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TECHNIQUES FOR GROWING THE UNDERUTILIZED NONI CROP AND ITS HEALTH BENEFITS

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ABSTRACT

Noni, botanically known as Morinda citrfolia L, a miracle plant with more than 150 nutraceuticals were found growing naturally in all types of lands right from sea coast to interior and are now being cultivated as crop by the farmers of India. While the crop's cultivation and medical importance are becoming more well-known, it's necessary to comprehend the different difficulties, constraints, and biotic stresses that the plant faces. The research and development work done in India and abroad led to an effort to review the material that is now out there and provide it here. Noni has been traditionally used in various folk medicine systems for treating a wide range of health conditions.

KEYWORDS: *Morinda citrifolia* L., Health benefits, Cultivation practices and Pest management

INTRODUCTION

Morinda citrifolia, L. popularly known as Indian Noni or Indian mulberry is an ever-green small tree bearing flowers and fruits throughout the year. It's a member of the Rubiaceae family. Tropical areas of the world are where it is grown. According to Morton (1999), this tree's fruits have historically been used in South East Asian and Pacific Island pharmacopoeias. It is the fullness of nature condensed into one fruit. It has more than 150 nutraceuticals, numerous vitamins, minerals, and micro and macro nutrients that support the body in a variety of ways from the cellular level to the organ level, making it the largest pharmaceutical unit in the universe. In Polynesia, noni is one of the most significant traditional folk medicines that has been utilised for more than 2000 years.

BIO-SYSTEMICS:

Botanical name: *Morinda citrifolia*
Family: Rubiaceae
Common name: Starvation fruit
Origin: South East Asia

DISTRIBUTION OF NONI:

Although it adapts well to coastal environments, the species is typically found from sea level to 400 m above MSL (Lu berck and Hannes, 2001). Evergreen noni trees are frequently observed beside lava flows. There are currently 80 species of the genus Morinda, most of which are found in tropical nations. Africa, Australia, Fiji, India, Thailand, and Vietnam are all affected. It is commonly produced in India's Andaman and Nicobar Islands under natural circumstances. Due of its wide range of environmental adaptation, it is common along fences and road sides throughout the coastal region. It can be found along the coasts of Kerala, Karnataka, Tamil Nadu, and many other places in India's main land.

Survey of Morinda in south India indicated that 12 different species or varieties of Morinda are distributed throughout Tamil Nadu and Kerala.

S. No.	State	Species
1.	Tamil Nadu	*M. tinctoria* L.
2.	Kerala	*M. citrifolia* L.

M. citrifolia L. is not known to exist in the Tamil Nadu study area, although it is widely dispersed throughout most of Kerala, particularly in the coastal region, as well as in the Mangalore district of Karnataka. A recently discovered species of Morinda with big, leathery leaves has been found in Orissa (Singh *et al*., 2007).

Table 1: NUTRITIONAL VALUE OF NONI (PER 100G EDIBLE PORTION)

S. No.	Constituents	Content	S. No.	Constituents	Content
1.	Protein	0.9 g	**7.**	Calcium	30 mg
2.	Fat	0.2 g	**8.**	Iron	0.4 mg
3.	Vitamin C	33 mg	**9.**	Magnesium	24 mg
4.	Vitamin A	15 µg	**10.**	Phosphorus	20 mg
5.	Vitamin E	0.5 µg	**11.**	Sodium	4 mg
6.	Vitamin K	0.2 µg	**12.**	Zinc	0.2 mg

HEALTH BENEFITS

Noni has been traditionally used in various cultures for its potential health benefits. While scientific research on noni is ongoing, here are some of the potential health benefits associated with consuming noni (Moorthy *et. al*., 1970).

- **Antioxidant properties:** Antioxidants found in noni, including anthraquinones, flavonoids, and vitamin C, can assist the body in scavenging dangerous free radicals. Antioxidants may maintain a healthy immune system and improve general well-being.
- **Anti-inflammatory effects:** Anti-inflammatory qualities have been discovered in noni, which may aid in lowering inflammatory levels in the body. The anti-inflammatory properties of noni may contribute to its potential health advantages because chronic inflammation is linked to a number of medical disorders.
- **Immune system support:** Noni is thought to provide immunity-enhancing qualities that support immune system strength and general immune health. This might be as a result of its antioxidant concentration and potential immune response regulation.
- **Digestive health:** Traditional uses of noni include supporting digestive health and easing tummy aches. According to Peter et al. (2007), it might support regular bowel movements and maintain a healthy digestive tract.

➢ Varieties:

1. **Hawaiian Noni:** This cultivar, which is frequently produced in Hawaii, is renowned for its big fruits. Hawaiian noni grows well in tropical areas and is frequently utilised for commercial production.
2. **Tahitian Noni:** Tahiti and other Pacific Islands have a significant farming presence for this cultivar. Tahitian noni is preferred for making noni juice because of its great fruit output.

3. **Indian Noni:** This cultivar, which is grown in India, is renowned for its capacity to cope with many environmental conditions. Indian noni plants can withstand a wide range of temperatures and, in contrast to Hawaiian and Tahitian types, yield smaller fruits.
4. **Australian Noni:** Australia's northern areas, in particular, are where this cultivar is cultivated. Australian noni plants were created to resist the unique climatic conditions of that nation.

Climate and Soil

A tropical plant called noni grows well in hot, humid environments. It thrives in tropical and subtropical climates all over the world. Here are some essential elements that contribute to a climate that is ideal for noni farming (Hawaii *et al*., 2006).

- **Temperature:** Noni favours temperatures between normal and hot. It thrives in environments that are between 75°F (24°C) to 95°F (35°C) in temperature. Since noni is susceptible to cold, it cannot withstand frost or prolonged low temperatures.
- **Sunlight:** Sunlight is essential for noni's growth and fruit production. It needs at least 6 to 8 hours of direct sunlight each day in order to grow.
- **Rainfall:** A tropical plant called noni prefers frequent rains. It needs a steady supply of water all year round. For noni farming, rainfall should fall between 40 inches (1,000 mm) and 70 inches (1,800 mm) annually.
- **Soil:** Although noni may grow in a variety of soil types, it likes fertile, well-draining soils. For noni cultivation, sandy or loamy soils with a high organic matter concentration are best. The pH of the soil should be between 5.5 and 6.5.
- **Humidity:** Noni thrives in high humidity environments. Relative humidity levels around 70% to 80% are ideal for its growth.

Selection of Planting Materials

It is possible to grow noni from seeds, stem cuttings, or tissue culture. For good plant growth and fruit production, it's essential to choose healthy and disease-free planting materials.

Propagation of Noni

It is possible to grow noni from seeds, cuttings, or tissue culture. Due to the plant's high cross-pollination rate, there is a great deal of variety among plans grown from seedlings. Seeds from recently ripened fruits should be collected and put in nursery beds in order to raise seedlings. Even after cutting, viability after storage loss in 6–8 months can be employed for multiplication. In commercial gardens, tissue culture saplings are typically planted.

NURSERY AND CULTURAL PRACTICES

Seed collections and storage

Noni fruits mature on the plant itself and are climacteric. For seed collection, only ripe, soft noni fruits should be used. By rubbing the fruit pieces together and scrubbing them vigorously with water, the seeds must be extracted from the fibrous fruit flesh. 200g of clean seeds can be obtained from a kilogramme of fruit. Noni seeds are oblong-trangular, reddish-brown, and have a noticeable air chamber. Due to their air chamber and their robust, water-repellent, fibrous seed coat, they are buoyant and hydrophobic. The seed coat is layered with parchment that resembles cellophane and is extremely robust and substantial in thickness. Between 70 and 90 percent of seeds germinate. If maintained in refrigerator and sealed bottles, the seeds' viability can be extended for a year.

Seeds treatment:

Mechanically scarified seeds treated for 24 hours with 800 ppm GA will exhibit a germination rate of 80-85% in 20- 30 days. The best cot mattresses will have a 1:2:1 ratio of soil, sand and FYM. Seedlings that are 30 days old and 10 cm or less in height can be transferred to poly bags with a 1:1:1 mixture of sand, soil, and FYM.

Vegetative propagation:

With a dip in IBA 400 ppm for 15 to 30 seconds, semi-hard stem cuttings (5-7 cm dia, 12 to 18 cm long, and 2-3 nodes) demonstrate strong roots and shooting in 3 to 4 weeks. For filed transfer, seedlings and cuttings that are 90–120 days old (20–25 cm in height) works best. May through July are the ideal months for planting (Antony *et al*., 2006).

Site Selection:

Tropical and subtropical climates are ideal for noni. It needs soil that is well-drained and has a pH between 6.0 and 7.5. Pick a location with plenty of sunlight because noni plants need full sun exposure for the best growth.

Planting and Spacing:

Noni plants should be spaced 10-15 feet apart. There are 290 plants per acre with a 12-foot spacing. Plant crowding results from shorter distances between plants, which may also make some pest and disease issues worse.

Irrigation:

When conditions are dry and plants are younger than 2-3 years old, irrigate once or more a week, applying up to 10 gallons per plant; for older plants, irrigate less frequently. Overwatering can speed up damage from root-knot nematodes, cause root rot, and leach fertilizer nutrients outside the root zone. Noni thrives with moderate irrigation and can survive prolonged drought once established and mature.

Fertilization:

Noni depends on the soil and rainfall for the quantity and frequency of fertilizer applications. Without fertilizer, noni trees growing in woodlands typically look healthy. While more mature or flowering or fruiting plants are encouraged to produce many large fruits by applying high-phosphorus fertilizers such as 10-20-20 or 10-45-10, younger, nonfruiting noni plants are encouraged to produce lush vegetative growth with balanced fertilizers (such as 14-14-14 or 16-16-16). Fertilizer formulations with controlled release are given to young seedlings and transplants, whereas formulations with rapidly available granules are given to older, mature plants. At the "drip line" of the plant, or the region where water drips from the edge of the leaf canopy, fertilizer should be applied away from the trunk.

Spraying foliar fertilizer works well on noni plants of all ages. Sprays of foliar fertilizers high in phosphorus (such as 10-45-10) and substances (such as seaweed emulsions) containing nitrogen and minor elements have been shown to increase the production of noni flowers and fruits.

Instead of fertilizing noni seldom with bigger volumes of fertilizer, it should be fertilized regularly with smaller amounts. Balanced fertilizer (14-14-14) can be applied to young plants up to a year old in high-rainfall locations at a rate of 12 pound per month, and to more mature plants at a rate of up to 1 pound per month.

Crushed coral, dolomite, K-mag, 7-7-7, composted chicken dung, and macadamia nut husks are among the efficient organic fertilizers for noni growing. A yearly lime application, around 1 pound per plant, will help some areas.

Pruning and Training:

Pruning helps noni plants create a balanced canopy structure and enhance airflow. Additionally, pruning can promote simpler harvesting and assist regulate plant size. Depending on the intended shape and management techniques, noni plants can be trained to have a single stem or several stems.

Harvesting and yield:

After being planted, noni plants can start producing fruit in around 9 months. Even though they are typically small and few at this early stage, fruits can still be plucked. Some farmers elect to prune back the branches in place of harvesting during the first and second years. As a result of this trimming, the plant becomes bushier, has more lateral and vertical branches, and yields more fruit overall. Although there are seasonal tendencies in fruit production that may be impacted or altered by the weather and fertilizer treatments, noni fruits can be gathered all year long.

Depending on nutrition and plant spacing, mature, robust plants should yield 250–500 pounds per plant year. However, with appropriate crop management, yields at some areas can approach 500 pounds per plant year. Fruits can be picked just before they start to fully mature and turn a whitish-yellow color on the tree.

Post-Harvest Handling:

Due to their high-water content and quick degeneration after harvest, noni fruits have a limited shelf life. The shelf life can be increased with prompt cooling and suitable storage conditions, such as cold temperatures and high humidity. Another method for extending the shelf life of the fruits is to process them into juices, purees, or other products with value-added.

It is important to keep in mind that noni agricultural production methods can change based on regional factors, climatic factors, and particular farming systems. Therefore, speaking with local agricultural extension agencies, noni specialists, or knowledgeable farmers in your area might offer insightful advice that is targeted to your particular locale.

Plant diseases

1. Black flag of noni

India experiences a severe leaf and fruit blight. Phytophthora botryose is the pathogen responsible for the illness. Among the signs are a chocolate- or black-colored fruit rot, stem or branch dieback, and

black leaf and stem blight. Extended damp weather is favorable for the sickness. The use of trimming, weeding, and field cleaning are examples of control measures.

2. Sooty mold

A nonparasitic fungus called sooty mould is a black, surface growth that feeds on the sugary exudates secreted by soft-bodied insects like scales and aphids. Leaves can be easily cleaned of sooty mould by hand. Sooty mould can be eliminated with a spray of soapy water.

3. Noni root-knot disease

Root-knot nematodes of the Meloidogyne species are responsible for the illness known as noni root-knot. Plant stunting, yellowing, and diminished vigour are the symptoms that are visible above ground. Roots that have been harmed may be galled, swelled, fractured, or rotting. By using nematode-free transplants and organic soil additions like composts containing chicken dung, this illness can be reduced.

4. Stem rot

In stem rot, plant tissues at the base deteriorate, causing stunted growth. Wilt, which includes leaf flagging, yellowing, and dropping, is the first sign of plant disease. Stem rot can be prevented or at least less severely affected by using pathogen-free plants, choosing suitable locations, and reducing plant stress.

Insect pests:

Pest attacks on cultivated noni can result in serious harm. Aphids (Aphis gossypii), ants, scales (the green scale), mites (eriophyid mites), whiteflies (fringe guava whitefly), and slugs are pests that have been observed attacking noni crops. Monocultures of noni favour pest outbreaks. Therefore, combining nonhost plant species in intercropping can reduce the overall intensity and frequency of pest infestations.

CONCLUSION

More than 50 nations around the world have access to noni. Millions of customers have experienced its health benefits. All portions of the noni fruit are used to make various goods, including noni juice, capsules, soap, and cosmetics. The growing of noni in North Bihar offers the local population a fantastic opportunity to create a living and receive health advantages.

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