Morinda citrifolia Linn. ó An important fruit tree of Andaman and Nicobar Islands

D R Singh* and R B Rai

Division of Horticulture and Forestry

Central Agricultural Research Institute, Port Blair-744 101, Andaman & Nicobar Islands, India

*Correspondent author, E-mail: drsingh1966@yahoo.com

Received 10 August 2005; Accepted 19 October 2006

Abstract

***Morinda citrifolia* Linn.** is a hardy plant which can grow on wasteland and tolerate salinity. Its fruit is used in traditional medicine and contain many vitamins and minerals. In this paper an attempt has been made to provide its cultivation aspects and economic value.

Keywords : Noni, Indian Mulberry, *Morinda citrifolia*, Nutrient composition, Cultivation.

IPC code; Int. cl.[8] — A01G 17/00, A23L 1/00, A61K 36/00

Introduction

***Morinda citrifolia* Linn.** (Family — Rubiaceae) also called Indian Mulberry is commercially known as Noni. It is known as *Lorang*, *Burma phal*, *Pongee phal* and *Suraogi* by the tribals of Andaman and Nicobar Islands[1]. Indigenous to Southeast Asia, the plant was domesticated and cultivated by Polynesians, first in Tahiti and the Marquesas, and eventually in the Hawaiian Islands. Today, it grows in most regions of the South Pacific, India, the Caribbean, South America and the West Indies. Noni's broad proliferation gives testimony to its value to traditional cultures. Historically, it was known as the queen of all canoe plants[2,3]. In Andaman and Nicobar Islands, it is widely found through out the coastal region and along the fences and the roadside. Due to its adaptability to wide range of climatic conditions, the noni plant grows even in infertile, acidic and alkaline soils and in the dry and wet areas. The tropical humid climate is very much suitable for the cultivation of this plant which is gaining popularity among the farmers and other people due to its good market value and tolerance to salinity. After the Tsunami disaster, the affected lands with seawater which had been left as wastelands have been occupied by the plants of Indian mulberry[4].

It is a small semi spreading evergreen tree or shrub with a medium foliage density that grows to about 3-10m in height at maturity. The prolific noni tree bears fruit year around; the plant sometimes supports itself on other plants as a liana. The fruits are generally greenish yellow and fleshy but vary in size, morphology, palatability, odour (foetid when ripe) and number of seeds/fruit (150-200). Seeds are brown in colour and can retain viability for months if left in water. The rooting is extensive lateral root system and a deep tap root. The yellowish wood and turmeric yellow coloured root (used as yellow dye) are the main distinguishing characteristics of the species ***M. citrifolia***.

Cultivation

Cultivation of morinda has recently undergone revival in Andaman and Nicobar Islands owing to its high medicinal and market value. Morinda is naturalized in almost all parts of the islands, as it grows in dry to wet and at sea level of about 450 m elevation. It can be found near the coast, in gulches and in undisturbed forests of the dryer areas, particularly along with the Kewra (Pandanus) trees. It grows in wide variety of soils and environment and has the ability to regenerate from shoots or root suckers rather than seed producing thickets or groves. It can be propagated from seeds, stem or root cuttings[5]. The plant bears specialized seeds which possess a woody watertight airsac that enables them to float between closely spaced islands[6]. Seed dormancy is the main problem that restrict its commercial cultivation[7,8]. Pre sowing chemical treatments[9] have generally been used to enhance seed germination and to increase seedling vigour[10]. The preferred methods of propagation are by seeds and by cuttings made from stem verticals[3]. Noni has emerged as one of the hot favourites of the farmers for cultivation under saline soil in Andaman and Nicobar Islands. This plant has been tested recently in research farm as well as salt affected land caused due to tsunami and found to be highly adaptive to the available agro niches of the Bay islands. After the identification and evaluation of this high price fruit plant in these particular areas farmers from all area of South Andaman and Nicobar group of Islands are eager to grow this plant in salt affected marshy land.

For propagation from seeds soft, ripened morinda fruits are chosen and seeds are separated from the fibrous, clinging fruits. The fruits are opened by hand, split into pieces and then separate the seeds from the flesh using a strong spray of water or strainer. Sometimes rubbing the fruit fragments on the screen by hand or with a blunt object can help force the fruit flesh through the screen. Scarifying the hard seed coat by scratching or puncturing reduces the germination time, improves the germination percentage and promotes uniform sprouting. The seeds can be dried and stored but viability time is to be observed. After cleaning, spread the seeds on a clean newspaper and dry in shade or indoors for 3-4 days. Store the seeds in airtight container at room temperature.

Morinda seeds can be planted immediately after extraction from the fruit. The seeds require hot, wet condition for maximum percentage of germination. If germinated out side, partial sun is preferable to full sun in case of drying of the medium. Morinda seeds can be germinated in seedling beds or trays or sown directly in containers with light medium that can retain water and remains aerated. Seedlings with deep, well-established taproots tend to withstand better transplanting and establish much quicker. Seeds are germinated in flat containers and transplanted into growing containers within a few weeks of germination.

If noni plants are transplanted too young then they may be susceptible to weed competition, mechanical damage and slug attack. Seedlings and young plants grown from cuttings can be given fertilizer once in a month. Young plants respond well to applications of dilute, liquid foliar fertilizers. Morinda is salt tolerant and fertilizer burn is uncommon under normal conditions. Cultivation of morinda plants from vertical and lateral stem cuttings lessens the time taken to obtain plants that are ready for transplanting. While cutting the plant for propagation the fresh sap will flow from the cut ends, if the sap flows readily, cuttings can be taken from these plants, but if sap does not flow readily or there is no sap to ooze then the cut materials must be discarded. Usually flowing sap signifies that it is actively growing plant with high energy. The cuttings are planted in the pot containing fresh growth medium and if required root hormones may be applied for proper vegetative growth. The cuttings planted in the pots are watered well until rooting and kept under partial shade[3]. An expedient way to propagate noni is simply to breakup a ripe fruit and spread the pulp with its seeds over the surface of planting medium in a bed.

As the morinda plants are quite susceptible to root knot nematode the site selection should not be done in those places, where other agricultural crops have been planted recently. Heavy and compact soil should be avoided. It does not grow well where winds are strong. The proper spacing for morinda plants is 3-4.5m; closer spacing usually results in over crowding and interferes with the plant growth. Plants may be pruned after their first production of fruit. The fertilizer and nutrient application depends on the climatic conditions such as rainfall and type of soil. Plants need moderate irrigation but once they are established fully they can even withstand drought. Over watering can result in root knot nematode and root rot[11].

Harvesting and yield

Fruit bearing starts from about 9 months and continues up to 1 year after planting. Rooted cuttings give yield 5 months after planting in pots and 6-7 months in field, and seedlings produce fruits 9 months after planting; however in first two years flowering should be discouraged in order to strengthen the plant. The farmers are given instruction to prune the branches, which could result in vertical and lateral branches, and greater fruit yield. Fruits should be harvested 3 years after planting at any stage of development depending on the proposed processing method. They can be harvested when they change their colour from green to yellowish green. At this stage fruits are suitable for boarding in ships. Mostly producers prefer green fruits, where as, the processors prefer mature yellowish green fruit for processing. For self use or local purpose fruits can be harvested when ripe so that the juice can be extracted easily. Noni fruits do not bruise or damage easily hence need not be refrigerated. Fruits can be harvested year round basis even though there is a seasonal trend according to the places. Their production is less during monsoon months in Andaman and Nicobar Islands. The expected yield from healthy and matured plant is 50kg/plant/year (Five year old plant) depending on nutrition, management and spacing. But according to the estimation done, the expected yield from the fully-grown mature fruiting tree is about 116-232 kg/plant/year with proper crop management. In some places, yield even increased more then 232kg/plant/year.

Noni fruits are best harvested for seed collection after it falls naturally from the tree when flesh is very soft. Fruit with any green colour should be avoided because the seeds may not be fully developed and may not germinate. Fruit

picked from the ground can be processed immediately for planting. Whereas, fruit picked from the tree is still hard and must be allowed to ripen fully before processing for seed. A farmer can expect to harvest approximately 7.5 tonnes /acre which is comparable to any other fruit crop.

Utilization and Chemical Composition

The tree has attained significant economic importance world wide in recent years through a variety of health and cosmetic products made from leaves and fruits. Nicobari tribes of these Islands are known to consume this fruit raw with salt or cooked as vegetable[4]. Noni has been used as a healing and medicinal plant for over 2,000 years by ancient cultures. Its healing and restorative powers to the human body are legendary. It is akin to gold in the South Pacific and is quickly gaining the same reputations in countries all over the world. Noni contains over 160 powerful vitamins, minerals and other

Morinda citrifolia plant laden with fruits

Morinda citrifolia seeds

nutrients that positively affect our bodies in many profound ways[12]. It rejuvenates the body, revitalizes the cells, relieves pain,

Noni fruits

reduces inflammation, releases stress, purifies blood, stimulates immune system, improves digestion, enhances well being, regular cell formation, helps in recovery from AIDS, maintains healthy skin, hair and scalp, protects from toxins and pollutants, reduces the risk of developing cancer, improves memory and concentration, inhibits tumour growth, reduces the chances of premature onset of age related diseases such as arthritis, heart diseases, diabetes or strokes, protects against vitral and bacterial strains that have become antibiotic resistant, and aids in digestion[13].

Physicochemical characteristics and nutrient composition of fruits

The fruit is 9.8 × 5.26 cm and weighs about 147.9g, with specific gravity (wt/volume) 30.13. The recovery of the juice was recorded 38.95%, pulp 44.76-46.72% and seed 3.24-4.31%. The TSS (°Brix) 8.40 and acidity 0.14%. The ascorbic acid (mg/100g) content of the fruit is 139.09 mg/100g at ripe stage.

The macro and micronutrient analysis of leaf, mature and ripe fruit was done in our laboratory. The studies showed that leaf and fruit contain: calcium, 0.55, 0.0004; potassium, 0.12, 0.12; and magnesium, 0.06, 0.01%; and

Morinda citrifolia potted plants

the micronutrients i.e. manganese, 4.47, 1.557; copper, 2.23, 11.893; and iron, -, 10.66 ppm, respectively.

Conclusion

Considering the positive discoveries made with noni fruit so far, there is sufficient reason to anticipate that further studies will prove the fruit and its preparations beneficial to health in numerous ways. It is a valuable medicinal plant and is likely to become an increasingly sought-after dietary supplement.

Yet we have a great deal more to learn about what the plant contains and how it works. Further, phytochemical investigations will likely lead to the discovery of other compounds. Biological activity studies will provide better information about how these agents work in living organisms. At some point human clinical studies will shed light on the specific activities of noni in the body.

The farmers of the coastal regions may be advised to take up this plant to grow on large scale on farm land and on the tsunami affected land. It may play a vital role in giving boost to the economy and utilization of this underutilized fruit tree in India.

References

1. Singh DR, Rai RB, Medhi RP and Singh B, The Great Morinda – A potential underutilized fruit for Tsunami affected areas in Bay Islands, *UTS's Voice*, Port Blair, 2005, April 16-30, p. 21.
2. Francis JK, Noni, *Morinda citrifolia* L. Rubiaceae, http://www.fs.fed.us/global/iitf/pdf/shrubs/morinda%20citrifolia.pdf.
3. Morton J, The ocean-going noni, or Indian Mulberry (*Morinda citrifolia*, Rubiaceae) and some of its "colorful" relatives, *Econ Bot*, 1992, **46**, 241-256.
4. Singh DR, Rai RB and Singh B, The Great Morinda – A potential underutilized fruits in Bay Islands, *The Daily Telegrams*, Port Blair, 2005, April 24, p. 2.
5. Hartman HT, Kester DE, Davies IT and Genere RL, Plant propagation: Principles and Practices, Seventh Practice Hall Inc. USA, 2002, 362p.
6. Wagner WL, Herbst DH and Sohmer SH, Manual of Flowering plants of Hawaii (Revised Edn), University of Hawaii Press, Honolulu, 1999.
7. Cambie RC and Ash J, *Fijian Meidcinal Plants*, 1994, CSIRO, Australia.
8. Ponnaiyan P and Vezhavendan S, Growth regulators and nicking on germination, *Int J Noni Res*, 2005, **1**(1), 37.
9. Nelson Scot C, *Morinda citrifolia*. Species profiles for Pacific Island Agroforestry, Version 1.2, http://agroforestry.net/tti/Morinda(noni).pdf.
10. Hsiao IA, The effect of sodium hypochlorite and gibberelic acid on seed dormancy and germination of wild oats (*Avena fatua*), *Can J Bot*, 1979, **57**, 1729-1739.
11. Nelson Scot C, Noni cultivation in Hawaii, CTAHR, *Fruits and Nuts*, March 2001, F&N-4.
12. Duncan R Lindsay, Benefits, History and Tradition of Noni Juice (*Morinda citrifolia*), http://www.noni-juice-distributer.us/noni-juice-history.shtml.
13. McClatchey Will, From Polynesian Healers to Health Food stores: Changing Perspectives of *Morinda citrifolia* (Rubiaceae), *Integr Cancer Ther*, 2002, **1**(2), 110-120.