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Application and innovative cultivation of noni (*Morinda citrifolia*) in North Bihar

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Abstract

Morinda citrifolia L. popularly known as 'Noni' is an important food and medicinal plant. An under utilised, it contains more than 196 nutraceuticals and has good antioxidant potential. They are growing naturally in all types of lands and as crop by the farmers of India. North east India has a rich diversity of Medicinal plants a majority of the rural population depends largely on herbal medicines, 'Noni' belong to family Rubiaceae, native to Indonesia and Australia. Recently, under National Medicinal Plant Board, New Delhi funded project rain forest research Institute, Jorhar, has introduced some elite clones of Noni from Central Agricultural Research Institute (CARI), Port Blair in Assam, Mizoram and Tripura.

The whole Noni Plant for herbal remedies. The fruit juice is in high demand in alternative medicine for different kinds of illnesses such as arthritis, diabetes, painful urination, liver disease, constipation, enlarged spleen, heart disease, gastric ulcer, infection, cancers, menstrual problem etc.

Keywords: *morinda citrifolia*, rubiaceae, nutraceuticals, antioxidant.

Introduction

Morinda citrifolia L. (Noni) Family: Rubiaceae is an important food and medicinal plant, native to Indonesia and Australia. Noni has a long history related to medical uses in southeast Asian countries. In North Bihar it is found naturally. It is introduced to several district of North Bihar like Samastipur, Muzaffarpur, Darbhanga, Begusarai, etc. Different parts of the plant such as leaves, stem and roots are used as medicine. In North Bihar it is used to cure cough, cold, pain liver disease, malaria and blood pressure. Considering the medicinal value of the plant, National Medicinal Plant Board, Govt. of India, has included Noni in the list of plants approved for cultivation. Noni is found to contain 196 nutraceutical compounds, is rich in health attributes as antioxidant, antidiabetic, anticancer and has vitamins and amino acids. Noni is also useful for relieving the misery of rheumatoid arthritis. There is a great demand for Noni products- Noni juice, Noni capsules and Noni creams in the market and their cost is very high. Noni juice is available in market for @ Rs. 500/- per 100 capsules. In north Bihar there is no commercial cultivation of Noni. North Bihar climate is very much suitable for Noni cultivation.

The roots are being used to synthesize red dye while the leaves, bark, and fruits are used to produce facial creams, soaps, toothpaste, lotions, tea powder and various other products. Abbott (1992)^[2] reported that Noni has been used as drink, food, medicine and dye. In the past decade the global popularity of Noni has increased dramatically (Dixon *et al.*, 1999 and Clatchey, 2002)^[8, 10] There are many Noni based products like health products, home care products, food products, health support products, fruit drinks, cosmetics like body care, oral line, face line, hand line, feet line etc.

Plant Description

It is medium sized tree or bush of about 3-9 m height leaf opposite, pinnately veined, blades membranous, broadly elliptical, 5-17 cm long, 10-45 cm broad. Flowers perfect and bisexual. Small tubular white flowers are grouped together and inserted on the peduncle. Calyx tubular, truncated rim, extremely reduced, with small lobes. Corolla white 5-lobed, the tube greenish white 7-9 mm long margin entire, obtuse or acute at the apex. Stamens five, scarcely exerted, alternate to the corolla lobes, shorter than corolla tube, equal, glabrous. Style exerted just beyond the corolla, about 15 mm long, exert. Ovary is inferior, 2 or 4 locular, narrowly obovoid. Fruit is densely clustered globose, syncarp fleshy, yellowish white about 5-10 cm long and 3-4 cm in diameter fetid when ripe seed posses distinct air chamber, ovoid to obovoid or reniform viable even after floating in water months.

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Propagation of Noni

Noni can be propagated through seeds, cuttings and tissue culture. Since, it is a highly cross pollinated plant., three exists lot of variation between plans raised from seedlings. For raising seedling, the seeds should be collected from fresh ripe fruits and sown in nursery beds. On storage loss viability in 6-8 months even through cutting can be used for multiplication. Tissue culture saplings are generally used for planting in commercial gardens.

Nursery and cultural practices

Seed collections and storage: Noni fruits are climacteric and mature on plant itself. Only soft, ripened noni fruits should be chosen for seed collection. The seeds must be separated from the fibrous fruit flesh by rubbing the fruit fragments and vigorous washing with water. One kg of fruit yields around 200g of clean seeds. Noni seeds are reddish-brown, oblong-triangular, and have a conspicuous air chamber. They are buoyant and hydrophobic due to this air chamber and their durable, water-repellent, fibrous seed coat. The seed coat is very tough, relatively thick, and covered with cellophane-like parchment layers. Germination percentage ranges from 70-90% The viability of the seeds can be prolonged for one year if stored in sealed bottles and kept in refrigerator.

Seeds treatment: Mechanically scarified seeds treated with 800 ppm GA, for 24h will shows 80-85% germination in 20-30 days. Nursery beds with Sand: Soil: FYM in 1:2:1 ratio will be ideal. 30 days old seedlings (~10cm in height) can be transplanted to the poly bags with sand: soil: FYM in 1:1:1 ratio.

Vegetative propagation: Semi-hard stem cuttings (5-7cm dia, 12-18cm length with 2-3 nodes) with a dip in IBA 400 ppm for 15-30 seconds shows good rooting and shooting in about 3-4 weeks. 90-120 days old seedlings (20-25 cm height) and cutting are ideal for filed transfer. The best season for planting is May-July.

Raising of plantations

Noni cultivation

Soil: Noni can be grown in a variety of soils and environmental conditions except water-logging and frost. Well drained sandy loam soil rich in humus is ideal.

Climate & Temperature: Noni can be grown in wide climatic conditions such as tropical, subtropical, dry humid climates. It comes up very well between 20.38°C temperatures. It can be grown from sea level to 2000 m above mean sea level.

Planting Seasons: The ideal season for plating is May to September or it can be planted in February to April where irrigation facilities are available.

Plantation practices

Planting design: Block planting at 3m x 3m spacing is preferable. Needs about 1111 seedling/hectare and pit size is 1 cubic foot (length x width x height).

Preparatory Cultivation: Ploughing and leveling the land to optimum filed condition is necessary.

Irrigation: Noni plant thrives with moderate irrigation and can survive even in drought conditions once the plant is established. Regular irrigation during the early stage of the planting enables the plants to establish better.

Weedings: It can be controlled by intercropping and weedicide when necessary.

Harvest: Noni plant starts glowering 8-10 months after

planting. Seed raised plants will start flowering and fruiting after 3 years. But it is suggested for removing all the flowers up to 18 months for better growth and bushy plant. Flowering and fruiting occurs from April to November. But 60% of the yield will be from August to October. It is a perennial crop and gives yield up to 40 years and yield will be maximum during 10-25 years age (as observed in other parts of India). Noni fruits can be harvested when they change their colour from green to yellowish green or creamy white. Fruits are at the stage harvested by hand picking the individual fruits with pedicel from the branches. Noni fruits do not bruise or damage easily and need not be refrigerated.

Nutrient management: Noni requires only limited application of fertilizers, Use of 20.-30 kg Neem cake and compost per hectare in two doses per annum once during February – march and again in September-october will be effective.

Intercrops

Noni cultivation should be purely organic. In order to diversify the income sources as well as permit polycultural options it is suggested to grow beneficial companion crops and/or intercroppings which do not demand pesticide- insecticide application. Depending upon their tolerance to root and light competitions, the compatible crops can be grown. Farmers are suggested to grow intercroppings such as Areca nut, Ginger, Turneric, *Stevia*, *Gymnema*, which are used as additives in various beverages and also the rare wild fruit plants like *Flacourtia jangamos*, *Garcinia semialata*, *Dimocarpouse longan*, *Rhus semialata* on the bunds, as they are in great demand, thereby helping in conservation and sustainable utilization of bioresources.

Pests, diseases and their management

Plant protection: Noni is resistant to pests and diseases. Grass- hoppers, larvae of moths and coleopteran beetles are the common insect-pests encountered which feed on leaves. The damage is negligible. Regular weeding and application neem cake and sprinkling with neem cake soaked water will help to deter the pests. In case of severe attack of insect-pest neem oil (15ml/L + 2-3 drops of detergent) spray will be effective.

Control: By intergrated cultural and preventive methods such as pruning, sanitation, avoidance, and an appropriate cropping system, providing good air circulation to ensure raid drying of leaves and fruits, by maintaining wider spacing between the plants; reducing relative humidity; planting of disease-free plants; maintaining good plant nutrition and foliar spray application of phosphorous acid.

Results

Output/Return: Harvest stars from 24th months onwards (seed raised plants) with increased fruit yield year after year. Noni plant yields up to 40 plus years. Noni is a highly profitable crop compared to other commercial orchard crops like mango, sapota. etc.

Table 1: Estimated yield of Noni plants

Month	Yield per tree
Up to 24 months	No
2 nd year	5.5-6.5 kg
3 rd year	11-16 kg
4 th year	16-21 kg
5 th year	24-29 kg

Traditional food Use: *Morinda citrifolia* fruit has long history of use a food in tropical regions throughout the world. Documentation of the consumption of the fruit as a food source precedes the twentieth century. An 1866 publication in London explained that *M. citrifolia* fruit was consumed as a food in the Fiji islands. Later publication described the use of this fruit throughout the Pacific Islands, Southeast Asia, Australia and India. In Samoa, Noni fruit was common fare and in Burma it was cooked in curries or eaten raw with salt. In 1943, Merrill described *M. citrifolia*, L. as an edible plant in a technical manual of edible and poisonous plants of the Pacific Islands, in which the leaves and fruits were used as emergency food. In 1992, Abott reported that Noni had been used as food, drink, medicine and dye. The tribes i.e., Nocibarese are known to have consumed this fruit raw with as well as cooked as vegetable (Singh *et al.*, 2005).

Medicinal uses: The whole Noni plant for herbal remedies. The fruit juice is high demand in alternative medicine for different kinds of illnesses such as Convulsions, diabetes, painful urination, liver disease, constipation, enlarged spleen, swelling, asthma, arthritis, joint pain, cancer, AIDS, cataracts, cough, colds, fever, malarial fever, nausea, smallpox, depression, digestive problems, and gastric ulcers, high blood pressure, infections. Kidney disorders, migraine headache, premenstrual syndrome, stimulate menstrual flow, vaginal discharge during pregnancy and stroke. Noni contains all the antioxidant vitamins like vitamin-A, vitamin-E, vitamin-C and rich with antioxidant betacarotenoids.

Medicinal properties: Anti-bacterial, antiviral, anti-fungal, anti-tumor, anti-diabetes, analgesic, anti-inflammatory immunity enhancing.

Conclusion

Noni is distributed in more than 50 countries across the globe. Its health benefits have been realized by millions of consumers. All parts of Noni are marketed as different products sold as Noni juice, capsule, soap, cosmetics etc. the cultivation of Noni in North Bihar has the great opportunity to generate livelihood and impart health benefits to the local populace.

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