MEDICINAL PLANTS AT LCPH
2024 GUIDE

Introduction

Purpose and sources
The purpose of the guide is to aid patients, clinicians, and herbalists at the Lamu Center of Preventative Health (LCPH) in Lamu, Kenya.

This guide was compiled using multiple sources. A primary source was Rebecca Mafazy, *The Swahili Art of Life*, especially Chapter 7 "The Swahili Art of Healing." We also consulted a 2014 study by Rebecca and Munib Mafazy, "Concepts of Illness among the Swahili of Lamu, Kenya," *Journal of Transcultural Nursing* 25 (3):218-222. Details on specific plant uses, preparations, and dosages were gathered through herbalist interviews conducted by Sundus Mafazy and Majid Said Mafazy, on-site director of LCPH. The local herbalists (twabibu) interviewed were Ali Salim Mohammed, Zainab Ahmed, Sabaha Athman, and Mwana Jumma. The herbs detailed in the guide were selected using these primary sources.

Two interns at Illinois Wesleyan University, Peter George and Miles Keaton, consulted many secondary sources to compile profiles, review the existent scientific literature, and collect salient details from research studies. In "Sources," readers will find some of the many studies about the plants to be found in journals like the *African Journal of Pharmacology and Therapeutics* based at the University of Nairobi.

Four kinds of secondary source can be distinguished: (1) "review articles," where scholars aim to collect all peer reviewed information about a plant in one place, organize the claims for active ingredients and properties, and identify the most promising programs of future research and empirical testing; (2) "analytical assays," where scholars isolate and describe chemically active ingredients and test their effectiveness in the lab "in vitro," e.g., in test tubes; (3) "animal studies," either in the lab or in the field, where active ingredients are tested on live animals, usually mice or rats in a controlled laboratory setting; and (4) "clinical studies," where active ingredients are tested on humans.

While the assays are not experimental, they are important for determining causal mechanisms, or the active ingredients in the plants. By contrast, animal and clinical studies do follow the experimental–treatment and control–method. They apply tests of statistical significance to measure the degree of impact along the specific causal pathways identified in the assays.

Joining Health Traditions

A Swahili proverb runs as follows: *Ugonjwa ni moja, matibabu wana tofauti ya elimu,* In English, "Sickness is the same, doctors differ in their science." The saying holds true for Lamu. There appear to be three different approaches to healthcare on the island: those who hold solely to the modern scientific method; those who hold only to the traditional, mainly Swahili ways; and those who try to embrace both modern science and traditional culture. We have taken the third approach here: the plant entries include information from laboratory studies and herbalist recommendations.

From its origins, the LCPH has been committed to "cultural competence" and offering "combination" approaches whenever possible. The Lamu clinic has favored "culturally congruent care" as articulated by Rebecca Gearhart Mafazy and Munib Said Abdulrehman Mafazy in their 2014 study. We expect that a joined approach can make use of the best of both traditions. The scientific method produces powerful insights, but it does so, at least in the main, by breaking compounds into constituent pieces and studying them part by part. The method is powerful in what it reveals, but it works necessarily by reduction and often gives us information about parts without consideration of the whole. The cultural approach is more holistic and allows the caregiver to situate the patient meaningfully within a larger context. It is an insightful but indeterminate method positing a necessarily plural, messy, and evolving whole.

The 2024 Guide represents an effort by LCPH to build a spirit of cooperation between the Lamu herbalists and clinicians. We ask both practitioners to stand aside from their approaches long enough to seek what is best for their patients—regardless of which tradition promises the surest route to health.

Production

Many hands went into the making of the guide you are holding in your hands. We see it as a prototype and hope it is only a 1.0 version with many iterations to follow. We want to thank Amy Aldeman for her expert work typesetting, Brady Poisal for his technical skill producing the plant images, and The Copy Shop in Bloomington, Illinois for the quality printing.

Peter George, Miles Keeton, and Jim Simeone

Bloomington, October 2024

List of medicinal plants (Miti shamba)

1. **Black seed (Mbegu nyeusi)**

Description: Black seed (*Nigella sativa*) is an annual plant with white-bluish flowers, growing to a height of 20–30 cm. The leaves are thin, light green and linear. The parts of the plant used medicinally are the black colored seeds resembling cumin (and sometimes referred to as black cumin).

Origin and Habitat: Black seed is native to a vast region of the eastern Mediterranean, northern Africa, the Indian subcontinent, and Southwest Asia. An annual plant, Black seed germinates between 7-14 days after planting, and blooms from late spring to early fall. Black seed has not done very well when planted in Lamu soil. Because of this history, there is little local knowledge of growing time, when the seed matures, length of growing season, or harvest times. LCPH has the long-term goal of cultivating black seed elsewhere in the region in order to assure some local supply.

Preparation: Black seed oil is a carrier oil: it is produced by pressing the seed, unlike essential oils, which are produced through distillation. Oil extracted from the seed and leaves are ground into a powder; both products are manufactured elsewhere and purchased locally. The seed and leaves of this plant contain its medicinal properties. Manufacturers pulverize the seed and infuse it in a neutral oil for two-three weeks to concentrate its benefits.

Uses: Medicinally, this plant is mainly used internally. It has been shown to be effective in treating diabetes (sukari). It acts by alleviating and improving the vascular complications of diabetes. It has also been shown to have antimicrobial benefits, meaning it kills infection, and has uses against hookworms and nodular worms. In Lamu, it is used internally for respiratory inflammation (asthma), bodily inflammation (cramps), to help a woman get pregnant, to reduce fever, to aid in weight loss, to combat diabetes, and to control blood pressure. Externally, it is used to treat joint pain (rheumatism) and to prevent hair loss. Other uses by herbalists in Lamu include storing black seed in the home to drive away evil-eye (hasfad) as well as evil spirits or jin (hasidi). Herbalists recommended always keeping some of this herb in the house.

Dosage: In Lamu, the oil is applied externally; the seed and leaf powder are used internally. Herbalists mix one tablespoon of powder in a cup of honey and direct patients to consume the mixture three times a day. Doses vary based on the condition being treated, and outside of Lamu the oil is taken internally. In one clinical study of the use of black seed to treat diabetes, patients in the treatment group were prescribed one 500mg capsule of black seed oil per day for eight weeks.

Side effects: Doses used in the clinical study did not have a negative effect on kidney and liver function in the patients being treated and monitored. Herbalists in Lamu report that topical treatment of black seed oil can lead to skin rashes. They also report that internal use can lead to vomiting and constipation. Zaatari is used to counteract these effects.

Properties: As a treatment for diabetes, black seed's active ingredient is thymoquinone, the major phenolic terpene. Black seed oil is also a valuable source of essential fatty acids (e.g., phytosterols, glycolipids and phospholipids). However, one clinical study found the impact on cholesterol and glucose levels not to be statistically significant. Black seed is valued for its nutritional properties, such as supporting cellular energy. The active ingredients in these last two properties are unknown. Antimicrobial and antifungal compounds in black seed have been identified, but how they work is not well understood.

Sources:

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(clinical study) Javaheri, J., et al. (2023). The Effect of Nigella sativa Powder on Blood Sugar and Lipid Profiles in Type 2 Diabetic Patients. *Jundishapur Journal of Natural Pharmaceutical Products* 18(2).

(review article) Ramadan, M. F. (2007). Nutritional value, functional properties and nutraceutical applications of black cumin (Nigella sativa L.): an overview. *International Journal of Food Science & Technology* 42(10).

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Mbegu nyeusi Black seed (Nigella sativa)

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2. Syrian oregano (Zaatari)

Description: Syrian oregano (*Origanum syriacum*) is an aromatic perennial herb in the mint family (Lamiaceae). It has clusters of small white/pink flowers, woody roots, and hairy stems, growing to a height of 60–90 cm. The plant grows in a dense upright shape. Its stems are green or reddish, stiff and upright, with opposite leaves, which are a velvety gray-green. Origanum syriacum exhibits high degrees of polymorphism, meaning it naturally expresses great genetic variability; its chemical composition varies. In particular, some subvarieties have more of a key active ingredient (carvacrol) and some of another (thymol).

Origin and Habitat: Zaatari is native to to the eastern Mediterranean region to the Arabian peninsula and widely used in culinary practices, particularly in Syria, Lebanon, Jordan, Egypt, Palestine, and Turkey. The word 'zaatari' comes from the Arabic verb "za'tarra" meaning "to sprinkle" and refers to the fact that the plant is the main ingredient in a commonly used spice mix. The plant germinates between 7-14 days after planting. While the plant is very drought resistant, watering is essential in the first year when roots are getting established. Zaatari blooms from late spring to early fall, but is not known to grow locally in Lamu. Thus, there is little local knowledge of growing time, when the seed matures, length of growing season, or harvest times. LCPH has the long-term goal of cultivating Syrian oregano at its farm in order to assure some local supply.

Preparation: Studies indicate that harvest time, type of soil, and climate all affect the quantity and quality of the essential oil extract. The oil is extracted from the whole plant through hydro distillation, thus making oregano oil an essential oil. By this process, the plant is shredded and fully immersed in boiling water or permeated with steam. The distillate is then condensed and separated; after drying, the essential oil is collected. It should be stored in a dark, cool place in a sealed glass vessel. The oil is currently not produced in Lamu and so must be purchased at the herbalist store (duki la mitishamba). It is prepared by placing a handful of leaves or powder in a liter of water. The water is to be heated but not boiled and the lid is closed to allow for saturation. Patients are directed to drink the infused water three to five times a day for as long as necessary depending on the severity of their condition.

Uses: Medicinally, zaatari is used internally and topically. It has been shown to be effective in antibiotic and antifungal applications. It is used as a cough medicine and for skin fungi. In addition, it contains numerous phytochemical compounds, including terpinene, many of which have been shown to have high antioxidant capacities. Anti-inflammatory properties have also been demonstrated through in vitro studies. In Lamu, zaatari is used internally to reduce a mother's pains during childbirth, to move gas into the stomach, to remove stomach infection, as a general antibiotic, and to regulate blood pressure. Also,

smoke from a fire smoldered with zaatari leaves is directed toward an infant using a *fusho* to induce sleep.

Dosage: Internally, the extract is taken in capsule form; topically, it is diluted in a mixture of carrier oil such as beeswax or gelatin.

Side effects: We currently do not have any information on the side effects of medicinal zaatari. Clinical studies (tests on humans) of origanum syriacum have been few to none.

Properties: Zaatari has been shown to possess antibacterial properties due to its active ingredients carvacrol, eugenol, and thymol. Their antimicrobial efficacy is based on their hydrophobic structure and chemical composition, properties which facilitate the penetration of these substances into the bacterial cell membrane. The antifungal or cytotoxic nature of zaatari's essential oils is also due to their lipophilic nature, enabling them to penetrate the cell wall and cell membrane.

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(analytical assay) AL-Mariri, A., et al. (2019). In Vitro Antibacterial Activity of *Origanum syriacum* L. Essential Oils Against Gram-Negative Bacteria. *Avicenna Journal of Clinical Microbiology and Infection* 6(1).

(analytical assay) Mayadah, S., et al. (2019). Rapid, Cost-effective and organic solvent-free production of biologically active essential oil from Mediterranean wild *Origanum syriacum*. *Saudi Pharmaceutical Journal* 27.

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Zaatari Syrian oregano (Origanum syriacum)

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3. Moringa (Mlonge or Mzunze)

Description: Moringa (*Moringa oleifera*), called the "tree of life," is a medium-sized, fast-growing tree with whitish-gray bark. Also known as the drumstick tree on account of the look of its seed pods (which are triangular in shape), it develops an umbrella canopy of lush green leaves and fragrant white flowers. The leaves grow in compound fronds of up to 60 cm. It is drought resistant and can live up to 40 years. There are 13 sub-species of moringa in Kenya and the tree exhibits high degrees of polymorphism, with the consequence that it naturally expresses much genetic variability.

Origin and Habitat: The tree is native to the Himalayan foothills of northern India, but has been introduced in many parts of Asia and Africa for medicinal purposes. "Moringa" comes from the Tamil word for "twisted pod." Its seeds germinate within two weeks of planting. It can be propagated from cuttings as well. A single tree can produce up to 25,000 seeds. But, because it is cross-pollinated, more than one specimen is needed to produce fruit. Moringa grows well and quickly in Lamu, does not take much water to grow, and–although it is not native and a fairly recent import–many of its properties are already well-known.

Preparation: All parts of the plant have been used medicinally. Leaves can either be consumed raw or dried or an extract of an aqueous infusion. However, studies show that antioxidant properties vary greatly based on the time of harvest (better in December than June) and soil type. The bark is boiled in water and soaked in alcohol to obtain infusions. The roots are soaked in alcohol or water and boiled. Moringa seed is ground into a powder. For maximum potency, leaves should be harvested in the morning before the sun is out.

Uses: Molecular studies show that moringa leaves have about as much potassium as a banana, more vitamin A than a carrot, about the same amount of Vitamin C as an orange, and are a good source of Vitamins B and E. It has been used as a nutritional supplement for humans and livestock. In Lamu, it is used internally to treat indigestion and to regulate blood pressure, cholesterol, and blood sugar; it is used externally to reduce swelling or inflammation (tumors).

Dosage: In many studies, leaves are prescribed in doses of 70 g a day. In Lamu, the standard dose is one teaspoon of powder (seed or leaves) mixed in a liter of water and taken in two to five small cups (kikombe kidogo) two to three times a day. In addition, seeds are eaten directly; leaves are either boiled in water and ingested or dried leaf powder is added to water as noted.

Side effects: Clinical studies (tests on humans) of Moringa oleifera have been few, but thus far no ill side effects have been reported. However, its impact on insulin and the thyroid suggest its use should be avoided by patients taking other medications relating to these. In addition, high levels of beneficial alkaloids and phytochemicals in moringa suggest that excessive doses could be harmful. Locally, herbalists know of no side effects, but they caution against ingesting moringa in the middle of the day when it is sunny.

Properties: Studies on diabetic rats have shown that Moringa oleifera has the power to reduce serum glucose. The active ingredient appears to be a certain flavinoid which mimics the action of insulin in the body. Its leaves have also been shown to contain seven times more Vitamin C than from oranges, ten times more Vitamin A than from carrots, 17 times more calcium than in milk, nine times more protein than in yogurt, 15 times more potassium than from bananas and 25 times more iron than that obtained from spinach. Studies have also shown that topical use of moringa seed oil on mice with ear edema controls inflammation. Preliminary studies suggest that moringa may also be effective as a control on blood sugar and blood pressure.

Sources:

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Mlonge or Mzunze Moringa (Moringa oleifera)

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4. Neem (Muarubaini)

Description: Neem (*Azadirachta indica*) is a fast-growing tree of the mahogany family (Meliaceae). Known in Swahili as the "tree of forty cures," neem grows up to 30 m in attractive, rounded crowns. It has thick furrowed bark and small white fragrant flowers. The tree has compound, toothed leaves up to 40 cm long; they are typically evergreen but will drop in cases of extreme drought. A bisexual tree, it produces a smooth yellow-green fleshy fruit with sweet- flavored pulp and a single stone.

Origin and Habitat: Neem is native to the Indian Subcontinent and drier areas of South Asia. This fast-growing tree has only been known in Lamu for 50 years; traditional knowledge of its growth patterns and properties is only now developing. For highest potency, leaves should be harvested early in the morning before the sun is out.

Uses: Nearly all parts of the tree have antifungal, antibacterial, and antidiabetic properties. Its oil is made in both essential and carrier oil varieties. Distilled neem essential oil is used as an insecticide, a fungicide, and oil from the bark is used to prevent tooth decay, but it is not recommended to be taken internally. In career oil (pressed) form, oil from neem leaf and powder has been tested extensively on human patients and found effective in a variety of uses. In Lamu, only the bark and leaves are used. Herbalists have found many uses for neem; they say that it is so valuable it is worthy of a sacrifice (sadaka). It is used internally to treat high fever (as in malaria), spinal cord disease, toothache and gum maintenance, inflammation, and headaches. It is used externally as a mosquito repellent, to nourish the skin, and in the form of a paste applied on the skin of cattle as a pesticide.

Dosage: One study prescribed 250 mg extract once a day for 16 weeks. Another administered two grams of leaf powder daily. In Lamu, the bark is ground into a powder and the leaves are either boiled or smoked. The standard dose is to mix a handful of leaves in a cup of water to be taken three times daily.

Side effects: Neem seed oil (both varieties), bark, and leaves are unsafe for pregnant women via consumption as they can cause miscarriages. In Lamu it is said that taken internally, it will exacerbate ulcers; and that applied externally it can increase hemorrhoids.

Properties: The active ingredient in neem seed oil is an isoprenoid nimbidin, which has been shown to suppress inflammation. In one study, a paste made of neem extract and turmeric effectively eliminated scabies. Neem extract was also shown to reduce significantly serum glucose and cholesterol levels in rats. In a clinical study, neem significantly ameliorated hypoglycemia in subjects with Type 2 diabetes, as compared to a placebo.

Sources:

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Muarubaini Neem (Azadirachta indica)

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5. Aloe (Subili)

Description: Aloe vera is a broad genus of plants that contains over 450 species. Most studies have been done on *Aloe barbadensis miller*, a perennial cactus-like shrub that grows in hot, dry climates. It belongs to the Liliaceae family. Its short-stemmed trunk holds long succulent leaves arranged in a rosette pattern. The leaves have sharp spines and sometimes have white spots on their surfaces. Aloe typically grows between 60-100 cm tall. The gel from the inside of the leaves is the primary medicinal product.

Origin and Habitat: Aloe mostly grows in the arid climates of Africa, India, and the American southwest. It can grow in a wide range of soils but the most desirable soil is a loamy mixture. Aloe is originally from the Arabian peninsula. The name "aloe vera" was derived from the Arabic word "alloeh" which means "a shining bitter substance" and the Latin word "vera" meaning "true." In Lamu, this resilient plant grows even in the dry season and in all soils. It is commonly planted in homes and gardens, and so is one of the most accessible and affordable medicinal plants on the island.

Uses: The gel from the leaves of the Aloe plant can be consumed as a juice or tonic that can help with digestion. The gel can also be used topically as a treatment for psoriasis, burns, and sores caused by the Herpes simplex virus. Aloe's effectiveness in healing burns, postoperative wounds, and breast fissure in lactating women has been proven in clinical studies. Research has also shown that aloe gel can regulate blood glucose and cholesterol levels. The green outer layer of the aloe plant contains a yellow fluid that has traditionally been used as a laxative. In Lamu, aloe has many uses. It is used to treat viruses in the eyes of chickens. It is added to the drinking water of dogs to control worms. For humans, it is used externally as a moisturizer in skin care, to promote hair growth, to reduce inflammation and pain in the joints, and internally to control constipation and improve digestion. Herbalists in Lamu consider an aloe plant a must have for the family garden; its presence has been found effective at warding off evil spirits.

Dosage: Lamu Herbalists recommend harvesting the leaves during the dry season, when they have the least water and the active ingredients are most concentrated. Aloe cream is available from the Lamu groceries either in gel form as imported from India or in 100 shilling packets of dried aloe leaf. Placing a mixture of dried aloe and honey under the tongue has been incorporated as a ritual for cleansing at the Islamic New Year. It serves as a purgative and preventative measure for a new homeostasis. As for the main external uses, there is no standard dosage. The gel is extracted from the leaves and allowed to dry. The dried gel is then ground into a powder and stored in an airtight container. The concentrated powder is then rehydrated for use.

Side effects: Should be avoided during pregnancy and breastfeeding because of certain considerations when taken orally.

Properties: The gel of aloe vera has anti-inflammatory, antifungal, hypoglycemic and gastroprotective properties and it can also be used to promote the healing of skin wounds, burns and frostbite. Of these healing properties, aloe's anti-inflammatory has been studied the most extensively. Many of the medical effects of aloe have been attributed to the polysaccharides which are found in the inner leaf as well as alkaloids, tannins, and flavonoids, which have health promoting properties. These bioactive chemicals give aloe its anti-inflammatory, antifungal and hypoglycemic characteristics. The tissue Parenchyma's ability to efficiently bind organic molecules might play an important role in aloe vera's ability to lower cholesterol and retain carcinogens and other toxic chemicals. Clinical studies have also shown that 100 and 200 mg aloe gel powder taken with water daily over the course of three months significantly lowered blood sugar levels, cholesterol, triglycerides, and blood pressure, as compared to a control group.

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Subili Aloe (Aloe barbadensis)

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6. Fennel (Shimari)

Description: Fennel (*Foeniculum vulgare*) is a hardy perennial vegetable in the same family as carrots and celery (Apiaceae). It has grooved stems, intermittent leaves that are combined with dark green, fluffy leaves and sheathed petioles. Its flowers are typically bisexual and have yellow umbrellas that resemble oval beads. The small seeds from fennel have a fragrant scent and pleasant flavor. They are around eight mm in length and three mm in width. Fennel seeds have a long, thin, cylindrical shape, and their sizes fluctuate with plant growth.

Origin and Habitat: Native to southern Europe and the Mediterranean, it is found today throughout Asia, the Middle East, and America. Fennel grows to 1 to 2 m tall. It does not grow well in Lamu, and LCPH has not yet tried to grow it. Currently, the seed can be purchased at the herbalist in 50 g packages for roughly 25 shillings.

Uses: As a vegetable, fennel is featured in Italian, Greek, Middle Eastern, and Indian cuisines. A good source of Vitamin C and manganese, it is used for treating chronic fever as well as obstructions in the hepatic, gastrointestinal, respiratory, and urinary tracts. In addition, it is used to treat conditions relating to the eyes, such as cataracts, and the stomach, such as persistent diarrhea, endocrine, reproductive, and respiratory systems. On Lamu, fennel is used as a food ingredient, as a digestive aid, for respiratory and coughing conditions, and to fortify breast-feeding mothers.

Dosage: In Lamu, fennel seed is ground by mortar and pestle and consumed as a tea. The tea is made with one-two teaspoons of powder in a cup of boiling water. The mixture is steeped for ten minutes and taken three times a day. For digestive issues, the seeds are also chewed. At weddings, fennel seeds are served at the end of a feast as a digestive.

Side effects: Doses used in the studies did not have a negative effect on kidney and liver function in diabetic patients who have been treated and monitored. In Lamu, some have reported rashes and swelling reactions. In the case of breast-feeding mothers, if the infant indicates irritation, the dosage can be lowered.

Properties: Fennel can trigger transcription factors that allow for the insulin-like growth basic to proper animal growth. In controlled studies, fennel seed extract was shown to activate a protein protecting the bowel in mice. The essential oils of fennel seed have also been shown to contain anti-microbial and anti-inflammatory properties. They suppressed the activation of neutrophils and might be widely effective for

the treatment of neutrophilic inflammatory diseases. Studies of the effect of a fennel seed extract diet on sheep demonstrate a positive impact on the healthy growth of muscle tissue.

Sources:

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Shimari Fennel (Foeniculum vulgare)

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7. Long pepper (Pilipili ndefu)

Description: Long pepper (*Piper longum*) is a flowering vine in the pepper family (Piperaceae). A woody evergreen perennial, it grows to 60 cm. It has green leaves grow in a simple, alternate pattern; its fruit, which grows to seven cm in the form of a catkin, turns reddish once ripe. In both fresh and dried forms, the fruit is used commonly as a spice in cooking and medicinally.

Origin and Habitat: Long pepper is native to South Asia, but is found everywhere on Lamu. It grows in all soils, where it requires little care, and in pots, where it needs to be watered.

Uses: Long pepper plays a central role in the cuisines of Malaysia and Indonesia. Medicinally, it is most commonly used to treat respiratory infections such as stomachache and, taken with other medicines, can promote their better absorption by the body. Multiple biological properties have been described for the herb including anti-tubercular, anti-allergic, anti-asthmatic, antipyretic, hypotensive, anti-fertility, hypoglycemic and coronary vasodilatory effects. It is used on Lamu to improve appetite, to boost the immune system, boost the libido, and to kill bacteria in the stomach. It has also been used locally as a pesticide and found effective at controlling rhino beetles on beans and as a mosquito repellant. In connection with its aphrodisiacal powers, use of long pepper is considered by herbalists to bring a good future.

Dosage: Fresh long pepper fruit is commonly put into stews. The fruit is quite variable in spiciness– some mild and others very hot. Medicinally, the standard dosage for internal use is one-two fresh fruits chopped up and added to any dish and used for as long as it takes to treat the symptoms. The dried fruit, ground into a powder, is also available for purchase.

Side effects: Doses used in the studies did not have a negative effect on patients who have been treated and monitored. Locally, side effects include skin irritation, acid reflux, and stomach upset. Yogurt is used to counteract these symptoms.

Properties: One study isolated the active compounds in long pepper and all produced statistically significant antioxidant effects as compared to a control. Antioxidants help reduce oxidative stress in cells by neutralizing harmful free radicals and activating an essential chemical pathway which boosts glucose uptake. This can prevent or mitigate the development of conditions like fatty liver and obesity, which are often linked to poor glucose metabolism. Another study showed that long pepper has stronger anti-inflammatory activity than indomethacin, a synthesized compound widely used for the treatment of osteoarthritis. Yet another study demonstrated that long pepper significantly mitigated asthma in

laboratory mice. Finally, a study showed that one active ingredient in long pepper, piperlongumine, reduced malignant brain tumors in mice and tumor samples from humans.

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Pilipili ndefu Long pepper (Piper longum)

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8. Mangrove apple (Koko ya mkomafi)

Description: Mangrove apple (*Sonneratia caseolaris*) is a tropical, evergreen, medium-sized tree in the same family (Lythraceae) as pomegranate. It grows in the mud flats along the coasts of the Indian Ocean. A fast-growing tree, mangrove apple can reach 20 m and produces a fruit similar in outward appearance to the persimmon. The trunk of the tree is a brownish-gray color and the flowers are red and have six petals. The fruit of the tree is typically 4 cm wide and is green and leathery. When it is ripe, the fruit can be eaten raw or cooked.

Origin and Habitat: Mangrove Apples are found in low-intertidal habitats in regions that receive high to moderate levels of rainfall. They thrive in tropical regions as they prefer full sun and lots of water and they grow in sand and mud along riverbanks. They are native to the Indo-West Pacific and have grown wild since ancient times. The fruit and seeds of the tree have been spread around by trade winds and the circulation of the ocean. In the Lamu rainy season, mangrove fruits are found floating at the seashore everywhere.

Uses: In southeast Asia, mangrove apples are used to soothe coughs and treat digestive issues. In Lamu, the fruits are also made into a poultice and used externally on skin irritations, insect bites, and bruises. In India, the fruits are fermented to create a medicine which is used to slow bleeding. In Lamu, the seeds are ground at home or purchased at the herbalist, ten seeds for 100 shillings.

Dosage: In Lamu, the seeds are boiled for several hours to soften them. The seeds are then pounded into a powder, which is then made into a paste and applied externally. It can be stored and used for up to three years.

Side effects: There could be possible vomiting if too much mangrove apple is consumed. The herbalists do not list any known side effects; they report that it is widely used.

Properties: Mangrove apple has not been well researched until recently. One older study found moderate antioxidant properties in powder made from the fruit, but another more recent study using ethanol extract found a powerful antioxidant property. The anthelmintic (anti-worm) properties have been confirmed as have its pain relieving and fever-reducing properties.

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Koko ya mkomafi Mangrove apple (Sonneratia caseolaris)

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9. Holy basil (Uvumbani)

Description: Holy basil (*Ocimum sanctum*) is an aromatic, medical herb that grows to nearly a meter tall and has sparse, hairy, green or purple leaves. A perennial in the mint family (Lamiaceae), holy basil has the typical basil morphology–having simple, serrated, oval-shaped leaves up to five cm long with spikes of purplish flowers. Holy basil is found in two primary subvarieties, green and dark purple or black, but both have similar phytochemical profiles.

Origin and Habitat: All varieties of holy Basil are native to India and commonly used in Ayurveda, the traditional Indian medicine system. The plant is commonly referred to as "Tulsi" from the Sanskrit meaning "matchless one." Considered an "elixir of life," it is revered as a sacred herb among the Hindus. It prefers full sun and moist, well-drained soil. It grows everywhere in Lamu and is found in every home. Planting it in clay soil allows the plant to thrive in drier climates; planted in sandy soil, it requires more watering.

Uses: Supports the immune system, relieves stress, promotes skin health, aids digestive health, and can decrease pain and swelling. In Ayurveda, holy basil has been used for its anticancer properties; extracts have been found to significantly reduce tumor cell size. In Lamu, it is used to control blood pressure, remove infection, control high fever, and aid in digestion. Smoking the leaves is used to create a mosquito repellant.

Dosage: All parts of the plant are used in Lamu, in fresh and dried forms. In fresh forms, whole strands can be soaked in water for five to six hours and the water is then consumed by the glass. For tea, fresh leaves can be boiled in water and let steep for five minutes**.** Holy basil leaf powder and essential oil extract is readily available to be purchased, but given its abundance on Lamu, not all families buy it from the store.

Side effects: Reported side effects from taking holy basil include lowered blood sugar, readier bleeding, and decreased fertility. In Lamu, no side effects have been noted.

Properties: Hyperglycemia was shown to be reduced in diabetic rats when an extract of holy basil was administered, in both acute and long-term studies. Studies of its use also demonstrated a decrease in pain and swelling in healing rat wounds. In addition, holy basil has been found to protect against cellular damage due to high levels of free radical scavenging activity.

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Uvumbani Holy basil (Ocimum sanctum)

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10. Hibiscus (Habiskasi)

Description: Hibiscus is a plant in the mallow family (Malvaceae**);** in some places it is perennial; in others it is annual. It exhibits great polymorphism and is found in at least three distinct varieties: *H. rosa sinensi*s, *H. syriacus*, and *H. sabdariffa*. H. rosa sinesis is more common and less expensive than H. sabdariffa, but there is less scientific evidence supporting its benefits. All grow 1 to 3 m in height and to1 m wide. It possesses a gray, woody stem that is odorless holding a gelatinous consistency inside. Hibiscus leaves are dark green in warmer seasons and yellow in the fall, their shape is ovoidal rounding to a sharp edge. The flowers are hermaphrodite, often self-pollinating, containing dark pink to crimson and dark purple petals arranged in radial symmetry up to 25 cm.

Origin and Habitat: Hibiscus rosa sinensis is native to southern China, Hibiscus syriacus is native to Korea, and Hibiscus sabdariffa is native to Malaysia. Currently, all are being cultivated across the globe. Hibiscus is best produced in the wild on mountain slopes, sunny edges of gardens, hedges, and partly in shaded gardens. In Lamu, hibiscus has been recently introduced– having been brought to shore by a fisherman within living memory–people believe from Madagascar. It is now found everywhere on the island, growing well even during the dry season and flowering within six weeks in the wet season. In addition, hibiscus is well-known on the island due to the popularity of traditional Egyptian hibiscus tea (karkade) sold at the herbalist.

Preparation: The red calyx (the structure around the petals) is the part primarily used, specifically in teas. Hibiscus petals are often left to dry out and are grounded into a powder. Purchased at the herbalist, it is often consumed in 500 mg capsules. One k of dried flowers sells for 500 shillings. The fresh petals can also be submerged into hot water to make tea, producing the same effects as the grounded powder. Ethanol extracts (produced by soaking the flowers in alcohol) have been used in many studies, but distilled or essential oil versions have been shown to more effectively pull in hydrophobic active ingredients and concentrate them.

Uses: Hibiscus has multiple uses for medicinal purposes in humans. It has been shown to inhibit the amount of calcium reflux into our vascular smooth muscle cells, which improves blood vasodilation, in turn, reducing hypertension. Hibiscus can also be used to increase the amount of insulin in the body by stimulating various hormones. It also has been associated with reducing fat mass and promoting anti-inflammation. In Lamu, it is used as a digestive aid, to reduce inflammation, to lower blood pressure, and to improve skin texture.

Dosage: Low dosage for a grounded powder would be 1.2 g daily and a high dosage would be 1.8 g daily. For teas, studies have recommended drinking 3 g of tea three times a day to produce the same effects.

Side Effects: With high dosages an increased likelihood of constipation and gas have been reported. No significant signs of toxicity have been detected.

Properties: Hibiscus has been shown to contain potent antioxidants, which are very important a defense mechanism against infection. It is popularly known as a "free radical scavenger" reducing their concentration in the body. Having too many free radicals is also associated with hyperammonemia and hypertension. Hibiscus sabdariffa reduces hypertension by improving vasodilation through the inhibition of calcium influx into vascular smooth muscle cells. One study demonstrated Hibiscus sabdariffa's ability to inhibit oral pathogenic bacterial strains; another showed its power to significantly reduce hypertension.

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Habiskasi Hibiscus (*Hibiscus sabdariffa*)

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11. Coffee senna (Mtokotoko wa kizuka)

Description: Coffee senna (*Cassia occidentalis)* is an annual, bi-annual, or perennial shrub in the legume family (Caesalpiniaceae). It grows to 1-2 m tall. It has spaced out arboraceous branches that produce many dark green leaves. Its flowers are yellow from spring to fall depending on when it begins to bloom, and it continues to produce them until conditions become unfavorable. The fruit produced from these flowers are a light green, positioned straight up, and have visible seeds or beans. The fruit can range from 7-13 cm when fully matured. Over time the beans will naturally dry out on the plant when they are ready for harvest.

Origin and Habitat: Originally native to North and South America, the plant is quite adaptable to various temperatures and conditions; it has been found to grow in regions like the side of the road, or garbage dumps. In India, it is used widely in ayurvedic treatments, and in western Asia is used in the Unani tradition. It can be invasive in some regions of Kenya where it overgrows in many areas. It is frost tolerant and can handle a range of sun exposures. It prefers humid regions and is most commonly cultivated in subtropical or tropical regions. On Lamu, it grows everywhere, though it can be hard to find in the dry season.

Preparation: The leaves, roots and fruit are used for medicinal purposes. The leaves are either ground and consumed in powder form or seeped in hot water to produce a beverage. In Lamu, the root is soaked in water for five to ten minutes, and taken by glass three times a day.

Uses: Extracts of the leaves have been found to have strong antimicrobial properties. The plant is also very effective in treating thalassemia (anemia) since it has the ability to reduce iron concentrations in the body, and covers many neuroactive and neuroprotective benefits. It is used to control gastrointestinal nematodes in sheep and goats. When taken as a beverage, it can attack and aid against harmful parasitic worms. It has been shown to protect against liver disease and Alzheimer's disease. In Nigeria it has been used often to assist with digestion and aid with general intestinal and gut health. In Lamu, it is used to treat constipation, relieve pain during childbirth, calm stomachache, and combat infection.

Dosage: Can be very damaging to the heart when overused. Consumption of more than seven or eight beans at a time can lead to poisoning. Not recommended to be given to children, for it may be much more harmful and degrading to their health. Herbalists prescribe patients a dose of three glasses per day of water soaked in Coffee senna root.

Side Effects: There are no side effects known in Lamu. Eating the beans commonly causes toxicity in cattle, and human poisoning has been rare. But one prominent case in India involved children left with severe jaundice and lethargy and taken to the hospital upon consuming many Cassia occidentalis seeds. Investigation indicated poisoning affecting multiple organ systems, primarily the liver, muscle, and brain (encephalopathy). Symptoms ranged from fever, heart palpitations, nausea, dizziness, weakness, to seizures. Other children may have died of heart attack at home after consuming too many beans.

Properties: The many properties of Cassia occidentalis have not been adequately studied. Both active ingredients and toxins are many. By reducing oxidative damage, it allows enzyme levels to improve, increasing protection against neurodegenerative ailments like Alzheimer's. Its benefits against thalassemia (anemia) are attributed to its ability to reduce high iron concentrations in the body. One study found it to have potent antibacterial and antitubercular properties. Hebalists in Lamu smoke Coffee senna leaves to cast out spells.

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Mtokotoko wa kizuka Coffee senna (*Cassia occidentalis*)

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12. Guava (Pera)

Description: Guava (*Psidium guajava*) is a low evergreen tree or shrub in the myrtle family (Myrtaceae). It grows anywhere from 1-8 m tall and has wide spreading branches and downy twigs. The leaves are oval or oblong shaped and are between 7-8 cm long while the flowers are four-petaled, white, and can grow 2-3 cm in diameter. The guava fruit can be round or egg-shaped, and begins with a green color; once it matures, it generally becomes a yellowish color. However, the tree exhibits great polymorphism and the fruit can run the spectrum from green to yellow to orange to pink.

Origin and Habitat: Guava is native to Central and South America, Mexico and the Caribbean. Guava trees are tropical to subtropical plants meaning that they thrive in full sun and well- drained soil. Guava plants need a minimum of six hours of sunlight per day but it should be closer to eight or ten. They grow best in soil that is well drained with a 5-7 pH. It is thought that guava was brought to Lamu by Vasco de Gama as its name in Swahili follows the Portuguese word for pear. It grows very well on the island and the mainland, and trees often produce fruit two or three times a year. It grows best when the ground underneath it is cleared of competing plants. In the dry season, it needs watering to thrive.

Preparation: Guava has long been eaten fresh, right off the branch or it can be made into a juice. *Agua fresca* is a guava fruit-based beverage that is popular in Latin America. In Lamu, the fresh fruit sells for five to ten shillings a piece. Recently, the leaves have been used medicinally. Herbalists recommend steeping the dried leaves for ten minutes to make a tea.

Uses: People use the leaves of the guava trees for stomach and intestinal conditions including diarrhea and other digestive system disorders, diabetes, and wound healing. The fruit is also used to treat high blood pressure. In Lamu, a paste is made of the leaves which is used externally to treat acne. Chewing its twigs is used to treat gum infection and bad breath. In addition, the fresh leaves made into a tea and taken internally to treat diabetes. The leaves are variable in taste–some sweet and some sour—but all are considered a good source of Vitamin C.

Dosage: Herbalists prescribe drinking per day one liter of tea made from boiling five to ten fresh leaves in water.

Side Effects: Herbalists have noted that drinking too much guava juice may lead to stomach upset. Several studies indicate that, even at high doses, the fruit and leaves are safe to consume.

Properties: Studies have shown that guava can help fight against diarrhea because the leaves have the ability to inhibit diarrheal pathogens and can decrease frequency of defecation. Other studies showed that guava leaf extract possesses significant hypoglycemic activity and is effective in preventing Type 2 diabetes and for its treatment when chronic.

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Pera Guava (Psidium guajava)

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13. Sandalwood (Liwa)

Description: Sandalwood (*Santalum album*) is a slow-growing, aromatic woody evergreen tree in the same family as the mistletoe (Santalaceae). The tree's wood, heavy, fine-grained, and yellow, is prized as lumber and for its fragrance. It is partially parasitic on other plants for reproduction and comes in a variety of forms including shrubs and climbing vines.

Origin and Habitat: Santalum album is native to India. Its wood and oil is used in the ayurvedic tradition. Long a part of human culture, sandalwood was used by the ancient Egyptians to embalm their dead.

Uses: Its distilled essential oil is widely used around the world for incense and as an aromatic. In Lamu, people pay more for sandalwood as lumber than as medicine. A piece of the wood suitable for furniture will go for 2000 shillings, whereas a few sandalwood roots will be given away free. It is used as an antiseptic to clean wounds, to soothe the skin during chicken pox, to reduce swelling, and to make the skin smooth. Sandalwood is used in Swahili marriage ceremonies as a paste on the face to purify the bride and groom.

Dosage: In Lamu, the wood is ground (on a stone not by mortar and pestle) and mixed with water to form a paste. The paste may be reapplied twice daily, and it must be made fresh each time. Sandalwood paste does not store well.

Side effects: Not known to have any. Its safety for oral use has been confirmed by testing.

Properties: The active ingredient in sandalwood oil is alpha-santalol, a phytochemical sesquiterpene. Clinical studies show it controls acne. Lab and clinical studies have demonstrated its ability to inhibit skin cancer and remove warts. Herbalists in Lamu recommend that every family have some sandalwood on hand.

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Liwa Sandalwood (Santalum album)

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14. Myrrh (Mane mane)

Description: Myrrh (*Commiphora myrrha)* is a spiny tree in the same family as frankincense (Burseraceae**).** It grows to 5 m and has oval gray-green leaves about 44 mm long.

Origin and Habitat: Myrrh is native to the Arabian Peninsula and the east African coast, including Somalia and Kenya. Its name comes from the Arabic word meaning bitter, which name it has due to its sour smell. Myrrh was used by the greatest of all medieval clinicians, the Muslim physician al-Razi, to treat aliments of the kidney, bladder, and stomach. It grows on slopes and valleys in desert areas. It does not grow well in Lamu, but it can be purchased at the herbalist (20 packets for 20 shillings or a whole tin for 200 shillings). LCPH is experimenting with growing it on the Lamu farm.

Uses: In Lamu, it is used to reduce swelling, to relieve pain, to heal fractures, to lessen a mother's pain after childbirth, to treat irregular periods, and to clear boils or staff infections in wounds (diffusion pulls the infection to the surface). Some also use it to treat infection in cattle. Other uses include treatment of mouth ulcers, bad breath, sore throat, and acne. Myrrh is used as part of the ayurvedic system in India, and is now extensively imported into China.

Dosage: Myrrh is prepared in combination with turmeric and aloe, which is applied externally around wounds or fractures. Internally, the pale-grey or brown-red resin is extracted from the leaves and bark and allowed to dry. Often the gum-like resin will be found oozing from the tree bark. The dried sap is then ground up and taken with 1.5 l of water drinking one or two cups a day.

Side effects: No side effects are known to the Lamu herbalists. It was approved as a food additive by the US Federal Drug Administration in 1992. However, distilled myrrh essential oil can be toxic if consumed.

Properties: Myrrh is one of the oldest medicinal known to humans but recently it has been studied for its anti-inflammatory and anti-cancer properties. Its active ingredients are steroids, terpenoids, and various phytochemicals. Lamu herbalists believe it is a medicine every home should have; it stores well as an essential oil. Lab studies demonstrated the mechanism of wound healing was the ability to modulate microphage function. Studies on bring shrimp and chicken embryos showed myrrh to contain antifungal and antibacterial properties. In vitro studies indicated that myrrh is an effective anti-cancer treatment for several different cancer cell lines. It has also been shown to be very effective in deterring colitis in lab rats.

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Mane mane Myrrh (Commiphora myrrh)

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15. Bellyache bush (Kiuno pembe)

Description: Bellyache bush (*Jatropha gossypifolia*), also known as cotton-leaf jatropha, is a shrub with lobed leaves and red or purple flowers. It is in the same family as spurge (Euphorbiaceae). The succulent leaves are 3 lobed and sticky when young and 3-5 lobed when mature and can grow 5-14 cm long and 7-13 cm wide. The flowers have yellow centers and grow up to 9 mm wide. The 1 cm seed pods produced are poisonous.

Origin and Habitat: Bellyache bush is native to Central and South America, as far north as Mexico and all the way down to Paraguay. It is a frost-sensitive tropical plant. The plant is not native to Lamu, but it has been in use as long as anyone can remember. It grows plentifully in areas that get a lot of rain and is harvested in the rainy season before the leaves become too dry. It is currently listed as an invasive species in many countries.

Uses: The fresh leaves and sap have been widely used for healing fresh wounds. It has been traditionally used for its anti-inflammatory, analgesic, antimicrobial, antidiabetic, and antifungal applications. In 1758, Benjamin Franklin listed bellyache bush and pennyroyal decoction as an abortion tonic. The seeds are also used as a laxative. In Lamu, the sap from the leaves is used externally to treat skin allergies and rashes, remove age spots, as a pain reliever, and as a burn and scar ointment.

Dosage: Four to five fresh, young leaves are ground. The sticky substance is then mixed with coconut oil and applied externally.

Side effects: No side effects are known in Lamu, but herbalists emphasize that the leaves used must be freshly harvested and it cannot be stored effectively.

Properties: Combined with J. Curcas, J. Gossypiifolia was found to create a significant reduction in blood sugar levels in lab rats. Root extract was also found to be effective at combating anemia in lab rats. Its active ingredients are both terpenoids and flavinoids.

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Kiuno pempe Bellyache bush (*Jatropha gossypifolia*)

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16. Prickly ash (Maasai)

Description: Prickly ash **(***Zanthoxylum usambarense*) is a shrub in the same family as kumquats (Rutaceae). It grows from 2 to 5 m tall. Possessing a woody base and branches that produce various dark green, concave and round leaves. The fruit is produced on newer green stems and when fully matured is a dark purple with multiple to a branch. The plant can grow around 40 cm in diameter and can be cleared of branches for several meters.

Origin and Habitat: Zanthoxylum usambarense is native to East Africa, including Ethiopia, Kenya, and Zambia. It typically grows in highland areas, especially in dry forests exposed to sun. The plant is quite resistant to high temperatures.

Preparation: Herbalists boil 40 g of stem bark in water or steeped it in oil for two days. It is then added to various beverages or consumed alone.

Uses: Zanthoxylum usambarense is commonly used against malaria by some Kenyan communities. Interest in its use has grown since the discovery in western and central Kenya of strains of malaria parasites resistant to quinine and chloroquine.

Dosage: Doses are tailored to the patient's need and ailment severity.

Side Effects: No specific side effects have been documented for Zanthoxylum usambarense used in traditional medicine.

Properties: The active components, usambanoline and tembetarine, are alkaloids that stop malaria hemoglobin production. They also interrupt foreign DNA and protein production by increasing oxidative stress, reducing the ability for viral replication.

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Maasai Prickly ash **(**Zanthoxylum usambarense)

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