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Research Article

A STUDY ON THE STANDARDIZATION PARAMETERS OF *MADHUCA LONGIFOLIA*

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ABSTRACT

Objective: There is an increase demand of herbal remedies due to their effective and safer way of treating various disorders. In today's scenario, the herbal medicines are much efficient for the treatment of various disorders as they have minimal side effects in comparison to the allopathic medicines. *Madhuca longifolia*, commonly called Mahua/Mahwa, belongs to the family *Sapotaceae*. It grows up to a height of about 20 m. The objectives of this study are to investigate various pharmacognostic, phytochemical analysis, and pharmacological properties of *M. longifolia*.

Methods: The powdered drug was used for estimating the loss on drying, ash values, fluorescence studies, chemical tests, and extractive values. Macroscopic and microscopic studies were also performed.

Results: The leaf microscopy revealed the presence of upper and lower epidermis, palisade tissue, and well-developed vascular bundle. The fluorescence characteristics of leaf powder were studied both in visible light and ultraviolet (UV) light (254 nm and 365 nm) after treatment with various reagents. Mahua is composed of glycosides, sapogenins, steroids, saponins, flavonoids, and triterpenoids. It was reported that the total ash value was 5.56±0.2% w/w. The acid-insoluble and water-insoluble ash values were 0.62±0.025% w/w and 0.47±0.025% w/w, respectively. Water soluble, ethanol, methanol, petroleum ether, and chloroform extractive values were 25.9±0.51% w/w, 28.1±1.38% w/w, 1.73±0.20% w/w, 0.83±0.20% w/w, and 25.5±2.29% w/w, respectively.

Conclusions: The main pharmacological activities of *M. longifolia* are anthelmintic, antiulcer, antitumor, antimicrobial, antidiabetic, anti-inflammatory, antigoitrogenic, and hepatoprotective. The present investigation provides the information on its pharmacognostic, phytochemical analysis, and pharmacological properties.

Keywords: Mahua, Sapogenins, Flavonoids, *Sapotaceae*, Ash value.

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INTRODUCTION

Madhuca longifolia belongs to family *Sapotaceae* and is also called Mahua [1]. The term Madhuca is derived from "Madhu" (Sanskrit word) which means honey. It is also known as Indian butter tree. Mahua is a deciduous and medium-sized tree found in India, Nepal, and Srilanka [2]. All the parts of Mahua possess many medicinal qualities. Fruits - refrigerant, aphrodisiac, tonic, and antiulcer. Leaf - wound healing, anthelmintic, emollient, and rheumatism. Flower - refrigerant, liquor, increase milk production in woman, diuresis, antihelmenthic, hepatoprotective. Bark - tonsillitis, stomachache, antivenom in snake poisoning. Oil - laxative, hemorrhoids, piles [3]. It is composed of various phytoconstituents which include flavonoids, triterpenoids, glycosides, saponins, and steroids [4]. *M. longifolia* can produce about 20-200 kg of seeds/year [5]. The tree of *Madhuca longifolia* is represented in Fig. 1. The leaves and fruits of *Madhuca longifolia* are represented in Fig. 2. The flowers of *Madhuca longifolia* is represented in Fig. 3.

Geographical Source: Mahua is mostly found in the Central and North Indian plains and forests and also in some parts of Eastern India such as West Bengal, Bihar, and Jharkhand [5].

Taxonomical classification [5,6]

Kingdom	Plantae
Division	*Magnoliophyta*
Class	*Magnoliopsida*
Order	*Ericales*
Family	*Sapotaceae*
Genus	*Madhuca*
Species	*Longifolia*

Synonyms [6]

Sanskrit	Atavimaduka
Hindi	Mohua, Mungli
Telugu	Ippa, Madhukamu
Tamil	Iluppai, Kattillupi
Odia	Mohuka, Mohulo
Malayalam	Illuppa, Iruppapu
Kannada	Doddippa, Halippa
Urdu	Mahuva
Marathi	Moha, Mhowra
Gujarati	Mahudo
Bengali	Mahula, Kochra

Medicinal uses

Its flower is widely used for making local liquor and leaves are used in headache and seed oil for cooking food. The leaf and bark are used for the treatment of skin diseases, rheumatism, and stomachache. Wounds can be treated by applying flower paste [7]. Mahua oil is used for the preparation of detergents, soap, fuel oil, and vegetable butter [2].

Macroscopic characters

The leaves are simple, alternate, and sinuate margin. The apex is acuminate whereas the base is decurrent. Its texture is glabrous [8].

METHODS

The leaves of *M. longifolia* were collected from Guttumal and Company, Shivaji Marg, Bareilly, Uttar Pradesh, India, and identified by Prof. A.K. Jaitly, HOD, Department of Plant Science, Mahatma Jyotiba Phule Rohilkhand University, Bareilly, Uttar Pradesh.

Powdered drug was used for moisture content, ash values, swelling index, and fluorescence studies were carried out by treating 0.5 g of powdered drug with different reagents and observation in color was made in visible light, UV light of short (254 nm) and long wavelength (365 nm) under UV chamber. Photomicrography was done by using Olympus C7070 camera [9].

RESULTS AND DISCUSSION

Microscopical examination of leaf

Parenchyma cells form the upper epidermis. The spongy and parenchymatous cells form the mesophyll layer. Vascular bundle was present in the center of the midrib. Xylem was surrounded by phloem. Calcium oxalate crystals were observed in cortex. The T.S. of leaf of *Madhuca longifolia* is represented in Fig. 4.

Powder study of leaf of *M. longifolia*

The leaf powder was examined under microscope and crystals, epidermal cells were observed.

Pharmacognostic evaluation of the plant: The plant material was used for quantitative determination of physicochemical values. Ash values, loss on drying, and extractive values were estimated.

Phytochemical Screening: The dried leaves were powdered and extracted with petroleum ether, chloroform, ethanol and water in soxhlet apparatus. The percentage yield was analyzed. The phytochemical tests were performed for the estimation of alkaloids, glycosides, flavonoids, and tannins in various plant extracts and resulted in the presence of carbohydrates, gums, proteins, alkaloid, saponins, flavonoids and tannins; results are given in Table 1.

Fluorescent studies of powder drugs: The fluorescence characteristics of leaf powder were studied both in visible light and UV light (254 and 365 nm) after treatment with various reagents and is represented in Table 2 [10-12].

The physiochemical parameters of leaf of *M. longifolia* are tabulated in Table 3. The loss on drying at 105°C in leaf was found to be 8.5±0.5%. Total ash value of leaf represents minerals and earthy materials attached in the plant material. It was reported that the total ash value was 5.56±0.2%. The acid insoluble ash value was 0.62±0.025%. The water-soluble ash value represents the presence of acids, sugar, and inorganic compounds and was found to be 0.74±0.025%. The results are given in Table 4.

The extractive values of *M. longifolia* in water, ethanol, chloroform, petroleum ether, and methanol were found to be 25.9±0.51% w/w, 28.1±1.38% w/w, 1.73±0.20% w/w, 0.83±0.20% w/w, and 25.5±2.29% w/w, respectively.

CONCLUSIONS

Preliminary phytochemical and physicochemical investigations of *M. longifolia* were performed in this study. These parameters are necessary for the identification of drugs and investigation of the bioactive constituents in medicinal herbs [13]. The presence of various chemical constituents in *M. longifolia* may be a potential cause of treatment of various disorders. The quality of the plant

Fig. 1: Tree of *Madhuca longifolia*

Fig. 2: Leaves and fruit of *Madhuca longifolia*

Fig. 3: Flowers of *Madhuca longifolia*

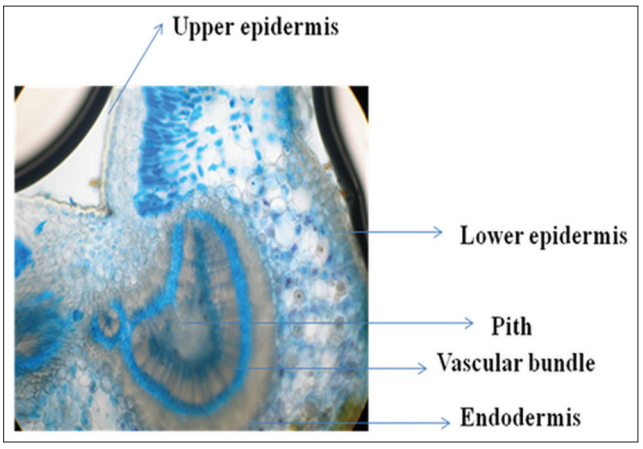

Fig. 4: T.S. of leaf of *Madhuca longifolia*

Table 1: Chemical tests

S. No.	Phytochemical tests	Ethyl acetate	Methanol	Water	Ethanol	Chloroform
1.	Carbohydrates					
	Molish test	-	+	+	+	+
	Fehling's test	-	+	+	+	-
	Benedict's test	-	+	+	+	-
	Barfoed's test	-	-	+	+	+
2.	Proteins					
	Biuret test	+	+	+	+	+
	Millon's test	-	+	+	+	-
	Xanthoprotein test	+	+	+	-	+
3.	Amino acids					
	Ninhydrin test	+	+	+	+	+
	Tyrosin test	+	+	+	+	+
	Cystein test	-	+	+	+	-
4.	Triterpenoid					
	Noller's test	+	-	+	+	+
5.	Steroid					
	Salkowski reaction	-	-	-	+	-
	Liebermann-Burchard reaction	-	-	-	-	-
6.	Cardiac glycosides					
	Baljet's test	-	+	+	+	+
	Legal's test	-	+	+	+	-
	Keller-Killiani test	-	+	+	+	+
7.	Anthraquinone glycosides					
	Borntrager's test	-	+	+	+	-
	Modified Borntrager's test	+	-	+	-	-
8.	Saponin glycosides					
	Foam test	-	+	+	+	+
9.	Cyanogenetic glycosides					
	Na - picrate test	+	-	+	+	-
10.	Flavonoids					
	Shinoda test	-	+	+	+	-
	Lead acetate	-	+	+	+	-
	NaOH	+	+	+	+	-
11.	Alkaloids					
	Dragendorff's test	-	+	-	-	-
	Mayer's test	-	+	-	+	-
	Wagner's test	-	+	-	-	-
	Hager's test	-	+	-	-	-
12.	Tannins					
	5% FeCl3	-	+	+	+	+
	Lead acetate	-	+	+	+	+
	Dil. HNO3	-	+	+	+	+
	Acetic acid	-	+	+	+	+

Table 2: Fluorescence activity of *Madhuca longifolia* leaves

S. No.	Material/treatment	Observation under UV cabinet		
		Visible light	Short UV 254 nm	Long UV 365 nm
1.	Drug powder as such	Muddy green	Green	Light brown
2.	Powder treated with concentrated HCl	Light brown	Black	Black
3.	Powder treated with 1 molar NaOH in water	Brown	Black	Brownish black
4.	Powder treated with concentrated ethanol	Golden	Green	Light green
5.	Powder treated with concentrated acetic acid	Golden	Dark green	Light green
6.	Powder treated with 5% $FeCl_3$	Pine forest	Dark green	Dark green
7.	Powder treated with concentrated benzene	Golden	Green	Reddish green
8.	Powder treated with methanol	Green	Dark green	Yellowish green
9.	Powder treated with 1 M H_2SO_4	Light green	Dark green	Blackish green
10.	Powder treated with concentrated HNO_3	Red	Reddish black	Black
11.	Powder treated with petroleum ether	Light green	Black	Dark green
12.	Powder treated with distilled water	Green	Greenish brown	Brown

UV: Ultraviolet

can be estimated by determining the physical parameters. These investigations are of great importance for carrying out the revalidation and estimation of its other pharmacological activities. It was concluded from the phytochemical study that the ethanolic extract contains flavonoids, glycosides, carbohydrates, tannins which are responsible for various pharmacological activities such as anti-inflammatory, chemoprotective activity, antioxidant, antidiabetic, antianxiety, and antidepressant.

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Table 3: Physiochemical parameters

S. No.	Parameters	Values (% w/w)	Values (% w/w)	Values (% w/w)	Mean±SD (% w/w)
1.	Total ash value	5.50	5.4	5.8	5.56±0.2
2.	Water-insoluble ash value	0.45	0.47	0.5	0.47±0.025
3.	Water-soluble ash value	0.75	0.77	0.72	0.74±0.025
4.	Acid-insoluble ash value	0.60	0.65	0.62	0.62±0.025
5.	Loss on drying	9.0	8	8.5	8.5±0.5

SD: Standard deviation

Table 4: Extractive values of *Madhuca longifolia* L.

S. No.	Solvent	Extractive value (% w/w)	Extractive value (% w/w)	Extractive value (% w/w)	Mean±SD (% w/w)
1.	Water	25.5	26.5	25.8	25.9±0.51
2.	Ethanol	28.8	29	26.5	28.1±1.38
3.	Chloroform	1.8	1.5	1.9	1.73±0.20
4.	Petroleum-ether	0.9	1	0.6	0.83±0.20
5.	Methanol	26.0	23	27.5	25.5±2.29

chemicals and other infrastructure for doing this research work. The work is dedicated to my guide and coguide.

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