International Journal of Botany Studies
www.botanyjournals.com
ISSN: 2455-541X
Received: 27-11-2021, Accepted: 13-12-2021, Published: 28-12-2021
Volume 6, Issue 6, 2021, Page No. 1436-1438

Physicochemical and pharmacognostic study of *Tectona grandis* Linn. bark

Sunita Ahire*, Amar Zalte, Vishal Gulecha
School of Pharmaceutical Sciences, Sandip University, Nashik, Maharashtra, India

Abstract
Tectona grandis Linn. belonging to Lamiaceae family is an important endangered plant that has been therapeutically used to treat different pathological manifestations since ages. It is commonly called as teak and locally known as sagon, sagwan. A lot of adulterations are also present in the market. The present study is aimed towards evaluating pharmacognostical and histochemical characteristics of the bark of *T.grandis* Linn. in detail. Macroscopic and microscopic pharmacognostical characters of bark and histochemical studies were noted by standard methods. Pharmacognostical evaluation of bark shows the presence of cambial zone, phloem layer, sieve tubes, parenchyma cells and medullary rays. The observations found in current work can be considered as reference standards in future studies and help to identify the plant from its other species.

Keywords: *Tectona grandis*, pharmacognostic evaluation, macroscopic and microscopic

Introduction
Tectona is a genus of tropical hardwood trees belongs to Lamiaceae family. This family includes about 236 genera and 6900 to 7200 species [1]. It is commonly known as sagwan (Hindi) (Fig. 1), saka (Sanskrit) and teak tree (English) [2]. The genus Tectona comprises 3 species viz *T. grandis*, *T. hamiltoniana* and *T. philippinensis*, *T. grandis* (teak) is widely distributed in Bangladesh, Thailand, China, India, and Pakistan [3]. Teak has worldwide reputation as a quality timber on account of its remarkable physical and mechanical properties, particularly elasticity, strength, durability and decay resistance [4]. Various chemical constituents isolated from different parts of plant *T. grandis*, wood contains lignin, Root contains lapachol, tectol, tectoquinone, β-sitosterol and a diterpene, tectograndinol, leaves contains Tectoionols-B, tectoionols-A , monoterpene, apocarotenoids. Seed oil contain fatty acids as caprylic, capric, linoleic acid, bark contains tannins, Hydroxyl lapachol [5]. T. grandis has variety of medicinal properties and traditional uses. Virtually every part of the teak tree has medicinal properties. The decoction of bark is used in bronchitis, hyperacidity, dysentery, verminosis, burning sensation, diabetes, difficult labour, leprosy and skin diseases [6].
The present work can only be an effort for providing broad report on the quality control and standardization parameters. Methods like microscopy and macroscopy, physicochemical parameters, extractive values, and fluorescence analysis were used to establish pharmacognostical standards. These parameters in turn can facilitate the quality of the drug and be helpful for its proper identification.

Material and methods
Material
Plant material collection and authentication
The plant was collected from Nampur region of Satana, Dist: Nashik, Maharashtra, India, in and authenticated by Dr. D. G. Shimpi, HOD, Department of Botany, BYTCO College, Nashik road, Nashik. The collected samples were cleaned, shade dried and pulverized by using mechanical pulverizer for size reduction to make coarse powder.

Methods
Morphological evaluation
Macroscopic study was carried out by means of sense organs. Which involve the evaluation of drug the process included the observation of the color, odor, taste, size, shape and texture of the seeds and bark of drugs [7].

Microscopic evaluation
Qualitative microscopic evaluation
Thin transverse section of bark was taken, dehydrated with different grades of alcohol, stained with phloroglucinol-HCl, concentrated H2SO4, and iodine solution and observed under 10X and 45X. The transverse sections were studied. The microscopic powder characteristics of the seed and bark were performed [8].

Evaluation of physical parameter
The powder behaviour and fluorescence study of the bark was carried out by treating with different chemical reagents and observe under natural light and UV light (short and long wavelength). Physicochemical parameters such as colour, odour, test, total ash, extractive value, Fluorescence analysis of crude drugs were observed by using standard methods as recommended [9, 10, 11, 12, 13].

Results and discussion
The macroscopic and organoleptic description of *Tectona grandis* bark [Fig 1] is given below

Fig 1: Bark of *Tectona grandis*

- **Color:** Outer surface – brown, inner surface– whitish brown to buff.
- **Odor:** Characteristic
- **Taste:** Acrid
- **Shape:** Quadrangular, Fluted
- **Size:** 5 – 12 mm thick

Transverse section (fig. 2) of the bark presence of periderm, cambium, cortex, medullary rays and parenchyma tissues.

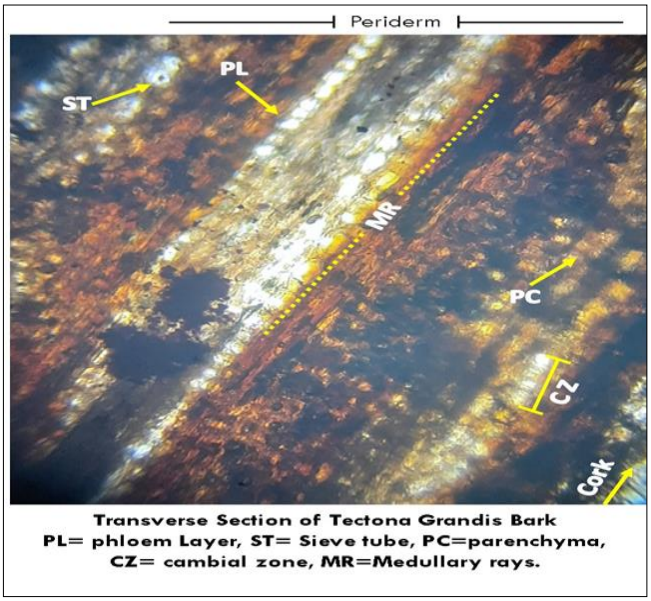

Fig 2: Transverse section of *Tectona grandis* bark

Periderm was multi layered composed of cork and phelloderm.
Phloem layer: Occurs lengthwise in groups of 3 masses are seen adhering to the fibres.

Sieve tubes: the sieve tube members are intact; they are rectangular in shape and thick walled.

Parenchyma: Typical parenchymatous cells which are either rounded or elongated are found.

Cambial zone: Secondary phloem is differentiated into inner intact non-collapsed zone, lying next to cambial zone.

Cork: Cork is exfoliative in nature and made up of rectangular cells with thickened walls.

Medullary rays: Medullary rays are uni to biseriate.

Physico-Chemical Evaluations

This study establishes the pharmacognostical and physicochemical standards of the crude drug and helps to differentiate the plant sample from the adulterants. Physicochemical parameter of plant showed in table no.1. Ash value is such a parameter by which purity of drug can be measured.

The physical and chemical parameters, when felts inadequate, as it often happens with powdered drugs, the plant material may identified from their adulterants on the basis of fluorescence study. Powder behaviour and Fluorescence study of plant tabulated in table no. 2

Table 1: Physicochemical Parameters of *Tectona grandis* bark

Sr. No.	Parameters	Mean % w/w
1	Loss on drying	9
2	Total ash value	11
3	Acid–insoluble ash value	4
4	Water soluble ash value	2
5	Alcohol soluble extractive value	0.5
6	Water soluble extractive value	1.5

Table 2: Fluorescence analysis of bark powder of *Tectona grandis* with various reagents

Sr. No	Reagent + Drug	Colour of powder at Day light	UV Light Short	UV Light Long
1.	Untreated powder	Blackish	Brown	Black
2.	Powder + saturated Picric Acid	Yellowish brown	Green	Black
3.	Powder + Nitric acid	Brown	Brown	Blackish
4.	Powder + 1 N HCl	Brownish	Brownish	Greyish brown
5.	Powder + conc. H2SO4	Light brown	Black	Black
6.	Powder + Glacial Acetic Acid	Brownish	Brownish	Blackish
7.	Powder + 1N NaOH	Blackish	Greyish	Greenish black
8.	Powder + Iodine	Brownish	Blackish brown	Blackish
9.	Powder + Ferric chloride	Yellowish brown	Dark green	Black

Conclusion

The pharmacognostic studies are the first step towards ascertaining the identity and the degree of purity of herbal materials.

The detailed morphology and microscopy of Tectona grandis Linn was carried out to support proper identification of drug. The information obtained from physic-chemical parameters and fluorescent study will be useful in finding out identity of drug. Thus present investigation help as standard reference for identification and distinguishing the Tectona grandis from its substituent and adulterants and assist in future drug evaluation. The thorough and systematic pharmacognostical evaluation will provide valuable information for further studies.

Conflict of interest

We declare that we have no conflict of interest

References

1. Kuete V, Medicinal spices and vegetables from Africa: therapeutic potential against metabolic, inflammatory, infectious and systemic diseases. Cambridge, MA: Academic Press, 2017, 222
2. The Ayurvedic Pharmacopoeia of India, Department of Indian System of Medicine and Homeopathy, New Delhi,2001:3:174-175
3. Vyas P, Yadav DK. Khandelwal P. *Nat.Prod. Res*.,2019:33(16):2338-2354.
4. Palanisamy K, Hegde M, Yi JS. Teak (Tectona grandis Linn. f.): a renowned commercial timber species. *J For Sci*.,2009:25(1):1-24
5. Goswami D, Nirmal S, Patil M, Dighe N, Laware R, Pattan S. *Chem.Pharmacol.Pro. Pharmacog. Revs*.,2009:3(5):181.
6. Nidavani RB, Mahalakshmi A... *Inter J Pharm Pharm Sci*,2014:6(1):48–54.

7. World Health Organization. Quality control methods for medicinal plant materials, Geneva: WHO Library, 1998, 1-115
8. Anonymous. The Ayurvedic Pharmacopoeia of India. New Delhi: Government of India, Ministry of Health and Family Welfare, Department of Ayurveda, Yoga & Naturopathy, Unani, Siddha and Homoeopathy (AYUSH),2007:1:122-125
9. Anonymous. Pharmacopoeia of Indian, Ministry of Health and Family Welfare, New Delhi: Govt. of India: Controller of publication, 1996, 47-89.
10. Mukherjee PK. Quality control of herbal drugs. Business Horizons, New Delhi, 2002
11. Anonymous. Standardisation of single drugs of Unani medicine. Part I, Central Council for Research in Unani Medicine, New Delhi, 1987, 267-271
12. Chase CR, Pratt R. *J. Am. Pharm. Assoc*,1949:38:324-331.
13. Kokoski CJ, Kokoski RJ, Slama FJ. *J. Am. Pharm. Assoc*,1958:47:715-717.