**Type: Original Research Article**

**A comprehensive characterization and therapeutic properties in ripening Noni fruits (*Morinda citrifolia* L.)**

**[Note:** No Author(s) details;Author(s) submit an anonymized file without the affiliation & authors' names. International Journal of Experimental Research and Review (eISSN: 2455-4855) follow a double-blind peer-review process, whereby authors do not know reviewers and vice versa.**]**

**Abstract:**

In this study, methanolic extracts from fresh ripening noni fruits (NFs) (*Morinda citrifolia*) were analyzed using GC-MS, FTIR, and XRD methods. Comprehensive assessments were studied by proximate analysis (PA), higher heat value (HHV), bulk density (BD) and swelling index (SI). The qualitative analysis of the ripening NFs extracts in various solvents, including distilled water, chloroform, dimethyl sulfoxide (DMSO), dimethyl formamide, and methanol, revealed positive results for starch, terpenoids, saponin, and cardiac glycosides. The percentages of volatile matter, ash content and fixed carbon in PA are 78.799±0.592, 7.18±0.044 and 14.02±0.553, respectively. To use biomass as energy, PA is essential that burns in a gaseous state (volatile matter), solid-state (fixed carbon), and inorganic waste material (ash). It is important to consider the HHV of 17.185±0.103 MJ/kg when estimating the potential for energy recovery from the fruit's biomass. Compositional analysis (CA) was used to determine the percentages of the extractive contents (4.497±0.346), cellulose (33.114±0.261), lignin (9.569±0.399), and hemicellulose (17.89±0.608), all of which have substantial antibacterial properties. Our research looked at its BD (0.312±0.001g/cm3) and SI (1.535±0.022%), resulting in increased susceptibility of the biomass to microbial activity. FTIR and XRD reveal C-O, O-H, N-H, O=C=O, C-H, and O-H linkages with solid lattice spacing. It helps to determine how a substance will interact with biological tissue following implantation. However, no research documents were found in any literature about the oil from noni fruits for the purpose of external pain relief. Advice on using NFs oil for pain treatment comes from our field study of a woman who is 80 years old. In ripening NFs extract, GC-MS analysis identified 100 phytochemicals, including D-limonene, 3-carene, gamma-terpinene, methyl eugenol, caryophyllene, hentriacontane etc. GCMS and virtual screening-cum-molecular dockingstudies have been done and reported first time to check the documentation and look for caryophyllene that could be used for pain-relieving properties. These compounds have been shown to have antioxidant, antimicrobial, anticancer, inflammation in the brain and oxidative stress-related effects. Our research confirms the bioactive potential of ripening NFs as an alternative medication source.

**Keywords:** Noni fruits, *Morinda citrifolia* L., GCMS, FTIR, XRD, Medicinal value.

[Note: Text/ column/ row should not be broken into two parts. Upon acceptance of the manuscript for publication will be formatted by the Publisher’s production house as required by the ‘Journal Format’]

**Introduction**

Traditional remedies continue to significantly treat various diseases (Sarkar et al., 2016; Banerjee et al., 2014; Sanyal et al., 2018; Kar et al., 2022). Plants have been used to treat illnesses since the dawn of civilisation. Traditional healers have gained importance recently for historical and cultural reasons, particularly in developing nations with scarce access to healthcare (Sarkar, 2016; Bhattacharjee, 2021). The lack of a scientific study of medicinal herbs to verify their usage may result in significant harmful effects (Maiti et al., 2013; Fitzgerald et al., 2020). One of the major sources of bioactive chemicals is thought to be plants and fruits. According to several studies, 80% of residents use medicinal plants as their primary source of healthcare (Maiti et al., 2010; James et al., 2018).

Noni fruits (NFs) (*Morinda citrifolia*, Family: Rubiaceae), which are native to China and India, are now used as a folk remedy (Choi et al., 2021). When NFs are ripe, it has an astringent or bitter flavour and a potent rancid scent resembling butyric acid. It is a significant plant that is utilised in medicine in many nations. This plant is known as Noni, Indian mulberry, Nuna, and Mengkudu (Potterat and Hamburger, 2007). It treats many conditions, including dysentery, heartburn, liver illness, diabetes, high blood pressure, migraines, joint pain, muscle aches, and arthritis. Likewise, it is often used to cure drug addiction. This plant's mature fruit is used to cure tuberculosis and respiratory illnesses (Singh, 2012).

However, research has revealed that NFs are beneficial in fighting bacteria, diabetes, cancer, free radicals, inflammation, and cardiovascular disease (Motshakeri and Ghazali, 2015). Due to the numerous changes and uses of plant structures for various medical purposes, NFs have attracted the interest of researchers in the food and pharmaceutical industries. Its potential as a valuable food source has also been mentioned (Almeida et al., 2019). Few NFs-containing foods are currently available on the market. Therefore, it is crucial to assess the chemical makeup and therapeutic potential. Through the analysis of numerous approaches and the assertion of the traditional view, this study attempted to describe the extract of ripe NFs.

##### **[Note: Introduction should be clear and concise. References should be up-to-date in all the text areas and searchable on the Internet/Google and unnecessary references may be avoided; *The author's subjects entirely determine both the headline, the subheadline & its text.*]**

**Materials and Methods**

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**Sample collection, size and Extraction**

Write in details

**Test for solubility (0.05 g in 10 ml & 0.1 g in 10 ml)**

Write in details

**Bulk Density (BD)**

Write in details

**Swelling Index**

Write in details

**Proximate Analysis**

Write in details

**Higher Heating Value**

Write in details

**Ultimate Value**

Write in details

**Compositional analysis**

Write in details

**X-ray diffraction (XRD)**

Write in details

**FTIR analysis**

Write in details

**GCMS analysis & Virtual screening-cum-molecular docking study**

Write in details

**Phytochemical Screening**

Write in details

**Screening for Anthraquinone (Borntrager’s test)**

Write in details

**Screening for cardiac glycosides (Keller-Kiliani test)**

Write in details

**Screening for Flavonoids (Shinoda Test)**

Write in details

**Screening for phenolic compounds (Ferric Chloride Test)**

Write in details

**Screening for saponin (Frothing test)**

Write in details

**Screening for tannins (Braymer’s Test)**

Write in details

**Screening for terpenoids (Salkowski test)**

Write in details

**Screening for Starch**

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**Statistical Analysis**

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**Result**

The solubility of an unidentified molecule can be used to make judgements about the size of the compound, its polarity, and whether or not it contains functional groups that are acidic or basic. This NFs powder was separated using a sieve with a mesh size of 40 µm. Solubility tests were carried out using distilled water, chloroform, dimethyl sulfoxide (DMSO), dimethylformamide, and methanol (Table 1).

**[Note:** Table & figure no should be mentioned in text**]**

**Table 1. Using distilled water, chloroform, dimethyl sulfoxide (DMSO), dimethylformamide, and methanol as solvents, 40 µm dust of maturing noni fruits (NFs) was used for the solubility test.**

Table -1

A basic concept of the existence of various chemicals with therapeutic benefits can be gained from phytochemical screening. The presence of Anthraquinone, cardiac glycosides, Flavonoids, phenolic compounds, saponin, tannins, terpenoids and Starch was screened in various solvent extracts of NFs using the methods. The ripe fruits of the Nani plant have been shown to contain starch, saponins, flavonoids, terpenes, and cardiac glycosides, all of which have passed tests for presence (Table 2 & Figure 1).

**Table 2. The table shows the results of the phytochemical analysis of ripening *Morinda citrifolia* L.**

Write in details

Table -2

Figure 1.

**[Note: Image/figure:** The main requirement for creating images of appropriate quality is that they have a minimum resolution of 600 dpi for colour images and 300 dpi for grayscale (or black and white) images. The image formats that are accepted are jpg, jpeg, and png.

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**Table 3. The table shows the results of bulk density, swelling index, proximate analysis, ultimate analysis and compositional analysis of ripening *Morinda citrifolia* L.**

Table 3.

Figure 2.

**Figure 2. The figure shows the results of bulk density, swelling index, proximate analysis, ultimate analysis and compositional analysis of ripening *Morinda citrifolia* L..**

**Bulk density (BD) and higher heating value (HHV)**

 (Table 3 & Figure 2)

**Proximate analysis (PA)**

Table 3 & Figure 2

**Compositional analysis**

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**Swelling index**

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**Ultimate analysis**

Write in details

**XRD analysis**

Write in details

Figure 3

**Figure 3. X‐ray diffractometry (XRD) peaks of ripening**  ***Morinda citrifolia* L. powder**.

**FTIR analysis**

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**Figure 4. FTIR spectra of ripening  *Morinda citrifolia* L. powder extract**

Figure 4

**Table 4. FTIR spectral peak values and functional groups were obtained for the leaf extract in *Morinda citrifolia* L. methanol solvents.**

Table 4.

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**GCMS analysis and Virtual screening-cum-molecular docking study**

Write in details

Figure 5.

**Figure 5. GC-MS study of the ripening fruit of *Morinda citrifolia* using the extract obtained from methanol.**

Figure 5.

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Figure 6

**Figure 6. GC-MS analysis of the ripening fruit of *Morinda citrifolia* utilizing the extract derived from methanol as the solvent and beta-caryophyllene & alpha-pinene interactions (protein-ligand) were visualized by BIOVIA-DSV software.**

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**Table 5. GC-MS study of the methanolic extract of ripening *Morinda citrifolia* fruit.**

Table 5

**Discussion**

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**Conclusion**

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**Acknowledgement**

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**Conflict of Interest**

The authors declare no conflict of interest.

**References**

[Note-1: Request that all references be thoroughly checked]

### [Note-2: Style of References: American Psychological Association (APA) Style]

[Note-3: Madhu, N. R. (2011). Pineal-adrenocortical interactions in domestic male pigeons exposed to long and short photoperiods and exogenous testosterone propionate. *International Journal of Experimental Research and Review*, *44*(4), 349-362. https://doi.org/10.52756/ijerr.2022.v28.020] [**\*It denotes that the volume is 44, the issue is 4, and the pages are 349-362.]**

**[Note-4:** A mandatory requirement for doi should be more than 90% of references**]**

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