

## ***Argania spinosa* (L.) Skeels**

Sapotaceae



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### **Morphological Description:**

A thorny, evergreen tree with small, green, lanceolate leaves. It can reach heights of up to 10 meters and lives approximately 150 – 200 years. The fruit has a green, fleshy exterior like an olive, but larger and rounder. Inside, there is a nut with an extremely hard shell, which in turn contains one two or three almond-shaped kernels. A thin, fleshy and hard to peel layer surrounds the nut. The fruits of the Argan can take up to one year to ripen. The seeds contain valuable edible oil rich in essential fatty acids.

### **Geographical Distribution**

**Local:** The argan tree, *Argania spinosa*, is a species native to Morocco and the second most common tree in the country. It grows wild and profusely in the area extending from Safi to the fringes of the Sahara and bounded by the Atlantic Ocean to the west and the Atlas Mountains to the east. Its geographic distribution is limited; located 29°15' to 31°20' N; 8°10' to 10°25' W. within the area where the argan grows there are about 21 million trees which play a vital role in the food chain and the environment, though their numbers are declining.

### **Ecology**

*Argania spinosa*, is native Moroccan botanical treasure from the Atlas and Anti-atlas Mountains, which adapts well to sandy, saline and marginal areas. It is extremely drought tolerant and thrives in semi-arid and arid zones where annual precipitations do not exceed 300 mm. In severe drought

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*Sideroxylon spinosum* L. (Old name given by Linné in 1737)

**Arabic:** Argan, Louz el-barbary (fruits); means:

اللوز البري - أرجان

**Berber:** Argan, Ardjan, Tizmint or Feyyacha (fruits),

**English:** Argan Tree, "the tree of iron", and "the olive tree of Morocco".

**French:** Arganier

conditions, the tree drops all of its leaves and becomes dormant. The dormancy period, which can last for several years, is broken when the tree senses moisture in the air. Its leaves are adept at absorbing any available moisture present in the air. Its root system can search for water 30 meters below the earth's surface. As a result of its extensive root system (up to 30 meters below the earth's surface), the argan tree is a major contributor in the fight against soil erosion and desertification. Its roots have a symbiotic relationship with microscopic mushrooms which deliver nutrients to the roots while the roots provide the moisture that enables the mushrooms to live. The process is called "mycorization".

Argan trees act as an excellent barrier against the desert. Under and around the trees, flora and fauna thrive and in turn create an eco-diversity crucial to this region.

In its place, Argan tree plays a vital role in maintaining the ecological balance and preserving biodiversity.

### **Propagation**

Primarily and easily by seed.

### **Status**

Vulnerable species.

Argan tree known to be a relic of the tertiary period is now endangered largely due to urban expansion and agricultural practices. Despite a strong legislative effort by the Moroccan government to control this problem, it continues to grow.

The Argan Forest now covers less than one million hectares. Unfortunately, in less than a decade, more

than a third of the argan forest has disappeared and its average density has declined from 100 to 30 trees per hectare. Researchers agree that without aggressive intervention, this national treasure will be lost over the next 20 years.

Argan tree should not be considered as a fossil, which is disappearing, but rather a tree of the future for certain arid regions. It is therefore vital to improve the argan tree's production potential, so that it can regain its key position in the agricultural systems of the region.

Currently, a handful of potential Biosphere Reserves are under consideration. Morocco is focusing on establishing Biosphere Reserves in the Souss Massa region, with special emphasis on the conservation and research in the multi-purpose tree *Argania Spinosa*.

Some relief has come also from a few international organizations and local NGOs. For example, The International Development Research Center (IDRC) sponsors a project aimed to help prevent further environmental degradation as well as to improve the economic well being of the rural populations of the Argan region in Southwestern Morocco.

## Parts Used

Fruits for oil, others for other purposes

### Production

The Argan tree bears fruit according to its age, the density of the tree population, the environment, and the amount of rainfall. One hectare of argan trees can produce 800 kilos of ripe fruit, which will later yield 40 kilos of nuts. These 40 kilos of nuts produces about 18 liters of argan oil.

### Harvesting

The collection of the fruits from the trees may be by hand or by goats. In the later, the trunk of the Argan tree is often twisted and gnarled, allowing goats to clamber along its branches and feed on the leaves and fruits. When goats eat the fruits, the fleshy part is digested but the nuts, because of their hard shell, are excreted during rumination. Farmers then collect the nuts.

Argan oil, extracted from the almond.

### Processing

The ripe fruit is spread out to dry in the sun and then de-pulped manually. Then the core is broken with two specially shaped stones in order to retrieve the seeds, which are then roasted and then ground.

Water is added to the paste that is created from grinding the seeds, and the oil is then extracted by kneading this paste. The yield is rather small: 100 kilos of fruit yields approximately 2 liters of oil. The production of argan oil, which is still mostly done by traditional methods, is a lengthy process. It is prepared in all the homes of this region, exclusively by women, as it has been for centuries. Several years ago, homegrown and foreign entrepreneurs began to develop new, more efficient processes. Inspired by the traditional method of production, they designed and developed new equipment and adapted others to the specific needs of Argan oil. The result is a cold-pressed oil second to none in flavor and quality, enjoyed in the domestic market, and by discriminating palates all over the world.

## Market

Argan oil is manufactured traditionally on a small scale.

## Constituents

Argan oil is deep golden oil, often with a reddish tinge. It is lighter in weight than nut oils and olive oils, having a weight and body similar to seed oils like sesame or pumpkin, but with a memorable flavor.

Argan oil contains 56 mg/Kg of polyphenols. It is unusually rich in tocopherols: 620mg/kg (olive oil: 320mg/kg). Vitamin E, or alpha-tocopherol, makes up 69% of the total tocopherols (the others are beta-, gamma- and delta-tocopherol).

More than 80% of its fatty acids are the unsaturated acids oleic and linoleic. Argan is markedly richer in linoleic acid than olive oil.

Phytosterols represent 20% of the insaponifiable fraction of argan oil. The main sterols, spinasterol and schottenol, are rarely found in vegetable oils. The major constituents of the triterpenic fraction of argan oil are tirucallol (27.9%), beta amyrine (27.3%), butyrospermol (18%), and lupeol (7%). The meaty part of the fruit, a valuable feed for stock, containing 10% protein and 7% fibre (dry matter basis).

The greyish-green oilcake contains saponin, which does not harm ruminants and passes out with the urine, however, when given to dairy cattle, the milk will contain some saponin, which may cause dia-

rhea in children. Up to 2 kg per day can be fed to cattle without harm.

## ■ Pharmacological Action and Toxicity

Argan oil is believed to have strong anti-oxidative properties, especially those that affect the skin. Argan oil is often used to combat the physiological aging and drying of skin; to neutralize free radicals and conjunctive tissue; to promote softer and stronger hair; and to strengthen breaking and unhealthy nails.

Argan oil is rich in naturally occurring antioxidants such as flavonoids and tocopherols. Undoubtedly it is the presence of these antioxidants, which explains the oil's reputation for skin protection and healing. They are also responsible for the oil's good storage stability and lack of aging.

Antioxidant flavonoids called polyphenols are found in the pigments of leaves, bark, seed, and flowers of plants. As a group of compounds, phenols are active germicides.

Flavonoids cannot be synthesized by the body and like essential fatty acids, must be obtained through the diet. These antioxidants are involved in many activities including: helping control the free radical nitric oxide, promoting good circulation, acting as a natural anti-inflammatory, enhancing the activity of vitamin C, and strengthening the immune system. Although alpha, beta, delta, and gamma tocopherol all have vitamin E activity, alpha tocopherol is the most biologically active of the four and is usually identified as Vitamin E. Alpha tocopherol makes up 69% of the tocopherols found in argan oil. Vitamin E, an essential component of the antioxidant network, limits tissue and cell damage caused by toxins and pollutants in the body. Vitamin E has numerous benefits such as preventing free radical damage / heart attack and stroke / lipid peroxidation / atherosclerosis, oxidation of L cholesterol LD/ growth of cancer cells, cataracts and other vision problems, increasing the body's level of immunity, and alleviating symptoms of arthritis.

Tocopherols are important because of their antioxidant actions and free radical scavenger effects.

Latest research shows a positive effect of antioxidants, e.g. Vitamin E, on the progress of Parkinson's Disease

Fatty acids are a group of organic acids classified as

either saturated or unsaturated. According to the American Heart Association, clinical studies have demonstrated that consumption of transfatty acids or saturated fat result in higher blood cholesterol levels than consumption of cis fatty acids or naturally occurring oils.

Linoleic acid (omega-6), an essential fatty acid, comprises 34% of the total FA content of argan oil. The second essential fatty acid, linolenic acid (omega-3), can also be found in trace amounts (0.1%). Essential fatty acids cannot be synthesized by the body and must be obtained through the diet. Linoleic acid deficiency symptoms can include arthritis-like conditions, heart and circulatory problems, susceptibility to infections, kidney and liver degenerations, eczema-like skin eruptions, sterility in males, and miscarriage in females. It is believed that 1-2% of total energy needs for healthy individuals must come from linoleic acid. One-tablespoon (14g) of organic Toasted argan oil can satisfy the body's daily linoleic acid needs.

However it is the phytosterol fraction of Argan oil, which is probably its most interesting feature. It is believed that the phytosterols in Argan oil are unique in their combination: there are no other vegetable oils with a comparable composition.

Argan oil contains the extremely interesting D-7-stigmasterols, which are relatively rare among the plant sterols. The common D-5-sterols are not present. The D-7-sterols are schottenol and alpha-spinasterol.

Schottenol is the main sterol found in Senita cactus (*Pachycereus schottii* (Engelm.) D. Hunt: synonymous with *Lophocereus schottii*), whose extract is used in Mexico as an effective anticancer agent.

According to one report schottenol, in the form of glucosides, is believed to have anti-tumour effects. Alpha-spinasterol is suggested to have cell stimulation activity.

Triterpenoids found in the unsaponifiable fraction of Argan oil are also biologically active substances. The main ones are tirucallol, beta-amyrin, butyrospermol, and lupeol which are cicatrizizing, skin protecting, sun protective and disinfectant respectively.

## ■ Traditional Medicine and Indigenous Knowledge

In folk medicine, Argan oil is highly regarded for its reinvigorating effects and as an aphrodisiac.

Moroccan women have been using it for centuries as a skincare product. It prevents the skin from drying out.

Argan oil is also used for the treatment of acne, skin allergies, chicken pox and burns. It is also used to treat the hair and give it strength and shine. The skin protecting properties are used in the local treatment of skin problems and in dermatological creams and medicines. Internationally, there is some interest in its possible cosmetic uses.

### ■ History

Argan tree has been known for ages and used by man since the ancient time. The Phoenicians used the oil they produced in their trading posts along the Atlantic coast.

In 1219, IBN ALBAYTAR, a well-known Egyptian doctor, described the tree and the process for extracting the oil in his Treatise of Simplicities (translated by LECLERC in 1877).

### ■ Other uses of the plant (Ethnobotany)

The argan tree is important to the local economy. The argan tree thus provides support for some 3 million people. Every part of the tree is useable and provides a source of income or food: The wood is for construction and heating things such as the oven or water for bathing. **Charcoal** is also produced for cooking food. The wood is very hard with an approximate density of "1". Its local nickname is "the wood of iron". It is also used decoratively in some of the inlaid boxes, which are made in Essaouira.

The **leaves** serve as feed for goats and camels (provide forage for goats).

The **fruit** of the Argan tree is a berry formed by a fleshy outer coating and a hard core that contains the seeds/nuts resembling almonds.

The **exterior pulp** that is removed in processing the seeds is given to animals as feed. The broken shell is also used as fuel.

Most importantly, the **seeds** are pressed to produce an oil that has culinary, cosmetic and medicinal properties. The by-product of the pressing process, which is called "cake" or "tortea", is also used as feed for animals.

### ■ Culinary uses

Argan oil has a long, significant, and tasty lineage in Morocco. It can be used for cooking and as a flavoring/finishing ingredient.

Traditionally it used for cooking Tagine, couscous, and other meals. It may be served alone as a dip for bread at breakfast time or in combination with honey, or with butter or also with blended almonds to make a mixture called Amlou. Amlou is a special preparation served as a fast meal especially for guests. Its flavor is similar to that of peanut butter. Combined with oat it is considered as a good meal for babies and children.

Today, it can be found on the menus of some of the best restaurants in the world, in France, in England, in the USA and elsewhere.

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