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Studies on physico-chemical properties of noni fruit (*Morinda citrifolia*)

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Abstract

Morinda citrifolia L. has been reported to have a broad range of therapeutic effects, including antibacterial, antiviral, antifungal, antitumor, anthelmintic, analgesic, hypotensive, anti-inflammatory and immune enhancing effects. In the present study, shelf life of fruit juice of *M. citrifolia* grown in Tamil Nadu was evaluated in terms of possibility of (a) decomposition of chemical compound/s (b) growth of microbes and (c) organoleptic properties of *M. citrifolia* juice at the initial stage and after 6 months. Possibility of decomposition of chemical compound/s in *M. citrifolia* juice was evaluated by means of (a) Thin Layer Chromatography (TLC) fingerprint profile and (b) phytochemical classes. Microbiological analysis was done by evaluating the presence or absence of microbes (eg. counts of aerobic bacteria, *Staphylococcus aureus*, yeast and moulds and *Escherichia coli*). Organoleptic properties such as colour, odour and taste of *M. citrifolia* juice were checked. Results revealed that intensity of the spots bearing Rf values of 0.45, 0.60, 0.72, 0.80, 0.88 appeared in the TLC at the initial stage retained as similar after 6 months. Phytochemicals such as alkaloids, phenols, tannins, flavonoids, steroids, saponins were detected in both initial stage and after 6 months. Further, *Escherichia coli*, Coliforms and *Salmonella* were absent at initial stage and after 6 months respectively. Counts of Aerobic bacteria, *Staphylococcus aureus*, Yeast and Moulds were <1, <100 and <1 respectively in both stages. Organoleptic properties of Noni juice were similar at the initial stage and after 6 months. In conclusion, *M. citrifolia* fruit juice can be kept at room temperature without any chemical deterioration and microbial contamination for 6 months.

Keywords: *Morinda citrifolia* L. medicated drink, shelf life, chemical profile, microbes

Introduction

Morinda citrifolia Linn is belonging to the family Rubiaceae. In India this plant is known as Indian Mulberry or Nuna whereas in Hawalli it is known as Noni [1]. The Noni plant is a small evergreen tree found growing in open coastal regions at sea level and in forest areas up to about 1300 feet above sea level. The plant is often found growing along lava flows. It's identifiable by its straight trunk, large, bright green and elliptical leaves, white tubular flowers, and its distinctive, ovoid, "grenade-like" yellow fruit. The fruit can grow in size up to 12 cm or more and has a lumpy surface covered by polygonal-shaped sections. The seeds which are triangular shaped and reddish brown, have an air sac attached at one end, which makes the seeds buoyant. This could explain, in part, the wide distribution of the plant throughout the Polynesian islands. The mature Noni fruit has a foul taste and odour [2, 3].

After planting *M. citrifolia* fruits will be appeared after 9 months to 1-year time period. The unripe fruit is dark green in colour and the ripe fruit has a foul taste and odour. The pulp has a light dull yellowish white colour. The ripped fruit is juicy and bitter and Noni juice is prepared from ripe Noni fruit [2, 4]. It has been reported to have broad spectrum of therapeutic remedies for diseases such as diabetes, arthritis, cancer, hypertension, cough, cold, pain, blood pressure, tuberculosis, malaria, intestinal worms, etc. [2, 5, 6]. Many value added products such as Noni juice, capsule, powder, Noni concentrates, tea, etc. are available in the market made out of different parts of *M. citrifolia*. Among them Noni juice is most popular for its nutraceuticals and high therapeutic values around the globe. Noni juice has been recently established in European Union as a novel food [7]. Eventhough many research work has been carried out for pharmacological investigations and chemical composition [2, 3] of *M. citrifolia* very few studies were carried out for this plant grown in Tamil Nadu. Within the same species of plant, the composition of phytochemicals can vary with the nutrient composition of the soil, climatic season, development stage of the plant, natural association with other plants, storage of raw materials and the types of processing methods such as drying and extraction procedures [6].

Therefore, an attempt was taken to evaluate the shelf life of juice of *M. citrifolia* grown in Tamil Nadu.

Materials and Methods

Collection of plant material

M. citrifolia mature fruits were collected from Tamil Nadu during the period of August and authenticated by Botanical Survey of India, Coimbatore, Tamil Nadu.

Preparation of *Morinda citrifolia* juice

Fruits of *M. citrifolia* were washed and embedded in an amber colour jar and kept for 14 days under sun light. After that, filtered and filtrate was added to 4 sterile glass bottles and sealed. These bottles were kept in the room temperature (28-30 °C).

Evaluation of shelf life of *Morinda citrifolia* juice

Shelf life was evaluated in terms of possibility of (a) decomposition of chemical compound/s (b) growth of microbes and (c) organoleptic properties of *M. citrifolia* juice at the initial stage and after 6 months. Possibility of decomposition of chemical compound/s in *M. citrifolia* juice was evaluated by means of (a) Thin Layer Chromatography (TLC) fingerprint profile and (b) phytochemical classes. Microbiological analysis was done by evaluating the presence or absence of microbes (eg. counts of aerobic bacteria, *Staphylococcus aureus*, yeast and moulds and *Escherichia coli*). Organoleptic properties such as colour, odour and taste of *M. citrifolia* juice were checked.

Development of a TLC finger print profile

Noni juice was added to a separator funnel containing dichloromethane and mixed well. Then dichloromethane layer was separated and added to a round bottom. This was repeated for thrice and evaporated to dryness. The residue was re-dissolved in 2 ml of dichloromethane and spotted on a TLC plate. As the mobile phase cyclohexane, dichloromethane and ethyl acetate in a ratio of 1:4:0.5 was used and observed under 254 nm and 366 nm.

Screening of phytochemical compounds

Secondary metabolites such as alkaloids, phenols, tannins, flavonoids, steroids and saponins were screened according to methods described by Goveas and Abraham [6].

Microbiological analysis

Limits of *Escherichia coli*, Coliforms, Salmonella, Aerobic bacteria, *Staphylococcus aureus* and Yeast and Moulds were determined in Noni juice according to the methods described in SLS standards.

Organoleptic properties

Organoleptic properties such as colour, smell, appearance were detected in the Noni juice.

Results and Discussion

The time duration which an active ingredient/s is expected to remain within the approved specification limits under the given storage conditions is known as shelf life of a product [2]. The storage condition of a product is the most important point when evaluating the shelf life of a product [4]. In the present study, *M. citrifolia* juice was kept in the room temperature (28-30 °C). Moreover, TLC fingerprint profile of *M. citrifolia* juice at the initial stage (Rf values of 0.45, 0.60, 0.72, 0.80 and 0.88) was similar to the TLC fingerprint profile of the

same juice after 6 months. Phytochemicals such as alkaloids, phenols, tannins, flavonoids, steroids, saponins were detected in the juice at both initial stage and after 6 months. More often, queries on microbial quality will arise for herbal beverages due to the complexity of chemical compounds rather than chemically define beverages [5].

Conclusion

In the present study, *Escherichia coli*, Coliforms and Salmonella were absent at initial stage and after 6 months respectively. Counts of Aerobic bacteria, *Staphylococcus aureus*, Yeast and Moulds were <1, <100 and <1 respectively in the both stages. Organoleptic properties of Noni juice was similar at the initial stage and after 6 months. In conclusion, fruit juice of *M. citrifolia* grown in Tamil Nadu can be kept at room temperature without any chemical deterioration and microbial contamination for 6 months.

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