months. The main fruit season is November to January. The ripeness can be determined by tapping the fruit to get a dull sound The part of the fruit on the ground changes from green to light yellow and the tendril near the base of the fruit becomes dry when ripe. Fruit yield can be 45 - 60 t/ha.

**Food Value:** Per 100 g edible portion

| Edible part | Moisture % | Energy kJ | Protein g | proVit A µg | proVit C mg | Iron mg | Zinc mg |
|---|---|---|---|---|---|---|---|
| fruit | 94.0 | 92 | 0.4 | 20 | 5 | 0.3 | 0.1 |
| seed | 5.1 | 2330 | 28.3 | 0 | 0 | 7.3 | 10.2 |

## Fruit

**English**: Guava
**Local:**

**Scientific name:** *Psidium guajava*
**Plant family: MYRTACEAE**

**Description**: A small evergreen tree 8 - 10 m tall with smooth, mottled bark which peels off in smooth flakes. It branches close to the ground and is shallow rooted. The branches are four-angled. The leaves are opposite, dull green, and somewhat hairy. They are oval and somewhat pointed at both ends, 15 cm long by 2 - 5 cm wide with short leaf-stalks. The showy flowers are white and borne in loose, irregular arrangements of 1 - 3 flowers thaty grow in the axils of leaves on new growth. The petals are 1.5 - 2 cm long. Both self and cross-pollination occurs. The fruit are rounded and 4 - 5 cm long. They are green, turning yellow when ripe. The outer covering is firm and encloses a pink, or nearly white, sweet-smelling, edible pulp with many seeds. In better selected varieties, the skin and the seeds are fully edible. Fruit vary from very acid to very sweet.

**Distribution**: A native to Central and South America, it grows in most tropical countries. Guava thrives in both humid and dry tropical climates and does best in sunny positions. It grows wild and is also cultivated. It is killed by frost and fruits better where there is a cooler season. Temperatures near 30°C give best production. It is widely distributed in open places and secondary forests throughout the Philippines and Papua New Guinea, and can become weedy under some conditions. It prefers a well-drained soil with good organic matter, but can stand some brief water-logging. A soil pH of 5 - 7 is best, but can tolerate a pH from 4.6 - 8.9. Trees cannot tolerate salty conditions. It suits hardiness zones 9 - 12.

**Use**: The fruit are eaten raw and can be used for jams and jellies. Half-ripe fruit are added to help the jelly set. The young leaves are eaten raw or cooked. It is an attractive and nutritious fruit.

**Cultivation**: They are mostly grown from seeds but seedling trees vary in quality. Seeds remain viable for a year or longer. Seeds usually germinate in 2 - 3 weeks, but can take 8 weeks. Selected trees can be propagated by budding or grafting. They can also be propagated by layering, root cuttings or stem cuttings if hormones are used. For stem cuttings, the tips are used and grown under mist at 28 - 30°C with bottom heat. Suckers can also be used. Using vegetative methods of propagation enables better fruit kinds to be preserved. In the lowland tropics, trees are self-sown. As fruit are produced on new season's growth, pruning does not affect greatly fruiting. Trees should be managed to give the maximum number of vigorous, new shoots. Trees can be pruned for shape. Trees can be grown at 2.5 m within rows and 6 m apart between rows.

**Production**: Seedling trees may begin to bear 2 - 3 years after transplanting. Pruning back the tips slightly increases fruit production. Fruit taste best if ripened on the tree. Ripening after picking can be hastened by placing them in a brown paper bag with a banana or apple. Mature fruit which have not changed colour can be stored 2 - 5 weeks at temperatures of 8 - 10°C and relative humidity of 85 - 95%. Mature fruit ripen in 2 - 3 days at normal temperatures and will keep for 7 days.

**Food Value:** Per 100 g edible portion

| Edible part | Moisture % | Energy kJ | Protein g | proVit A µg | proVit C mg | Iron mg | Zinc mg |
|---|---|---|---|---|---|---|---|
| fruit | 77.1 | 238 | 1.1 | 60 | 184 | 1.4 | 0.2 |

## Fruit

**English**: Boabab
**Local:**

**Scientific name:** *Adansonia digitata*
**Plant family: BOMBACACEAE**

**Description**: A large tree. It grows up to 25 m tall. It loses its leaves during the year. The branches are thick, angular and spread out wide. The trunk is short and stout and can be 10 - 14 m around. Often the trunk has deep grooves or is fluted. The bark is smooth and grey but can be rough and wrinkled. The leaves spread out like fingers on a hand. There are 5 - 9 leaflets. Often the leaves are crowded near the ends of branches. The flowers are large and 12 - 15 cm across. The petals are white and the stamens are purple. The fruit hangs singly on a long stalk. The fruit has a woody shell. This can be 20 - 30 cm long and 10 cm across. Inside the fruit are hard brown seeds. They are about 15 mm long. The seeds are in a yellow white floury pulp. The pulp is edible. The thick roots end in fattened tubers.

**Distribution**: It is a tropical plant that grows in the lowlands. It grows in the hot dry regions of tropical Africa, such as the Sahel. It survives well in dry climates. It grows where rainfall is 100 - 1,000 mm a year. It can tolerate fire. It grows where the annual temperatures are 20 - 30°C. In most places it grows below 900 m altitude but occasionally grows to 1,500 m altitude. It requires good drainage. It can grow in arid places and suits hardiness zones 11 - 12.

**Use**: The young leaves are eaten as a cooked vegetable. The dried leaves are also used to thicken soups. The fruit pulp is eaten raw. It is also used for a drink. The flowers are eaten raw or cooked. The seeds can be eaten fresh or dried and ground into flour then added to soups. They yield a cooking oil. The shoots of germinating seeds are eaten. The young tender roots are eaten. The fattened root tubers are cooked and eaten. The bark is eaten and the dried leaves are used as flavouring.

**Cultivation**: Trees are grown from seed. The seed remain viable for several years but before planting the seeds must be treated to break the hard seed coat, by soaking the seeds in hot water for several minutes or by cutting the seed coat. Seeds that float in water should not be used. Seeds can be planted in nurseries in plastic bags then transplanted after 6 months. Plants can also be grown from cuttings.

**Production**: Trees grow quickly reaching 2 m in 2 years. Trees produce fruit after 2 - 15 years. The plant is pollinated by bats, insects and winds. Trees can last 600 or more years. Fruit can be stored for about a year.

**Food Value:** Per 100 g edible portion

| Edible part | Moisture % | Energy kJ | Protein g | proVit A µg | proVit C mg | Iron mg | Zinc mg |
|---|---|---|---|---|---|---|---|
| nut (dry) | 7.8 | 1832 | 33.7 | - | | 13.9 | - |
| fruit | 16.0 | 1212 | 2.2 | - | 360 | 7.4 | 6.7 |
| leaf | 77.0 | 290 | 3.8 | - | 50 | - | - |

## Fruit

**English**: Bird plum
**Local:**

**Scientific name:** *Berchemia discolor*
**Plant family: RHAMNACEAE**

**Description**: A tree. It grows 12-18 m tall. It usually loses its leaves during the year. The branches are spreading. The crown is dense and round. The leaves are simple and nearly opposite. They are dark green above and paler underneath. They are 2.5-10 cm long and 8 cm wide. They are oval with pointed tips. The flowers are in small stalked clusters in the axils of leaves. The fruit are like small pointed plums. They are about 2 cm long. They are yellow or red. They have a sweet yellow pulp and a kernel with 2 seeds. The fruit are edible.

**Distribution**: A tropical plant. It grows in dry forest. It grows at low altitude in South Africa. In East Africa it grows from sea level to 1,600 m altitude. It is damaged by frost or cold winds. It is drought resistant. It grows in areas with an annual rainfall between 300-635 mm. It can grow in arid places. It is often on termite mounds. It grows in the lowlands and along rivers.

**Use**: The fruit are eaten raw or dry. They are also used to flavour porridge. The dried fruit can be stored. The dried fruit (after the kernel is removed) are pounded with millet seeds and made into a biscuit dough and baked. The fruit are also fermented into an alcoholic drink.

**Cultivation**: Plants can be grown from fresh seeds. The seeds germinate easily. Seedlings can then be transplanted. Seeds can also be sown directly in the field. Plants can also be grown from root suckers.

**Production**: Plants grow very slowly. When dry, the fruit can be stored for a long time. Fruit are normally available in the wet season.

**Food Value:** Per 100 g edible portion

| Edible part | Moisture % | Energy kJ | Protein g | proVit A µg | proVit C mg | Iron mg | Zinc mg |
|---|---|---|---|---|---|---|---|
| fruit | 78.8 | 305 | 1.1 | - | 50.3 | 2.2 | 0.3 |

## Fruit

**English**: Red star apple
**Local:**

**Scientific name:** *Diospyros lycioides*
**Plant family: EBENACEAE**

**Description**: A fast growing shrub or small evergreen tree. It can be 3 - 7 m tall. The bark is dark grey and smooth. It can have several stems. There are 4 different types based on leaf shape and venation. The leathery leaves are simple and alternate. They are usually crowded near the ends of branches. The flowers are bell-shaped. They are white or yellow. The flowers have a sweet smell and hand downwards. The fruit are round or oblong and 2 cm long. They are bright red and fleshy. The seeds are oblong and smooth with a groove along them. There are 2 subspecies.

**Distribution**: A tropical plant. It can tolerate drought and frost. It grows 600 - 1,000 m above sea level in southern Africa. It does well in a sandy soil. It can grow in slightly salty soils and can grow in arid places. It grows in Miombo woodland in Africa. It suits hardiness zones 9 - 11.

**Use**: The fruit are eaten sometimes by children. They are bitter. The fruit are also fermented and distilled to produce brandy. The seeds are roasted for coffee.

**Cultivation**: Plants can be grown from seeds. Seeds germinate fairly easily. It can be cut back and will re-grow.

**Production**:

**Food Value:** Per 100 g edible portion

| Edible part | Moisture % | Energy kJ | Protein g | proVit A µg | proVit C mg | Iron mg | Zinc mg |
|---|---|---|---|---|---|---|---|
| fruit | 78.0 | 296 | 0.9 | - | 45.2 | 1.0 | 0.3 |

## Fruit

**English**: Kaffir orange
**Local:**

**Scientific name:** *Strychnos cocculoides*
**Plant family: LOGANIACEAE**

**Description**: A shrub or small tree up to 6 m tall. It is evergreen and thornless. The stem can be 23 cm across. The leaves are simple and opposite. They are leathery. They are dark green above and lighter below. They are 5 - 12 cm long by 2.5 - 6 cm wide. The base is narrowed. The edges roll inwards. The flowers are in dense clusters in the axils of leaves. The flowers are tubular and with 5 white star like petals. These can be 1.9 cm across. The berries are plum like and 2.5 cm long. They are red and turn purplish-black. The have 1 or 2 oval flat seeds. The fruit are edible.

**Distribution**: A tropical plant. It grows in bushveld and usually on sandy soils or in rocky places. It grows 400 - 2,000 m above sea level. It can grow in acid soils. It grows in areas with an annual rainfall of 600 - 1,200 mm. It can grow in arid places.

**Use**: The fruit are eaten and have a good flavour. The fruit are also buried in the ground until the fruit pulp becomes liquid and then used as a drink. The fruit are also used for alcoholic drinks. The seeds are also reported as being eaten. **Caution:** These are considered **poisonous**. The fruit and leaves can kill. The seeds may be poisonous as they contain strychnine.

**Cultivation**: Plants can be grown from seeds. It can be cut back and will re-grow.

**Production**: In Tanzania, fruit are collected from July to December. Ripe fruit can be stored in the shade for about 2 weeks.

**Food Value:** Per 100 g edible portion

| Edible part | Moisture % | Energy kJ | Protein g | proVit A µg | proVit C mg | Iron mg | Zinc mg |
|---|---|---|---|---|---|---|---|
| fruit | 80.4 | 308 | 0.7 | - | 6.7 | 0.2 | 0.1 |

Image accessed from: https://farm4.staticflickr.com/3599/3412216728_4ea6595f78_b.jpg

## Fruit

**English**: Giant yellow mulberry
**Local:**

**Scientific name:** *Myrianthus arboreus*
**Plant family: URTICACEAE**

**Description**: A medium sized tree that grows 15 - 25 m tall. It branches low down and the crown is dense. The leaves are compound with leaflets arranged like fingers on a hand. There are 5 - 7 leaflets. Leaves are 90 cm long and 60 cm across. They are leathery and are whitish underneath. There can be teeth along the edge. The male and female flowers are separate. The male flowers are in long stalks and are yellow. The female flowers are in small balls. The fruit are large and yellow. They have 4 or 5 sided sections. Fruit can be 20 cm across. Each section contains a hard oval seed.

**Distribution**: A tropical plant that grows along the edges of rain-forests. It is often near streams and in moist locations. It grows up to 1,200 m altitude but is most common below 300 m.

**Use**: The fruit have a nice flavoured juice. They are eaten raw. Young leaves and shoots are eaten in soups. The seeds are eaten after cooking.

**Cultivation**: Plants are grown from seed and take about 1 month to germinate. Soaking seeds helps more to germinate. Plants can be grown from stem cuttings and by grafting. Plants can be budded.

**Production**: Plants from seed can produce fruit in 4 - 5 years. In some places fruiting is seasonal and in other places it is year round. Leaves can remain fresh for 3 - 5 days after harvesting. There is a flush of edible leaves during the dry season.

**Food Value:** Per 100 g edible portion

| Edible part | Moisture % | Energy kJ | Protein g | proVit A µg | proVit C mg | Iron mg | Zinc mg |
|---|---|---|---|---|---|---|---|
| kernel (dry) | 13.5 | 1969 | 23.6 | - | - | 6.6 | - |
| leaf | 85.5 | | 1.9 | - | - | 1.1 | - |

Image accessed from: http://photos.mongabay.com/j/Myrianthus-arboreus-J-P-Vandeweghe.360.jpg

## *Vegetables*

**English**: Bitter cucumber
**Local:**

**Scientific name:** *Momordica charantia*
**Plant family: CUCURBITACEAE**

**Description**: A pumpkin family plant. It is a slender annual climber with flowers of both sexes on the one plant. It has simple tendrils and vines can be 4 m long. It has bright green lobed leaves 5 - 12 cm long on thin leaf stalks 3 - 10 cm long. The flowers have a sweet smell and 5 small, yellow petals. Fruit are green when young and orange when ripe. The fruit have a lumpy appearance, with ridges along its length and when fully ripe burst open. It has bright red covering on the seeds inside. The seeds are pale brown and 10 - 16 mm long and 7 - 10 mm wide. Considerable variation in the fruit occurs between varieties.

**Distribution**: A tropical plant that grows from sea level up to about 500 m and will probably grow to 1,000 m altitude in tropical regions. They require a well-drained soil preferably rich in organic matter. Seeds do not germinate below 15°C. Plants grow best with temperatures of 18 - 35°C. A soil pH of 6.5 is best. It suits hardiness zones 9 - 12.

**Use**: The young bitter fruit are cooked and eaten. They are boiled, stuffed, fried or pickled. They are used in soups, stews and stir-fried dishes. The seed mass of the ripe fruit is used as a food flavouring. The leaves are also cooked and eaten as a flavouring. The tender shoots and leaves are sometimes eaten. **Caution:** The leaves are considered to cause diarrhoea and vomiting.

**Cultivation**: Plants are grown from seed. For large scale plantings, 6 - 7 kg of seed are required for planting one hectare. Seeds are planted at 50 cm spacing in the place where the plants are to grow and need a stick to climb up. Often plants are grown on raised beds 2 m apart with 0.5 m between plants. The seed has a hard seed coat and germinates slowly. Soaking seeds for 24 hours before sowing gives a quicker more even germination. Regular watering is required.

**Production**: Fruit are ready to harvest 45 - 55 days after planting. Fruit should be harvested when young and tender. Once fruit have begun to change colour to yellow they are past maturity for eating. Early removal of young fruit also ensures continuous fruit setting. This can allow 6 - 8 successive pickings of fruit. Fruit on the plant are sometimes wrapped in paper to prevent fruit fly damage. Seed well stored can remain viable for 4 - 5 years. The young bitter fruit are cooked and eaten. The fruit is blanched or soaked in salt water to reduce the bitter taste.

**Food Value:** Per 100 g edible portion

| Edible part | Moisture % | Energy kJ | Protein g | proVit A µg | proVit C mg | Iron mg | Zinc mg |
|---|---|---|---|---|---|---|---|
| seed | 8.6 | 2020 | 18.6 | - | - | - | - |
| leaf (raw) | 84.7 | 252 | 5.0 | 44 | 170 | 7.1 | 0.3 |
| leaf tip (boiled) | 88.7 | 146 | 3.6 | 173 | 57 | 1.0 | 0.3 |
| fruit | 93.6 | 105 | 1.2 | - | - | 0.2 | - |
| pod (boiled) | 94.0 | 79 | 0.8 | 11 | 33 | 0.4 | 0.8 |
| pod (raw) | 94.0 | 71 | 1.0 | 380 | 84 | 0.4 | 0.8 |

## Vegetables

**English**: Kale
**Local:**

**Scientific name:** *Brassica oleracea var. acephala*
**Plant family: BRASSICACEAE**

**Description**: A cabbage plant. The leaves are ruffled or crinkled but some are more smooth than normal kales. The leaf shape and colour varies considerably. The flowers are yellow or white.

**Distribution**: A temperate plant. Young leaves are used in salads while older leaves are used in cooking.

**Use**: The leaves are eaten boiled, steamed, used in soups and stews. The unopened flower buds are used like broccoli.

**Cultivation**: Plants are grown from seed or transplanted. Plants should be spaced 30 - 45 cm apart no more than 1cm deep.

**Production**: Leaves are harvested 40 - 60 days.

**Food Value:** Per 100 g edible portion

| Edible part | Moisture % | Energy kJ | Protein g | proVit A µg | proVit C mg | Iron mg | Zinc mg |
|---|---|---|---|---|---|---|---|
| leaf (raw) | 84 | 210 | 3.3 | 70 | 120 | 1.7 | 0.3 |
| leaf (boiled) | 91.7 | 109 | 2.1 | 313 | 18 | 0.5 | 0.4 |

Distribution, cultivation and production information and photograph from: Canberra organic growers society 1977-2010, http://www.cogs.asn.au/growing-guides/kale/

## Vegetables

**English**: Pea aubergine
**Local:**

**Scientific name:** *Solanum torvum*
**Plant family: SOLANACEAE**

**Description:** A shrub that grows 1.5 - 3 m tall. The leaves are oblong and 10 - 25 cm long. They can be entire or lobed. They often have prickles beneath the midrib. The young stem and underside of leaves are hairy. The flower is white and 2 cm across. The fruit are round berries, yellow when ripe. They are about 1 cm across. They grow in clusters. The seed are roughly circular and 2 - 3 mm across.

**Distribution:** A tropical plant that grows in open, moist places up to 2,000 m altitudein the equatorial tropics.

**Use**: The green unripe fruit are added to curries in Malaysia. They are eaten in soup in Cambodia and China, and pickled in Nepal. They are also dried and preserved. The young shoots are eaten raw or cooked. **Caution:** This plant contains poisonous compounds.

**Cultivation:** Plants are grown from seed.

**Production:**

**Food Value:** Per 100 g edible portion

| Edible part | Moisture % | Energy kJ | Protein g | proVit A µg | proVit C mg | Iron mg | Zinc mg |
|---|---|---|---|---|---|---|---|
| fruit | 85.4 | 196 | 2.4 | | | 4.6 | |

## Vegetables

**English**: Shepherd's purse
**Local:**

**Scientific name:** *Capsella bursa-pastoris*
**Plant family: BRASSICACEAE**

**Description**: A cabbage family herb. It is an annual plant or it can take 2 years to complete its life cycle. The stem is erect and grows to 60 cm high. It has a rosette of leaves near the base. The leaves vary in shape and are toothed along the edge. The upper leaves are smaller, sword shaped and without stalks. The flowers are white. They occur in clusters at the ends of branches. The fruit is a flat, triangular, pod.

**Distribution**: It grows in temperate and subtropical places. It grows in higher rainfall areas and does best in moist soils. It is resistant to frost and drought and can survive winter snow. In Zimbabwe, it grows from 1,490 – 1,920 m above sea level.

**Use**: The young tender leaves are cooked and used as a vegetable. They can also be eaten raw in salads. They need to be gathered before the flowers appear. The dried seed pods give a pepper like flavouring. The fresh or dried roots can be used as a ginger substitute. **Caution:** Eating this food is not recommended during pregnancy as it can cause miscarriage.

**Cultivation**: Plants are grown from seed. The seeds can lie dormant in the soil for 30 years.

**Production**: The seeds contain 15 - 20% oil.

**Food Value:** Per 100 g edible portion

| Edible part | Moisture % | Energy kJ | Protein g | proVit A µg | proVit C mg | Iron mg | Zinc mg |
|---|---|---|---|---|---|---|---|
| leaf | 88.2 | - | 4.2 | 150 | 91 | 4.8 | - |

## Vegetables

**English**: Bush okra
**Local:**

**Scientific name:** *Corchorus olitorius*
**Plant family: MALVACEAE**

**Description**: An annual plant. It is upright, branching, and slightly woody. Plants vary in height, shape, leafiness and hairiness. Plants grown for leaves are usually only 30 cm tall. They also have many branches. Leaves are shiny and have leaf stalks. The leaves have teeth along the edge. The tips of the lowest leaves in each side, have long bristle like structures. Small clusters of yellow flowers grow in the axils of the leaves. The fruit are ridged capsules. They can be 7 cm long. These have partitions across them between the seeds. A ripe capsules contains 180 - 230 seeds. The seeds are dull grey and with four faces and one long point. Each seed has one pale line along it.

**Distribution**: A tropical plant. It is mostly coastal, below 250 m altitude. Temperatures of 22°-35°C are suitable. It can stand both drought (2 - 3 weeks) and water-logging, except when young. A well-drained soil is best. They require humus-rich soils. A soil pH of 5.5 - 7.0 is best, but they can grow in soils with pH up to 8.5. They also need adequate moisture for good leaf production. A rainfall of 1,000 mm is suitable. A high relative humidity (80 - 90%) is best. It produces seeds when day lengths are short. It grows in most African and Asian countries.

**Use**: The young leaves and stem tops are eaten cooked. They are slimy unless fried. They are also used to make a thick soup. Leaves can be sun dried, pounded to flour, then stored for a long time.

**Cultivation**: Plants grow from seed, and they can be transplanted. Seeds are often broadcast into fine seed beds at the beginning of the wet season. Mixing the small seeds with sand makes it easier to sow them evenly. Often seeds are slow to start growing. This can be overcome by soaking them in hot water. A spacing of 20 - 30 cm between plants is suitable. For vigorous varieties this could be increases to 45 - 50 cm. Seeds are saved from pods for re-sowing.

**Production**: First leaves can be harvested after 5 - 6 weeks. Tips about 20 -3 0 cm long are picked. Production of edible green tips, is not large. 7 - 8 kg of leaf tips can be harvested from 3 - 8 pickings over 3 - 4 months. Seeds can be collected after 13 - 15 weeks. If seeds of a particular variety are desired, it is necessary to grow these plants 16 m away from other plants, to avoid cross pollination. Seeds can be stored for 8 - 12 months in well-sealed jars.

**Food Value:** Per 100 g edible portion

| Edible part | Moisture % | Energy kJ | Protein g | proVit A µg | proVit C mg | Iron mg | Zinc mg |
|---|---|---|---|---|---|---|---|
| leaf (raw) | 80.4 | 244 | 4.5 | 574 | 80 | 7.2 | - |
| leaf (cooked) | 87.2 | 155 | 3.4 | 156 | 33.0 | 3.1 | 0.8 |

## Vegetables

**English**: Marrow
**Local:**

**Scientific name:** *Cucurbita pepo*
**Plant family: CUCURBITACEAE**

**Description**: A bristly hairy annual vine in the pumpkin family. It has branched tendrils. The stems are angular and prickly. The leaves are roughly triangular. The leaves have 5 lobes which are pointed at the end and are toothed around the edge. Male and female plants are separate on the same plant. Male flowers are carried on long grooved flower stalks. Female flowers are borne on shorter more angular stalks. The fruit stalks have furrows along them but are not fattened near the stalk. The fruit vary in shape, size and colour. Often they are oval and yellow and 20 cm long by 15 cm wide. The seeds are smaller than pumpkin and easy to separate from the tissue. The scar at their tip is rounded or horizontal, not oblique. There are a large number of cultivated varieties.

**Distribution**: A subtropical plant. They are more suited to drier areas. They are frost sensitive, and grow best with day temperatures between 24 - 29°C and night temperatures of 16 - 24°C. It suits tropical highland regions. It suits hardiness zones 8 - 11.

**Use**: The young fruit are cooked and eaten. They can be steamed, boiled or fried. They are used in pies, soups, stews and cakes. The young leaves and the ripe seeds can also be eaten cooked. The seeds are dried, salted and toasted and eaten as a snack food. The seeds can also be pressed to produce oil. The sprouted seeds are used in salads. Flowers and flower buds can be eaten boiled. They can be dried for later use.

**Cultivation**: They are grown from seeds. The seeds germinate after one week. They can be grown from cuttings. They are best planted on mounds. A spacing of 2 - 3 m between plants is needed. Hand pollination assists fruit setting. Plants can also be grown from cuttings as plants root at the nodes.

**Production**: The first usable immature fruit are ready 7 - 8 weeks after planting.

**Food Value:** Per 100 g edible portion

| Edible part | Moisture % | Energy kJ | Protein g | proVit A µg | proVit C mg | Iron mg | Zinc mg |
|---|---|---|---|---|---|---|---|
| seed (dry) | 3.7 | 2266 | 29.4 | - | - | 7.3 | - |
| leaf | 89.0 | 113 | 4.0 | 180 | 80 | 0.8 | - |
| fruit (mature) | 92.0 | 105 | 1.6 | 17 | 16 | 2.4 | - |
| fruit | 91.3 | 102 | 1.1 | - | 12 | 0.8 | 0.2 |
| yellow fruit | 92.0 | 97 | 1.0 | 180 | 8 | 1.4 | - |
| immature fruit (raw) | 92.0 | 92 | 1.5 | - | 9 | 0.4 | 0.1 |

## *Nuts, seeds, herbs and other foods*

**English**: Bambara groundnut
**Local:**

**Scientific name:** *Vigna subterranea*
**Plant family: FABACEAE**

**Description**: An annual plant that can be either a bunchy bush or a trailing plant. Often the creeping stems are near ground level. It often appears as if bunched leaves arise from branched stems near ground level. It has a well-developed taproot. The leaves have 3 leaflets. The leaf stalk is erect and thickened near the base. The end leaflet is slightly larger than the side leaflets. Leaflets are about 6 cm long by 3 cm across. The flowers are yellowish-white and occur in pairs. The flower/fruit stalk elongates after being fertilised and pushes into the soil. The fruit are pods which are round and have one seed. Some kinds have 3 seeds. This pod develops under the ground on a long stalk. The seeds are hard and are of many colours. Pods can be 3.7 cm long.

**Distribution**: It is a tropical plant that can grow in hot climates. It can also grow on poor soils. It does best with moderate rainfall and sunshine. It can tolerate drought. Long day-lengths can reduce or prevent pod development in some kinds.

**Use**: Seeds can be eaten fresh or roasted while immature. Mature seeds are hard so must be boiled before being used in cooking. Seeds can be dried and made into flour and used for baking. They can be popped like corn. The seeds are roasted as a coffee substitute. Young pods are cooked and used as a vegetable or in stews. The leaves can be eaten.

**Cultivation**: Plants are grown from seed. Plants are often put in rows 50 cm apart and with 15 cm spacing between plants. Ridges are formed to enable the pods to penetrate the soil. It is mostly grown intercropped with other plants. Soil should be light and friable and the seed bed loose and fine. Normally the whole plant is pulled up for harvesting. Any pods which become detached are harvested by hand. Pods are dried in the air before threshing.

**Food Value:** Per 100 g edible portion

| Edible part | Moisture % | Energy kJ | Protein g | proVit A µg | proVit C mg | Iron mg | Zinc mg |
|---|---|---|---|---|---|---|---|
| seed | - | 1572 | 18.4 | - | - | - | - |

## Nuts, seeds, herbs and other foods

**English**: Rose-pink sesame
**Local:**

**Scientific name:** *Sesamum calycinum*
**Plant family: PEDALIACEAE**

**Description**: A herb that grows for one or a few years. The stem can be single or branched. The leaves at the top are long and thin and with almost no stalk. Lower leaves can have stalks and be divided into lobes. The flowers are 2 - 5 cm long and purple or pink. The fruit is a narrow capsule.

**Distribution**: A tropical plant. In Kenya it grows from sea level to 3,000 m altitude. It grows in light clay and sandy soils. It can grow in arid places.

**Use**: The young leaves are cooked and eaten. They are often cooked with other leaves such as Corchorus.

**Cultivation**: Plants can be grown from seeds. A spacing of 20 cm is suitable.

**Production**: The tender leaves are plucked off the bush.

**Food Value:** Per 100 g edible portion

| Edible part | Moisture % | Energy kJ | Protein g | proVit A µg | proVit C mg | Iron mg | Zinc mg |
|---|---|---|---|---|---|---|---|
| leaf | 76.5 | - | 5.6 | - | 47.0 | 35.2 | - |

Image accessed from: http://www.zimbabweflora.co.zw/speciesdata/images/15/152550-2.jpg

## Nuts, seeds, herbs and other foods

**English**: Boyinya
**Local:**

**Scientific name:** *Uvaria angolensis*
**Plant family: ANNONACEAE**

**Description**: A small tree. The fruit are yellow when ripe.

**Distribution**: It is a tropical plant. In Ethiopia it grows in the lowlands. It grows in dry forest.

**Use**: The hard shell is removed and the inner flesh and seed kernel are eaten.

**Cultivation**: Plants can be grown from seed.

**Production**:

**Food Value:** Per 100 g edible portion

| Edible part | Moisture % | Energy kJ | Protein g | proVit A µg | proVit C mg | Iron mg | Zinc mg |
|---|---|---|---|---|---|---|---|
| fruit | 40.0 | 440 | 1.3 | - | - | - | - |
| nut | 20.0 | 397 | 0.6 | - | - | 0.2 | - |

Image accessed from: http://annonaceae.myspecies.info/sites/annonaceae.myspecies.info/files/IMG_0616.jpg

## Nuts, seeds, herbs and other foods

**English**: Resurrection bush
**Local:**

**Scientific name:** *Myrothamnus flabellifolius*
**Plant family: MYROTHAMNACEAE**

**Description**: A shrub that can lie along the ground or be erect. It has many branches. It grows 30 - 90 cm tall. The young branches are 4 sided. There are narrow wings. The leaves cross over along fast growing long branches. The leaves are 10 - 14 cm long by 6 - 8 cm wide. The flowering stalks are 2 - 3 cm long. They are on the ends of short branches. The fruit is a capsule with 3 lobes. The seeds are 0.5 mm long. The leaves can shrink and appear dry in the dry season, then turn green in a few minutes after rain, so is called the resurrection bush.

**Distribution**: It is a tropical plant. It grows in hot, arid places. It can grow in semi-desert. It is drought tolerant. In Zimbabwe it grows 500 - 1,900 m above sea level.

**Use**: The leaves are used for medicinal tea. They are also used as a spice. The twigs are used to flavour tea.

**Cultivation**:

**Production**:

**Food Value:** Per 100 g edible portion

| Edible part | Moisture % | Energy kJ | Protein g | proVit A µg | proVit C mg | Iron mg | Zinc mg |
|---|---|---|---|---|---|---|---|
| leaf | 6.3 | 1130 | 7.6 | - | - | 17.9 | 7.5 |

Image accessed from: http://www.zimbabweflora.co.zw/speciesdata/images/12/125310-8.jpg

## Nuts, seeds, herbs and other foods

**English**: Sand apple
**Local:**

**Scientific name:** *Parinari capensis*
**Plant family: CHRYSOBALANACEAE**

**Description**: A shrub with underground stems that are woody and up to 1 cm thick. These form a branching network. Aerial stems arise from these. These can be 20 cm high. There are a few erect leaves. The leaf blade is sword shaped and 8 cm long by 1.5 cm wide. The lower surface has a white felt. The flowers are in loose clusters. They are cream coloured. The fruit is oval and fleshy. They are 1.8 cm long and have one seed. The fruit has a strong smell.

**Distribution**: A tropical plant. It grows amongst rocks and in sand and clay soils. It can be in seasonally flooded grassland. It grows between 900 - 1,200 m above sea level. In Zimbabwe it grows between 1,200 - 1,600 m above sea level. It can grow in arid places.

**Use**: The sweet outer layer of the fruit is eaten. It is buried in the sand to become ready to eat. It can be dried and eaten as a soft cake. It is also used to make beer. Juice of the fruit can be drunk fresh or boiled to a firm consistency. The crushed kernels are eaten as a relish with meat.

**Cultivation**:

**Production**:

**Food Value:** Per 100 g edible portion

| Edible part | Moisture % | Energy kJ | Protein g | proVit A µg | proVit C mg | Iron mg | Zinc mg |
|---|---|---|---|---|---|---|---|
| nut | 1.9 | 2919 | 26.3 | - | - | 4.7 | 3.7 |

## Nuts, seeds, herbs and other foods

**English**: Comb fringe grass
**Local:**

**Scientific name:** *Dactyloctenium aegyptium*
**Plant family: POACEAE**

**Description**: An annual grass. The stems are slender. They can lie along the ground. These can form roots at the nodes. They can have runners and form mats. It is 15 - 60 cm high. The edges of the leaf sheaths have small hairs. The leaf blades are flat and 5 - 20 cm long by 0.2 - 0.6 cm wide. The surfaces are lumpy/hairy. It tapers to the tip. The flowers spread like fingers on a hand. There are 2 - 9 flower stalks. They are long and narrow. They often spread out horizontally. The spikes are on one side of the stalk. The tip is bare. The seed grains are about 1 mm across.

**Distribution**: A tropical plant. It grows in disturbed weedy places especially on sandy soils in S China. It grows in tropical to warm temperate regions. It grows on clayey, sandy or black soil along the borders of ponds, swamps and bogs. In West Africa it grows from sea level up to 2,000 m altitude. It grows in alkaline and salty soils. It grows in areas with an annual rainfall between 100 - 1,580 mm. It can grow in arid places.

**Use**: The seeds are husked then boiled into a porridge. They are also roasted in a hot pot to soften them. It is then pounded into flour and cooked into porridge. The rhizome or runners are eaten raw.

**Cultivation**: Plants can be grown from seeds.

**Production**: The seeds are collected during the dry season. The seeds can be stored for several months.

**Food Value:** Per 100 g edible portion

| Edible part | Moisture % | Energy kJ | Protein g | proVit A µg | proVit C mg | Iron mg | Zinc mg |
|---|---|---|---|---|---|---|---|
| seed | 7.5 | 1234 | 9.8 | - | - | 6.9 | 4.7 |

Image sourced from: Giles Tran AFZ @feedipedia.org

**English**: Apple ring acacia
**Local:**

**Scientific name:** *Faidherbia albida*
**Plant family: FABACEAE**

**Description**: A very large spreading tree that grows 20 - 31 m tall. The trunk is light grey and can be 1 m across. The leaves are fine and drooping and can be light green or blue-green. The twigs are white and smooth. It has thorns which are straight and 4 cm long. They are white at the base and brown at the tips. They occur in pairs. Each leaf has 4 - 8 side branches although there can be 2 - 12 branches. These carry 6 - 23 pairs of small oblong leaflets. The leaf stalk does not have glands. It is leafless during the rainy season and has leaves during the dry season. The flowers are long cream spikes. The pods are large - about 10 cm long by 2.5 cm wide. They are red brown and twisted or almost curled into a ring. The pods do not burst open. The pods contain several hard shiny seeds. These are edible after processing. The seeds are 9 - 11 mm long by 6 - 8 mm wide.

**Distribution**: A tropical plant that mostly grows on river banks and river flats and can grow on sandy soils. It can be damaged by frost. It grows in dry savannah but prefers damp sites and river banks. In southern Africa it grows from 40 - 1,070 m altitude. It grows in areas with an annual rainfall between 20 - 1,800 mm. It can grow in arid places.

**Use**: The seeds are boiled, then re-boiled and the skins removed then eaten in times of food scarcity. This is done to remove toxic components. The pods are sometimes eaten. The pods are used for flavouring. **Caution:** The seeds can contain hydrogen cyanide and would need to be cooked.

**Cultivation**: Plants can be grown from seeds. The seeds are put in boiling water and soaked overnight then planted. It can be cut back and will re-grow.

**Production**: Trees grow quickly. They can be 7 m tall in 3 years. It develops its first fruit after 2 - 15 years. A large tree can yield a ton of pods.

**Food Value:** Per 100 g edible portion

| Edible part | Moisture % | Energy kJ | Protein g | proVit A µg | proVit C mg | Iron mg | Zinc mg |
|---|---|---|---|---|---|---|---|
| seed | 6.5 | 1437 | 24.8 | - | - | 6.8 | 2.6 |

# *Nutritional values of food plants by plant Family*

| Plant Family | Scientific name | Common name | Edible part | Moisture % | Energy kJ | Protein g | Vit A µg | Vit C mg | Iron mg | Zinc mg | Page |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **AMARANTHACEAE** | *Amaranthus thunbergii* | Thunberg's amaranth | leaf | 83.6 | 147 | 4.3 | - | - | 12.5 | 0.7 | 32 |
| **ANNONACEAE** | *Uvaria angolensis* | Boyinya | fruit | 40.0 | 440 | 1.3 | - | - | - | - | 49 |
| **ARACEAE** | *Colocasia esculenta* | Taro | root | 66.8 | 1231 | 1.96 | 3 | 5 | 0.68 | 3.2 | 17 |
| **BASELLACEAE** | *Basella alba* | Indian spinach | leaf | 85.0 | 202 | 5.0 | 56 | 100 | 4.0 | - | 28 |
| **BOMBACACEAE** | *Adansonia digitata* | Boabab | fruit | 16.0 | 1212 | 2.2 | - | 360 | 7.4 | 6.7 | 36 |
| **BRASSICACEAE** | *Brassica oleracea var. acephala* | Kale | leaf (raw) | 84 | 210 | 3.3 | 70 | 120 | 1.7 | 0.3 | 42 |
| **BRASSICACEAE** | *Capsella bursa-pastoris* | Shepherd's purse | leaf | 88.2 | - | 4.2 | 150 | 91 | 4.8 | - | 44 |
| **CHRYSOBALANACEAE** | *Parinari capensis* | Sand apple | nut | 1.9 | 2919 | 26.3 | - | - | 4.7 | 3.7 | 51 |
| **CONVOLVULACEAE** | *Ipomoea aquatica* | Kangkong | leaf | 90.3 | 126 | 3.9 | 315 | 60 | 4.5 | - | 29 |
| **CONVOLVULACEAE** | *Ipomoea batatas* | Sweet potato | tuber (baked) | 72.9 | 431 | 1.7 | 961 | 24.6 | 0.5 | 0.3 | 13 |
| **CUCURBITACEAE** | *Cucurbita pepo* | Marrow | yellow fruit | 92.0 | 97 | 1.0 | 180 | 8 | 1.4 | - | 46 |
| **CUCURBITACEAE** | *Momordica charantia* | Bitter cucumber | pod (raw) | 94.0 | 71 | 1.0 | 380 | 84 | 0.4 | 0.8 | 41 |
| **CUCURBITACEAE** | *Citrullus lanatus* | Watermelon | fruit | 94.0 | 92 | 0.4 | 20 | 5 | 0.3 | 0.1 | 34 |
| **EBENACEAE** | *Diospyros lycioides* | Red star apple | fruit | 78.0 | 296 | 0.9 | - | 45.2 | 1.0 | 0.3 | 38 |
| **FABACEAE** | *Dolichos trilobus* | Japanese arrowroot | root | 72.4 | 1794 | 7.1 | - | - | 0.2 | 4.4 | 19 |
| **FABACEAE** | *Sphenostylis stenocarpa* | African yam bean | seed | 9.0 | 1470 | 19.2 | - | - | - | - | 20 |
| **FABACEAE** | *Phaseolus vulgaris* | Common bean | pod | 88.0 | 151 | 2.5 | 750 | 27 | 1.4 | 0.2 | 21 |
| **FABACEAE** | *Vigna unguiculata subsp. unguiculata* | Cowpea | seed (dry) | 11.2 | 1189 | 23.5 | - | 1.5 | 6.4 | - | 22 |
| **FABACEAE** | *Cajanus cajan* | Pigeon pea | seed | 10.0 | 1449 | 19.5 | 55 | - | 15.0 | - | 23 |
| **FABACEAE** | *Acacia farnesiana* | Sweet acacia | seed (dry) | 8.1 | 1522 | 36.6 | - | - | 6.0 | 0.6 | 24 |
| **FABACEAE** | *Canavalia rosea* | Coastal jack bean | seed | 10.9 | - | 22.0 | - | - | - | - | 25 |
| **FABACEAE** | *Psophocarpus scandens* | African winged bean | pod | 87.0 | - | - | 3.6 | - | - | - | 26 |
| **FABACEAE** | *Vigna subterranea* | Bambara groundnut | seed | - | 1572 | 18.4 | - | - | - | - | 47 |
| **FABACEAE** | *Faidherbia albida* | Apple ring acacia | seed | 6.5 | 1437 | 24.8 | - | - | 6.8 | 2.6 | 53 |
| **LOGANIACEAE** | *Strychnos cocculoides* | Kaffir orange | fruit | 80.4 | 308 | 0.7 | - | 6.7 | 0.2 | 0.1 | 39 |
| **MALVACEAE** | *Sida cordifolia* | Goat's horns | leaf | 6.6 | 1296 | 24.2 | - | - | 79.8 | - | 30 |
| **MALVACEAE** | *Hibiscus cannabinus* | Vegetable kenaf | leaf | 79.0 | 280 | 5.5 | 34 | - | 12.1 | - | 33 |
| **MALVACEAE** | *Corchorus olitorius* | Bush okra | leaf (raw) | 80.4 | 244 | 4.5 | 574 | 80 | 7.2 | - | 45 |
| **MORINGACEAE** | *Moringa oleifera* | Horseradish tree | leaf | 76.4 | 302 | 5.0 | 197 | 165 | 3.6 | - | 27 |
| **MYRTACEAE** | *Psidium guajava* | Guava | fruit | 77.1 | 238 | 1.1 | 60 | 184 | 1.4 | 0.2 | 35 |
| **MYROTHAMNACEAE** | *Myrothamnus flabellifolius* | Resurrection bush | leaf | 6.3 | 1130 | 7.6 | - | - | 17.9 | 7.5 | 50 |
| **OPILIACEAE** | *Opilia amentacea* | Catkin blooming | leaf | 9.2 | - | 14.8 | - | 3.9 | 15.7 | 3.2 | 31 |
| **PEDALIACEAE** | *Sesamum calycinum* | Rose-pink sesame | leaf | 76.5 | - | 5.6 | - | 47.0 | 35.2 | - | 48 |
| **POACEAE** | *Dactyloctenium aegyptium* | Comb fringe grass | seed | 7.5 | 1234 | 9.8 | - | - | 6.9 | 4.7 | 52 |
| **POACEAE** | *Pennisetum glaucum* | Bullrush millet | seed | 13.5 | 1363 | 12.7 | - | - | 3.5 | - | 15 |

| Plant Family | Scientific name | Common name | Edible part | Moisture % | Energy kJ | Protein g | Vit A µg | Vit C mg | Iron mg | Zinc mg | Page |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **RHAMNACEAE** | *Berchemia discolor* | Bird plum | fruit | 78.8 | 305 | 1.1 | - | 50.3 | 2.2 | 0.3 | 37 |
| **SOLANACEAE** | *Solanum tuberosum* | Potato | tuber (baked) | 71.2 | 456 | 2.3 | 0 | 12.9 | 1.4 | 0.3 | 16 |
| **SOLANACEAE** | *Solanum torvum* | Pea aubergine | fruit | 85.4 | 196 | 2.4 | | | 4.6 | | 43 |
| **URTICACEAE** | *Myrianthus arboreus* | Giant yellow mulberry | kernel (dry) | 13.5 | 1969 | 23.6 | - | - | 6.6 | - | 40 |

*Solutions to Malnutrition and Food Security*

# FOOD PLANT SOLUTIONS

ROTARIAN ACTION GROUP

www.foodplantsolutions.org