

MORINDA CITRIFOLIA IS A PROMISING MEDICINAL PLANT RAW MATERIAL FOR THE PRODUCTION OF HERBAL REMEDIES

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Introduction. *Morinda citrifolia* or noni is a popular source for preparing traditional medicines in Pacific Islands. The main biologically active ingredients of *Morinda citrifolia* are phenolic and terpenoid compounds, organic acids, and alkaloids.

Material and methods. The object of the investigation included dried leaves, fruits and roots of *Morinda citrifolia*, which had been gathered in Ghana. The biologically active substances of the studied raw materials were identified and their quality was assessed according to the standard pharmacopoeial methods described in the State Pharmacopoeia of the Russian Federation, XI and XIII editions).

Results and conclusion. The content of basic groups of biologically active substances was phytochemically estimated. Alkaloids were found in the roots, leaves, and fruits. Anthraquinones were detected in the roots only. Tannic acids were found in the roots and leaves. The presence of flavonoids in all plant organs was confirmed, but most of them were in the roots.

The merchandising and technological parameters of the analyzed herbal substances *Morinda citrifolia* fruit, leaves, and roots were established.

Key words: *Morinda citrifolia* L., Noni, product analysis, phytochemical analysis, roots, leaves, fruits.

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INTRODUCTION

Morinda citrifolia L. or Noni is one of the most significant sources of traditional medicines among Pacific Island communities. For over 2000 years, Noni has played a key part of the culture of the Polynesians and has been used by them for the treatment of various diseases, including cancer, hypertension, diabetes [1, 2, 3, 4]. *Morinda citrifolia* L. is common to Tahiti and Hawaii and can be found also in Malaysia, Indonesia, Taiwan, India, Africa and Australia [1, 5]. Noni grows in shady forests and open rocky or sandy shores. It is very undemanding and can grow in saline, volcanic and calcareous soils. The plant is widely cultivated in tropical countries.

Almost all parts of the plant for centuries has been used in folk medicine. The most useful parts of *Morinda citrifolia* are the roots, fruits, leaves and of *Morinda officinalis*; the roots. Historically, Noni's use in the treatment of several diseases has been widely documented.

The biologically active substances found in noni documented are phenolic compounds, terpenoids, organic acids and alkaloids. Noni contains vitamins (A, B, Ascorbic acids), minerals (selenium, iron, potassium, magnesium, calcium), polysaccharides (glucuronic acid, disaccharide fatty acid ester, arabinose, rhamnose, galactose), amino acids, anthraquinones (Damnacanthal, Morindin, Morindone, Alizarin), alkaloids, flavonoids (quercetin, rutin), iridoids, terpenoids and sterols and many other compounds [6].

Qualitative and quantitative compositions of biologically active substances of *Morinda citrifolia* significantly vary depending on the place of origin, species and the parts investigated [7].

Antimicrobial, anti-inflammatory, analgesic, immunomodulating and oxidative effects are some of the biological essentials reported of noni. Also reported are antitumor and antidiabetic properties of this plant [2,3,4,8].

In traditional medicine, the fruits, seeds, leaves, flowers, bark and roots of noni have been used as herbal preparations. Noni juice reduces high blood pressure, relieves spasms, heal gastric ulcers, alleviates arthritis, normalizes digestion, and play an important role in cardiovascular systems. The fruit juice is used for preparing medicines against tuberculosis. The oil obtained from the seeds of noni fruit contains linoleic acid, which is used to alleviate skin inflammations. Laxative infusions prepared from the leaves of noni exert a diuretic effect.

Extracts from the fruits, leaves and roots of *Morinda citrifolia* are documented in the Vietnamese Pharmacopoeia IV edition as laxatives and diuretics, antihypertensive agents and as an antioxidant. The fruits of *Morinda citrifolia* have been highly recommended for use as an infusion [9].

Current pharmaceutical markets use raw materials from noni to produce a range of Biologically Active Substances (BAS). There are commercial productions of noni juice, granules of mixtures of leaves. Powdered mixtures of the leaves, roots and fruits of *Morinda citrifolia*

are produced and commercialized as capsules. *Morinda officinalis* is marketed as brands in the form of granules and capsules. Noni cream products are also found on a commercial scale.

With respect to the wide spectrum of BAS documented in various parts of noni, there exist the need to further investigate and develop Phytopreparations from enriched extracts of the various BAS identified. The first step in addressing this goal is to conduct a comparative product and phytochemical analyses of the fruits, leaves and roots of *Morinda citrifolia*.

RESULTS OF THE PRODUCT ANALYSIS OF FRUIT, LEAVES AND ROOTS OF MORINDA CITRIFOLIA

| Indicators | Experimental data | | | Regulatory requirements of the Russian Pharmacopoeia, thirteenth edition |
|-------------------------------------|-------------------|------------|------------|--|
| | Fruits | Leaves | Roots | |
| 1 | 2 | 3 | 4 | 5 |
| Moisture Content, % | 4,69±0,17 | 6,50±0,19 | 8,22±0,20 | Less than 14% |
| General Ash, % | 7,37±0,11 | 8,53±0,17 | 7,82±0,18 | Less than 10% |
| Part of plant that lost colour | 0,00 | 0,36±0,05 | 0,00 | Not more than 3% |
| Other parts of plant | 0,00 | 0,00 | 0,00 | Not more than 2% |
| Organic impurities, % | 0,00 | 0,24±0,02 | 0,20±0,02 | Not more than 1% |
| Mineral impurities, % | 0,18±0,03 | 0,23±0,02 | 0,42±0,03 | Not more than 1% |
| Content of extractive substances, % | Water | 24,06±0,53 | 30,30±0,44 | 25,28±0,87 |
| | 40% ethanol | 21,17±0,21 | 27,38±0,43 | 30,07±0,66 |
| | 70% ethanol | 20,15±0,84 | 23,32±0,65 | 27,75±0,55 |
| | 96% ethanol | 24,06±0,53 | 30,30±0,44 | 25,28±0,87 |

PHYTOCHEMICAL COMPOSITION OF EXTRACTS FROM FRUITS, LEAVES AND ROOTS OF MORINDA CITRIFOLIA

| Sample Reagent | Data on the presence or absence of phytochemicals | | |
|--|---|--------------|----------------------------|
| | Fruits | Leaves | Roots |
| 1 | 2 | 3 | 4 |
| Alcoholic solution of 3% ferric chloride (III) | – | Tannins | Tannins |
| Alcoholic solution of 2% aluminum chloride (III) | Flavonoids | Flavonoids | Flavonoids |
| An aqueous solution of 10% sodium hydroxide | – | – | 1–8 Dihydroxyanthraquinone |
| Ammonia gas | – | – | 1–8 Dihydroxyanthraquinone |
| Wenger's reagent | Alkaloids | Alkaloids | Alkaloids |
| 1% Ferric-Ammonium aqueous mixture solution | – | Tannins | Tannins |
| Vanillin in 1% concentrated hydrochloric acid | No Catechins | No Catechins | No Catechins |

EXPERIMENTAL PART

Dried leaves, fruits and roots of *Morinda citrifolia* collected from Ghana served as objects of this investigation.

Assessments of the quality of raw materials were carried out using standard techniques described in the Russian Pharmacopoeia, XI and XIII editions [10, 11]. The presence of phytochemical compounds in extracts (70% ethanol) of fruits, leaves, and roots of *Morinda citrifolia* were investigated using generally accepted qualitative analytic and Thin Layer Chromatographic (TLC) methods [12]. The results; comparative product analysis of phytochemical components found in *Morinda citrifolia* are presented in the table below. Results of qualitative phytochemical analysis of herbal substances found in *Morinda citrifolia* (Table 2).

Table 1

The result of phytochemical evaluation of the content of basic groups of biologically active substances was established that: alkaloids were present in the roots, leaves, and fruits of noni; anthraquinones were present only in the roots of noni; tannins were present in the roots and leaves of noni; flavonoids were present in all of the parts investigated. The roots extracts of noni exhibited the highest quantity of flavonoid compounds.

Table 2

Initial extractive and technological processes of sample materials were studied [13]. The studies were based on: fractional composition of herbal substances (average particle diameter); bulk density (bulk weight). The results of determination of technological parameters of the crushed material are presented in tables 3 and 4.

Average particle size of mesh-filtered samples of *Morinda citrifolia* calculated.

CONCLUSION

It was concluded that:

1. Product analysis of the fruits, leaves and roots of *Morinda citrifolia* were within range values prescribed in the Russian Pharmacopoeia.

Table 3

FRACTIONAL COMPOSITION OF CRUSHED FRUITS, LEAVES AND ROOTS OF MORINDA CITRIFOLIA

| Particulate size | Fractional composition, % | | |
|------------------|---------------------------|------------|------------|
| | Fruits | Leaves | Roots |
| 2 mm | 0,15±0,02 | 0,00 | 0,06±0,01 |
| 1 mm | 57,30±0,39 | 85,49±0,45 | 70,11±0,35 |
| 0,5 mm | 12,82±0,08 | 3,50±0,06 | 3,69±0,06 |
| 0,25 mm | 24,10±0,12 | 5,70±0,08 | 8,24±0,09 |
| <0,25 mm | 5,63±0,08 | 5,31±0,07 | 17,9±0,11 |

Table 4

TECHNOLOGICAL PARAMETERS OF CRUSHED FRUITS, LEAVES AND ROOTS OF MORINDA CITRIFOLIA

| № | Indicators | Value | | |
|---|-----------------------------------|-----------|-----------|-----------|
| | | Fruits | Leaves | Roots |
| 1 | Bulk weight, g/sm ³ | 0,50±0,02 | 0,19±0,01 | 0,21±0,02 |
| 2 | Average diameter of particles, mm | 0,79±0,02 | 1.23±0,03 | 1.28±0,03 |

2. A comparative analysis of the phytochemical composition of the roots, fruits and leaves of *Morinda citrifolia* presented the roots as a more promising part for further investigations

3. Technological characteristics of sampled plant substances of the fruit, leaves and roots of *Morinda citrifolia* were established.

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МОРИНДА ЦИТРУСОЛИСТНАЯ – ПЕРСПЕКТИВНОЕ ЛЕКАРСТВЕННОЕ СЫРЬЕ ДЛЯ ПРОИЗВОДСТВА ФИТОПРЕПАРАТОВ

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РЕЗЮМЕ

Введение. Моринда цитрусолистная, или нони (*Morinda citrifolia*) – популярный источник для получения традиционных лекарственных средств на тихоокеанских островах. Основные биологически активные вещества моринды цитрусолистной: фенольные и терпеноидные соединения, органические кислоты и алкалоиды.

Материал и методы. Объектом исследования служили высушенные листья, плоды и корни моринды цитрусолистной, собранные на территории Ганы.

Оценку качества и выявление биологически активных веществ исследуемого сырья осуществляли по стандартным фармакопейным методикам (ГФ XI и XIII изданий).

Результаты и заключение. Проведена фитохимическая оценка содержания основных групп биологически активных веществ. Алкалоиды обнаружены в корнях, листьях и плодах. Антрахиноны были выявлены только в корнях. Дубильные кислоты обнаружены в корнях и листьях. Наличие флавоноидов подтверждено во всех органах растения, но их больше всего в корнях.

Установлены товароведческие и технологические показатели анализируемых растительных субстанций – плодов, листьев и корней моринды цитрусолистной.

Ключевые слова: моринда цитрусолистная, нони, товароведческий анализ, фитохимический анализ, корни, листья, плоды.