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CULTIVATION, PRODUCTION AND UTILIZATION OF *ALOE* –A WONDER PLANT IN MID-HILL CONDITIONS OF HIMACHAL PRADESH

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ABSTRACT : *Aloe barbedensis* Miller or *Aloe vera* Linn. is a succulent plant of family Liliaceae with its origin in African continent. Ancient records show that the benefits of Aloe Vera have been known for centuries with its therapeutic advantages and healing properties. Many ancient works including the Bible refer to the use of Aloe. It is grown in many parts of the world with warm climate. It grows mainly in the dry region of Africa, Asia, Europe and America. In India it is found in Rajasthan, Andhra Pradesh, Gujarat, Maharashtra and Tamil Nadu. Its uses are multiple and undoubtedly the nature's gift to humanity. It is commonly known as "Ghrit Kumari". Its leaves have a high capacity of retaining water even in warm and dry climates and therefore this plant can survive for longer period of drought and harsh circumstances where most of the vegetations disappear. When a leaf is cut, a yellow-orange coloured sap drips from the open end; as a drink this bitter sap has a very strong laxative effect. A "stabilized" product is incorporated in a wide variety of preparations of commerce.

Keywords : *Aloe vera, medicinal uses, cultivation, production, properties.*

Scientific name of *Aloe vera* is *Aloe barbedensis* Miller. It belongs to family Liliaceace. The name 'Aloe' is derived from the Arabic word "alloeh" or Hebrew word "halal", meaning bitter shiny substance; 'vera' in Latin means "real". Due to its cactus like morphological character, it is often mistaken as a "Desert Cactus". There are over 400 species of *Aloe* grown around the world, but it is the *Aloe barbedensis* Miller (*Aloe vera* or "True Aloe") plant which has been of most use to mankind because of its diverse medicinal properties (Jain, 17).

HISTORY

Aloe vera is a favourite herb of many nation of the world. It has been found and described in writings in many different cultures and as far back as the Greek, Egyptians, Romans, Chinese and Indian cultures. The very first physical record of an *Aloe vera* plant occurs on a stone tablet, written in Sumerian, from around 2100 BC, though there is evidence to suggest that this plant was used long before then to treat a wide variety of illnesses and ailments. References have also been found in writings from the Indian and Chinese early cultures. It has been one of the most widely utilized and sought after plants throughout history (Chauhan, 8). The earliest record of *Aloe vera* use comes from the Egyptians. There are records of the Egyptians drawing pictures of *Aloe vera* plants on the walls of the temples. They would have even elevated the plant to a 'God - like' status. A variety of queens believed it to be the source of their beauty and health and that it could even grant them immortality. The juice from *Aloe vera* leaves was used to wash the skin and it was also drunk to promote health. It is also famously used for the preserving of dead bodies, and because it is both antifungal and antibacterial, it was very effective at preserving bodies once they were buried. The healing properties of the *Aloe vera* were utilized for centuries earning the name "Plant of Immortality" (Baldwin Gertrude, 4). Many ancient works including the Bible refer to the use of Aloe vera. The Bible mentions removing Christ from the cross and wrapping his body in aloes and myrrh (Samuel and Riasaid, 21). Aloe vera was fairly rare and extremely valuable at some stages of Greek and Romans. During his crusade to conquer the world, Alexander the Great took it upon himself (though some say that Aristotle asked him to) to capture a number of islands were great quantities of *Aloe vera* was being grown. These plants quickly became part of their rations given to his armies, were it

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was used to heal burns and minor wounds sustained in the camps and in battle. It was often included in supply trains to his encampments. During the reign of Nero, the emperor's healer traveled across the known world, consulting with other healers to find new ways of utilizing *Aloe vera*. He wrote about his discoveries and about the medicinal uses of *Aloe vera*, ranging from treating burns to combating acne to soothing gastrointestinal conditions. Much of the research that he did is still believed today. *Aloe vera* was included in the cargo sent along with Columbus when he discovered the new world. It may very well have been these voyages, along with other explorers that followed his lead, which brought it to the new world, where it found new root and new purpose. These plants were transported in pots across the ocean and were used for their healing purposes on ships where gastrointestinal discomfort, malnutrition, and minor wounds and burns would have been common. When the plants were brought to the Mayan and Aztec civilizations, they regarded it just as the earliest humans and Egyptians did: as a gift from the Gods. History has shown us that Aloe vera is one of the oldest mentioned plants on record due to its medicinal properties and health benefits. Since generations women of Indian states e,g. Chattisgarh are using aloe as home remedy for burns, cuts and wounds. The use is very common in other parts of country and the world. In Rajasthan a special dish using aloe gel is prepared. The pregnant women are given the preparations containing dried leaves of Aloe. The traditional healers of India use fresh and dried leaves in treatments of many common and complicated diseases (Nadkarni, 20).

Aloe is one of the promising herbs having the unique quality to repel termites. In rat infested fields the farmers plant Aloe to attract the snakes (presence of Aloe invites snakes) for rat management. Many a times it acts as live fence to stop entry of cattle in the field. In the area where soil erosion is a problem Aloe is planted which helps a lot in soil binding.

ORIGIN AND DISTRIBUTION

The genus *Aloe* comprises about 600 species, most of which are indigenous in South Africa (*A. ferox, A. africana, A. spicata*); some have been introduced in Asia (*A. chinensis*). Barbedos Island in Central America *(A. barbedensis*) and Europe (*A. arborescence*). The genus includes tree (A. ferox), shrubs and herbs (*A. barbedensis*); they are xerophytic plants with large, fleshy leaves carrying spines at margins and resemble Agave or century plant (*Agave americana* Linn.).It is indigenous to eastern and southern Africa and grown in Cape colony, Zanzibar and islands of Socorita. Native to eastern and southern Africa, *Aloe vera* grows wild in the tropics and is cultivated extensively worldwide. The genus Aloe is widespread throughout the entire African continent, but the tropical regions are particularly rich. It is found as wild along the coast of South India. It is also grown as an ornamental. In India, it is under cultivation in states like Chhattisgarh, Maharashtra, Madhya Pradesh, Gujarat and Andhra Pradesh (Kirtikar and Basu, 19).

PLANT'S PROFILE

Aloe vera is a stem less or very short-stemmed plant growing upto 60–100 cm in height, spreading by offsets. The leaves are thick and fleshy, green to grey-green; with some varieties showing white flecks on their dorsal and ventral surfaces, the margin of the leaf is serrated and has small white teeth. The flowers are produced in summer on a spike up to 90 cm tall, longer than leaves, each flower being pendulous, with a yellow tubular corolla 2–3 cm long (Yates,22). Fruit are triangular capsule containing numerous seeds. Like other *Aloe species, Aloe vera* forms arbuscular mycorrhiza a symbiosis that allows the plant better access to mineral nutrients in soil (Gong *et.el.,*15). *Aloe vera* leaves contain phytochemicals for possible bioactivity, anthraquinone glycosides (King *et al.* 18). Barbaloin (aloe-emodin anthrone C-10 glucoside) is the major active constituent. *Aloes* also contain resins, aloetic acid, homonataloin aloe-sone, chrysophanic acid, chrysammnic acid, galactouronic acid, choline salicylate, saponins, mucopolysacchrides, glucosamines, hexuranic acid and coniferyl alchohol alongwith isobarbaloin (crystalline aloin) (Eshun and He,13).

CULTIVATION PRACTICES

The cultivation of *A. vera* has acquired great commercial importance for medicinal products and cosmetics processing but information is scarce about agronomic management of this crop. Despite the ideal climatic conditions for the cultivation of this plant, people not had been able to exploit it entirely. The reasons may be lack of appropriate cultivation and processing know-how.

CLIMATIC AND SOIL

Is dose well in a variety of climate and can withstand drought easily. It grows very well in temperate climate with low rainfall. Driest and poorest soils are good for economic yield of *Aloe*. It can be grown on a variety of soils. However, water logged soils are not suitable for its cultivation. Though, *Aloe* can be cultivated on any type of soil for 'dry land management', sandy loamy soil is the best suited for it

in pots. It can be grown in containers consisting two parts of loam and one part of coarse sand, broken bricks and crushed limestone, with a bit of bone meal added.

LAND PREPARATION

The ground is to be carefully prepared to keep free from weeds and the soil is kept ideally slightly acidic. Plants should be supplied supplements in the form of FYM/Vermicompost at least twice a year.

PROPAGATION

Aloe is propagated by breaking of small rooted plantlets (2-3 inches tall), through seeds, suckers and cuttings. *Aloe* is generally propagated by root suckers by carefully digging out without damaging the parent plant and planting it in main filed. It can also be propagated through rhizome cuttings by digging out the rhizomes after the harvest of the crop and making them into 5-6 cm length cutting with a minimum of 2-3 nodes on them. Then they are rooted in specially prepared sand beds or containers. The plant becomes ready for transplanting after the appearance of the first sprouts (Bently and Trimen, 5). About 36,500 suckers are required for one hectare plantation. Optimum spacing requirement are yet to be standardized. Generally, 60 $\times$ 30 cm spacing is followed (Agarwal and Upadhyay, 1).

NUTRITION AND IRRIGATION MANAGEMENT

No chemical fertilizer is recommended for its cultivation since in most of the areas where Aloe is cultivated it is only under rain fed condition. It thrives well when grown with vermicompost or FYM. In India, Aloe is raised organically and only farmyard manure is applied @ 12-15 tones/ha. In standing crop cow dung solution is applied for nutrient and pest management. However, for better results, the soil should be supplemented with ammonium nitrate every year. The crop is not irrigated normally and this can come up very well in dry areas. Therefore, there is no recommendation on irrigation scheduling. However, it requires about 150 mm of water each month for its quality production.

PHARMACOLOGY

Cathartic action of the drug limited to large intestine, is attributed to anthraquinone glycosides, chiefly aloin. Latter is not absorbed in upper gut but hydrolysed to the active aglycone at the site of action in the Colon and rectum by intestinal bacteria. The anthrones irritate the mucus membrane, leading to an increase in the secretion of mucus, thus stimulating peristalsis. Also they induce an active secretion of water and electrolytes into the lumen of the gut, and inhibit the absorption of electrolytes and water by the colon. Aloe is one of the few medicinal plants that have maintained its popularity for a long period of time. *Aloe* latex is used for its laxative effect and should be distinguished from aloe gel, used both in cosmetic and in ointments for skin ailments (Alemdar and Agaoglu, 3). Aloe whole leaf is another preparation used internally as a drink in a wide range of human diseases including cancer, AIDS, ulcerative colitis and other disturbances (Dange *et al.,* 9). The word *Aloe* in pharmacopoeias and formularies means a drug derived from the dried leaf juice. This has always created confusion because the leaves of the genus *Aloe* are the source of two products that are quite different in their chemical composition and therapeutic properties: aloe latex and aloe gel. These two, cells (latex) and gel form parenchymatous cells. Therefore, the term juice must be avoided, as it could mean either the latex from the pericyclic cells or the gel after extraction form the leaf. However, to add even more confusion for people interested in medicinal herbs, there is also a preparation obtained from the whole leaf (total extract) and another obtained from the aloe wood, so-called lignaloe or aloe of the Bible, a fragrant wood obtained from an entirely different plant that was once used as an 'incense' (Farooq,14).

PEST INFESTATION

No major insects or diseases have been reported in India.

HARVESTING

The plant has a lifespan of about 12 years. Crop is ready to harvest about 8 month after sowing/transplanting. In India, the average yield for organically grown *Aloe* is about 12 ton/ha (on fresh weight basis leaves). To collect the gel and bitter liquid, the leaves are cut and drained as required. The plants can be harvested every 6-8 weeks by removing 3 to 4 leaves per plant.

MEDICINAL PROPERTIES AND USES

The natives and traditional healers of Aloe growing areas in different parts of the word are well aware of the medicinal uses and properties since time immemorial. In the international market different preparations from aloe are having good demand. It is used for healing different diseases (Agarwal, 2). Now a days it is in great demand for *Aloe vera* gel, juice and latex that have varied applications and uses in the

cosmetic, food and alternative medicine industries. A few of them are listed below:

Fresh leaf : Apply the split leaf directly to burns, wounds, dry skin, fungal infections, and insect bites. It can be taken up to 2 tsp in a glass of water or mixed with fruit juice, three times a day, as a tonic.

Ointment : Split several leaves to collect a large quantity of gel, and boil it down to a thick paste. Store in clean jars in a cool place and use like the fresh leaves gel.

Tonic wine : In India fermented aloe gel with honey and spice is known as "Kumaryasava" and is used as a tonic for anaemia, poor digestion, and liver disorders.

Inhalation : It can be used in a steam inhalant for bronchial congestion.

Powder : Can be used in powdered form or capsuled as a purgative for stubborn constipation and it will stimulate bile flow too (Chauhan *et al.,* 7; Davis *et al.,* 10).

Beauty treatment : Aloe vera has a long history being used as skin lotion (Devi and Roy,11).

In healing wounds : If applied to wounds, aloe gel acts as mild anaesthetic, relieving itching, swelling, and pain, it also has antibacterial and antifungal properties, increases blood flow to wounded areas, and stimulates fibroblasts, the skin cells responsible for wound healing (Capasso,6).

It soothes burns : The burns heal more quickly if aloe gel is applied.

It minimizes frostbite damage : Aloe gel is helpful in frostbite. It prevents blood flow to the frozen tissues, a common cause of tissue loss in frostbite.

Aloe screens out radiation : Aloe gel protects skin damage against x- rays (King *et al.* 18). It is an effective antioxidant, mopping up the free radicals caused by radiation, and that it protects healing substances, super oxide dismutase (an antioxidant enzyme) and glutathione (an amino acid which stimulates the immune system).

Protection from lung cancer: Juice prevents human pulmonary carcinogenesis (lung cancer) and is preventive or suppressive against various human cancers (Grindley and Reynolds,16).

It eases intestinal problems : *Aloe vera* juice can be effective for treating inflammatory bowel diseases.

In reduction of blood sugar : Its juice reduces the blood sugar levels in diabetics. It can reduce blood sugar levels by an average of 45% with no change in their total weight.

Oral disease control : Aloe has been seen to enhance defence mechanisms, and it has a variety of components to combat periodontal disease and other oral conditions.

Sound health : Now days the juice of aloe is very popular for getting sound health and developing disease resistance in body (Erdman, 12).

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