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Aloe vera: Cultivation Practices and Its Human Benefits

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Aloe vera is perennial, tropical, drought resistant, succulent plant belonging to Liliaceae family. It is cultivated in many parts of India including mainly in Tamil Nadu, Rajasthan, Gujarat and Maharashtra. It can grow in all kinds of soil. It is propagated mainly through root suckers/pulp or by cutting of new growth. In India, 150-200 quintal raw leaves and 450-500 kg flower per hectare as it yield have been reported. It is an important medicinal herb used for an array of ailments such as mild fever, wounds and burns, gastrointestinal disorder, diabetes, sexual vitality and fertility problems to cancer, AIDS, and various skin diseases. It has been also used for the manufacture of topical products such as ointments and gel preparation as well in the production of tablets and capsules. So there is an instant need to aware about the miscellaneous uses of *Aloe vera* along with cultivation protection for human benefits.

Introduction

Aloe vera is a very hardy perennial tropical, drought-resisting, succulent plant belonging to the Liliaceae family (Baby and Justin, 2010). It is under cultivation in fairly large areas in many parts of India viz; Tamil Nadu, Rajasthan, Gujarat, Maharashtra, etc. (Das and Chattopadhay 2004). Aloes are often thought to be grown only in hot and dry climates but they can actually grow in a variety of climates including desert, grassland, and coastal or even alpine locations (Davis, 2009). Several species of 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* Rayle, *A. perryi* Baker, etc. Among these *A. vera* Linn *syn. A. barbadensis* Miller is accepted unanimously as the correct botanical source of Aloe. There are more than 200 compounds found in *Aloe barbadensis*, about 75 of which have biological activity, *Aloe vera* leaves contain a diverse array of compounds, including anthraquinones (e.g. aloe-emodin), anthrones and their glycosides (e.g. 10-(1, 5' anhydroglucosyl)-aloeemodin-9-anthrone, also known as aloin A and B), chromones, carbohydrates, proteins, glycoproteins, amino acids, organic acids, lipids, sugars, vitamins and minerals (Manvitha and Bidya, 2014), (Patidar *et al*., 2012). This plant became very popular in the world due to its medicinal value. *Aloe vera* is an anti-biotic, anti-septic, germicidal, anti-fungal and anti-viral and also excellent uses for the skin treatments/cosmetic use, urine related problems, ulcers and pimples (Naveena *et al*., 2011). *Aloe vera* helps with digestion, detoxification process, heart healthy and boosting the immune system.

Cultivation Practices

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

Soil and Climate

Aloe vera is found to grow in hot humid and arid conditions. It is grown in all kinds of soils but well drained soil with high organic matter, is most suitable. It grows well in bright sun light. Shady conditions results in disease infestation. It is highly sensitive to water stagnation. Therefore, well drained high land should be selected for its cultivation. The plant grows best when supplied with an excess of 50 cm of rain annually, in nitrogen-rich (0.40%–0.50%) sandy loam that is slightly alkaline soil with *pH* 8.5.

Land Preparation

About 2-3 ploughing and laddering are done to make the soil weed free and friable. Land leveling is then followed. Along the slope, 15-20 feet apart drainage is made.

Propagation

Aloe is normally propagated through root suckers/pulp or some time by cutting of the new growth. About 15-18 cm long root-suckers or rhizome cuttings are planted by keeping two third portions under the ground. Nearly 15 thousand suckers are required for plantation of one hectare of land. Both plant to plant and row to row, 60 X 60 cm^2 spacing is to be maintained.

Manure and Fertilizer

In India, Aloe is raised as organic crop and only FYM is applied @ 12-15 tonnes ha^{-1}. Apart from FYM and natural manures with good nutritional values at the time of land preparation can be applied. But for commercial cultivation, it may be recommended dose of fertilizer such as 35 kg N, 70 kg P_2O_5 and 70 kg K_2O/ha are added for the optimum yield. In September–October about 35-40 kg N as top dressing may be applied. If the soil is rich in organic matter, N dose can be reduced.

Irrigation and Intercultural Operations

After 40 days of planting, weeding and earthing up are done. Earthing up is also practiced after top dressing of fertilizer. *Aloe vera* is slightly tolerant to drought, but very sensitive to water stagnation. As per need light irrigation during drought is enough. It requires about 150 ml of water monthly for yield of good quality weighing approximately one kg. The plant is irrigated through sprinkler method.

Harvesting and Yield

Harvesting of leaves starts after 7-8 months of planting. Sharp knife is used for harvesting. Proper harvesting is a labor-intensive process. Typically, the outermost 3–4 leaves are harvested by pulling each leaf away from the plant stalk and cutting at the white base. The leaves should be handled gently. Care should be taken to prevent damage to the outer rind and to maintain the seal at the base of the leaf in order to prevent introduction of bacteria. Leaves that show signs of tip necrosis should not be harvested, as these provide entry points for microbial contamination. Care also has to be taken to reduce the loss of juice from the cut portion. If harvesting is done once in a year, October–November is the best period for harvesting. Second year gives maximum yield and for about 4-5 years good yield could be harvested. After harvesting, leaves are dried in shade

and then in sun before storages. Flowers are collected in December – January and preserved after proper drying. Harvested leaves are carefully stacked and then transferred to a refrigeration or processing facility. Economic yield are obtained in 5 years after that it need replanting. In India, average yield for yearly 150–200 quintals raw leaves and 450–500 kg flowers/ha are obtained.

Post Harvest Handling and Processing

For manufacture of *Aloe vera* leaf juices, processing should take place as soon as possible due to the highly perishable nature of the juice, ideally within 36 hours of harvesting the leaves. Immediately after harvesting, the Aloe levees are tipped, tailed and its spiny ridge 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. Aloe gel is just juice of the plant cold processed with a minimum additive for its stabilization. *Aloe vera* leaves are typically subjected to a series of processing techniques.

Nutrition Values

Aloe vera is quite an incredible medicinal plant full of nutritional benefits. Different parts of the plant are used for different purposes and *Aloe vera* has both internal and external applications.

Table 1: Nutrition Composition of *Aloe vera* (per 100 g of fresh weight)

Moisture (g)	97.2
Protein (g)	0.06
Fat (g)	0.09
Ash (g)	0.75
Fiber (g)	0.42
Carbohydrate (g)	1.42
Energy (Kcal)	7.0
Vitamin C (mg)	53.0
Iron (mg)	0.27

(Source: Goyal and Sharma, 2009)

Product Preparations from *Aloe vera*

Aloe vera is an industrial crop and in the food industry it has been utilized for the preparation of health food drinks, beverages like tea, milk, ice-cream and confectionary. *Aloe vera* gel also find application in cosmetic and toiletry industry for the preparation of the creams, lotions, soaps, shampoos and facial cleaners. Once a leaf is cut, enzymes start to break down some of the long chain sugars which make *Aloe vera* gel an effective healing product, so it is important for the plant to have been properly handled and stabilized. Commercial, stabilized gel product may not work as well as the fresh gel, cold processing is thought the best retain the beneficial properties (Chandegara and Varshney, 2013). *Aloe vera* juice is most often the form of the gel that is used internally.

***Aloe vera* juice**

***Aloe vera* gel**

***Aloe vera* medicine & skin care products**

Table 2: Benefits/Uses of *Aloe vera* to Human Body

External	Skin care	It acts as an astringent, moisturizer, humidifier and cleanser of skin
	Cures gum disease	Actually heals gums and eliminates gum disease, mucositis, lip fissure and mouth herpes lesions.
	Relieves Itching	*Aloe Vera* Juice relieves itching that occurs due to allergies and insect bites and aids healing.
	Relieves pain	Pain in the joints and muscle pain occurred due to arthritis is reduced by the application of Aloe Vera sprays or gels.
Internal	Relief in Liver Infections	*Aloe vera* Juice improves the liver function and is an excellent antidote in case of excessive ingestion of alcohol. In addition to this, it also prevents scarring of the liver.
	Cures digestion	*Aloe vera* Juice prevents stomach ulcers, facilitates digestion and intestinal transit.
	Anti-inflammatory Agent	Juice contains 12 essential nutrients that inhibit inflammation with rare incidence of side effects. Also, the juice of Aloe Vera improves joint and muscle mobility.
	Cures diabetics	It stimulates insulin release from the pancreas and can lower blood glucose levels in mice.
	Heart disease	*Aloe vera* gel was administered to patients with heart disease and high cholesterol, these conditions were reduced to a lowered risk

Source: (Manvitha and Bidya, 2014)

Conclusion

The plant Aloe is as old as human civilization and its versatile properties for various purposes have been well document. *Aloe vera* ancient herb has a long history as a medicinal plant with diverse therapeutic application. Successful cultivation of *Aloe vera* plant is economically attractive and therefore, cultivation of *Aloe vera* has acquired great commercial importance for medicinal products and cosmetic processing. The nutrient make up of *Aloe vera* is one of a kind and has amazing natural healing properties and also having, the nature's gift to humanity.

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