Phytochemical and pharmacological properties of *Morinda tinctoria* – A review

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**ABSTRACT**

Indian systems of medicine and alternative medical systems were very successful with the use and incorporation of herbs to treat diseases. The scientific evidence was not established in the traditional claims of the herbs. In this review extensive segregation of the research work that had been performed on the plant *Morinda tinctoria* is done. The Pharmacological activities, Phytochemical work and pharmacogostical work that was performed on the plant had been reviewed and documented in this paper.

**INTRODUCTION**

Human beings have been using plants in their medicine from the origin of human race. Traditionally and culturally they had an influence on the evolution of humans. even though there was no scientific advancement and development in those ages, plants have been used to treat diseases of various kinds and the knowledge of treatment have been forwarded to next generation through word of mouth and just as folklore. Even though there had been no established scientific evidence of the activity and safety of herbs, there is an enough amount of medical support to state the uses of herbs [1].

In this generation also the tribal people use the herbs as their primary source of medicines and transmit their knowledge which is called as ethnobotany and ethnopharmacology of plants. This is the reason to establish an enough literature through survey or review articles or documentation of sources to preserve the folklore knowledge of the plant and their uses. So, in this current article, focus was thrown on the plant named *Morindatinctoria* Roxb. Which is also called as Indian mulberry plant to document its traditional uses folklore based on ethnobotany and ethnopharmacology and also segregate the research work that had been performed on the plant in every corner of the plant.
The plant is distributed very widely in tropical Asian and African countries and has a medicinal importance. It is also called as *Morinda citrifolia*. The plant is a shrub which is evergreen plant which grows to 5m tall plant. The leaves are pubescent with hairs underneath the surface. They are broad and lanceolate in shape. The petals of the leaves are 0.5 to 1 inch long and are variable in their sizes. The fruits are green and succulent berries. They give more pulp and approximately 1-1.5 inches in diameter which has only one seed that is flat. All the parts of the plant are useful and have medicinal properties Figure 4.

The plant is cultivated and also wildly available in the hills and plateus of southern India. It is used extensively to prepare Morindone dye which is called as Suranji as a market name. Morindone is a dye that is used to stain cotton and silk with red colour. There is a glycoside called as Morindin that is hydrolysed to produce red colour Figure 1.

**Traditional claims**

As said all parts of the plant are useful and traditionally used too. The leaves have been used to treat dyspepsia, ulcers and diarrhea. Basically, the leaves are said to be used for gastric problems like indigestion and stomatitis too. They are also used as general tonic and emmenagogue. The juice of the leaves is used externally to treat wounds which has amazing wound healing property. It is also used to treat fevers of unspecified origin.

Roots are used to treat inflammations and wounds. The paste is applied on the skin to treat boils.

Ripe or unripe fruits are used to prevent amoebic dysentery, and diarrhea. There are claims that the fruits are burned and charred to ash. This ash is used to control vomiting and cholera too [2].

**Pharmacological properties**

**Antulcer activity**

There was research that is carried out to test the anti ulcer activity of the plant leaves. Ethanol extract was extracted from the leaves and the ulcers in the rats were tested using pylorus ligation model and cysteamine induced ulcer model. The extract was administered orally and the ulcer parameters were tested in both the models. The extracts showed antulcer activity by modulating the defensive factors thereby facilitating the cytoprotection [3].

**Antibacterial property**

The antibacterial property of the plant extract were tested using various solvent extracts of the leaves of the plant. This result showed an antibacterial activity of the plant. The phytochemistry of the plant was also analyzed and various constituents like quinoes, steroids, terpenoids and glycosides were eluted using FTIR. The ethanol extract of the leaves showed esters and carboxylic acids and alkenes [4].

**Antioxidant activity**

The antioxidant activity of the morinda was tested in different solvents resulting in chloroform, n-hexane,
ethyl acetate and methanol extracts of the leaves and the total phenolic content was also estimated. Cynarin was isolated from chloroform extract and oleuropein was isolated from methanol extract and tested for antioxidant activity in DPPH method. The extract showed 91% activity in hexane extract which was the highest and least showing 65% in ethyl acetate extract [5].

The antioxidant activity of the extracts were tested using DPPH free radical scavenging method and H2O2 method. The ethanol extract of the leaves of the plant were used to test the activity and the results showed a 85% inhibition of free radicals with almost 8% total antioxidant capacity. In H2O2 method, 78% of the activity was shown by the extract [4].

Anti-inflammatory activity
Ethanol extract of the leaves of Morinda had been investigated to prove its anti-inflammatory potential by estimating the protease activity, and protein degradation. The results showed 44% degradation of proteins and 45% of protease activity and the extract prevented the break down of cells by almost 70%. Therefore, it can be confirmed that the ethanol extract of the leaves showed an anti-inflammatory property [4].

Wound healing activity
There was study where the chloroform extract of the fruits of Morinda was investigated for wound healing potential with the topical application at the dose of 20 and 10mg/ml concentrations in rats. The complete wound healing was noticed in just 15 days which was almost 50% more than untreated groups [6].

Another study involved the investigation of wound healing property of Morinda aqueous extract of the leaves in wistar rats. The wound healing was estimated by evaluating the wound contraction, epithelialization period after applying the extracts directly on the wound. The results showed that the extracts possess a better wound healing property suggesting that the extract can be used in ointments for wound healing [7].

Pharmacognostic study
The study was conducted on morinda plant for its pharmacognostic parameters like ash values, LOD, phytochemical analysis, and fluorescent analysis. It showed the presence of alkaloids, tannins and polyphenols in aqueous and methanol extracts. The fresh leaves were tested for the amino acid content using paper chromatography and proved the presence of glycine, proline, phenyl alanine and valine [8].

Phytochemistry
The leaves have been investigated for the phytochemistry and the following compounds have been isolated from the plant. Flavonoids like Quercetin, Kaempferol, Acacetine and uroslic acid had been isolated [9]. Leaves have been found to contain elements like iron, copper, manganese and zinc in the concentrations of 20, 79, 5 and 10ppm Figure 3 [10].

The stem of the plant contained many chemical constituents apart from morindone, glycoside. Tinctormorone which is an anthraquione ester, dammacanthal and nordamacanthal were isolated from heartwood of the plant Figure 2 [11].
Fruits of the plant were investigated and isolated for reducing sugars and lipids. The fruits are major source of manganese, calcium and potassium. The fruits were also isolated for its high fibre content [12].

CONCLUSION

This review paper documented all the activities of the plant Morinda and reviewed the pharmacological activities like wound healing, antioxidant, anti-inflammatory properties etc. this plant had been intensively studied for its chemistry and pharmacological work. Based on this evidence of the research work on the plant, there is a need to investigate and establish proof scientifically for the traditional and folklore claims of morinda.

Conflict of interest

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