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Pelargonium



Pelargonium

Scientific name: *Pelargonium sidoides*

Family: Geraniales: Geraniaceae

Common names: Pelargoniums

General Information and Agronomic Aspects



***Pelargonium sidoides* is indigenous to South Africa and Lesotho.**

The pelargonium is a tender evergreen perennial.

Geographical

Distribution of Pelargonium in Africa

Climatic conditions, soil and water management

Pelargoniums like a sunny exposure, but in very hot areas they benefit from partial shade. They grow well in average soil that is well drained. They are very drought resistant.

Propagation and planting

Propagation is from cuttings, sometimes from seeds. Cuttings can be taken any time of the year except for the coldest months. Choose a compact side shoot about 10cm long and pull off a small "heel". Remove the lower leaves and press into wet sand. Keep protected and damp until rooted. Plant 90cm apart, as the rose-scented varieties grow very quickly (Margaret Robert's A-Z Herbs).

Medicinal Properties and Uses

***Pelargonium sidoides*: This herb is most commonly known by the name**

"Umckaloabo" which originates from the Zulu language and means "heavy cough". It has long been used in South African traditional medicine to treat coughs and respiratory ailments. Tests in Europe show it may be especially useful against sore throats and bronchitis. the 3-year old roots are the plant parts most often used to obtain extracts, although all plant parts contain active agents. Use certified and tested products.

Information on Pests and Diseases

To avoid problems is obtain plants that are insect and disease-free. Diseases are rare on cultivated *Pelargonium* species. Overwatering can lead to root-rot; to avoid it regulate watering and use soil or a planting medium with good drainage. Never plant in containers that do not have drainage holes.

Mealybugs maybe maiby be a problem for pelargoniums. Usually they do not occur on the above ground parts, but produce large colonies of

insects on the roots, especially tuberous roots, that can seriously damage plants. Above ground they are easy to identify as they appear as white cottony masses.

Aphids can become a problem but they can be easily removed by washing with a strong stream of water.

The caterpillar larvae of some butterflies and moths do damage pelargoniums, but they are easily controlled with any of the biological sprays or dusts that contain the bacteria *Bacillus thuringensis* (Bt) (UCI Arboretum).

Information Source Links

- **Margaret Roberts' A-Z Herbs: Identifying Herbs, How to Grow Herbs, the Uses of Herbs. Struik Publishers, ISBN: 9781868724994**
- **South African Biodiversity Institute:
<http://www.plantzafrica.com/plantnop/pelargsidoid.htm>**
- **UCI Arboretum 'Arboretum Quarterly' Vol. 3 No. 4: Pelargonium Species Part II <http://darwin.bio.uci.edu/arboretum/pel.htm>**

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Artemisia**Artemisia****Scientific name: *Artemisia annua*****Family: Asterales: Asteraceae****Common names: Annual wormwood, sweet wormwood****General Information and Agronomic Aspects**

Artemisia annua* is a crop for the production of anti-malarial and possibly antibacterial agents and natural pesticides. It was originally collected by the Chinese as a herbal medicine and is currently processed by pharmaceutical firms for the production of artemisinin for Artemisinin-based Combination Therapies (ACTs) in the treatment of malaria. (EcoPort) ACTs have been shown to have rapid resolution to fever and parasitaemia; low toxicity and are well tolerated. The artemisinin compounds are effective against *Plasmodium falciparum

and *P. vivax*, including multi-drug-resistant strains.



Artemisia is native to Asia, the center of origin is most probably China; wild populations occur both in China and Vietnam. It has become naturalized in many countries and is widely dispersed throughout the temperate regions of the world. In Africa, Artemisia has been introduced for cultivation to Cameroon, Ethiopia, Kenya, Mozambique, Tanzania, Uganda, Zambia etc. - all in high-altitude regions and/or regions with a pronounced cool period.

Geographical

Distribution of Artemisia in Africa

Climatic conditions, soil and water management

***Artemisia annua* is a fast-growing annual plant. It prefers a sunny position but it can also grow under light shade. It prefers light to medium textured soils (sandy and loamy soils). It requires well drained or dry soils and thrives in fertile soils but will grow in nutritionally poor soils. (Plants for a Future, 2000). Plants are more aromatic when grown in a poor dry soil. Often found on low and alluvial ground and on mudflats. The plants are longer lived, more hardy and more aromatic when they are grown in a poor dry soil (Genders, 1994). *Artemisia* is useful for filling gaps at the back of a border. It has become a weed of waste places in many areas of the world.**

It thrives in many temperate to sub-tropical ecologies, but the plant is not adapted to the tropics because flowering will be induced when the plants are very small; with the possible exceptions of high altitude plateaus and/or regions with a pronounced cool period. (Per Diemer,

2005, FAO). A special hybrid of *Artemisia annua*, known as *Artemisia annua anamed (A-3)* is especially important for the natural treatment of malaria, because it is adapted for the warmer climates where malaria is endemic. Whereas wild varieties of *Artemisia* grow to only 5 cm in the tropics, A-3 can reach heights of 3m and contains 20 times more artemisinin (World Agroforestry Center). *Artemisia annua* is extremely vigorous and essentially disease and pest free. (Plants for a Future, 2000)

Land preparation

Prepare your the land well where you will transplant the seedlings to. Well prepared land leads to uniform growth. Poor land preparation and lack of care leads to poor production. *Artemisia* has been grown successfully under minimal till systems, the aim of which is to conserve soil moisture. Some soils of Kenya are known to have a natural hard pan or a compaction pan that has been created by earlier cultivation practices. If these occur, it is advisable to deep rip the soil to ensure good root penetration and water percolation through the soil profile. A

deep rip is better than a shallow rip to allow maximum penetration. The seedlings can then be planted by hand along the rip line, into prepared soil. In some soils, when a very deep rip is made, it may be necessary to lightly roll the land afterwards in order to close the rip slightly, to reduce the risk that the seedling drowns in a heavy rainstorm.

Start soil preparations well before the rain season to ensure that the soil is not cultivated when too wet as this will lead to loss of soil structure and compaction of the soil resulting in poor plant performance. Early preparation will also assist in weed control that is an extremely important factor in growing Artemisia successfully as weeds will germinate in between first and second cultivations. By destroying these with the second cultivation (ploughing or ridging) it will reduce the amount of time required for hand weeding.

If organic matter such as well rotted animal manure can be added to the soil it will materially assist in improving the structure, giving better aeration, greater root penetration and water percolation and greater efficiency in utilizing irrigation water. The addition of up to 20 tonnes

per hectare of composted or well rotted manure is highly recommended both as a short term crop stimulant as well as a long term measure to improve soil fertility.

Propagation and planting and husbandry

Growing *Artemisia annua anamed* plants from the tiny seeds is difficult. 1 gram of seed contains an estimated 12,000 seeds. Vegetative propagation is therefore favoured as multiplying the plant from cuttings is easy, takes less time and maintains the genetic qualities of the plant (World Agroforestry Center).

To obtain an A-3 starter kit, please see on www.anamed.net for further information.

The time of establishment will be related to the availability of irrigation water/rainfall, temperature and daylength and to the desired period during of harvest. These factors will vary from region to region but the timing should allow for a seed germination time of about 4 weeks, a

further period of about 5 weeks before transplanting and about another 12 weeks to reach maximum dry leaf weight and artemisinin content. Rain-fed crops should be drilled 3 weeks before the onset of the rainy season. E.g. in Kenya, should rains be expected mid-April, then sowing should be done in the last week of February. Water stress as well as low temperatures will accelerate flowering. In Kenya, direct drilling is not used due to the tiny seed (1000 seed weight = 0.03g) and the need for a vigorous seedling. (Stress will induce early flowering).

Nursery Preparation The nursery must be sited in a different position every year, to prevent build-up of soil-borne pests and diseases, and to prevent nutrient build up or depletion. Soil fumigation may be necessary prior to planting. Ideally, soil pH should be between 5.5 and 6.5 - the pH should be determined by soil analysis and any lime requirement (in case of acidic soil) should be applied at least 2 months prior to sowing. The site chosen should either be partially shaded, or out of direct sunlight. Nursery areas should be prepared well in advance of sowing. Weed control around the site to a distance of 10 meters is advisable and the site should be fenced to prevent access by unauthorized persons or

animals. (EABL). The area should be cultivated as early as possible, to a depth of 35-40 cm, and raked to a fine tilth, and any weed roots removed. The use of a jembe handle can be helpful in breaking soil clods to the required tilth. A suggested bed size is 1.5 m wide and 20 m long, raised 20 cm high. Prior to sowing, the beds should be thoroughly irrigated, to allow residual weed seeds to germinate. Proper preparation for weed control in the seedbed is essential- as Artemisia seeds are so small, it can be difficult to identify weed seedlings from Artemisia seedlings at an early stage. (EABL, 2005).

Sowing Irrigate the field before sowing. There are several suggested methods of sowing. Pelleted seed can be mixed with fine grade sand, which is then sprinkled lightly over the surface of the bed, at the rate of about 1 gm seed per m². The aim should be to produce 500 healthy seedlings per m². EABL recommends that growers estimate an establishment rate of 50%. Thus 1000 seeds should be sown per per m². These can then be thinned out to the correct density. Note that 1 gram of raw seed is sufficient to sow 13 m². Artemisia requires light and uniformly high levels of moisture, at temperatures of 18-20°C for

germination. It is essential that the seeds are not covered with soil after sowing - this is one of the main reasons for failures in the nursery.

The plantlets will emerge in 6 or 7 days and as they appear, the cover can be removed, and the plantlets kept moist with regular applications of fine-droplet water from a can or (preferably) a mist-sprinkler. If no shade is used it is essential that the seedbed be irrigated with LIGHT but frequent irrigating.

It is recommended to transplant seedlings that have been raised either in trays or in seedbeds and that have produced vigorous, upright plants for transplanting. The ideal transplanting size is 12 cm tall, with well-developed roots. To be able to lift the plants successfully, the beds should be well watered the evening before transplanting is to start. This watering must be very thorough and the beds should not be able to absorb any more water, with the soil being wet to at least 50 cm deep. This will ensure that the soil in the immediate root zone contains adequate moisture during transplant. The next morning, to lift the plants, use a fork or a shovel and GENTLY raise the soil being careful

not to damage the plant roots. It is important to have as many roots as possible to support the plant after it is put in the field and the seedlings should be ?teased? from the soil to prevent damage. Only lift as many seedlings as you can plant in an hour. The soil around the plant roots must be pressed firmly into contact with the plant - this will prevent the plant from wilting too much and increase the rate at which it recovers from the shock of transplanting.

There are a number of trials that have been conducted in Kenya to determine the best plant number per hectare. Based on several years experience, (using vigorous seedlings) the current recommendation is to plant at a spacing of 1.0 m between plants and 1.0 m along the row. This will give a plant population of 10,000 per hectare. Measure the distance between plants, do not guess. If there is just 5 cm too much between plants it will reduce the plant numbers by almost 500 per hectare and production will be correspondingly lower. Use a marked measuring stick. (EABL, 2005).

Irrigation: Give some water after planting to assist recovery of the

seedlings. The plant is able to withstand dry conditions when it is fully established, but stress at early point in its life can induce premature flowering and this in turn may be reflected in a reduced artemisinin content in the leaf and a lowering of production per hectare which results in lower returns for the crop.

A rain-fed crop requires between 600 mm and 650 mm of rain during the season, so timely planting is important in all circumstances. The most critical stage of growth for additional water is in the first 12 weeks of the crop life after transplanting. Water requirements vary according to soil type and climate, they should be discussed with the local contractor (in Kenya - EABL) who will advise on the need for water.

**Mulching is essential to retain soil moisture and suppress weeds.
(EABL)**

Harvesting

Harvest timing is critical, as artemisinin content tends to climb steeply

during late active growth, then to plateau briefly and finally, to fall off sharply once flowering has initiated, with its corresponding leaf drop. The plant begins to flower from laterals originating at the bottom of the main stem. With the current variety (East Africa), when approximately half to three quarters of the plants show signs of bud initiation, artemisinin content will be at a maximum and the plants will be ready to harvest. (EABL, 2005).

The plants are cut and can be left to wilt in the field or hung up to dry in an enclosed space, to prevent post harvest losses. If you dry the plants in the field, they should be stoked, to prevent leaf rotting. Be careful not to dry the leaf to much, or leaves will be lost to the wind. Removal of leaf can be done using a tractor, or by manual beating. The plants should be stacked on plastic to catch the leaves.

Medicinal Properties and Uses

Every year 2 million people die from malaria, most of them children. Drugs that have been used for decades are of lesser and lesser help,

because the agents that cause malaria have become resistant. Newer drugs now promise a remedy. They are produced from the inner material of the Artemisia plant. The tablets, so-called ACTs, are combined with another anti-malaria agent, thus they should cure malaria and the combination of drugs should simultaneously avoid the development of resistance. ACTs have been shown to have rapid resolution to fever and parasitaemia; to be low in toxicity and well tolerated. The artemisinin compounds are effective against *Plasmodium falciparum* and *P. vivax*, including multi-drug-resistant strains. Despite promises of the pharmaceutical industry, not enough tablets can be supplied and they are not to be found in the rural areas of Africa and often not even in the cities. This is where the Artemisia plant can help:

***Artemisia annua* can grow almost anywhere in the world, in every kitchen garden, in every field. It is actually only an inconspicuous mugwort plant, and yet the hope for the many millions of people that suffer from malaria. Its inner substance, artemisinin, is highly potent, effective and compatible, according to the international aid organisation "Doctors Without Borders". After the first dose 90% of the agents that**

cause malaria were destroyed. The simplest way to take advantage of its curing properties is in the form of tea made from the plant. Even on its own it can work miracles with the most serious form of malaria - *Malaria tropica*.

Previous studies attribute the tea only 80% effectivity. However, when it is combined with other anti-malaria drugs it becomes over 90% effective, exactly the same as the ACTs. However, the WHO has prohibited the use of artemisia single drug therapy, and artemisia tea itself can be seen as single drug therapy. Dr. Wirt from ANAMED ("Aktion natürliche Medizin") does not agree with that. In the many studies he has carried out he ascertains that the tea is not a single drug treatment. Dr. Wirt: "*We can say that the tea contains 60 active agents. These 60 agents often work in synergy and so prevent resistance. We have also shown that tea can be dosed very exactly. We have shown that the concentration remains stable for over 3 years if the tea is properly dried and stored. We have compiled guidelines on how the tea should be prepared for one person or for groups of people who suffer from immunodeficiency, for example those with HIV, or children under 5 years whose body defenses*

are not yet strong enough. For these groups of people we combine the tea with old, patent-free anti-malaria drugs and so reach a good level of effectiveness."

(Transcript Context Science and Medicine, 2006)

News: Coartem® is a pre-qualified, fixed-dose artemisinin-based combination therapy (ACT) that pairs artemether, a derivative of the plant *Artemisia annua* with lumefantrine to effectively treat both short- and long-term effects of malaria. It is considered a breakthrough in the treatment of multi-drug resistant malaria and has been added to the WHO's Essential Medicines list (Ärzte Zeitung 2002)

Production and Markets

Commercial production of Artemisia in Africa has largely been limited to Kenya and Tanzania. Current demand for artemisinin has led to a significant increase in the commercial production, both in established as well as new areas.

Leaf production is very variable depending on climatic conditions and

harvesting techniques used. In East Africa yields average 2.5 t/ha.

Markets:

Hundreds of millions of people at risk of drug-resistant falciparum malaria are in urgent need of access to quality artemisinin-based combination therapies (ACTs) at affordable prices. (Diemer, FAO)

Information Source Links

- **Anamed - Action for Natural Medicine: www.anamed.net**
Artemisia annua Tea - a revolution in the history of tropical medicine (Circular letter May 2006): [online-version](#)
- **Anamed - To obtain an A-3 starter kit, please see on www.anamed.net**
- **EABL (2005) East African Botanicals Ltd. Growers' Production Manual for Artemisia annua.**
- **EcoPort. The consilience engine. www.ecoport.org. Updated EcoPort version - Peter Griffee (ex FAO) and Per Diemer (FAO consultant). Artemisia annua; the plant, production, processing and**

medicinal applications. <http://ecoport.org/ep?SearchType=earticleView&earticleId=727&page=-2>.

- Genders R. (1994): Scented Flora of the World. Robert Hale. London. 1994 ISBN 0-7090-5440-8
- Ken Fern: Plants For A Future 2000: Edible & Useful Plants For A Healthier World. Artemisia annua: <http://www.pfaf.org/>
- World Agroforestry Centre, 2007: African Malaria Day Special Report: Artemisia, a homegrown cure for malaria. www.worldagroforestry.org
- Ärzte Zeitung 08.05.2002: <http://www.aertztezeitung.de>

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Ocimum kilimandscharicum

Ocimum kilimandscharicum

Scientific name: *Ocimum kilimandscharicum*

Family: Lamiales: Lamiaceae



Common names: kilimanjaro basil, camphor basil, hoary basil, feverplant

General Information and Agronomic Aspects



**Geographical
Distribution of
*Ocimum
kilimandscharicum* in**

***Ocimum kilimandscharicum* is one of the species of the genus *Ocimum* plant that is native in East Africa and was introduced and cultivated in India and some parts of Turkey. It is an evergreen aromatic perennial under shrub belonging to the *Lamiaceae* family. It thrives as a natural rounded woody shrub that can reach 2 m high in warm temperate regions of the tropics but can be propagated both by seeds and vegetative.**

The plant has pubescent quadrangular branchlets with simple leaves that are opposite and oblong, narrow at the base and deeply serrated (Warrier,

Africa et.al., 1996). The leaves contain aromatic oils, which is the essence of the plant. The essential oil is extracted using distillation, expression or solvent extraction methods. The oil constitutes liquid oil and white solid crystals, where the pure crystals possess a characteristic odour and taste of natural Camphor.

Agronomic aspects

- ***O.kilimandscharicum* can be propagated by seeds and cuttings;**
- **Farmer experience indicates that seed propagation is the most suitable;**
- **70-140 g of *O.kilimandscharicum* seeds can plant 1-hectare of land (Wealth of India, 1966);**

- ***O.kilimandscharicum* seeds are black and very small, oval shaped and about 1mm in the middle and 2mm long;**
- **Seedlings are raised in nurseries and transplanted on the farms;**
- **Once the shrub is established, it can be harvested three times per annum for more than three years;**
- **It requires well-drained soils, though does well in clayey and sandy soils, with an average annual rainfall of 1250 mm, fairly high temperatures and at altitudes of up to 900 mm (Wealth of India, 1966);**
- **The plant is not grazed or browsed by animals;**
- **It has an efficient rooting system and perennial habits which prevent soil erosion where it is grown;**
- **During growth, the plant requires little management in the field thus it is not labour intensive;**
- **However, harvesting is slightly labour intensive where cutting and plucking of leaves can be tedious.**

1. Establishing an *O. kilimandscharicum* seedbed nursery

- **Seedlings are raised in seedbeds and these are prepared using specific equipment that depends on the land characteristics;**
- **Seedbeds can be prepared in nurseries at farmer or CBO levels;**
- **This is done gradually by following a series of steps;**
- **The nursery should be prepared by observing hygienic and careful seedling production that involves seed selection, site selection, tillage and seed propagation.**

a) Seed selection and preparation

- **Ocimum kilimandscharicum seeds are collected from mature plants;**
- **The seed is prepared hygienically by drying under shade, threshing, winnowing and storing;**
- **Records are kept of the region where the seed is obtained so that it is easy to trace their origin;**

b) Site selection

The site selected for raising a nursery should be convenient enough to:

- **Minimize any possible damage to the seeds or seedlings;**
- **Be easily accessed;**
- **Have windbreaks or trees that provide shade and protection;**

The site should be free from contamination and too much manure.

c) Land preparation

- **The seedbed should be prepared properly to produce a suitable medium for seedling germination, establishment and growth;**
- **It should be firm and smooth;**
- **The land is prepared in two successive stages that are primary and secondary tillage.**

Primary tillage

- **This is undertaken to break-up the soil compaction, loosen the size of the soil clods and invert plant residues to kill them;**
- **The soil moisture should be sufficient enough so that it crumbles when worked by farm implements;**
- **The selected site should be cleared to free the land from previous crops and other vegetation;**
- **Mark out the size of the nursery required on the land;**
- **Using hoes as tillage implements, prepare the marked land by digging and cross digging;**
- **Shake the soil from any plant roots, tree stumps and other vegetation matter;**
- **Leave the land for a few days to allow the waste vegetation to rot.**

Secondary tillage

- **This is undertaken to remove all kinds of waste materials on the tilled land, level it properly and prepare beds for plant propagation;**
- **Using forked hoes as tillage implements, prepare the tilled land by cross digging to remove all wastes;**

- **Raised seedbeds are constructed measuring 1000 mm wide and of any convenient length;**
- **Use the implement to establish smoothness on the seedbeds land;**
- **Before sowing, amend the soil by incorporating compost manure with the top layer of the soil;**
- **Level the soil using a rake.**

d) Sowing the *O.kilimandscharicum* seeds in the seedbed

- **Because of their size, the *O.kilimandscharicum* seeds cannot be sown directly to the soil;**
- **Take dry soil and work it into a powder;**
- **Mix dry clean seeds with dry powdered soil;**
- **Using the edge of a board or the back of a rake, make shallow furrows or drills or 'valleys' in the seedbed at a spacing of 150 mm;**
- **Sow the mixed seeds uniformly in the drills;**
- **Do not cover with soil after sowing.**

e) Seedbed management

Protection

- **After sowing the seeds, cover the soil with dry mulch using either grass or soft banana leaves;**
- **The cover ensures protection from birds and direct sunlight, and also improves germination and growth;**
- **Germination is noticed after 7-10 days (Kannan, in.lit., 1966);**
- **After a few days, remove the mulch cover and construct a shade over the seedbed.**

Watering

- **Sufficient water is required for *O.kilimandscharicum* germination and growth;**
- **When it is dry, the seedbeds should be watered regularly with clean water to keep the soil moist throughout the germination period;**
- **Water should be applied by fine sprinkling of water in the early evening for the first one week;**

- **From the second week onwards, water should be applied for 3 days per week;**
- **Watering during sunlight should be avoided.**

Aftercare

- **Weeding by hand should be done regularly;**
- **Germinating seedlings should not be mistaken with weeds;**
- **Remove weeds that appear in the seedbed using a knife by cutting just below the ground level. Pulling can disturb the seedling roots.**

Drainage

- **The pathways between seedbeds should be slightly sloped to ensure good drainage of water;**
- **The slope ensures that water logging does not occur in and around the beds.**

f) Transplanting *O. kilimandscharicum* seedlings

- **Once the seeds have germinated, the plant grows rapidly above the ground after 2 months;**
- **The seedlings are ready for transplanting after 5-7 weeks in the seedbed (Wealth of India, 1966;**
- **The land where the plants will be transplanted should be well prepared and free of waste materials;**
- **Holes are dug and a handful of clean dry manure applied;**
- **The seedlings are removed from the seedbed and moved to the transplanting site where they are kept in a shade for a day;**
- **Transplanting should be done when it is not too sunny, preferably in the evening;**
- **After transplanting, the maturation period of the plant is 4-6 months before the first harvest commences (wealth of India, 1966).**

2. Growth and development of *O. Kilimandscharicum* plant

- **O.kilimandscharicum requires minimal care and no pesticide control;**
- **Minimal clean manure should be applied. Records of any pre and post manure applications on the plots should be kept and a calendar of any manure applications prepared to ascertain consistency and yields changes;**
- **Once mature, it thrives as a perennial, and can be harvested three times in a year for more than three years.**

3. Harvest, post-harvest handling and processing of *O. Kilimandscharicum* plant leaves

- **Harvesting is undertaken very early in the morning before sunrise to minimize wilting of leaves and loss of oil from volatilization when it is hot;**
- **During harvesting, the plants are cut 50 - 75 mm above the ground and collected in heaps where the leaves are plucked and air-dried under shade (Kannan, in.lit., and Deogun, in.lit. 1961/2);**
- **The yield of wet and dry leaves of *O. Kilimandscharicum* depends on the agronomic, soil, environmental and post harvest handling factors;**

- **From literature, yields of cultivated *O. kilimandscharicum* dry leaves range between 2,200 - 5,500 Kg per hectare per annum (Deogun, et.al., in.lit., 1961/2);**
- **After 5 years, the shrub can be cut off and the farm replanted;**
- **Oil from the plant leaves is extracted using steam hydro distillation method;**
- **Experience show that too much manure results in good leaf harvests but low oil content.**

Medicinal Properties and Uses

Traditionally, extracts of *Ocimum Kilimandscharicum* were used to alleviate many ailments in East Africa including treatment of colds, coughs, abdominal pains, measles, diarrhea, insect repellent, particularly against mosquitoes and storage pest control (Kokwaro, 1976; Hassanali, et.al., 1990, The Herb Society of America; Golob et al., 1999). Toxicity and protectant potential of Camphor has been found to work against product beetles (Ofori and Hassanali, 1998). Research undertaken on this plant?s medicinal and insecticide efficacy classifies it as an aromatic plant whose bioactive properties can find use in

pharmaceutical, aroma therapeutic and pesticide industries (Bekele and Hassanali, 2000; Bekele, et.al., and Nyamasyo, 1995; Deogun, in.lit., 1961-62). The low boiling point of the oil may be used as a solvent for metallic lustres on ceramic bodies (Chowdhiri and Haksar, in.lit., 1959).

Kilimanjaro basil has many different uses, some of them are:

- **Traditional medicine**
- **Raw material for commercial production of "Naturub" (see below)**
- **Mosquito repellent**
- **Source of nectar for bees in apiculture**
- **Protection against storage pests**
- **Flavouring agent**

Pest control:

Dried leaves and essential oil extracts are used as a grain protectant. A hundred percent mortality was observed in adults of the maize weevil (*Sitophilus zeamais*), the lesser grain borer (*Rhizopertha dominica*) and the Angoumois grain moth (*Sitotroga cerealella*) exposed for 48 hours to dried ground leaves and essential oil extract at doses of 25 g and 0.3

g per 250 g of grain respectively (Golob et al., 1999).

Relative proportion of identified chemical constituents of *O. Kilimanscharicum* essential oil

GC Peak Number	Component (%)	
3	Camphene	5.07
5	Limonene	6.23
6	1,8-Cineole	7.20
11	Camphor	70.43
12	Linalool	0.47
13	4-Terpineol	1.44
14	Trans-caryophyllene	2.80
15	Alpha-Terpineol	0.60
16	Endo-borneol	0.60

Case Study on Sustainable Use - Kakamega Forest integrated conservation forest project

To minimise the uncontrolled collection and sale of large quantities of plant materials from the forest, which leads to the destruction of many forest plants, a project was started to support sustainable utilisation of medicinal plants (including *Ocimum kilimandscharicum*) in the Kakamega forest in Kenya. Harvested leaves of *O. kilimandscharicum* are being used in the production of essential oils for the manufacture of aroma therapeutic products.

***O. Kilimandscharicum* oil is the main ingredient used in the manufacture of two Naturub® range of products (balm and ointment) that were developed by International Centre of Insect Physiology and Ecology (ICIPE), University of Nairobi (UoN) and Kenya Wildlife Service (KWS) and produced for Muliru Farmers Conservation Group Enterprise (MFCG). The balm is used to alleviate colds, flu, insect bites and**

muscular aches while the ointment is used for the fast relief of muscular strain, rheumatism, arthritic joint, fibrositis, bruises, lumbargo, neuralgia and sciatica. Naturub® is certified and registered as the first natural product by the Pharmacy and Poisons Board of Kenya, it is sold widely in corporate retail chains in Kenya .



Case Study: Kakamega forest, where farmers cultivate *Ocimum kilimandscharicum*

© Wilber Lwande

Pests and Diseases

The most notable pests are termites, which attack the plant roots after the first harvest due to the handling disturbances caused;

The attack is random based on the extend of disturbance per plant;

When they attack, alkali ash is sprinkled around the seedbed furrows. This deters the termites from attacking.

Information Source Links

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Tamarind



Tamarind

Scientific name: *Tamarindus indica*

Family: Fabales: Fabaceae

Local names: Swahili: ukwaju, mkwayo

General Information and Agronomic Aspects

The actual origin of *Tamarindus indica* is unknown. It is generally believed to be indigenous



to the drier savannahs of tropical Africa, but certainly became naturalised long ago in tropical Asia. The species was known and cultivated in Egypt as early as 400 B.C. *T. indica* is now cultivated in most tropical countries. (EcoPort). It grows in Burkina Faso, Cameroon, Central Africa Republic, Chad, Ethiopia, Gambia, Guinea, Guinea-Bissau, Kenya, Madagascar, Mali, Niger, Nigeria, Senegal, Sudan, Tanzania and Uganda. Farmers commonly cultivate it in parklands in the arid and semiarid zones of West Africa (Kalinganire et al.).

Geographical Distribution of Tamarind in Africa

The fruit is edible and can also be used as a sort of spice to be added to food. Young leaves and very young seedlings and flowers are cooked and eaten as greens and in curries in India. In Zimbabwe, the leaves are added to soup and the flowers are an ingredient in salads. Tamarind seeds have been used in a

limited way as emergency food. They are roasted, soaked to remove the seedcoat, then boiled or fried, or ground to a flour or starch (Morton 1987).

Climatic conditions, soil and water management

Tamarind is well adapted to semi-arid tropical conditions; it also grows well in many humid tropical areas with seasonally high rainfall. It grows well over a wide range of soil and climatic conditions, occurring in low-altitude woodland, savannah and bush, often associated with termite mounds. It grows in well-drained, slightly acidic soils and although it cannot withstand stagnant inundation, it can tolerate a wide range of physical site characteristics. It prefers semi-arid areas and wooded grassland, and can also be found growing along stream and riverbanks. It does not penetrate into the rainforest. Its extensive root system contributes to its resistance to drought and wind. It also tolerates fog and saline air in coastal districts, and even monsoon climates, where it has proved its value for plantations.

Young trees are killed by the slightest frost, but older trees seem more

cold resistant than mango, avocado or lime. A long, well-marked dry season is necessary for fruiting (EcoPort).

Propagation and planting

The tamarind becomes a fairly large tree, so keep this in mind when planting the tree. It should be planted in full sun. It is highly wind-resistant with strong, supple branches.

Tamarind may be propagated from seeds, and vegetatively by marcotting (air layering), grafting and budding. Rootstocks are propagated from seed, which germinate within a week. Seeds retain their viability for several months if kept dry. Plant seeds 1 to 1.5cm deep in containers. Seeds should be selected from viable trees with good production and quality. Germination is best when seeds are covered by 1.5 cm loose, sandy loam or by a mixture of loam and sand. Seedlings should attain at least 80 cm before being transplanted to their final location at the beginning of the rainy season. Seedlings should begin to produce fruit in 6 to 8 years.

Outstanding mother trees are vegetatively propagated; shield and patch budding and cleft grafting are fast and reliable methods, currently used in large-scale propagation in the Philippines. Trees can also be started from branch cuttings, and superior clones can also be grafted onto seed-propagated rootstock. Vegetatively propagated trees come into bearing within 3 to 4 years. They produce more fruits as well as more-uniform fruits than seed propagation. Trees also seem to remain smaller - making them easier to harvest and handle (ICRAF, CRFG; Lost Crops of Africa). Young trees should be planted in holes larger than necessary to accommodate the root system. They should be planted slightly higher than ground level to allow for subsequent settling of the soil and a water basin should be built around each tree to assure adequate moisture for young trees. (Morton 1987)

Husbandry

Young trees are pruned to allow three to five well spaced branches to develop into the main scaffold structure of the tree. Maintenance pruning only is required after that to remove dead or damaged wood

(CRFG).

Information on Pests and Diseases

The tamarind tree is seldom affected by pests and diseases. Ripe fruit in humid climates is readily attacked by beetles and fungi, so mature fruit should be harvested and stored. The most serious pests of the tamarind are scale insects (*Aonidiella orientalis*, *Aspidiotus destructor* and *Saisetia oleae*), mealy-bugs (*Nipaecoccus viridis* and *Planococcus lilacinus*), and seed beetles. Tamarind pods are attacked by the bruchid beetle (*Caryedon (Pachymerus) serratus* or *C. gonagra*). Diseases, reported from India, include leaf spot, powdery mildews, a sooty mould, stem disease, stem, root and wood rot, stem canker, a bark parasite and a bacterial leaf-spot (ICRAF; ECHO).

Medicinal Properties and Uses

Fruits: The flesh of the fruits is edible. The sweet fruit-pulp is used for the preparation of a refreshing drink and is eaten as an occasional snack. When the fruits are soaked in water overnight the liquid becomes

a tasty fruit juice, which is especially appreciated by children (EcoPort). In the Sahel, the fruit pulp is used primarily for sauces, porridge and juice. In eastern and western Africa, the fruit pulp is eaten raw, but local varieties generally have a strong acidic taste compared with sweet-tasting cultivars introduced from Thailand. In Kenya, the fruit pulp is also used to tenderise meat (Kalinganire et al.).

The fruit pulp has laxative properties and is highly nutritive. It is often added to boiled cereal pap for the treatment of constipation. In China it is dispensed to treat nausea during pregnancy. (Iwu 1993). Tamarind preparations are universally recognised as refrigerants in fevers and as laxatives and carminatives (induce the expulsion of gas from the stomach or intestines). Alone, or in combination with limejuice, honey, milk, dates, spices or camphor, the pulp is considered effective as a digestive, even for elephants, and as a remedy for biliousness and bile disorders, and as an antiscorbutic. The pulp is said to aid the restoration of sensation in cases of paralysis (Morton 1987).

Roots: In northern Nigeria, the roots are used for leprosy treatment. In

many parts of West Africa, a decoction of the roots is the principal ingredient in remedies for cardiac diseases (Iwu 1993).

Leaves: Tamarind leaves and flowers, dried or boiled, are used as poultices for swollen joints, sprains and boils. Lotions and extracts made from them are used in treating conjunctivitis, as antiseptics, as vermifuges, treatments for dysentery, jaundice, erysipelas (a skin infection that often follows strep throat) and hemorrhoids and various other ailments (Morton 1987).

Bark: The bark of the tree is regarded as an effective astringent, tonic and febrifuge. Fried with salt and pulverised to an ash, it is given as a remedy for indigestion and colic. A decoction is used in cases of gingivitis and asthma and eye inflammations; and lotions and poultices made from the bark are applied on open sores and caterpillar rashes (Morton 1987). The bark infusion is drunk by woman after childbirth as a general tonic (Iwu 1993).

Seeds: The seeds are a rich source of protein, and have a favourable

amino acid composition. The powdered seeds are made into a paste for drawing boils and, with or without cumin seeds and palm sugar, are prescribed for chronic diarrhoea and dysentery (Kalinganire et al.; Morton 1987).

Tamarind is also a valuable timber species, used in making furniture, tool handles and charcoal and as fuelwood (Kalinganire et al.).

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Sutherlandia

Sutherlandia



Scientific name: *Sutherlandia frutescens*

Family: Fabales: Leguminosae

Common names: cancer bush

General Information and Medicinal Properties



Geographical Distribution of Artemisia in Africa

Sutherlandia is native to South Africa, Namibia and Botswana. It grows naturally in the southern part of both Cape-provinces and in the Little Karoo (African Herbs).

***Sutherlandia frutescens* sub-species *microphylla*, is regarded as the most profound and multi-purpose of the medicinal plants in Southern Africa. Because of its efficacy as a safe tonic for diverse health conditions it has enjoyed a long history of use by all cultures in Southern Africa. (Afrikaanse Kruiden)**

Sutherlandia helps the organism to mobilise its own resources to confront various physical and mental stress situations; it should

therefore, more correctly, be known as an adaptogenic tonic (CMA). A multi-disciplinary team headed by Dr Nigel Gericke, a botanist, medical doctor and indigenous plant specialist, found that Sutherlandia contained a powerful combination of molecules which have been identified and used in the treatment of patients with cancer tuberculosis, diabetes, schizophrenia and clinical depression and as an antiretroviral agent. Gericke set up a company, Phyto Nova, to produce tablets, powder, tea and gel from the plant and has been distributing it to AIDS patients (BBC news, 30.11.2001).

Sutherlandia herbal tablets are available from African Herbs: AfricanHerbs (www.africanherbs.info) or from AfricanDrugs (www.africandrugs.com) in bottles that contain 60 tablets of 300 mg. Each patient takes two tablets after meals twice a day (in all four tablets a day). So 36 bottles will last three patients for six months of treatment each.

HIV/AIDS Improvements in appetite, weight-gain, sleep, exercise tolerance, anxiety and overall sense of well-being can be expected.

Researchers anticipate that there will be a delayed progression of HIV into AIDS. This will require compliance of taking appropriate doses of the correct selection of Sutherlandia on an ongoing basis, in addition to meticulous attention to diet. Alcohol, recreational drugs and other drugs that damage the immune system should be avoided. Anecdotal evidence from doctors and health workers using the plant on HIV patients describes remarkable results (New Scientist, 30.11.2001). It has to be stressed, however, that Sutherlandia is not a cure for AIDS.

Gilbert Matsabisa, Director of Indigenous Knowledge Systems, says it is important that people receive advice on how to prepare and standardise the drug from the common plant. A very bitter powder can be ground from the leaves and branches of the shrub. (New Scientist, 30.11.2001)

Precautions

In keeping with World Health Organisation guidelines of the assessment of herbal medicines, Sutherlandia is generally regarded as safe on the basis of its long history of safe use in South Africa. No severe adverse effects are known.

Known side-effects include occasional reports of dry mouth, occasional reports of mild diuretic effect; occasional reports of loose stool, occasional reports of constipation. Slight dizziness has been occasionally noted in very wasted and weak patients (e.g. in an ill adult weighing 35kg) who take Sutherlandia without meals this is corrected by instructing wasted patients to take the product after meals. Although there is a well-established traditional use of taking Sutherlandia in pregnancy, this is not recommended until there is further evidence of safety during pregnancy.

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Mondia



Mondia

Scientific name: *Mondia whytei*; *Mondia whitei*

Family: Asclepiadaceae (Apocynaceae)

Local names: Kenya: Mkombela

Common names: White's ginger

General information

Distribution

It is widely distributed in tropical Africa from Guinea through Cameroon to East Africa. It is widespread in Zimbabwe but threatened in South Africa, due to over collection for medicinal purposes. In Kenya its more prevalent in the



remnant tropical rain forest of Kakamega and its outliers Malava, Kiseru and Bunyala, scattered in Nandi forests and ranges, Chyulu hills, Mt. Kilimanjaro regions, Mt. Kenya ecosystem and some parts of Coastal regions especially Arabukosokoke (Mukonyi et al 2001) and in Malawi, Uganda.

Description

***Mondia whitei* (Hook. F.) Skeels (Apocynaceae) is also known as mondia, or Whites's ginger. Mondia is a vigorous climber (3-6 m high) with attractive heart-shape leaves and a vanilla aroma. The flowers are arranged in panicles of cream-yellow buds which open to reveal deep reddish-purple inner petals. Habitat: it is found in a variety of woodland habitats.**

***Mondia whytei* is a slow growing vine that used to be abundant in Kakamega Forest but is now getting scarce. Main threat to the species has been over**



***Mondia whitey* climber in**

exploitation by local communities for subsistence and commercial purposes. The species is reported extinct from wild source in Tugela river in South Africa (Crouch et al 1998). In Kenya its among the heavily exploited species from Kakamega forest by local communities (Mukonyi 1998). It is reported to have disappeared from central province due to over exploitation and increase in demand for agricultural land.

**Kakamega,
Kenya, Oct
2008
© Monique
Hunziker**

The roots of *Mondia whytei* are harvested extensively from Kakamega Forest in a well organized trade leading to scarcity of the plant *Mondia whytei* roots are sold in towns in Kenya and in other African countries. The roots are eaten by the young and old as a flavoring and appetizing agent. More than 500 members of the community adjacent to Kakamega Forest were trained in methods of cultivating *M. whytei* on-farm. Community



Mondia whitey flower.

members are shown how to prepare seedbeds for *M. Whytei* seedlings. Once mature, roots from the farmer's plots of *M. whytei* will be purchased and used for commercial production in powder and other forms.

Leopard Rock Game Reserve, Vumba, Zimbabwe, 30 Dec 2003
© Mark Hyde and Bart Wursten, Flora of Zimbabwe



Mondia whytei market. The roots are eaten by the young and old as a flavoring and

appetizing agent.
© **icipe**



The roots of *Mondia whytei* are harvested extensively from Kakamega Forest in a well organized trade leading to scarcity of the plant *Mondia whytei* roots are sold in towns in Kenya and in other

African countries.

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Medicinal properties and uses

***Mondia whytei* root infusion is popularly used as an aphrodisiac in Malawi and as a natural appetizer, enhancer of cerebral and peripheral blood circulation.**

Food: the fleshy bark of the narrow roots is eaten raw or occasionally in the dried state for its good taste, as an appetizer, to freshen the mouth or for pleasure leaving a persistent spicy taste in the mouth; a source of vitamin A, D, K and E, the minerals, magnesium, zinc, iron, calcium and protein.

Medicinal use: anorexia, treatment of sexually transmitted diseases, stomach ailments and impotence, in countries where it occurs in Africa. The Luhya community of western Kenya use it for; love potion, symbol of peace, sign of power, treatment of hypertension, stroke, anemia,

improved sleep, body warmth, asthma, enhanced urination, hang-over, mastitis, allergies, eases after birth pain, heartburns, bilharzias, stress and tension, measles, hepatitis, rickets, typhoid, stops vomiting, meningitis, pneumonia and improved vision. Others include, mouth fresheners, aphrodisiac (root infusion), food and mouth diseases, enhanced memory, appetizer, toothbrush, leaves for animal fodder and human vegetables.

Phytochemicals and nutritional status

Studies were undertaken to establish important phytochemicals and its nutritional status to support the traditional claims and enhance the species value for improved marketing and conservation. The main flavouring principle preferred by consumer was identified as 2-hydroxy-4-methoxy benzaldelyde. Both root and leaves extract were active against, brine shrimp. The root extract were active against Neisseria gonorrhoea, and superior to minoglycine drug used for control of sexually transmitted diseases (STD). Both root and leaves showed antibacterial effect against *Escherichia coli*, *Salmonella typhii*,

***Pseudomonas auriginosa*, *Bacillus subtilis*, *Staphylococcus aureus* and *Shigallae dysentrae*. *Escherichia coli* was more susceptible while *Salmonella tyhpii* showed the least. Fungal bioassay carried out on *Candida albicans* and *Aspergillus niger* showed root extract to be more potent than leaf extracts.**

Roots and leaves showed varied significant amount of proteins mineral vitamins and sugars depending on source. Mean concentration levels of minerals varied as potassium 11.34 - 32.05 mg/g, Sodium 5.61 - 24 mg/g, Magnesium 1.40 - 2.83 mg/g, Calcium 3.08 - 8.25mg/g, Iron 0.20 - 0.43 mg/g, Zinc 0.03 - 0.07 mg/g, Copper 0.003 - 0.06 mg/g, Manganese 0.64 - 0.05 mg/g, Cadmium and Lead were in trace amounts. Crude protein ranged form 4.35 mg/g - 21.8 mg/g, highest being from leaves. Vitamin varied as B carotene 4.35 - 21.81 ugg-1, Thiamine 0.78 - 3.70 mgg-1, Niacin 0.52 - 8.15 mgg-1, Riboflavin 0.62 - 2.45 mgg-1 and sugars, fructose 7.908 - 15.26 ugg-1, Xylose 9.17 - 18.70, glucose 2.40 - 9.0.

Comparison of basal diets for animal feeds, showed *Mondia* leaves had high crude protein and ash percentage of 20.25 and 16.98 respectively

while dairy meal had crude protein and ash percentages 16.76 and 7.83 respectively. These results support traditional medical claim on use of *Mondia whytei*. The results show it has potential for human and animal health care. The chemical and phytochemical results have been used to reschedule *Mondia whytei* products for quality assurance that are now being sold in leading Kenyan supermarkets.

Case Study - Commercial Cultivation of Medicinal Plants



The uncontrolled collection and sale of large quantities of plant material from the forest leads to the destruction of many forest plants. Local communities, traditional medicinal herbalists and herbal medicine vendors popularly collect roots, bark and whole shrubs.

More than 500 members of the community adjacent to Kakamega Forest were trained in methods of cultivating *Mondia whytei* on-farm

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The Kakamega project has introduced a new action plan to support sustainable utilization of medicinal plants. Farmers have been mobilized to practice on-farm cultivation of selected medicinal plants. This results in reduced pressure on forest herbal medicine while providing alternative income to the local community. Candidate medicinal plants for on-farm cultivation and commercialization were selected on the basis of their product effectiveness, toxicity, propagation potential as well as product market evaluation. Extensive agronomic studies

Community members are shown how to prepare seedbeds for *Mondia whytei* seedlings

© icipe



Once mature, roots

accompanied the selection process.

The formulation of the plant products was refined by ICIPE in collaboration with the, Pharmacology Department, University of Nairobi and the Kenya Forestry Research Institute (KEFRI). *Mondia whytei* root (known locally as mukombera) is being formulated into a high value powder by KEFRI. The plant is used as a natural appetizer, enhancer of cerebral and peripheral blood circulation. It is a source of nutrients such as vitamin A, D, K and E, the minerals, magnesium, zinc, iron, calcium and protein while its aroma

from the farmer's plots of *Mondia whytei* will be purchased and used for commercial production of *M. whytei* in powder and other forms

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Mondia tonic



Mondia tonic

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makes it useful as a food-flavoring agent. A total of 14,000 *M. whytei* have been planted by the forest adjacent communities in their farms. The farmers also plant endangered tree species such as *Prunus africanus* adjacent to the vine to support it.

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Prunus africana



Prunus africana

Scientific name: *Prunus africana*

Family: Rosales: Rosaceae

Local names: Kamba: Mumbaume / Keiyo: Tenduet / Kikuyu: Muiri / Kipsigis: Arareut / Kisii: Omoiri / Luhya (busuku): Kumutura / Maasai: Olkojuk / Marakwet: Tenduet / Meru: Mweria / Nandi: Tendwet / Ogiek: Tenduet / Sabaot: Oromoti / Swahili: Kiburabura / Tugen: Kunyukwa

Common/Trade names: Red stinkwood, Prunus (Kenya)

General Information and Agronomic Aspects

Prunus africana is native to the montane tropical forests of Sub-Saharan Africa and Madagascar. It occurs in wild in forests from 22 countries,



majority in the Eastern and Southern Africa region such as Ethiopia, Uganda, Kenya, Tanzania, Zambia, Malawi, Mozambique, South Africa, but also Cameroon, Nigeria, Sao Tome, Angola etc.

A valuable timber and medicinal tree has more recently come under heavy pressure for wild harvest for timber and bark extraction, as there is a fast growing market for the bark. It has been added to Appendix II of CITES list of endangered species, for regulation of trade from wild harvest. Kenya has the largest planted area (628 ha planted by year 2000), but the tree is increasingly becoming a popular agroforestry tree and coppices (it can be cut back and produces shoots from stools or roots) well when young. Leaves and twigs contain the same medicinal properties

Geographical Distribution of Prunus in Africa

as the bark; so can be harvested sustainably while coppicing the tree in agroforestry systems.

The timber is hard and durable and is used in Africa for the manufacture of various household products such as axes, hoes and furniture.

Prunus works well as shade tree for coffee plants and other crops. It grows best in tropical highlands from 1000 to 2500m above sea level with rainfall between 500 to 2000 mm/year and fertile loam soils.

Description

An evergreen tree up to 25 m tall or rarely, a shrub. In the forest the dense foliage is open, in grassland the tree is more stunted. The bark is black to dark brown, and has a rough corrugated or fissured and scaly texture, fissuring in a characteristic rectangular pattern. The leaves are leathery, glossy dark green and have margins with shallow rounded teeth. The leaf stalk is typically pink to reddish brown. The fruit is red to brown, rounded and about one cm; it is often bilobed containing one seed in each lobe. It grows in bunches. Prunus flowers and fruits from about 4 m high.

Propagation and planting

The seeds are collected from directly underneath the trees. Seeds from dark red to brown fruits germinate better than seeds from green fruits. Remove the fruit flesh and sow the seeds in a nursery while fresh; they do not store well. Also wild seedlings (wildlings) can be collected and planted. There is evidence that seeds and seedlings survive best in soil with relatively high humus content. Nursery soils should contain either peat or decomposed sawdust. Seeds generally germinate 50 to 90 days after planting. Up to 50 seedlings/m² in the nursery can do well - with higher density the survival rate diminishes. Young seedlings need about 40% shade.

Husbandry

Plant young seedlings on contours and borders. Prepare two- feet deep planting holes. Fill it with back soil mixed with compost and leaf matter. Water once a week for the first year. Use a filled and upended bottle or other water conserving system.

Harvesting

Do not harvest bark till the tree is at least 30 cm in diameter at breast height. From trees 30 to 50 cm diameter two bark panels of not more than 15 to 20 cm wide can be harvested from each side of the tree from about one meter above ground level up to the first branch. After 4 to 5 years two more panels can be harvested on the other sides of the tree. If bark is over harvested the tree dies. However leaves contain the same medicinal properties as the bark, so these can be used in local medicine. From younger trees only the leaves and twigs can be pruned or coppiced.

Market

At least four European companies are actively buying bark of *Prunus Africana*. In 2000 the bark trade amounted to US\$ 150 million/year or 3500 tonnes of this commodity. It was estimated that this demand would triple or quadruple to 7 to 11000 tons/year in export and about 500 tonnes/year for use in Africa the next few years.

Medicinal Properties of *Prunus Africana*

The active ingredients in *Prunus Africana* are effective treatment for benign Prostatic Hyperplasia and Prostate gland Hypertrophy (enlarged prostate gland), ailments that affect about 60% of men over the age of 50, especially in Europe and USA. Traditional healers also use the bark in treatment of stomachache, wound dressing, infusion of leaves to improve appetite, treatment of both bacterial and non-bacterial chronic prosthesis and genital infection as well as hirsutism in women.

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Neem

Images

Neem (*Azadirachta indica*)



**William M. Ciesla, Forest Health
Management International,
www.insectimages.org (Courtesy of**

EcoPort, www.ecoport.org)



Neem seeds

**Dr. Pankaj Oudhia (Courtesy of EcoPort,
www.ecoport.org)**

Neem flower



**Dr. Pankaj Oudhia (Courtesy of EcoPort,
www.ecoport.org)**

Neem mill for oil extraction



A.M.Varela

Milling of cake



A. M. Varela.

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Moringa

Images

Moringa leaves



Ellis RP (Courtesy of EcoPort,

www.ecoport.org)

Moringa flower



**Oson ME (Courtesy of EcoPort,
www.ecoport.org)**

Moringa seeds



**Botha R. (Courtesy of EcoPort,
www.ecoport.org)**

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Pelargonium

Images



Pelargonium sidoides

Courtesy of Ulrich Katz, Botanischer
Garten, Ruhr-Universität Bochum

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Artemisia

Images

Artemisia annua



**Peter Griffee (Courtesy of EcoPort,
www.ecoport.org)**

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Ocimum kilimandscharicum

Images

Ocimum kilimandscharicum harvest

**Kakamega forest integrated
conservation project**



icipe, Wilber Lwande

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Tamarind Images

Tamarind



**Arnoldo Mondadori Editore SpA, Courtesy
of EcoPort (www.ecoport.org)**

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Sutherlandia

Images

Sutherlandia frutescens flowers



The flowers are bright red, 35mm long, and are borne on short stalks in loose clusters.

Ellis RP, Courtesy of EcoPort

(www.ecoport.org)

Sutherlandia frutescens



This soft sub-shrub is widespread throughout South Africa. Prefers disturbed and gravelly soils.

**Ellis RP, Courtesy of EcoPort,
www.ecoport.org**

Sutherlandia frutescens bush with fruit



The fruit, which are inflated pods, become pale brown and papery when ripe and accumulate under and on the bush in large numbers.

**Jooste M., Courtesy of EcoPort
(www.ecoport.org)**

Sutherlandia frutescens seeds



Seeds black, flattened, reniform and pitted, with funicle; about 5 mm long.

**Botha R, Courtesy of EcoPort
(www.ecoport.org)**

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Mondia

Images

Mondia whitei, flower



Leopard Rock Game Reserve, Vumba, Zimbabwe, 30 Dec 2003

Mark Hyde and Bart Wursten, Flora of Zimbabwe

Mondia whytei

Mondia in Kakamega, Kenya, Oct 2008



Monique Hunziker

Mondia whitei, stipules



Mondia whitei. Perennial climber. False stipules with stiff fimbriae between each pair of leaves. in open miombo woodland, 23 Jul 2004

Mark Hyde and Bart Wursten, Flora of Zimbabwe

Mondia whytei, root

Mondia in Kakamega, Kenya, Oct 2008



Monique Hunziker

Mondia harvesting

The roots of *Mondia whytei* are harvested extensively from Kakamega Forest in a well organized trade leading



**to scarcity of the plant
Mondia whytei roots are sold
in towns in Kenya and in
other African countries.**

icipe

Mondia whytei market

**The roots are eaten by the
young and old as a flavoring**

and appetizing agent.



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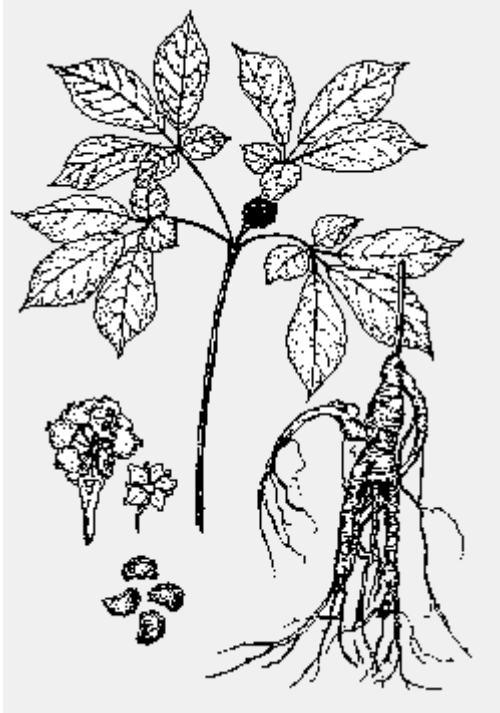
Prunus africana

Images



Prunus africana

www.ecocrop.fao.org



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