

## Commercial cultivation of Aloe

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The plant *Aloe* is as old as human civilization and its versatile properties for various purposes have been well documented. The genus is found in tropical and South Africa, Malagasy and Arabia and introduced in other places for ornamental and medicinal purposes. Several species of the genus have been in use under the common name of Aloe, viz. *Aloe vera* Linn., *A. barbadensis* Miller, *A. ferox* Miller, *A. chinensis* Baker, *A. indica* Royle, *A. perryi* Baker, etc., belonging to family *Liliaceae*. Among these, *A. vera* Linn. syn. *A. barbadensis* Miller is accepted unanimously as the correct botanical source of Aloe. In most reference books, *A. barbadensis* Miller is regarded as the correct name but as per the WHO monograph, *A. vera* Linn. is accepted as the legitimate name for this species.

*A. vera* is a succulent, almost sessile perennial plant with multiple tuberous roots and many fibrous supporting roots penetrating into the soil. The plants generally grow up to one meter close to ground in typical rosette shape. The leaves are radically arranged in two or three circles. Each leaf is 30 - 50 cm long and 10 cm broad at the base having an indented margin. The leaves are pea green in colour, occurrence of white spots

when young. Bright yellow tubular flowers appear in a spike.

Aloes have long been in use for several diseases, particularly connected with the digestive system; they have also been used for wounds, burns and skin problems. The term Aloe stands for the dried juice, which flows from transversely cut bases of its leaves. It is the best herbal answer to support the health and healing mechanisms of the body because it does not heal, rather it feeds the bodies own systems in order for them to function optimally and be healthy.

Pharmacologically it is an immunity booster and detoxifies the system. It is recommended in adjuvant therapy with antibiotics, NSAIDs (Non Steroidal Anti-Inflammatory Drugs) and chemotherapy to eliminate drug induced



Aloe sp.

gastritis and other adverse effects. Useful in various diseases such as type II diabetes, arthritis, eye disease, tumor, spleen enlargement, liver complaints, vomiting, bronchitis, asthma, jaundice and ulcers. Relieves constipation, maintains a good gastric pH, helps in inflammatory bowel disease, non-ulcer dyspepsia, gastric and duodenal ulcers. A dietary supplement in pre- and post-operative patients, post-menopausal women and in cases of osteoporosis.

A large number of research workers have published their research reports on cosmetic uses of *A. vera* and at present it is in a great demand in the market. The gel possesses good moisturising properties and anti-wrinkle properties. There are personal care and skin care creams, moisture lotions, shampoos and conditioners prepared from Aloe gel. Additionally, there are toothpastes, after-shave balm and sun-screen lotion, hair styling gel that contain Aloe in it to refresh and protect the skin.

There are a variety of every day, household and other uses of *A. vera*. Many people have found that by adding a spoonful of Aloe gel mixed with 4-5 drops of lemon juice provide a nice after bath lotion. For burns, small amount of gel is applied to the wound areas, which greatly diminishes the chance of scarring and aid in the healing as well as easing the pain. By applying Aloe gel several times a day, the redness of sunburn disappear within



a day or two without the skin peeling off. Additionally, the creams containing Aloe gel have been found to be effective in treating frostbite injury and even psoriasis in patients. Aloes are salt resistant species and useful for seaside landscaping. Leaf and flower stalk are pickled. Leaves yield fibres and dye. The pulp is also valued as a cooling application on inflammatory joints. To relieve headache, a small piece of sliced leaf is tied to the forehead. Some Americans use the cold infusion in brandy or liquor to relieve hemorrhoids.

### Cultivation

*A. vera* is found as wild herb along the coast of South India. It is under cultivation in fairly large areas in many parts of India, viz. Chhatisgarh, Maharashtra, Madhya Pradesh, Gujarat, etc. and also grown as ornamental plant.

It is a sure cash spinner and progressive farmers can go for plantation of it. Cultivation of this herb in a large scale can make India move towards the leadership in global herbal market and this will fetch India good foreign reserves as well as domestic economic prosperity.

Commercial cultivation of Aloe has been started in many parts of India. They can be grown in deserts and other dry situations. They flourish in a variety of climates and even on the poorest of soils, but need protection from frost. No major diseases or pest have been reported so far.

**Soil:** Naturally occurs in driest and poorest soils and can be grown in variety of soils. But the most ideal soil for it is sandy loam that is slightly alkaline with a pH up to 8.5. The root system of this plant is shallow and does not penetrate deep

into the soil. However, water logged soil is totally unsuitable.

**Propagation:** Aloe is normally propagated through root suckers (pups) or sometimes by cuttings of the new growth. About 15-18 cm long root-suckers or rhizome cuttings are planted by keeping two third portion under the ground. Nearly 15,000 pups are required for plantation of one hectare of land. Both plant-to-plant and row-to-row, 60 cm × 60 cm spacing is to be maintained.

**Irrigation:** Aloe does not require much water, however, soon after planting, the land should be irrigated. It requires about 150 ml of water monthly for yield of good quality leaf weighing approximately 1 kg. The plant is irrigated through rain-fed and sprinkler method.

**Manure and Fertilizer:** In India, Aloe is raised as organic crop and only Farm Yard Manure (FYM) is applied (12 –15 tonnes/ha). In standing crop, cow-dung is applied (5 – 10 tonnes/ha). Apart from FYM and natural manures with good nutritional value at the time of land preparation, it demands additional annual supplements like ammonium nitrate for optimum yield.

### Harvesting/Yield

Leaving the fresh and young leaves from the top, older outer leaves are generally harvested. The plants can be removed manually or with the help of a tractor-drawn disc harrow or cultivator. New leaves grow from the center upward. Offshoots are grown spontaneously next to the mother plant. Crop is ready to harvest after 18 months of sowing.

Economic yields are obtained in 5 years after that it needs replanting. In India, the average yield for organically grown Aloe is about 12 tonnes/ha (on fresh weight basis).

### Post-harvest care/Processing

Immediately after harvesting, the Aloe leaves are tipped, tailed, and its spiny ridges are removed after harvesting. For the extraction, juice is allowed to drain from the cut leaves into suitable vessels or it can simply be squeezed or grinded to get the gel. There are other sophisticated ways to separate the gel without loss of the product quality. The juice is concentrated by evaporation, either spontaneously or more frequently by boiling.

The properties of Aloe are in the concentration of all the elements that it contains and no particular extract or part of its components stands out individually in the health benefits of *A. vera*. For this reason, Aloe gel is just the juice of the plant, cold processed with a minimum of authorized additives for its stabilization. In pharmaceutical laboratories, strict quality controls are carried out at each stage of processing in order to guarantee the condition of materials used and the final product.

### Market scenario

The current global turnover of raw Aloe leaves amount up to US \$ 70 – 80 million dollars, which is expected to grow at a rate of 35 % in the next five years. For processed derivatives and value added products, current global trade is estimated at around US \$ 1 billion and US \$ 25 billions, respectively.



USA supplies the major bulk of Aloe in world market having a share of 60 – 65 %, whereas Latin American countries 20 –25 % and Australia, China and India has a market share of only 10 per cent. It is estimated that about 40-50 thousands rupees could be earned annually by a plant grower from Aloe cultivation.

### Indoor cultivation of Aloe

Generally, Aloe grows openly in the field, but it can also be grown indoors in pots kept in sunny southern or eastern window. Containers have to be filled a

quarter full with drainage material and compost consisting of two parts loam and one part coarse sand, broken bricks and crushed limestone, with a bit of bone meal added. Plant should be potted in the spring and watered carefully until established. During the summer, water can be given as soon as the soil is dry, but from September to March very little water is needed, just enough to prevent the leaves from shriveling. Over watering will kill the plant. Well-rooted plant will benefit from occasional applications of dilute liquid fertilizer in the summer. Large plants, however, do need an occasional top

dressing of fresh soil in each spring; any loose soil should be removed and replaced with new. The drainage holes should be plugged up. Once established, the mother plant will send off shoots, which may be transplanted when they are at least 2.5 to 5 cm tall. In fact, Aloes do not need to be repotted often; plants in large pots will flourish for many years without being moved. The plant takes four years to reach the maturity and has a life span of about 12 years. The leaves are harvested after four years when it reaches maturity. The plants can be harvested every 6 –8 weeks by removing 3 to 4 leaves per plant.

### Indian Barberry in Himalayan wastelands

In Uttaranchal different climatic condition and altitude provide a variety of medicinal plants throughout the region. The inhabitants of this region have their own traditional system of medicinal use through available plant species. Large-scale cultivation of medicinal plants growing wild in this region can become the option for sustainable livelihood of residents of rural areas.

Indian Barberry, *Berberis aristata* DC. (Hindi — *Rasaut* or *Daruharidara*; Garhwal—*Kirmod*)), an evergreen shrubs, much branched, up to 4 m in height, is found on rocky slopes, in cultivated areas and wasteland near villages. Leaves undivided spiny-toothed with spiny stem having yellow wood. The flowers are tiny yellow in bloom during April to July. Fruit is dark purple in colour and edible. It is common in Himalayan region up to 3,600 m altitude. Alkaloids like berberine, osikanthene, colambamine, berbamine, piymatine, and zatroraisen have been isolated from its

roots and stem and are used in modern medicine. It possesses excellent property for curing conjunctivitis, malaria, urogenital disorder, earache and ulcers. It is also used as blood purifier. Root paste is applied on cuts and wound as antiseptic. The wood produce a yellow dye used for dying leather.

Due to enormous medicinal properties cultivation of Indian Barberry in wasteland areas near villages in Himalayan region can become a source of livelihood for the local community. Its cultivation process is simple and cost effective. It is germinated through seeds, which can be collected from the plant during May to July. Purple ripe fruits can be collected for germination into poly bags and nursery. It can grow easily without much investment, protection and care. The roots are harvested during November - December and approximate market rate is Rs 20/kg.

Other species, viz. *B. asiatica* Roxb., *B. chitria* Lindl. ,

*B. kumaonensis* Royle and *B. lycium* Royle found in this region can also be considered for cultivation.

*Asparagus racemosus* Willd., *A. curillus* Buch.- Ham. ex Roxb., *A. filicinus* Buch.-Ham.ex DC. and *A. gracilis* Royle ex Baker are other medicinal plants, which can easily be grown along with *Berberis* species. *Asparagus racemosus* (*Satawarl Girand*) is a climbing, spiny under shrub. Its tuberous roots are ready for harvesting along with *Berberis* during November-December. Approximate market rate of roots is Rs 60-70/kg and root powder Rs 90/kg. Tubers are used as tonic in dysentery and general debility. Plant paste is applied on head for cooling the body temperature and externally used for eyesores [Contributed by Dr. (Mrs) Bhagwati Uniyal, NAVDANYA, 105, Rajpur Road, Dehra Dun – 248 001, Uttaranchal; E-mail: bhagwatiuniyal@rediffmail.com].