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Review Article

REVIEW ON CULTIVATION PRACTICES OF *AMLA* (*PHYLLANTHUS EMBLICA*)

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ABSTRACT

Amla has a great potential with *Rasayana* potential (rejuvenating) which boost our immunity and help us live longer, and helps in disease-free lives. *Amla is* scientifically known as *Phyllanthus Emblica*. *Amla* is much higher in vitamin C when compared with other available natural food resources, making it an exceptionally rich food. In addition, it has plenty of antioxidants, calcium, potassium, vitamin A, and other nutrients. Traditional medicine uses *Amla* extensively because of its many health benefits. It is thought to strengthen the immune system, facilitate better digestion, promotes healthy hair growth, and improves skin health. Three primary varieties and seven cultivated varieties exist, each with unique fruit characteristics. It is extensively utilized for pharmaceutical products as well as commercial bases. Due to its growing commercial use and increased demand cultivation of *Amla* through sustainable techniques is essential. Certain techniques have been developed for cultivation of *Amla* that provide better, higher yields in shorter span of time. This article reviews about different aspects of cultivation technique of *Phyllanthus Emblica*.

INTRODUCTION

In Ayurveda, an indigenous medical system of India, *Amalaki (Emblica officinalis*) holds a prominent place.[1] *Amalaki*, also referred to as *Phyllanthus emblica* or Indian gooseberry, is a member of the *Euphorbiaceae* family.[2] One could refer to the plant as the *"Amrutphal."*[3] In Tamil, it is called Nellikai, *Avala* in Marathi, Nelli in Kannada, and *Amalaki* in *Sanskrit*. [4] Numerous religious texts, including the *Ramayana, Charak Samhita, Sushrut Samhita*, and other classics, highlight its many medicinal and spiritual benefits. [5] *Amla* is renowned in Ayurveda for its *Rasayana* (rejuvenating) *Karma*.[6] The three most beneficial qualities of *Amla* are *Rasa (Panchras), Veerya (Sheeta), and Vipaka (Madhura*). [7] In daily life, *Amla* is used in a variety of Ayurvedic preparations such as *Chyavanprash, Triphala churna, Brahma Rasayana*. The most widely used preparation is *Chyavanprash*, which has several immune-boosting and health-boosting properties. Additionally, it is widely used without a doctor's or other healthcare professional's prescription.[8] The fruits are thought to be a good liver tonic because they are high in vitamin C.[9] The three active ingredients in *Amla* are rutin, gallic acid, and ellagic acid. It has a number of pharmacological properties, including analgesic, anti-inflammatory, anti-oxidant, and hepato-protective, anti-diabetic, anti-cancerous, and antibacterial properties. [10] It has been discovered that phytolemblin derived from fruit pulp has a mildly central nervous system depressant effect.[11] The preparation of different health care products, such as hair oil, dye, shampoo, face creams, and tooth powder, has a good demand from the industries. Some Indians even use *Amla* to make pickles. [12]

Phyllanthus emblica Linn, is widely found in most tropical and subtropical countries. It primarily occurs in China, Myanmar, Sri Lanka, Pakistan, Indonesia, and the Malay Peninsula. The trees grow in hill cliffs, mountains, and tropical and subtropical regions of India.[13] *Amla* is medium sizes tree, with leaves in closely pinnate fashion, flowers are pale green in colour has a fleshy fruits with light greenish yellow colour. [14] It can spread throughout a range of climatic conditions. Tropical and dry subtropical climates are ideal for the large-scale, productive cultivation of this tree. The tree can tolerate

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temperatures as high as 46°C and needs annual rainfall. The tree can grow in any kind of soil because it has deep roots and is deciduous.[15]

MATERIAL AND METHODS

Literature review regarding *Amla* was done using literature search from different journals, Ayurveda and modern text, authentic websites (PubMed, Google Scholar, Scopus, etc).

RESULT

Soil & climate

E. officinalis is a subtropical tree that can withstand a wide range of weather conditions. On the other hand, this tree can be grown quite successfully on a large scale in tropical and dry subtropical climates. E. officinalis trees prefer 630–800mm of annual rainfall for optimal growth and development. They can also withstand temperatures as high as 46°C because the warm weather is beneficial when fruit growth begins. As a deep-rooted, deciduous tree species, it can be grown in a wide variety of soil types, from clay to sandy loam, and in both arid and semi-arid environments. [16]

Varieties of *Amla*

In India, there are three primary types of *Amla.* Banarasi *Amla*, Francis *Amla*, and Chaikaya *Amla* are the three sub varieties. Every one of these *Amla* varieties has advantages and disadvantages of its own. Narendra Dev University of Agriculture and Technology brought several *Amla* varieties- Krishna, Kanchan, Narendra Aonla -6, Narendra Aonla -7, and Narendra Aonla - 10 for commercial cultivation in India in consideration of its limitations. [17]

Chakaiya *Amla*

Cultivar Chakaiya grows tall and straight. The fruit is flattened, small to medium in size, and has smooth, greenish-colored skin along with hard, fibrous flesh. It is a variety that matures slowly. The fruits are of good quality and can be used to make pickles and other products. [18]

Francis *Amla*

The Francis *Amla* is originally from ranges of Pratapgarh in Uttar Pradesh. In India, the Francis gooseberry variety is favored for use in high-value goods like juices, powder, and candies. The fruit is large, oval, flattened, and has smooth skin that is colored greenish yellow. The flesh is almost completely devoid of fibers. Francis is a regular fruit bearer variety with a high yield. It is not suitable for preservation because of its high susceptibility to fruit necrosis. [19]

Banarasi Amla

One cultivar that is frequently grown in Uttar Pradesh's Varanasi district is called Banarasi. With three branchlets per node and an upright growth habit, this variety is quite popular. When the fruit reaches maturity, it will have six linear grooves running from the base to the apex. The fruits are medium to large, round, and light green when they are young, turning whitish-green as they mature. The flesh is semi-transparent, soft, and moderately fibrous. The fruits mature earlier than those of other varieties, and flowering starts early, in the fourth week of March. This variety's disadvantage is that it frequently experiences fruit loss, leaving a bare canopy in its midst. Furthermore, gooseberries have a shorter shelf life than other varieties. [20]

Table 1: Others cultivated varieties

Variety of *Amla*	Characteristics
Krishna (NA-4)	Krishna (NA-4) is the result of Banarasi-based selective breeding. The fruits are big, have smooth skin, range in color from whitish-green to apricot-yellow, and have red spots on their exposed surfaces. The flesh is extremely astringent, hard, semi-transparent, and fibreless. There is no sign of fruit necrosis on this shy and early-maturing bearing cultivar. [21]
Kanchna (NA-5)	Kanchan (NA-5) is the result of Chakaiya-based selective breeding. Medium-sized fruits with smooth skin, an oblong shape that has been flattened, a light green color, and six difficult-to-separate segments are also high in fiber. The tree is tall and grows in a spreading manner. In semi-arid areas with abundant fruit production, this variety has gained broad acceptance. Industries favor this variety for producing a range of products and for pulp extraction. [22]
Narendra Aonla-6	A cultivar called Narendra Aonla-6 (NA6) was developed from Chakaiya. It produces medium-to large, glossy, flattened fruits with low fiber content, Mid-season (mid-November to mid-December) is when it reaches maturity. This is the most promising variety of Indian gooseberry that can currently be planted on a plantation. [23]

Narendra Aonla-7	A cultivar of Francis open-pollinated is called Narendra Aonla-7 (NA-7). The fruits range in size from medium to large, oval in shape with a conical base, smooth skin, and a yellowish-green hue. The flesh is soft, nearly fiberless, of a moderate quality, necrosis-free, and fit for processing. The states of Madhya Pradesh, Jharkhand, Bihar, and Rajasthan have all accepted this variety. The brittleness of the branches, which frequently break due to the fruit load, is the main limitation of NA-7. [24]
Narendra Aonla-10	(NA-10) is the outcome of a random selection made from Banarasi. Fruits have round, flattened forms, and range in size from medium to large. The pale skin is rough, pink-tinged, and yellowish-green. The flesh is juicy, tender, whitish-green, somewhat fibrous, and extremely astringent. This is the highest-quality variety that matures the earliest. [25]

Planting Practices

Typically grown from seeds, E. officinalis trees have a lengthy juvenile growth stage and provide lower-quality fruit. In addition to being late-bearing because they require more time to reach the first reproductive stage than trees propagated vegetative, trees grown from self-sown seeds in forests are not true-to-type and show significant variability in terms of irregular patterns of vegetative growth, fruit shape, size, yield (both quality and quantity), etc. [26]

Furthermore, even under ideal circumstances, fresh seeds typically do not germinate due to the stiff and thick testa; therefore, they need special treatments such as water soaking, scarification, stratification, plant growth regulator therapy, etc. to break dormancy. [27]

Grafting & Budding Techniques

Both patch and shield budding are used in business propagation. In early July, one-year-old seedlings with a thickness of one centimeter are typically shield budded with robust and healthy buds.

With a 70% success rate, softwood grafting is a successful alternative to budding, especially for arid regions. Furthermore, veneer and cleft grafting have been shown to be successful. [28]

Water Management

Generally, well established aonla orchards do not require irrigation in the normal rainfall and soil moisture conditions. Irrigation should be avoided during flowering period (February and March), but irrigation is required after application of manures and fertilizers, if sufficient moisture is not available in the soil. Under rain fed conditions, plants irrigated through drip at alternate day with 60% wetted area recorded better growth, yield and quality of aonla, however it can be grown successfully under rain fed semi-arid condition without irrigation. [29]

Nutrient Management

While using vermin compost greatly enhances fruit quality, applying a combination of organic and inorganic fertilizers boosts fruit yield and quality. These nutrient sources affect the physical, biological, and chemical characteristics of soil. Manure and fertilizer dosages vary according to soil fertility, plant age, and fruiting frequency. One-year-old plants typically receive 10kg FYM, 100gm nitrogen, 50gm phosphorus, and 100gm potassium. Along with standard fertilizers, 100–500gm of boron, zinc sulfate, and copper sulfate are added to any problematic area. It is also possible to apply a basic application of 16 tons/ha FYM and 100:50:50 g NPK/plant. [30]

Pest Management

For *Amla* trees, integrated pest and disease management is a thorough strategy that combines different agricultural techniques to reduce the harm that pests and diseases cause.

Eating caterpillar: This pest burrows into the main trunk and branches, causing sap to leak out of the openings and causing damage. Applying chlorpyrifos and removing the impacted areas will help bring the situation under control. [31]

Shoot galler meker: Throughout August and September, the juvenile caterpillars bore into fragile shoots and fed in pits. A structure resembling a gall develops in the damaged area. [32]

Fruit Borer: It causes holes in the fruits, which causes the fruit to rot. For control, pheromone traps and Bacillus thuringiensis spraying are advised. [33]

Aonla aphids: There is a severe infestation of new flushes. Tender shoots, leaves, flower buds, and fruits are infested by aphids. Infested shoots appear twisted and bent at growth points, and infested leaves turn yellow and dry. Ants are another sign of an aphid infestation. [34]

Leaf rollers: On the underside of newly sprouting leaves, the tiny purplish-brown moth deposits its eggs. The eggs hatch after two to three days, and the young apodous caterpillars create zigzag mines on the ventral surface of tender leaves as they eat. They scrape rolled leaves in order to consume chlorophyll. [35]

Harvesting

The fruits turn light green at the maturity and ripening stage, turning greenish-yellow or, in rare cases, brick red. Mature fruits have the highest ascorbic acid content, while immature fruits have the lowest ascorbic acid and mineral content. Fruits are ready to be picked by hand in November and December. [36]

Whole fruits are harvested as soon as possible to prevent fruit dropping, especially for cultivars of "Banarasi" and "Francis." This can be done in the early or late hours of the day. A budded or grafted tree begins to bear fruit after three years of planting, whereas a seedling tree takes six to eight years to begin bearing fruit. The latter type of tree can continue to bear fruit for up to 75 years of age. A single E. officinalis tree can produce 100–300kg of fruits, or 15–20 tons per hectare. [37]

Post Harvest Management

Plant hormone sprays, pre- and postharvest chemical treatments, grading, and packaging can all extend the shelf life of aonla fruits. Large-sized "A" grade fruits (more than 4.00cm in length and diameter) are used to make murabba and candies; small-sized "B" grade fruits are used to make *Chavyanprash* and *Triphala*; and blemished "C" grade fruits are used to make powder and shampoo. [38]

The best packing materials to prolong the shelf life of fruits during long-distance transportation are wooden crates, CFB boxes with a newspaper liner inside, and polyethylene bags as liners. In contrast, it is gathered and transported for the local market in newspaper-lined plastic crates. [39]

DISCUSSION

According to Ayuveda and modern science *Amla* has so many qualities that make him king of herbal plants. In ancient literature, it was called *Amrutphala*.

Sustainable cultivation of *Amla* is very essential due to this growing world, increasing demand and lack of supply. Sustainable cultivation using traditional and newly evolved agriculture advance techniques can assure *Amla* supply in terms of better quality and quantity.

Seedling and grafting techniques are the most used techniques for cultivation. Management of pests and physiological disorders will help in a better yield.

CONCLUSION

The fruit of the Indian gooseberry has gained popularity all over the world due to its therapeutic and nutritional qualities.

To fulfill the current and future demand of *Amla* Sustainable cultivation practices should be done.

Traditional as well as modern agro techniques standard operating procedures should be adopted for the higher yield and consistency in phytochemical ingredients.

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