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Extraction and Characterization of Bioactive Compounds from Leaf Extract of *Morindacitrifolia*

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Abstract

The purpose of this study was to isolate the bioactive compounds of *Morindacitrifolia* (noni). The extracts from the leaves of *M. citrifolia* exhibited one indigo band and two blue bands under the UV light. Six bands were also exhibited under the visible light. The leaf extracts of *M. citrifolia* gave fourteen fragmentations under GC/MS (Gas Chromatography Mass Spectrometry) and exhibited strong absorption bands at 3429.43 for N-H bond, 2945.30 for O-H bond, 1732.80 for C=O, 1234.44 for =C-OR bond and 1051.20cm^{-1} for R-O-R bond. It could be concluded that the leaf extracts of *Morindacitrifolia* contain acids, unsaturated aldehydes and ketones, alkaloids, anthraquinone, carotenoids, flavonoids, triterpenoids and sterols.

Keywords: *Morindacitrifolia*, bioactive compounds, unsaturated aldehydes and ketones, alkaloids, anthraquinone, carotenoids, iridiods, flavonoids, chlorophyll derivatives, triterpenoids and sterols.

Introduction

Morindacitrifolia belongs to the Rubiaceae family and comprises 80 species [1]. Noni is a common name for *M.citrifolia* Linn (Rubiaceae) and is one of the most important traditional Polynesian medicinal plants. The leaves are 8-10 inches long oval shaped, dark green and shiny, with deep veins. This plant is found in South-East Asia, Caribbean countries, Australia and Central-South America[1]. It has been reported to have a broad range of health benefits for cancer, infection, arthritis, diabetes, asthma, hypertension, and pain[1].

A number of major components have been identified in the Noni plant such as scopoletin, octoanoic acid, potassium, vitamin C, terpenoids, alkaloids, anthraquinones (such as nordamnacanthal, morindone, rubiadin, and rubiadin-1-methyl ether, anthraquinone glycoside), b-sitosterol, carotene, vitamin A, flavone glycosides, linoleic acid, Alizarin, amino acids, acubin, *L*-asperuloside, caproic acid, caprylic acid, ursolic acid, rutin, and a putative proxeronine[2].

Also, two novel glycosides in *M. citrifolia* and a new unusual iridoid named citrifolinoside have been shown to have an inhibiting effect on AP-1 transactivation and cell transformation in the mouse epidermal JB6 cell line[2].

Noni has been used as a medicine for many ailments such as dysentery, heartburn, liver diseases, diabetes, high blood pressure, muscle aches, headaches, heart diseases, cancer, gastric ulcer and arthritis[1]. Noni has approximately 200 phytochemical compounds which are distributed throughout the plant. Anthraquinones, a major bioactive compound, is present in different parts of the plant[1]. The many compounds found in the root of this plant include damnacanthal, nordamnacanthal, tectoquinone and others. These compounds have antibacterial, antifungal and other biological activities [2].

Several research engagements have been carried out to investigate the medicinal properties of *M.citrifolia* . Deng et al. [1] reported low cytotoxicity, reasonably high antioxidant properties and great phytochemical content for Noni blossom. In another study, Wang et al. [2] reported the reduction of superoxide anion radicals and lipid hydroperoxide, a property attributed to the antioxidant capabilities of Noni Juice. Despite the plethora of researches on the blossoms and fruit of Noni plants, few researches have in-deptly explore the medicinal properties of this plant. Hence, this paper aims to investigate the bioactivity of the leaf extract of Noni plant using spectroscopic and chromatographic analysis.

Materials and Methods

Collection and Preparation of Plant Materials

Fresh *M. citrifolia* leaves were collected from the garden house in Ibadan, Oyo state. Thereafter, the leaves were brought to the Laboratory, Department of Food Science and Technology, Federal University of Technology, Akure. It was oven-dried at 30-40^{0}c, then pulverized and ultimately soaked in hexane-ethanol for two weeks.

Chromatographic Analysis

The column was clean with n-hexane and allowed to dry and assembled vertically.The head of the column was blocked with cotton wool and a slurry of approximately 32g of silica gel in 200ml of n-hexane was used to pack the column. The eluent was collected in a beaker. The Gas Chromatographic analysis was GC/MS analysis was conducted on an Agilent (Agilent Technologies, Wilmington, DE, USA) 5973 mass spectrometer coupled to a 6890 gas chromatographer in accordance with the protocol reported by Wei et al. [3].

UV-Spectrophotometry Analysis

The UV-Vis spectroscopy was used to determine the total phenolic extract (280 nm), flavones (320 nm), phenolic acids (360 nm), and the total anthocyanins (520 nm). Four (4) ml of

chromatographic fraction was placed into quartz cuvette and readings was taking on a spectrophotometer using a wavelength of 650nmand bandwidth of 2.0nm.

Infrared-Spectroscopic Analysis

Fourier transform infrared (FTIR) spectroscopic analysis was carriedout on the chromatographic fraction sample using an IRaffinity –1S spectrometer according to the method of Mansoori et al. [4].

Result and Discussion

The UV-Visible spectra of the leaf extract of *Morindacitrifolia* in Fig. 1 and 2revealed six bands (300nm, 302nm, 342nm, 362nm, 364nm and 378nm) in the visible region and revealed one indigo band (430nm) and two blue bands (454nm and 470nm) in the UV region. This study was in agreement with the work of [1–9] which identified some bioactive components such as anthraquinone, carotenoids, flavonoids, chlorophyll derivatives, triterpenoids and sterols in *M. citrifolia* leaf.

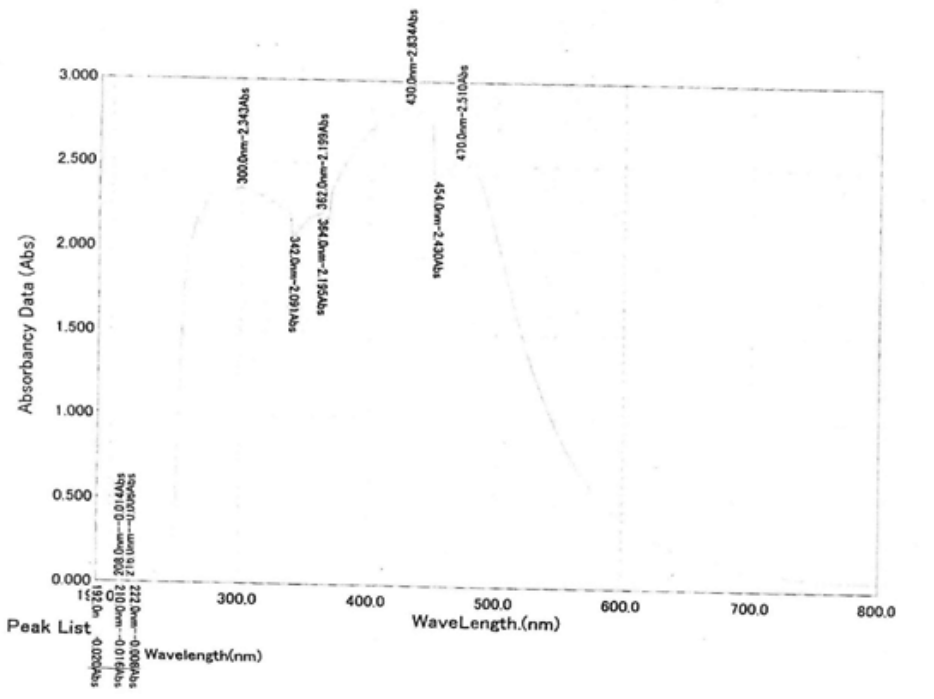

Figure 1.Showing the UV -Spectrum of the analyzed sample

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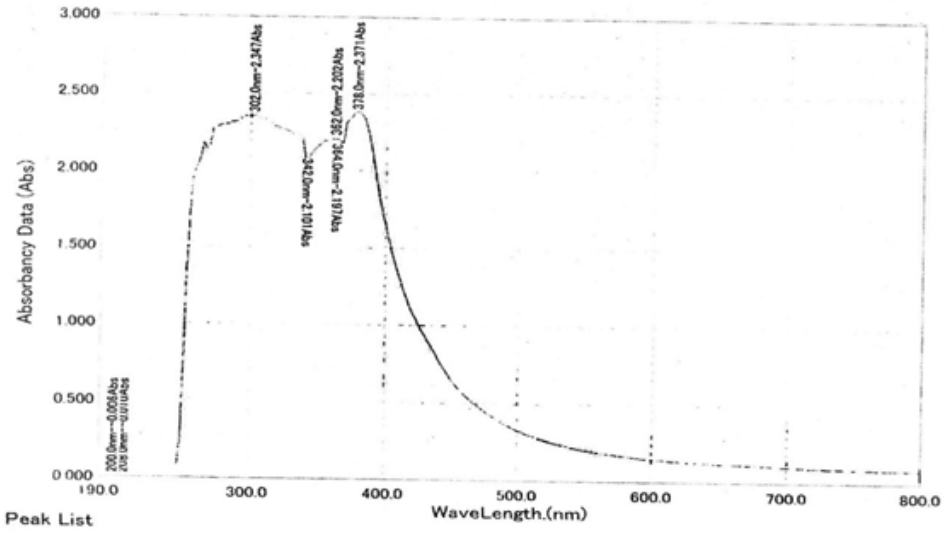

Figure 2.Showing the UV-Spectrum of the analyzed sample

The result of the IR spectrum (Figure 3) exhibited strong absorption bands at 3429.43 for N-H bond, 2945.30 for O-H (Carboxylic acid) bond, 1732.80 for C=O, 1234.44 for =C-OR bond and 1051.20cm^{-1} for R-O-R bond for the leaf extract from *Morindacitrifolia.* This study showed that there was alkaloid (due to the presence of N-H group) in the leaf extract of *Morindacitrifolia.* The absorption band of O-H showed that there was acid, the C=O band indicated the presence of carbonyl compound (aldehyde or Ketone), the =C-OR absorption band revealed that unsaturated ether was presence and the R-O-R band showed that dialkylether was presence in the leaf extract of *Morindacitrifolia.* According to some published work, unsaturated aldehydes and ketones, alkaloids, anthraquinone, carotenoids, iridiods, flavonoids, chlorophyll derivatives, triterpenoids and sterols with these functional main groups have been shown to be present in the leaves of *Morindacitrifolia*[1-9].

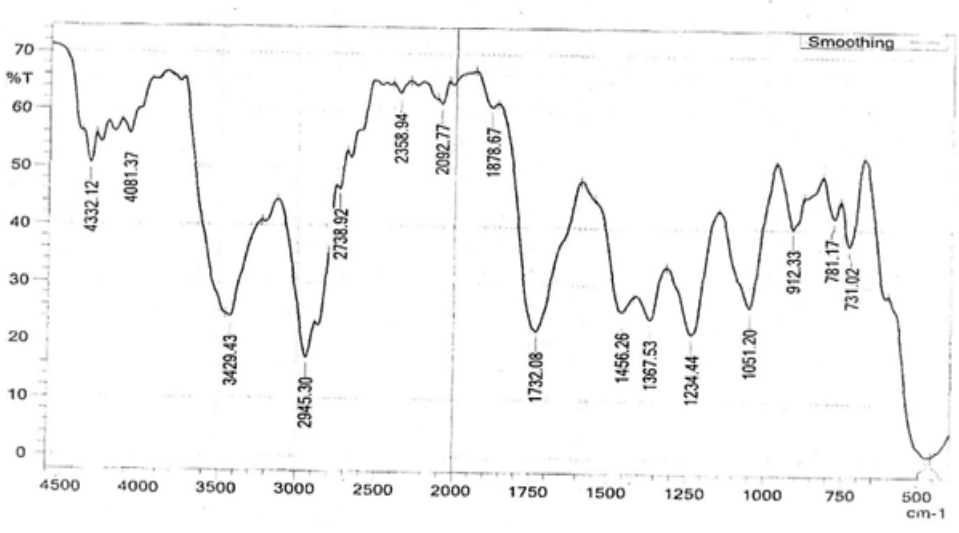

Figure 3.Showing the IR-Spectrum of the analyzed sample

The bioactive components of the leaf extract of *Morindacitrifolia* by GCMS analysis (Figure 4) clearly showed the presence of fourteen compounds.

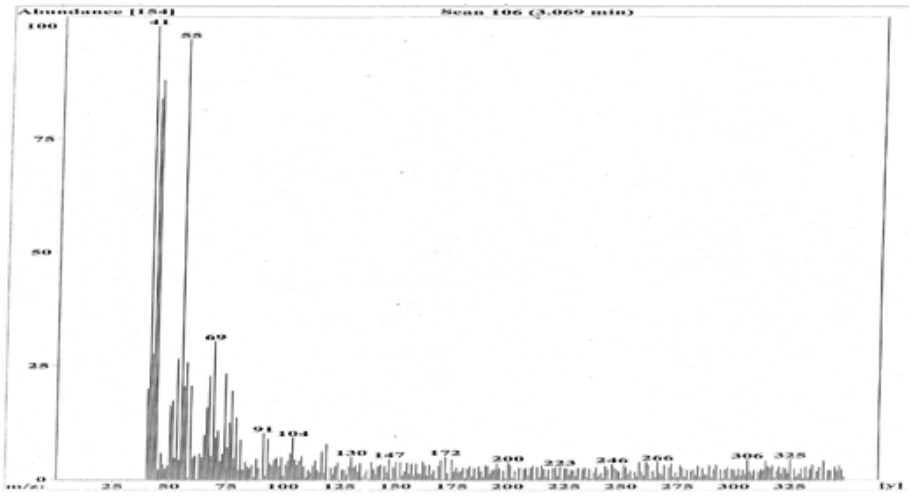

Figure 4.Showing the GC/MS Of the analyzed sample

Conclusion

Based on the research in this study, it can be showed that the leaf extract of *Morindacitrifolia* contain some bioactive components such as anthraquinone, carotenoids, flavonoids, chlorophyll derivatives, triterpenoids and sterols. Few work has been done on isolation and characterization of bioactive compounds of leaf extract of *Morindacitrifolia* which showed that these compounds may be used to develop drugs against infectious diseases with antioxidants source in future. However, isolation and characterization of the compounds and validating their therapeutic efficacy against different pathologies is required for clinical implementation.

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