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Pharmacognostical Standardization and Phytochemical of *Machilus macrantha* Nees. Bark



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ABSTRACT

The aim of the present study was to investigate the morphological and microscopical characters of *Machilus macrantha* Nees bark along with primary phytochemical evaluation. The concerned plant of Gulmavu was collected from Rye wood park premises (Lonavala, Pune) and its phytochemical and physicochemical analysis were performed. Under microscopical evaluation, the study of transverse section, as well as powder characteristics, were completed. The physicochemical evaluation included parameters such as preliminary phytochemical analysis, loss on drying, total ash value, acid insoluble ash value, solubility and extractive value. This article will improve the existing knowledge of *Machilus macrantha* and provide a comprehensive report on its pharmacognostical, phytochemical specifications.



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INTRODUCTION

Machililus macrantha Nees is a member of the family Lauraceae. It is distributed in western Peninsula, Sri Lanka and in India up to an altitude of 2100 m. It is commonly known as Kulamavu, Kulirmavu, and Kollamavu (Tamil) and is locally known as Golum, Pisara, Kurma, Gulmavu, and Chittutandrimara in various regions⁽¹⁾. The plant is reported to contain several phytochemicals such as norlignans, alkaloids, β -sitosterol and the bark is the rich source of mucilage. The plant in particular leaves and bark has several traditional uses. It is used to prepare incense sticks because of its insecticidal property. The leaf is used externally for ulcer and is also used to cure asthma, cough, diarrhea, dysentery, edema, and wounds^(2,3).

MATERIAL AND METHODS

Collection & Authentication

Gulmavu - *Machilus macrantha* Nees.

Gulmavu was obtained from Rye wood park premises in May 2014 with due permission of Regional Forest Officer as it is a protected species. Only fallen matured pieces were allowed to be collected.

Prof. Dr. D. A. Patil, Professor & HOD, Department of Botany, S. S. V. P. S. Arts, Science College, Dhule did the confirmation of the plant. The authentication of the plant was done by comparing the morphological features (leaf arrangement, fruit, and seed morphology). The herbarium of the plant has been deposited at Registered Botanist, Department of Botany, S. S. V. P. S. College of Arts and Science, Dhule.



Fig. 1: Herbarium of Gulmavu (*Machilus macrantha* Nees)

RESULTS AND DISCUSSION

Pharmacognostic studies

Microscopy:

Botanical name: *Machilus macrantha*

Family: Lauraceae

TAXONOMY

Kingdom: Plantae

Subkingdom: Viridiaeplantae

Phylum: Tracheophyta

Subphylum: Spermatophytina

Infraphylum: Angiospermae

Class: Magnoliopsida

Subclass: Magnoliidae

Superorder: Lauranae

Order: Laurales

Suborder: Lauraceae

Family: Lauraceae

Genus: Persea

Subgenus: Machilus

Species: *Machilus macrantha* Nees⁽⁴⁾



Description: Gulmavu (*Machilus macrantha* Nees) is a large tree having 27 meters of Length, 3 meters of Girth and around 7.5 meters of the cylindrical bore. Pharmacognosy of

the stem bark has carried out which reveals important morphological features like presence of wrinkles, fibrous fracture and characteristic odor ^(5,6,7).

Table 1. Organoleptic observations

Sl. No.	Physical Constants	<i>Machilus macrantha</i> bark
1.	Microscopic Characteristics	
	• Nature	Bark
	• Color	Dark Brown
	• Odor	Characteristic
	• Taste	Acrid

Microscopy:

Transverse section of bark showed the presence of four different regions including Periderm, Cortex, Sclerenchyma band and secondary phloem. Periderm is composed of cork region followed by Phellogen and phelloderm from cortex region ⁽⁸⁾. Cork region consists of several layers of stratified, thin walled elongated cells. Phellogen region is one to two-layered which consists of rectangular cells which are lignified. Phelloderm consists of two to three layers of brown colored, roughly rectangular cells which are non - lignified.

Secondary Cortex is having about thirteen layers of parenchymatous cells, encircling either as an isolated or as a scattered group of Scleride. Each Scleride is the nearly rectangular cell having pits both at inner as well as the outer wall. Some of the cortical cells show the presence of prismatic and micro sphenoidal calcium oxalate crystals and simple starch grains. A continuous thick sclerenchymatous layer plays the role of barrier between secondary cortex and phloem. The inner and radial layers of Scleride are thicker as compared to the outer layers of Scleride. Small patches of pericyclic fibers are scattered over the region of outer Sclerenchyma ⁽⁹⁾.

Secondary phloem contains phloem parenchyma, phloem fibers, and medullary rays. Phloem parenchyma is a larger portion which encompasses phloem fibers (present in a group of 1-3 in the scattered pattern). Medullary rays are 2-3 cells wide which divide phloem parenchyma radially ^(10, 11).

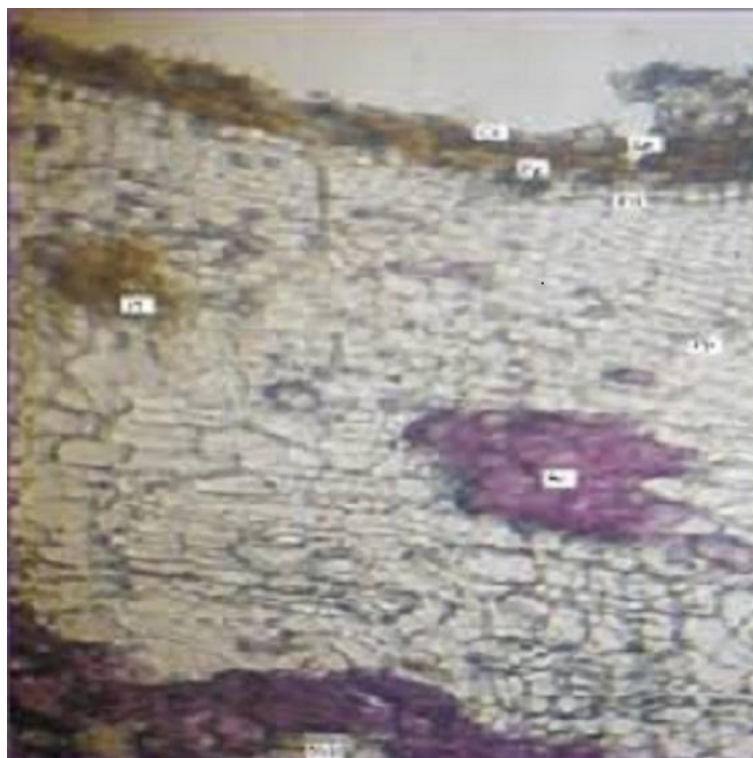


Fig. 2: Transverse section of *Machilus macrantha* Nees bark

Physicochemical evaluation I:



After microscopical evaluation of *Machilus macrantha* bark, the plant material (bark) is powdered and subjected for determination of Loss on drying, and extractive values. After that, it was also screened for confirmation of the presence of various secondary as well as primary metabolites to confirm its phytochemical status ⁽¹²⁾. The detailed results have been shown as follows.

Table 2. Results of Physicochemical Evaluation

Sl. No.	Physical Constants	<i>Machilus macrantha</i> bark
1.	Loss on Drying (% w/w)	4.10%
2.	Extractive Values (% w/w)	
	• Water-soluble Extractives	3.19%
	• Alcohol soluble Extractive	7%

Table 3. Results of Phytochemical Investigation of *Machilus macrantha* bark powder ⁽¹³⁾

Sl. No.	Name of the Test	<i>Machilus macrantha</i> bark
1.	Test for carbohydrates	
	a) Molisch's test	+
	b) Fehling's test	+
	c) Benedict's test	+
2.	Test for proteins	
	a) Biuret test	-
	b) Xantho protein test	-
	c) Millions test	-
3.	Test for Flavonoids	
	a) Mg-HCl test	+
4.	Test for Alkaloids	
	b) Dragendroff's test	+
	c) Mayer's test	+
	d) Hager's test	+
	e) Wagner's test	+
5.	Test for sterols	
	a) Salkowski test	+
	b) Liebermann reaction	+
6.	Test for phenolics & tannins	
	a) Ferric chloride test	+
	b) Lead acetate test	+
	c) Dil. HNO ₃ test	+
7.	Tests fixed oils and fats	
	a) Saponification test	-
	b) Stain test	-
8.	Test for triterpenoids	
	a) Liebermann Burchard's Test	-
	b) Salkowski test	-
9.	Test for glycosides	
	a) Keller-Killiani Test	+
	b) Baljet's Test	+
	c) Anthraquinone test	-
10.	Test for saponins	
	a) Hemolytic test	-
	b) Foam test	-
11.	Mucilage	+

(+) = Positive, (-) = Negative

Extraction of mucilage from the powdered bark ⁽¹⁴⁾:

1. Four (04) kgs of dried barks of *Machilus macrantha* were weighed and powdered.
2. The powder was then subjected to extraction of mucilage.
3. The mucilage obtained was then placed on Glass slides and subjected to shade drying as direct heating/ drying in hot air oven is claimed to have a deteriorating effect on physical properties of mucilage (Color change/ odor change with possible alteration in chemical properties).
4. The off-white dried powder was obtained at the end of prolonged drying sessions.
5. 1.275% yield was obtained for
 - The mucilage obtained in bulk should be shade dried over few weeks for complete drying in order to avoid complications associated with direct heating.

By following above-mentioned procedure one would be assured of a regular production of *Machilus macrantha* dried mucilage.



Table 4: Physical Characteristics of *Machilus macrantha* bark mucilage

Sl. No.	Name of the Extract	Nature	Colour	Odour	Taste	Quantity in gms (for 4 kg bark powder)	Percentage yield
4.	<i>Machilus macrantha</i> mucilage	Dried mucilage powder	Off white	Characteristic	Mucilaginous	51 gm	1.275%

Physicochemical evaluation of *Machilus macrantha* Mucilage ^(15, 16, 17):

After successful extraction of mucilage from Gulmavu bark, it was evaluated to determine certain physicochemical specifications which will in turn prove helpful for the future pharmacological screening of the drug. The parameters which were determined are Ash value (using Muffle furnace), Crude protein content (Kjeldahl method), Crude fiber content (by gravimetric method), Total lipid content (Soxhlet extraction method), Swelling power, etc.

Table 5. Chemical compositions of the mucilage's (Mean ± SD, n = 3). Chemical composition	OFI	OS
Ash value (%)	33.96 ± 0.06a	29.93 ± 0.05b
Crude fiber content (%)	0.06 ± 0.01a	0.07 ± 0.03a
Fat content (%)	0.42 ± 0.03a	0.38 ± 0.06a
Moisture content (%)	11.57 ± 0.02a	11.72 ± 0.04b
Protein content (%)	6.82 ± 0.01a	5.18 ± 0.03b

Solubility and swelling power of the mucilage 'sat different temperatures (Mean ± SD, n = 3). Tem.(°C)	Solubility (%)			Swelling power (per gram of sample)
	OFI	OS	OFI	OS
15	54.41±3.22c	49.63 ± 2.41c	3.15 ± 0.17b	4.66 ± 0.38b
40	57.63 ± 1.59b,c	54.40± 1.60b,c	3.99± 0.26b,d	5.41± 0.42b,c
55	62.16 ± 4.43b,c	57.63± 6.41b,c	5.01± 0.60b,c	7.06± 0.99b,c
65	65.42 ± 6.40a,b	63.24± 4.82a,b	6.78 ± 1.59a,c	9.01± 2.96a,c
75	68.00 ± 3.21a,b	64.80± 3.99a,b	6.68 ± 0.78a,c	8.10± 1.03b,c
85	75.19 ± 0.79a	71.22 ± 2.39a	6.02± 0.55a,c,d	7.86± 0.63b,c

RESULTS

The present investigation reveals that *Machilus macrantha* Nees bark does have unique microscopical identification marks such as "U" shaped sclerites and plenty of mucilage cells. Extraction of mucilage also revealed its usefulness as an effective application as a pharmaceutical aid. Besides this current work also marked versatility of *Machilus macrantha* Nees bark in terms of chemical composition. On the whole, *Machilus macrantha* Nees give us a scope to evaluate itself to provide us a medicinally, pharmaceutically useful drug in future.

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