

Noni fruit the Indian mulberry (*Morinda Citrifolia* L.) health supplement: A review

Swapnil Shinde^{1*}, Vaibhav Bhosale¹, Yash Doiphode¹, Tejas Tembore¹, Akanksha Shinde², Mayuri Urhe²

¹ Baramati College of pharmacy, Tal- Baramati, Dr. Babasaheb Ambedkar technological University, Barhanpur, Maharashtra, India

² LSDP College of Pharmacy, Mandavgan Pharata, Tal-Shirur, Pune University, Maharashtra, India

Abstract

Noni fruit (*Morinda Citrifolia* Linn), which have largest value of the medication purpose but it has very strong pungent flavor, acrid taste and turbid in nature. Based on these characteristics nature, the present experiment was aimed to develop noni fruit juice mix with another substance so that they combine together then crush with force so that it becomes flat, soft with sensory acceptability and shelf stability. The extracted noni juice was utilized for the preparation for fruit juice blended squashes with 0 to 25% of Alma, sathukudi (sweet) and grapes juice distinctly and the best combination was obtained. The standardized noni fruit juice mix with amla squash (80-20) was prepared, packed in PET bottles and stored at room temperature and in refrigerated condition. The stored squashes were observed to check out the different changes in physico-chemical characteristics during storage of six months. At the end of the result states that an increasing trend in acidity, decreasing sugar and non-enzymatic chemical reaction that takes place during preparation of sample, where as decreasing trend in ph., total sugar, ascorbic acid, tannin, total antioxidant activity and color values, which where predominantly low in refrigeration conditions during storage. Squashes retained maximum level of ascorbic acid total antioxidant activity in the room temperature and refrigerated condition at the end of storage.

Keywords: morinda citrifolia, clinical trial, antioxidant, immune system, antifungal, anti cancer

Introduction

Noni called as 'Indian mulberry' (*Morinda Citrifolia* Linn) is an evergreen shrub or smaller tree that grows 10-20 ft. height and it comes to family, Rubiaceae. In India noni was totally produced by 342 cultivators in the area 653 acre. The sector of the production of noni in Andaman and Nicobar Islands was high (192 acre) followed by Maharashtra (166 acre) and Tamil Nadu were the lowest production noni fruits (5 acre) with one cultivator. According to traditional treatment and recent researches state that noni plant has a broad range of therapeutic effects including antimicrobial, antiviral, antifungal, analgesic, immune enhancing effects. When noni fruit is ripening it has a pungent odor and hence it has also known as vomit fruit. Noni fruit has become a popular health supplement. In the first dozen years of its commercial marketing, more than 106 million liters of Tahitian noni means 'Starvation fruit'. The fresh noni fruit contains moisture 78.54% amino acids 2-3% vitamin C, 2-390% pectin 1.90% other extractive 1.02%, carbohydrates 6-8% crude fiber ash 0.97%, calcium 1-2%, potassium 1.5-3%, zinc 2-4%, magnesium 1-3%, iron 1-2%, folate 1-1.7%, aluminum and sodium in traces, reducing sugar 0.087%, sucrose 0.18%. Noni also provides fatty acids, amino acids and powerful antioxidants. A large number of nutrients and phytochemicals have been identified in noni fruit. In noni fruit irridoids are the major phytochemicals constituents, this investigation provides further insight into their biological activities as provide an identification of the compound likely responsible for at least some of the antimicrobial Properties observed in previous studies of noni fruit. Noni fruit has been subjected to an official safety evaluation within the European Union and found to be acceptable for human consumption [1, 2, 3, 5].



Fig 1

Taxonomy [7]

Table 1

| Kingdom | Plantae |
|---------------|--------------------|
| Subdivision | Angiosperm |
| Class | Eudicots |
| Order | Gentianals |
| Genus | Morinda |
| Family | Rubiaceae |
| Species | M.citrifolia |
| Binomial name | Morinda Citrifolia |

Origin and Distribution

The noni fruit plant is believed have originated in south-east Asia. Ocean and tropical Australia expand from Polynesia to

India and noni fruits is cultivated on a commercial scale in Latin America, from Mexico to Columbia and Venezuela as well as Costa, Rica, Panama, Kenya, Florida and the West Indies (Abboth and Shimaza 1995). These plants develop in wild in the coastal region of Kerala, Karnataka, Orissa, Tamil Nadu. The largest by nature grown public are seen in Andaman and Nicobar islands [13].

Growth and Development [12]

Growth rate

Noni fruit growth is medium normally 0.75-1.5m/year.

Flowering and fruiting

Noni are flowering and fruiting are unbroken over year, then this flowering and fruiting may occur due to seasonal effect (rainfall, temperature, sunlight intensity)

Yields (quantity per year)

Fruits yields in the per year among noni variations or genotype and the environment (soil, water) and growing system and/or desert yields may be year per year only few pounds. Noni fruits are growing under largest forest area, may be about 80,000 kg/hectare more may be full sun with largely implantation.

Rooting habit

In noni rooting habit are related to the citrus and coffee, with are large scale lateral root process and deep bud.

Reaction to Competition

Noni does not compare to land and agricultural crop, Noni are the forest underwood that than allow very harsh situations and plant achievements from other forest trees, including allopathic species.

Material and method

Fresh noni fruits are cultivated Horticultural college and research institute. Periyakulam Tamil Nadu. The noni fruits Choose at maturity stage 4. (Hard white). The fruits are allowed for ripen at room temperature (30± 2 °c) for 2 days closed condition before weighed ripened fruits are cleaned using tap water and treat with hot process technique. On the steam process technique blanching was at 100 °c 2, 4, 6 min as a consequence. This process done then cooled at room temperature 5 min. another technique is cold washed ripened noni fruits kept freezing process at -18 °c for 6 to 30 hours. After pretreatments the juice extracted pressing and passing in nylon mesh. In the fermentation process fresh ripened noni fruits were hold on to an airtight container room temperature and juice was collected by drip out from the fruits after 30,60 and 90 days. The changes antioxidant and total phenol activity were examine form extracted juice from noni Fruits [8, 10].

Chemical constituents

Noni fruit at maturity stages (1-4) it contain high levels of soluble protein carbohydrate ascorbic acid, rutin and phenol. According to a Malaysian medicinal plant book noni fruits chemical constituent are: 5,7-Acacetin-7-O-b-D(+)-glycopyranoside, ajmalicine isomers, alizarin, asperuloside, ampeloid acid, chrysophanol (1,8-dihydroxy-3-methylanthraquinone), damnacanthol, digoxin, 5,6-dihydroxylucidin, 5,6-dihydroxylucidin-3-b-primeveroside, 5,7-dimethylapigenin- 4-O-b-D(+)-galacto pyranoside,

lucidin, lucidin-3-b-primeveroside, 2-methyl-3,5,6-trihydroxyanthraquinone, 3-hydroxymorindone, 3-hydroxymorindone-6-b-primeveroside, a-methoxyalizarin, 2-methyl-3,5,6-trihydroxyanthraquinone-6-b-primeveroside, mono-ethoxyrubiadin, morindadiol, morindin, morindone (1,5,6-trihydroxy-2-methylanthraquinone), morindone-6-b-primeveroside, nor-damnacanthol, quinoline, rubiadin, rubiadin 1-methyl ether, saronjidiol, urosolic acid, alkaloids, anthraquinones and their alcohols, fatty acid and glycosides, caproic acid, (C5-9), flavones glycosides, flavonoids, glucose (b-D-glucopyranose), indoles, purines, and b-sitosterol [13].

Uses [11, 13]

Medicinal uses of Noni

Noni fruit juice focus powerful activate cannabinoid 2 which is exert beneficial immunomodulation effect on the human body. Noni fruit is remove demonstrated hypotensive activity and have been shown to ACE inhibitory activity. Since ACE inhibitor are regularly prescribed to treatment of blood pressure, this activity point to the potential therapeutic use. The noni fruit is commonly use in Malaysia for the treatment of diabetes mellitus. Ripe noni fruit carry a concentration of anthraquinones adding one called damnacanthol which Posses purgative activity. In China, Japan and Tahiti various part trees serve and treatment of fever, eye, and skin problem and gum and throat problem stomach pain.

Industrial uses

Natural preservative

M. citrifolia is recognize as a novel food ingredient under the noni fruit pure. In *M. Citrifolia* due to leaf, fruit, and root are shown antioxidant properties which as same to vitamins E and also contain butylated hydroxytoluene. The noni fruit are use preservative because they unpleasant off taste. *M. citrifolia* is bad smell and they increased it's resistance humidity.

M. citrifolia Juice

The noni juice product are a basis on a industrial sector. Fresh noni juice is obtained the press the right away after harvesting, whereas homegrown juice are prepared by fruit decay naturally. And in case of

Commercial juice the Depend on the method of juice extraction. The fermented Indian *M. citrifolia* fruit contain the saponins, anthraquinones and scopoletin and the fermented fruit juice recorded vitamin contain (C, B₁, B₂, B₃, B₁₂). In *M. citrifolia* juice vitamins included of the America. Alkaloids, anthraquinones, antioxidant, essential oils, flavonoids, saponins, scopoletin and sugar.

Pharmaceutical activity [4, 6, 7, 9, 13]

Anti-depress activity

Hyoericum Perforatum, *Ginkgo biloba*, *Apocynum venetum*, *Melissa officinalis*, *M. citrifolia* and *valeriana officinalis*, these plants have investigated by the scientists. These some plants have the potential action. These plants are used for the treatment of depression and anxiety

Effect on nervous system

The scientists evaluated the protective effect of Noni Juice on the brain damage caused by ischemic stress in mice. The effect of fruit juice on the development of ischemic due to

the brain damage. The fruit juice is used for the treatment of the post - ischemic glucose intolerance as a cerebral protective mechanism. This mechanism may available for use of neuronal protective effect of oral Noni Juice in opposite to ischemic stress as derived from the above results.

Effect on Alzheimer's disease

Calculation of neuroprotective effect of Noni against Scopolamine induced memory loss in mice indicated that oral administration of Noni juice. This juice developed reversible weakness of retention in step down latency inhibition Test. From the result, the authors assumed that Noni juice offers a preventive effect against oxidative damage.

Antifungal Activity

Noni juice extract was used in the antifungal test. The antifungal properties of Noni fruit extract in opposite to *Candida albicans* were this is tested *in vitro* at different times in various Concentrations. The interruptory effect of *Morinda Citrifolia* extract on the *Candida albicans* was determined by broth dilution test and Culture. Using this culture that the growth of *Candida albicans* was not detected. The study of *Morinda Citrifolia* fruit extract that indicate an antifungal effect against *Candida albicans*.

Wound healing activity

Fresh Tahitian *Morinda Citrifolia* leaf juice (1mg/ml) and its leaf extract gives ethanol (10-200µg/ml) and its methanol and hexane fractions (10-200 µg/ml), where search for their topical wound healing properties. In the wound healing Receptors involved such as Platelet-derived growth factor (PDGF) and adenosine A2A receptor. Where studied on the male mice. All Noni extracts show wound healing activity. But, leaf methanol extract significantly increased wound closure and tower half closure time in treated mice compared to the Control The promising result in this study should be Confirmed through the vivo studies on different models to drowse a sharp Consequence about the healing mechanism.

Anti-tuberculosis activity

The anti- tuberculosis activity of each extract and Compound was measure in based on minimum inhibitor Concentration values. That values expressed as the lowest concentration inhibition growth of the Colonies of *Mycobacterium tuberculosis*, untill the determination of minimum bactericidal concentration [MBL] was indicated by the clear zones around the medium.

Anti-cancerous activity

The *Morinda Citrifolia* juice has the capacity to enhance the host immune System that has been suddenly studied by Japanese research team. The *Morinda Citrifolia* juice has perceptible fraction that corresponds to the polysaccharide rich Substance. This polysaccharide compound that which is composed of arabinose galactose rhamnose and glucuronic acid which have the immuno modulatory and anti-tumors effect against the Lewis lung Carcinoma. *Morinda Citrifolia*-Precipitate also help into the stimulates, the release of mediators form murine effectors cells that as in such way cytokines that work on the cell cycle of the tumors and that slow down the cell cycle of the tumor, that is signal

the another immunized cells that attack against tumor growth also contains potent macrophage activator activity. Which plays role in the death of tumor in anti-cancer's activity.

Acknowledgement

With lots of respect to my family and my colleague, I would like to grateful thanks to my college B.C.O.P College of pharmacy for permitting me to do this review article. Special Thank to my Friends, respected Teacher's and Co-authors give us lots of information and valuable time, thank for support. I also thankful of International Journal of Research in pharmacy and Pharmaceutical Science, who gives me this opportunity to publish our review article.

Conclusion

Noni fruit is highly nutritious and chemical composition of nutrition as compared to different food resources. It shows as cancer prevention and treatment. Noni fruit provide various other nutrient including protein, mineral, vitamins, and antioxidant. Therefore more should be done in study taxonomy, uses, growth and development, method of preparation. And noni fruit are shows the antifungal, anticancer, antioxidant activity against a variety of harmful viruses. This received encourages further there research and encourages considering day by day supplement with *M. citrifolia*.

References

1. Thorat BS, Kambale AR, Patil KM. Noni fruit crop is a versatile medicinal plant. *Journal of medicinal plant. Journal of medicinal plant studies.* 2017; (5):247-249.
2. Deng S, Isami F, Uwaya A, Jensen CJ. The potential health benefits of noni juice. A review of human intervention studies. *Foods.* 2018; (58):1-22.
3. West BJ, Palmer KS, Deng S, Paul AK. Antimicrobial activity of an irridoids rich extract form *Morinda Citrifolia* fruit. *Current research journal of biological science.* 2012; (1):52-54.
4. Kaur H, Gujjar N, Gill R. The noni fruit (*Morinda Citrifolia* Linn): A systematic review of anticancer potential and other health beneficial pharmacological activities. *Journal of medicinal plants studies.* 2018; (2):86-93.
5. West BJ, Jensen CJ, Westendorf J, Whith LD. A safety review of noni fruit juice. *Article in journal of food science.* 2006; (71):1-8.
6. Maulik NE, Hendro W, Saputo SH, Kristina TN. Anti tubercular activity of extract and compound of Noni (*Morinda Citrifolia* Linn). *International journal of pharmacy and pharmaceutical science.* 2017; (9): 105-109.
7. Ayunda MN, Zulharmita, Azizah Z, Rivai H. Review of phytochemical and pharmacological activities of Noni (*Morinda Citrifolia* L.). *Scholar academic journal of pharmacy.* 2020; (12):340-346.
8. Thirukkumar S, Vennila P, Maheswari TU. Investigation of total antioxidant activity and phenol in Indian noni fruit (*Morinda Citrifolia* linn) juice extraction. *Journal of Pharmacognosy and Phytochemistry.* 2017; (2):241-243.
9. Ali M, Kenganona M, Manjula SN. Health benefits' of *Morinda Citrifolia* (Noni): A Review. *Article in Pharmacognosy journal.* 2017; (8):321-333.

10. Thirukkumar S, Vennila P, Maheswari TU. Studies on extraction of juice from Noni fruits (*Morinda Citrifolia* linn) Indian journal of natural sciences. 2017; (7):11988-11994.
11. Assai RA, Darwis Y, Abdulbagi MI, Khan AA, Vuanghao L, Laghari MH *et al.* *Morinda Citrifolia* (Noni): A comprehensive review on its industrial uses, pharmacological activities and clinical trials. Arabian journal of chemistry. 2017; (10):691-707.
12. Nelson SC. *Morinda Citrifolia* Rubiaceae (rubioidae) coffee family. From Polynesian healers to health food stores: changing perspectives of *Morinda Citrifolia* (Rubiaceae) integrative cancer therapies. 2002; (2):110-120.
13. Sharma Y, Venugopal CK, Hegde RV, Mokashi AN. Noni: A new medicinal plant for the tropics. African journal of plant science. 2014; (5):243-247.