



A CONCISE REVIEW ON *MELIA DUBIA* CAV. (MELIACEAE)

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Received 13/01/2015; Revised 29/01/2015

Accepted 23/02/2015

ABSTRACT

The Indian subcontinent is endowed with rich and diverse local health tradition, which is equally matched with rich and diverse medicinal plant genetic resources. With the emerging interest in the world to adopt and study the traditional system and exploit their potential based on different health care system, the evaluation of the rich heritage of the traditional medicine is essential. This article discusses about the medicinal values of *Melia dubia*. The antidiabetic, anti cancer, anti inflammatory, antioxidant, antibacterial, anti-urolithiatic activity, larvicidal, insecticidal and antifeedant properties of *Melia dubia* were reviewed.

Keywords: *Melia dubia*, Meliaceae, Traditional medicine, Medicinal values of *M.dubia*.

INTRODUCTION

India has rich contribution of approximately 1800 plant species used in Ayurveda, 600 for Siddha, 400 for Unani and more than 400 for Homeopathic system of medicine. Medicinal plants are the major components of all indigenous or alternative system of medicines like Ayurveda, Homeopathy, Naturopathy, Oriental and Native American Indian medicine. Demand for herbal drug is increasing throughout the world due to growing recognition of natural plant based products, being non toxic, having no side effects, easily available at affordable price [1]. More than 80% of the world's population presently uses herbal medicines for their primary health care as alternative system of medicine [2]. Use of herbal medicines in Asia represents a long history of human





interactions with the environment. Plants used for traditional medicine contain a wide range of substances that can be used to treat chronic as well as infectious diseases. A vast knowledge of how to use the plants against different illnesses may be expected to have accumulated in areas where the use of plants is still of great importance.

The traditional knowledge on medicinal plants can lead to the development of drugs and plant based medicine. The increasing price of modern medicine and prevalence of disease have resulted in the demand for discovery of less expensive and potent drugs. Plants of medicinal characteristics are one of such source. In the present investigation *Melia dubia* (*M. dubia*) have been selected due to their medicinal importance.

Habit and Habitat

M. dubia is also called as a Maha neem or forest neem which is fastest growing tree species of India, Sri Lanka, Malaysia to Australia and Angola. It is found in deciduous forests from plains to 750m above sea level.. It is popularly known as *Melia azedarach* Linn [3]. *Melia dubia* tree grow up to 25 m tall. Bark 6-8 mm thick, dark brown, rough, flakes large rectangular in shape young parts scurfy tomentose. Leaves 2-3 pinnate, (rarely 1-pinnate), imparipinnate, rachis 10-30 cm long, terete, slender, swollen at base, scurfy tomentose. Flower in axillary panicles, pendulous; greenish-white, fragrant. *Melia dubia* flowers between March-April and fruits from April.. Fruit a globose drupe, dark green, dorsally compressed with longitudinal ridges; seeds 3 or 4.



Taxonomical classification of <i>Melia dubia</i>			
Kingdom: Plantae Division: Magnoliophyta Class: Magnoliopsida Order: Sapindales Family: Meliaceae Genus: Melia Species: <i>M. dubia</i> Binomial name: <i>Melia dubia</i> Cav. Synonyms: <i>Melia composite</i> .	Figure 1. <i>Melia dubia</i> plantataion 		Figure 2. <i>Melia dubia</i> leaves 
	Figure 3. <i>Melia dubia</i> flowers 		Figure 4. <i>Melia dubia</i> seeds 

Chemical and molecular specification

Valentina *et al* had reported that the leaf extracts of *M. dubia* revealed the presence of alkaloids, carbohydrates, steroids, tannins, flavonoids, saponins and glycosides.[2] Purushothaman *et al* found that two new tetranortriterpenoids, compositin and compositolide, have been isolated from leaves and seeds of *Melia dubia*. [4] Nagalakshmi *et al* had reported that the leaf essential oil consists chiefly of monoterpenes (35.71%) and oxygenated monoterpenes (27.98%), accompanied by a relatively much smaller amount of alkanes (11.17%), sesquiterpene hydrocarbons (9.26%) and phenylpropanoids (3.90%). The monoterpene camphene occurs as a major constituent (21.68%) of this leaf essential oil. It is accompanied by a noticeable amount of α - and β -pinene (3.12% and 5.13%, respectively) and a much smaller amount of sabinene (2.75%). The oxygenated monoterpenes are distinctly dominated by the presence of the bicyclic ketone camphor (17.85%), while iso-borneol and borneol are detected in much smaller amounts (4.15% and 1.12%, respectively)[5]. De Silva *et al* earlier reported that the bitter principle in *Melia dubia* Cav. fruits is salannin, previously found in *Melia azadirachta* L. [6].

Murugesan *et al* had reported that the phytochemical components of *Melia dubia* (Cav) are unsaturated fatty acids, terpenoids (diterpenes and sesquiterpenes) antioxidants, phenolic derivatives and lipophylic organic compounds. Phytochemical compounds such as Linolenic acid, Palmitic acid, Caryophyllene, Humulene, Aromadendrene, Probucol, Germacrene-D, Phthalic acid 6-ethyl-3-octyl, Butylated hydroxy toluene [7].

Medicinal value of *M.dubia*

Antioxidant activity

Valentina *et al* had reported that the solvent extracts of *Melia dubia* exhibited excellent antioxidant activity by Nitric oxide radical scavenging method, evidenced by lower IC50 (16.89 μ g/ml) value in the ethanolic extract. The results revealed that, ethanolic fraction of *Melia dubia* Cav which contains highest amount of phenolic and flavonoids compound may be contributing to antioxidant potential of the plant [2].

Anti microbial activity

A preliminary investigation done at Ootacamund, Tamilnadu indicated that ethanolic and aqueous extracts of the bark were found to posses significant antibacterial activity against *Staphylococcus aureus* [8]. Nagalakshmi *et al* had reported *Melia dubia* leaf essential oil exhibited bacteriostatic and fungistatic activities against *Pseudomonas aeruginosa*, *Escherichia coli*, *Klebsiella pneumoniae* and *Fusarium oxysporum* and *Candida albicans* respectively [5] Saptha Jyothi Gerige *et al* studied the chemical constituents of *Melia dubia* leaf volatile oil by GC-MS and found that the chemical compound “monoterpene camphene” shows the good antimicrobial activity which inhibits 78% of skin isolates at 250ml concentration, whereas the *Melia dubia* leaf volatile oil that contains 21.68% of camphene as a major constituent, inhibits 88% of skin pathogens [9].

Anti inflammatory activity

Khadse *et al* had reported that the anti-inflammatory activity of aqueous extracts and its fractions of *Melia dubia* (Meliaceae) fruits were screened *in-vivo* using carrageenan induced rat paw edema method and *in-vitro* by albumin denaturation and membrane stabilization assay at different concentrations. The aqueous extract was found most active; it was then fractionated into four major fractions (FR) and was evaluated for Anti-inflammatory



activity. In-vivo result showed that, FR-III 200 mg/kg & 400mg/kg showed most significant ($P < 0.01$) inhibition of edema with 49.11% & 56.24% respectively, which was compared with reference drug indomethacine, that have shown 60.15% most significant ($P < 0.01$) inhibition of edema. In-vitro study of FR-III have shown 61.45% inhibition of thermally induced protein denaturation and 61.43% inhibition by membrane stabilization method at concentration of 200µg/ml. From the present study, it is accomplished that FR-III have shown significant dose dependant anti-inflammatory activity [10].

Hepatoprotective activity

Rao *et al* showed ethnolic extract of *Melia azedarach* Leaves (300 mg/kg and 500 mg/kg) treated against Simvastatin (20mg/kg/p.o) induced hepatotoxicity in rats using Standard drug Silymarin (25mg/kg). There was a significant changes in biochemical parameters like increases in serum glutamate pyruvate ransaminase (SGPT), Serum glutamate oxaloacetate transaminase (SGOT), alanine phosphatase (ALP), serum bilirubin and decrease the total proteins content. The leaf showed significant hepatoprotective activity. The results also imply that the hepatoprotective effects of *Melia azedarach* may be due to its antioxidant property [11].

Analgesic activity

Samdani and Rana had evaluated *Melia azedarach* Linn roots for analgesic activity in the doses of 100 and 200 mg/kg, extract inhibited 82.23 % and 88.94 % writhing induced by acetic acid [12].

Anti diabetic activity

Susheela *et al* had indicated that fruit extract of *Melia dubia* has been tested on mice and found to be an effective hypoglycaemic agent [13]. Rohini and Arya had reported that Liminoid as active constituents of the *Melia dubia* and the alcoholic extract of its fruit at a dose of 300mg/g showed antidiabetic activity against Streptozotocin induced diabetic mice [14]. However, Valentina *et al* had clearly demonstrated that ethanolic extract of *Melia dubia* has shown high potent α - amylase inhibiting property with IC_{50} value of 24.82 µg/ml (2).

Anticancer activity

Kathiravan *et al* had reported that the silver nanoparticles synthesized from *Melia dubia* plant extracts tested against human breast cancer (KB) cell line. Results revealed that silver nanoparticles synthesized from *Melia dubia* plant extract showed remarkable cytotoxicity activity against KB cell line with evidence of high therapeutic index value [15].

Anti bacterial activity

Chanthuru *et al* showed that the *Melia dubia* leaf extract at the concentration of 60 µl showed appreciable

zone of inhibition activity against all the bacterial pathogens tested i.e., *Escherichia coli*, *Salmonella typhi*, *S. paratyphi*, *Klebsilla pneumonia*, *Staphylococcus aureus* (28, 20, 18, 26 and 22 mm respectively). The ethyl acetate extracts of root exhibited minimum activity in some of the organisms, namely *E.coli* and *S. paratyphi* (7 and 8 mm respectively [16]. Further, Karthikeyan *et al* confirmed antibacterial activity against other organisms like *Bacillus subtilis*, *Proteas mirabilis* and *Vibrio cholera* [17].

Antifeedant activity

Koul *et al* had reported the growth inhibitory activity and deterency of *Melia dubia* (Meliaceae) extracts to *Spodoptera litura* and *Helicoverpa armigera* larvae were investigated. artificial diet bioassays using neonate larvae of both *S. litura* and *H. armigera* indicated that dichloroethane (DCE) and methanol (Me) extracts of *M. dubia* inhibited growth in a dose dependent manner. DCE and Me-SII fractions also resulted in 50% deterency at concentrations of 22.5 and 16.8 Ilg/cm² respectively against *S. litura* larvae in a leaf disc-choice test [18].

Anti-urolithiatic activity

Senthil *et al* had reported that aqueous and ethanol extracts of *Melia azedarach* Linn leaves have potent antiurolithiatic activity against ethylene glycol-induced calcium oxalate urolithiasis in male albino rats .The effect of oral administration of aqueous and ethanol extracts of *Melia azedarach* Linn leaves on calcium oxalate urolithiasis has been investigated. Lithiasis was induced by oral adminstration of ethylene glycol (0.75 %v/v) in male albino rats for 28 days. Each of the extract (250 mg/kg) was administered orally day 0 as a prophylactic regimen and from day 15 as a curative regimen. Histopathological study, urine microscopy, serum analysis and biochemical analysis of kidney homogenate were performed. The results indicate that the aqueous and ethanol extracts of *Melia azedarach* Linn leaves have potent antiurolithiatic activity against ethylene glycol-induced calcium oxalate urolithiasis in male albino rats [19].

Larvicidal activity

Karthikeyan *et al* had reported that the larvicidal activity of crude aqueous leaf extracts of *Melia dubia* and silver nanoparticles synthesized using *Melia dubia* leaves were tested against 4th instar larvae of the filarial vector *Culex quinquefasciatus*. The results revealed that highest mortality of filarial vector was observed with the synthesized silver nanoparticles compared to crude aqueous leaf extracts of *Melia dubia* [15]. Chanthuru *et al* confirmed that this plant material exhibited significant activity on *Culex quinquefasciatus* and hence, could be considered as potent natural larvicidal agent [16].



Ovicidal & biopesticidal activity

Malarvannan *et al* reported that eggs of 24, 48 and 72 hr old eggs were prevented from hatching by 0.5% of hexane extract. Petroleum ether extract at 0.5% dose resulted in zero hatchability of 72 h old eggs. The medium dose of 1.0% was effective in case of acetone extract against 48 h old eggs. Contrastingly, at higher doses the egg hatchability was not completely arrested.

CONCLUSION

The experimental results proved that the biopesticides derived from less explored plants like *Melia dubia* play a major role in combating the insect pests at the egg stage itself, and thereby prevent the damage caused by the larval stages. In addition, if applied at the right dosage and time it would certainly be an alternative to chemical pesticides at the field level [20].

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