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Karkala Manvitha
Department of Pharmacognosy, Al
Ameen College of Pharmacy,
Bangalore, India.
Email: manvitha11@gmail.com

Bhushan Bidya
Department of Pharmachemistry, MS.
Ramaiah College of Pharmacy,
Bangalore, India
Email: bidyabhushan31@gmail.com

Aloe vera: a wonder plant its history, cultivation and medicinal uses

Karkala Manvitha, Bhushan Bidya

Abstract

The purpose of this review is to discuss about the interesting History, Cultivation and medicinal uses of *Aloe vera*. *Aloe vera* is the oldest and the most applied medicinal plant worldwide. The *Aloe vera* plant is a member of lily plant known as *Aloe barbadensis* which is full of juice and closes similar to a cactus. Due to its cactus like feel, Aloe is often mistakenly called a "Desert Cacti". There are over 250 species of aloe grown around the world. However, only two species are grown today commercially, with *Aloe barbadensis* Miller and *Aloe arborescens* being the most popular. Aloe is native to North Africa and Spain, now the plant is also grown in the hot dry regions of Asia, Europe and America. For centuries, it has been medicinally used for an array of ailments such as mild fever, wounds and burns, gastrointestinal disorders, diabetes, sexual vitality and fertility problems to cancer, immune modulation, AIDS and various skin diseases. In the pharmaceutical industry, it has been used for the manufacture of topical products such as ointments and gel preparations, as well as in the production of tablets and capsules. So, there is an urgent need to educate about the miraculous uses of *Aloe vera* along with its cultivation methods for human race and popularize it for greater interest.

Keywords: Cultivation, *Aloe vera*, Medicinal uses, History.

1. Introduction

Aloe vera is a perennial, drought-resisting, succulent plant belonging to the Asphodelaceae family. The name, aloe, is derived from the Arabic "alloeh" or Hebrew "halal" meaning bitter shiny substance. It has a vast traditional role in indigenous system of medicine like ayurveda, siddha, Unani and homoeopathy [1]. *Aloe barbadensis* miller or *Aloe vera*, a semi tropical plant is one of the 250 species of Aloe. Most commonly used for its medicinal properties, *Aloe Vera* or the Sanskrit name "Ghee kunwar" is a member of Lilly family. The plant has lance-shaped, sharp pointed, and jagged & edged leaves [2]. *Aloe vera* is found as the wild herb along the coast of south India. It is under cultivation in fairly large areas in many parts of India viz; Tamil Nadu, Gujarat, Maharashtra etc. [3]. Aloes are often thought to only grow in hot and dry climates but they actually grow in a variety of climates including desert, grassland, and coastal or even alpine locations [4]. 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 [5, 6, 7]. *Aloe vera* has number of uses and mainly they are used as a food preservative and medicine. Commercially, aloe can be found in pills, sprays, ointments, lotions, liquids, drinks, jellies, and creams [8]. Numerous aloe species around the world are used for conditions ranging from dermatitis to cancer [9]. Various studies have revealed that *Aloe vera* leaf possesses many pharmaceutical activities, including antimicrobial [10], anticancer [11], antioxidant [12], antidiabetic [13], antiulcer [14], hepatoprotective [15], immunomodulatory [16] and many more activities. Many of the health benefits associated with *Aloe vera* have been attributed to the polysaccharides contained in the gel of the leaves [17].

2. History

The *Aloe* plant and its' derivative products have played a role in medicine and health care dating as far back as the 4th century B.C. when ancient Greek doctors obtained aloe from the island of Socotra in the Indian Ocean. There are also many romantic tales about it,

Correspondence
Karkala Manvitha
Department of Pharmacognosy, Al
Ameen College of Pharmacy,
Bangalore, India.
Email: manvitha11@gmail.com
Tel: 918095801445

suggesting that the Egyptian Queens Nefertiti (1353 BCE) advertised as “the most beautiful woman who ever lived” and Queen Cleopatra VII (69-30 BCE) used it as part of their regular beauty regimes and medicines. Supposedly Alexander the Great in 333 B.C. was persuaded by his mentor Aristotle to capture the Island of Socotra in the Indian Ocean for its famed Aloe supplies, needed to treat his wounded soldiers. The ancient Nile Valley civilization of Kemet (“Land of the blacks” now referred to as ancient Egypt which derived from Greek name Aigyptos later Latinized under Roman rule to Aegyptus which derived from the name “Hekaptah” which means “Lands of the temple of Ptah”) used Aloe for medical treatments, beauty care and embalming.

The medicinal use of aloe was already mentioned more than 4000 years ago in a collection of Sumerian clay tablets dated 2100 BC. Aloe was also mentioned as a laxative in the Egyptian Papyrus Ebers from 1552 BC. Aloe has had a very long historical use as a strong laxative treatment for chronic constipation, and it is still listed as a laxative in many pharmacopoeias. However, it has now been largely superseded by less toxic laxatives. The original commercial use for the Aloe plant was in the production of a late substance called Aloin, a yellow sap used for many years as a laxative ingredient. This product became synonymous with the name “Aloe” and recorded in the trade, technical, and government literature during the early 20th century. This terminology created much confusion later when Aloe’s other main ingredient, Aloe Gel, beginning in the 50’s, has gained respect as a useful commodity that is used as a base for nutritional drinks, as a moisturizer, a healing agent in cosmetics and OTC Drugs.

In 1964 however, Dr. Bill C. Coates a practicing pharmacist in Dallas, Texas, USA, became a man with a dream – to make the complete benefits of Aloe Vera available to the world and the millions of people who need it. Convinced the plant’s “Gel” could be extracted and used without losing its potency, Dr. Coates dedicated himself to learning the secrets of the plant’s chemistry – and to do what no one had ever been able to do in the plant’s 4100 years plus known history – to extract and naturally stabilize the “Gel” while preserving its natural healing potency; and in 1968 he succeeded. Since then, new frontiers have opened for the use of the stabilized Aloe Vera gel in medical, athletics, health and beauty, cosmetics and animal care.

3. Cultivation

Aloes’ thick, tapered, green, spiny leaves grow from a short stalk near ground level. Aloe is closely related to other members of the Lily family such as onions, leeks, garlic, tulips, turnips and asparagus. Though, Aloe is native to North Africa and Spain, the plant is now also grown in the hot dry regions of Asia, Europe and America.

Aloe plant survives for more than 7 years without water. It takes the water it needs for survival and growth from dew collected on the surface of its leaves. It repels attacking insects, rodents, snakes by means of the bitter Aloin (the yellow colored part of the sap) just beneath the rind. It is a perennial plant, growing to the height of 1½ - 2½ ft. Its leaves are long and thick, juicy with a wheel like phyllotaxy. The two sides of the leaves have thorny structure with a thorny tip. The inner substance of the leaves is jelly like, with bad odour and bitter in taste.

The plant will have fully mature leaves in 3 years. Each plant usually has 12-16 leaves that, when mature may weigh up to 3 pounds. The shoots should be removed from mother plants at least twice annually to encourage larger leaf growth in the parent plants. The length of the leaves ranges from 25-30 cm, while the breadth ranges from 3-5 cm normally, it flowers during October

to January and the long inflorescence has a large number of small pink flowers all around. Fruits are developed during February to April. It is normally not propagated through seeds. Vegetative propagation is easy and convenient.

Of late, because of sky rocketing price of allopathic medicines with its known side effects, medicinal plants and ayurvedic medicines are becoming popular. World trade worth about 80 million US\$ dollars exists now and this is likely to increase by 35-40 percent within 5 years. USA dominates the market (65%) while India and China have a share of 10 percent each which could be enhanced by its commercial cultivation.

3.1 Soil and climate

Aloe vera is found to grow in hot humid and high rainfall conditions. It is grown in all kind of soils but well drained soil with high organic matter, is most suitable. It grows well in bright sun light. Shady conditions result 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, alkaline soil. Soil nitrogen should ideally be maintained at 0.40%–0.50%. While most species of *Aloe* typically grow in sandy soils.

3.2 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 ft apart drainage are made.

3.3 Application of Plant Nutrients

Before land preparation, about 8-10 tonnes FYM/ ha is applied. Before the last ploughing, 35 kg N, 70 kg P2O5, and 70 kg K2O/ha are added. For controlling termites problem, 350-400 kg Neem Cake / ha may be applied. 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.

3.4 Irrigation and Interculture

After 40 days or so 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. Therefore, proper drainage is more important than irrigation. As per need light irrigation during drought is enough.

3.5 Harvest

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 are 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.

3.6 Handling and Processing

Aloe vera leaves are typically subjected to a series of processing techniques. 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. If immediate processing is not possible, leaves should be stored in a refrigerated facility. Prolonged storage of the leaves after harvest without refrigeration may result in enzymatic and bacterial degradation of the polysaccharides. Due to concerns over potential carcinogenicity of aloins A and B, filtration ("decolorization"), often with activated charcoal and diatomaceous earth, has become a common practice in the manufacturing of *Aloe vera* leaf juices. Decolorization removes a variety of small-molecular-weight organic compounds, including aloins A and B, from *aloe vera* leaf material.

4. Medicinal Uses

Medicinal properties of *Aloe vera* range from external burn treatments to helping relieve constipation by consumption. *Aloe vera* is the most efficacious natural plant used both externally and internally and there are numerous benefits that are derived from this wonderful plant. The health benefits of *Aloe vera* have been propagated throughout the world.

There are two parts of *Aloe vera* that are commonly used. The bitter exudate is used as a natural drug for its cathartic effect and is widely employed as a bittering agent in alcoholic beverages and as a laxative. The dried latex, with a high barbaloin content, is a strong laxative, but its use should be limited to no more than one week, and it should not be used during menstruation, pregnancy and nursing. The suggested medicinal use of *Aloe vera* is based on its historic and traditional use, and an analysis of modern pharmacological and toxicological research. The inner gel, or "pure gel", is the more readily known part of the *Aloe vera* plant. This is the section of the plant that is most commonly known to be used for treatments of sun burns. But if prepared properly, the inner gel can be consumed to help treat certain internal ailments.

4.1 Five Unique benefits of *Aloe vera* to the body

i. **Penetration** – *aloe* has the ability to reach deepest body tissues some 7 layers deep

ii. **Antiseptic** – *aloe* has at least 6 antiseptic agents which kill bacteria, viruses and fungi

iii. **Stimulates cell growth** – *aloe* stimulates the birth of new healthy tissue

iv. **Settles nerves** – *aloe* has a clearing effect on the body's nervous system

v. **Cleanses** – *aloe* detoxifies and normalizes the body's metabolism

4.2 External Uses of *Aloe vera*

Aloe Vera contains a majority of the necessary amino acids and vitamins that our skin needs to heal. The *Aloe Vera* gel itself forms glue-like substance on skin which acts as a natural "band aide", sealing in the nutrients and allowing them to begin working immediately and keeping out any bacteria or agents that could cause healing to slow or cease completely.

The *Aloe Vera* gel is also high in water content which is essential for the body to heal. Although *Aloe Vera* is effective when taken orally, it is also beneficial when included in topical formulations

like ointment, cream or lotion. It mainly protects the wounds due to its moisturizing properties.

4.2.1 Skin Care - *Aloe Vera* is used widely in Dermatology, as it acts as an astringent, moisturizer, humidifier and cleanser. It softens the skin, diminishes wrinkles and cures acne, herpes, red spots, psoriasis, eczema, mycosis, fever blisters, skin irritation and provides protection to the skin against pollution. Also, it is ideal for sunburns, fragile skin, and for removal and repair of dead skin and cells.

4.2.2 *Aloe vera* cures gum disease: The *Aloe Vera* actually heals gums and eliminates gum disease, mucositis, lip fissure and mouth herpes lesions.

4.2.3 Relieves Itching Aids Healing - *Aloe Vera* Juice relieves itching that occurs due to allergies and insect bites and aids healing.

4.2.4 *Aloe Vera* relieves joint and muscle pain - Pain in the joints and muscle pain occurred due to arthritis is reduced by the application of *Aloe Vera* sprays or gels.

4.3 Internal Uses of *Aloe vera*

Numerous scientific studies on *Aloe Vera* are demonstrating its analgesic, anti-inflammatory, wound healing, immune modulating and anti-tumor activities as well as antiviral, anti-bacterial, and antifungal properties. *Aloe*'s medicinal properties can be attributed to the synergistic effect of the combined nutritional elements producing a more powerful effect than the individual components. The nutrients together make a powerful combination that can be used in many different therapies to aid in the treatment of different ailments.

4.3.1 Provides 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.

4.3.2 Cures Stomach & Intestinal Problems - *Aloe vera* Juice prevents stomach ulcers, facilitates digestion and intestinal transit.

4.3.3 Acts as an Anti-inflammatory Agent - *Aloe vera* 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.

4.3.4 *Aloe vera* stabilizes blood sugar and reduces cholesterol in diabetics: Laboratory studies show that *aloe* can stimulate insulin release from the pancreas and can lower blood glucose levels in mice.

4.3.5 High cholesterol and triglyceride levels can be lowered naturally with *Aloe vera* - High cholesterol is a risk factor that may often lead to heart disease and strokes. According to medical studies that were conducted, the benefits of the *Aloe vera* gel when taken internally were proven. The results confirmed that when the *Aloe vera* gel was administered to patients with heart disease and high cholesterol, these conditions were reduced to a lowered risk.

4.3.6 Antiviral and Anti-tumor Activity - *Aloe vera* facilitates the stimulation of immune system that in turn protects the body against viral and tumor related disorders.

5. Discussion

The aloe plant and its' derivative products have played a role in medicine and health care dating as far back as the 4th century B.C. From the 250 species existing, *Aloe vera* is best known for its medicinal properties. It is used for healing different diseases. Moreover, the juice of *Aloe vera* is 100% non-toxic, with rare side effects. The Aloe plant is grown in warm tropical areas and cannot survive freezing temperature. Farmers in India regularly faces problem like lack of rain, low ground water level, soil degradation etc. therefore cultivation of *Aloe vera* would be beneficial as it requires minimum usage of water & the returns from it would be more than 50,000 yearly per acre. According to market demand, many processing units have already established in the country & according to estimation, more than 300 industries are processing *Aloe vera* leaf. Cultivation of *Aloe vera* is expanding day by day in the area as it provides quick and regular income to the farmers.

6. Conclusion

Aloe vera, an ancient Indian herb has a long history as a medicinal plant with diverse therapeutic applications, also used in many different countries. Through human trade and migration, this plant came to be known and was widely used to cure burns and wounds throughout ancient civilizations. Successful cultivation of this plant is economically attractive provided marketing is not a problem. The cultivation of *Aloe vera* has acquired great commercial importance for medicinal products and cosmetics processing. *Aloe vera* cultivation demands skill and it is also very labour intensive. Better management can results in much higher income and net profit .The nutrient make up of *Aloe Vera* is one of a kind and has amazing natural healing properties. Its uses are multiple and undoubtedly, the nature's gift to humanity and it remains for us to introduce it to ourselves and thank the nature for its never-ending gift.

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