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Pharmacognostic Evaluation of *Litchi chinensis Sonn* leaves

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Abstract

Background The plant *Litchi chinensis*, belonging to the Sapindaceae family, holds significant importance in traditional Indian medicine systems like Ayurveda and homeopathy due to its various medicinal properties. Due to its compound composition and therapeutic properties, *Litchi chinensis* has attained a status like to other significant medicinal plants.

Methodology Pharmacognostic analysis of *Litchi chinensis Sonn*. involved comprehensive assessments including physicochemical evaluation, phytochemical screening of its leaves using various reagents for facilitating its identification. Phytochemical screening detected the presence of alkaloids, flavonoids, phenolic, glycosides, and tannins in the leaves.

Result Quantitative pharmacognostic analysis was done different standard methods such physicochemical property of *Litchi Chinensis* leaves powder extract are Water Soluble 10.48%,

Ethanol Soluble 18.25%, Total Ash Value 5.15%, Acid Insoluble Ash 1.65%, Water Soluble Ash 0.73%. the next is phytochemistry evaluation which detected the presence of flavonoid, phenolic, terpenoids and coumarins.

Conclusion These research article detailed Pharmacognostic and preliminary phytochemical investigations serve as valuable tools for the accurate identification and authentication of Litchi chinensis Sonn. leaves.

Keywords: Physicochemical, phytochemical, extraction process, morphology, *Litchi chinensis.* plant study, medicinal herb, Flavones

Introduction

Litchi chinensis, commonly known as litchi, is a subtropical tree highly valued in the global market due to the widespread consumption of its fruits [1]. While native to Southern China and Southeast Asia, litchi is now cultivated in numerous countries worldwide [2]. Litchi fruit is abundant in minerals and vitamins, with approximately 50 mg of vitamin C, 0.6 mg of vitamin B2 and B3, and 0.5 mg of vitamin B1 per 100 g of pulp. Additionally, it contains essential nutrients like iron, calcium, and potassium [3]. Traditional Chinese medicine utilizes litchi pericarp for its diverse medicinal properties, including antitussive, analgesic, antiulcer, haemostatic, anti-inflammatory, and diuretic effects [4]. Studies exploring the active compounds within litchi pericarp and seeds responsible for these benefits have identified polyphenols, polysaccharides, triterpenes, phytosterols, and other polyphenolic compounds, which exhibit significant biological activities such as antioxidant and anticancer effects [5]. Although litchi leaves are commonly used in tea preparations, their biological properties remain largely unexplored [6]. The anti-inflammatory properties of crude ether extract from litchi leaves in experimental animals, suggesting potential antinociceptive effects [7]. In this study, we aim to investigate the Pharmacognostic details of *Litchi chinensis* leaves for the first time, for evaluate their antioxidant, antiulcer, anti-inflammatory and antinociceptive potentials [8]. Epicatechin and procyanidin A2 demonstrated notable antioxidant properties. Luteolin exhibited the most potent antimicrobial effects against various bacteria including S. aureus, E. coli, S. dysenteriae, Salmonella, and B. thuringiensis. Different parts of the plant, including leaves, flowers, fruits, seeds, pulp, and pericarp, have been utilized for their therapeutic benefits[9]. These parts contain a rich array of phytochemicals such as epicatechin, procyanidin A2, procyanidin B2, leucocyanidin, saponins, butylated hydroxytoluene, rutin, isolariciresinol, kaempferol, and

stigmasterol. Additionally, epicatechin, procyanidin A2, and rutin also displayed weaker antimicrobial activity [10]. Furthermore, procyanidin A2 exhibited significant cytotoxic effects against human hepatoma HepG2 and human cervical carcinoma Hela cells. Further research to identify additional chemical compounds and explore the bioactivity of litchi leaves holds promise for better understanding and harnessing the potential of this plant [11]. Phytochemical analyses revealed that phenolics are the primary bioactive compounds in *Litchi chinensis*, holding significant pharmacological potential. The findings strongly support the traditional use of *Litchi chinensis* in folk medicine, highlighting its role as a medicinal and nutritional resource for treating various human ailments. However, further in-depth research is necessary to fully understand how the active constituents work and to maximize their preventive and therapeutic benefits [12].

Fig 1. *Litchi chinensis* leaves

1.1 Morphology and Taxonomy Description

The *Litchi chinensis* tree is typically evergreen and often stands at heights below 19 meters (62 feet), although it can occasionally grow taller than 15 meters (49 feet) [13]. Its bark is characterized by a grey-black color, while the branches tend to have a brownish-red [14,15]. The leaves of the tree are typically 10 to 25 centimeters (3.9 to 9.8 inches) in length, sometimes even longer, and are arranged in pairs of two to four leaflets [16,17]. Interestingly, the foliage of the lychee tree bears resemblance to that of the Lauraceae family, likely owing to convergent evolution (Lin S et al. 2012). To adapt to its environment, the lychee plant has developed leaves that possess water-repellent properties, known as laurophyll or lauroid leaves [18,19,20].

Table 1. Taxonomy Description

Kingdom:	Plantae
Order:	Sapindales
Family:	Sapindaceae
Subfamily:	Sapindaceae
Genes:	Litchi
Species:	*L. Chinensis*
Vernacular name:	Nephelium litchi

1.2 Chemical constituents

A various Chemical compounds are present in leaves parts of the *Litchi Chinensis* are mention table no. 2

Table 2. Chemical constituents with molecular formula

Group	Compound	Molecular formula
Chromanes	Litchtocotrienol A – G	$C_{27}H_{42}O_4$
	Macrolitchtocotrienol A	$C_{27}H_{40}O_4$
	Cyclolitchtocotrienol A	$C_{27}H_{39}O_3$
Lignans	Schizandriside	$C_{25}H_{32}O_{10}$
Phenolics (Flavon-3-ols):	Epicatechin	$C_{15}H_{14}O_6$
Proanthocyanidins	Procyanidin A2	$C_{30}H_{24}O_{12}$
	Cinnamtannin B1	$C_{45}H_{36}O_{18}$
Flavonols	Quercetin	$C_{15}H_{10}O_7$
	Kaempferol-3-O-β-D-glucoside	$C_{21}H_{20}O_{11}$
	Quercetin-3-O-rutinoside	$C_{27}H_{30}O_{16}$
Flavones	Luteolin	$C_{15}H_{10}O_6$

1. Materials and Methods

2.1 Plant collection and authentication

The *Litchi Chinensis* leaves were carefully removed from the plants and subsequently identified and verified by the Department of Botany at Banaras Hindu University (BHU) in Varanasi. A voucher specimen has been securely stored at the institute's museum for future reference. Following collection, the leaves underwent a thorough washing with tap water [21]. Afterwards, they were left to air dry in the shade at room temperature for a duration of 7 to 14 days.

2.2 Physicochemical standards

Physicochemical parameters of the *Litchi Chinensis* powdered drug. The powdered drug's moisture content was determined using the loss on drying method [22,23]. mentioned table 4. Additionally, the ash values, including total ash, acid-insoluble ash, and water-soluble ash, were determined to assess the physiological state and detect the presence of extraneous matter [24].

2.3 Powder study

The *Litchi Chinensis* powder was observed their color and odor.

Fig 2. *Litchi Chinensis* powder

2.4 Plant extraction

A *Litchi Chinensis* extract was prepared using shade-dried leaves. The leaves were weighed 100 gram and then coarsely powdered [25,26,27] The powder was subjected to Soxhlet extraction using hydroethanolic as the solvent for a duration of 3 days. In the Soxhlet apparatus, 500 ml of 70/30% hydroethanolic was added to the powdered extract [28,29,30]. The extract was continuously extracted and collected in a round-bottom flask. Subsequently, the collected extract was concentrated using a Rota Vapor apparatus until approximately 25 ml remained in the round-bottom flask [31,32]

Fig 3. Soxhlet extraction

2.5 Phytochemical investigation

The phytochemical tests of revealed *Litchi Chinensis* extract the hydroethanolic extract contained terpenoids, alkaloids, flavonoids, phenolic compounds and their presence mentioned table 5. [33,34].

2.5.1 Test for alkaloids: To confirm the presence of certain compounds in a plant extract, 0.5 ml of the extract was taken and mixed with Wagner's reagent. The occurrence of a positive test was affirmed by the formation of a reddish-brown precipitate.

2.5.2 Test for flavonoids: A few drops of sodium hydroxide solution were added to 0.5 ml of the plant extract. Upon the subsequent addition of dilute acetic acid, a noticeable change from yellow to colorless occurred, indicating the presence of flavonoids [35].

2.5.3 Test for phenols: The extract portion was subjected to treatment with a 5% aqueous solution of ferric chloride. The formation of a black color or deep blue color upon addition of the ferric chloride indicates the presence of phenols.

2.5.4 Test for coumarins: When a few drops of 10% sodium hydroxide (NaOH) were added to 2 ml of the extract, a yellow color appeared, suggesting the presence of coumarins [36].

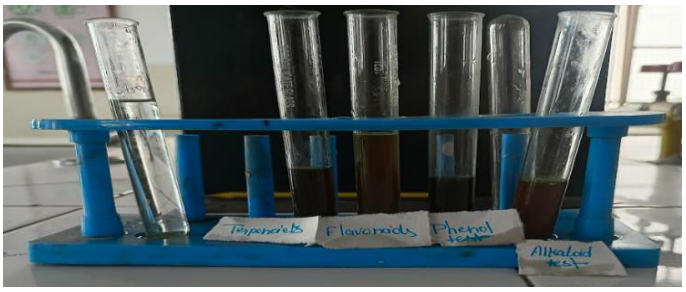

Fig 4. Phytochemical tests of *Litchi Chinensis* leaves extract

2. Results and Discussion

3.1 Morphological characteristics

The morphological studies of *Litchi Chinensis* revealed the leaves to mentioned table 3.

Table 3. Morphological studies of *Litchi Chinensis*

Color	Green
Odor	Characteristic
Shape	Pinnate, elliptic-oblong to lanceolate, abruptly pointed, leaflets,
Size	10-25cm length

3.2 Physicochemical standards

Physicochemical property of *Litchi Chinensis* leaves powder extract mentioned table 4.

Table 4. Physicochemical standards of *Litchi Chinensis*

Water Soluble	%	10.48

Ethanol Soluble	%	18.25
Total Ash Value	%	5.15
Acid Insoluble Ash	%	1.65
Water Soluble Ash	%	0.73

3.3 Phytochemical screening

Phytochemical screening *litchi chinensis* leaves extract revealed mentioned table 5.

Table 6. Phytochemical screening of *Litchi Chinensis*

Alkaloids	Absent
Terpenoids	Present
Flavonoids	Present
Phenol	Present
Coumarins	Present

3. Discussion

Various synonyms of litchi have been documented, including *Dimocarpus lichi Loureiro, Euphoria litchi Desf., Euphoria didyma Blanco, Nephelium chinense, Euphoria sinensis Gmel., Litchi chinensis var. euspontanea H. H. Hsue, Litchi philippinensis Radlk., Litchi litchi Britt.,* and *Scytalia litchi Roxb* [37]. The previous study indicates that the hydroethanolic extract of *Litchi chinensis* leaves exhibits hepatoprotective qualities, validating its traditional use in ethnopharmacology. Its effectiveness is attributed mainly to anti-inflammatory properties rather than antioxidant enzymes. Importantly, the extract showed no immediate toxicity. However, further investigation is required to assess its safety with prolonged use [38,39]. Litchi chinensis Sonn. is recognized for its diverse therapeutic properties, such as anticancer, antiseptic, hypoglycemic, and antiviral effects, among others. Scientists have isolated various bioactive compounds from litchi using modern techniques, and ongoing research continues to uncover new compounds [40,41]. Consequently, litchi has gained recognition akin to other significant medicinal plants, attributed to its compound constituents and therapeutic effectiveness, akin to conventional drugs [42,43]. The immunomodulatory effects of dried litchi pulps containing polysaccharides. Their findings showed that dried litchi pulps significantly enhanced spleen lymphocyte proliferation at a concentration of 200 mg/mL. Moreover, they induced higher secretion levels of NO, TNF-α, and IL-6 from RAW264.7 macrophages compared to other forms of litchi pulp. Consequently, the drying process was identified as the most effective method for augmenting the immunomodulatory properties of litchi pulp [44].

4. Conclusion

Since there is a lack of existing Pharmacognostic on these indigenous plants, the current research was initiated to establish standards that could aid in verifying the authenticity of these medicinally valuable plants. The findings obtained serve as a robust foundation for advancing the development and utilization of *Litchi chinensis* as both a pharmaceutical agent and a dietary supplement. Exploring further in this realm can deepen our understanding of this plant and establish a groundwork for its safe and effective utilization.

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7. Conflict of interest statement

The authors declared no conflict of interest

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