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Comparative study of physico-phytochemical parameters of seeds and stem bark of Shirish (*Albizia lebbeck* Benth.)

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Abstract
Ayurveda is considered to be the oldest healing science. Ayurveda also known as “The science of living”. Ayurveda knowledge makes it possible to understand how to achieve and maintain balance of the body, mind, and awareness in accordance with one's unique constitution and how to make lifestyle modifications to achieve and keep this equilibrium. Dravyaguna is also known as Ayurvedic Materia Medica. It includes Pharmacognosy, pharmacology and therapeutic uses of the medicinal plants. Plants synthesize hundreds of chemical compounds for function including defence against insects, fungi and many other diseases. Shirish (*Albizia lebbeck* Benth.) is an Ayurvedic anti-poisonous herb. This study compares the physicochemical and phytochemical properties of the stem bark and seeds of *Albizia lebbeck* Benth. (Shirish), a plant with extensive traditional medicinal use. By analysing moisture content, ash values, extractive yields, and key phytochemicals, this research aims to evaluate and compare the therapeutic potential of these two plant parts, which is crucial for their application in herbal medicine.

Keywords: Ayurveda, physicochemical study, morphology, phytochemical study

Introduction
Ayurveda is considered to be the oldest healing science. In Charaka Samhita, Ayurveda has been described as ‘Shashvata’ (eternal) [4]. Ayurvedic wisdom is frequently referred to as the "Mother of all healing" and has its roots in India from more than 5,000 years ago. Ayurveda give special importance to prevention and promotes health maintenance by emphasising life balance, proper thinking, a healthy food, active lifestyle, and the use of herbs [5]. *Albizia lebbeck* Benth. Is a tree species with a rich history of use in traditional medicine for its anti-inflammatory, antioxidant, and antimicrobial properties [6]. Physicochemical and phytochemical studies are crucial in various scientific fields, especially in pharmacology, chemistry, and agriculture. The stem bark and seeds of Shirish are utilized in various therapeutic contexts, but their comparative physicochemical and phytochemical profiles have not been thoroughly investigated. This study aims to fill this gap by comparing the two parts of the plant to better understand their medicinal potential.

Aim and objectives
- To enlist the Morphological characters of both the parts of Shirish.
- To evaluate physicochemical parameters of Seeds and stem bark of Shirish.
- To analyze phytochemical constraints of Seeds and stem bark of Shirish.

Materials and Methods
Sample Collection
Seeds and stem bark of *Albizia lebbeck* were collected from mature trees. The macroscopic and microscopic characteristics of seeds and stem bark should be observed with the naked eye and under an electronic microscope.

Phytochemical Analysis
Standard methods were used to detect the presence of alkaloids, flavonoids, tannins, saponins, and phenolic compounds.

Physicochemical Analysis
Moisture content, ash value and extractive values were determined using standard procedures.

Results and Observations

Macroscopic Characterization of stem bark: Macroscopic characters of stem bark were done by naked eye observations like thickness, shape and colour. Bark is 1.5-2.5cm thick. External Surface is dark brown, rough due to longitudinal fissures and transverse cracks.

Table 1: Organoleptic characters of stem bark powder organoleptic characters of Shirish *Albizia lebbeck*

Characters	Observations
Colour	Dark brown
Odour	Slightly aromatic, somewhat earthy or woody
Taste	Generally bitter, slightly astringent
Texture	Rough

Morphology of stem bark of Shirish *Albizia lebbeck*

The stem bark of Shirish (*Albizia lebbeck* Benth.) typically exhibits the following morphological features:

1. **Colour:** The colour of the stem bark can vary, but it's commonly greyish-brown to dark brown.
2. **Texture:** The texture of the bark is usually rough and slightly fissured, especially in mature trees.
3. **Thickness:** The bark is moderately thick, providing protection to the inner tissues of the stem.
4. **Lenticels:** These are small pores or openings in the bark that allow for gas exchange. They can vary in size and distribution across the bark surface.
5. **Grooves and ridges:** The bark may have distinct grooves and ridges, which can provide clues for species identification.
6. **Odor and taste:** When crushed, the bark emit a characteristic Odor, which can be described as faint or slightly aromatic. The taste is bitter.
7. **Fibrous nature:** The bark is fibrous in nature, containing fibres that provide structural support to the tree.

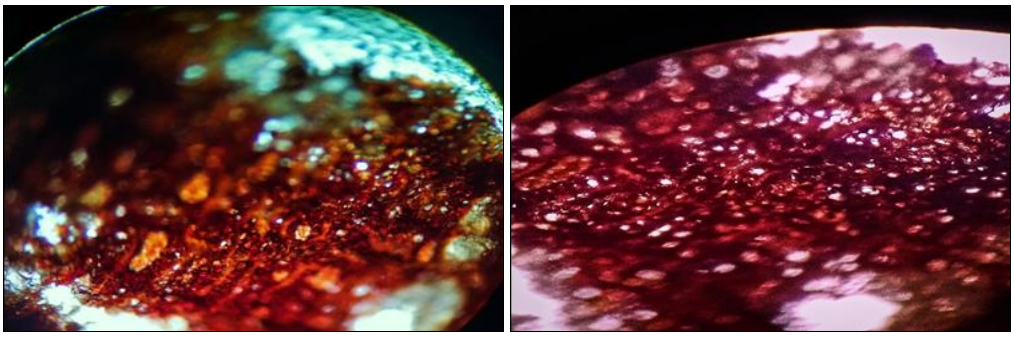


Fig 1: Microscopic study of Stem bark

Transverse section of Stem bark shows: Parenchyma cells with simple and compound starch grains, Solid cork with stone cells layers, Group of stone cells, Sclereids

Macroscopic characters of dried Shirish Seeds

Macroscopic characters of dried Shirish Seeds were done by naked eye observations like shape and colour. Seeds are brown, flat elliptic 8-10x 6-7mm, transversely placed in pods.

Table 2: Organoleptic characters of Seeds Organoleptic characters of Shirish *Albizia lebbeck*

Characters	Observations
Colour	Dark brown
Odour	Mild nutty aroma
Taste	Bitter
Texture	Smooth and shiny

Morphology of Seeds of Shirish *Albizia lebbeck*

The seeds of Shirish (*Albizia lebbeck*) have several distinctive morphological features:

1. **Size and Shape:** The seeds are typically small, ranging from about 1 to 1.5 cm (0.4 to 0.6 inches) in length. They are generally oval or elliptical in shape.
2. **Colour:** When mature, the seeds usually have a dark brown to black coloration.
3. **Surface Texture:** The seed coat is typically smooth and shiny, although it may have some slight irregularities or fine ridges.
4. **Hilum:** The hilum is the scar left on the seed where it was attached to the plant. In *Albizia lebbeck* seeds, the hilum is usually prominent and may be located on the edge of the seed.
5. **Hilum Shape:** The shape of the hilum can vary, but it's often elongated or linear.
6. **Seed Coat Thickness:** The seed coat is relatively thin but durable, providing protection to the embryo within.
7. **Endosperm:** Inside the seed coat, there may be a white or pale-yellow endosperm, which serves as a nutrient reserve for the developing embryo.
8. **Embryo:** The embryo is typically small and located within the endosperm. It consists of the future plant parts, including the cotyledons (seed leaves) and the embryonic axis.

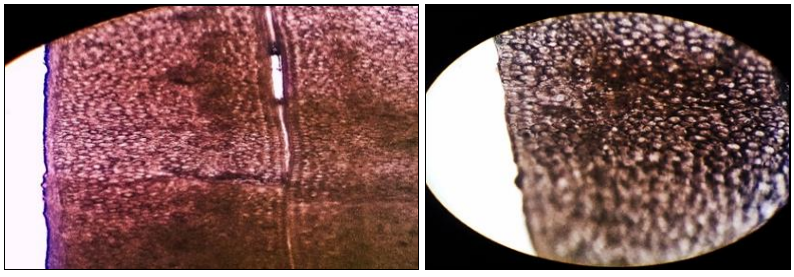


Fig 2: Microscopic Study

Transverse section of Seed shows
Starch grains, Seed coat, Tegma, Epidermal cells, Palisade cells, collapsed tegma cells, Endosperm cells, Outer parenchyma and inner parenchyma cells.

Physico-chemical study: A physicochemical study typically involves examining the physical and chemical properties these properties include the presence of foreign matter, ash content, extractive values, and moisture content, which collectively provide insights into the purity, quality, and potential medicinal efficacy of these plant parts [7].

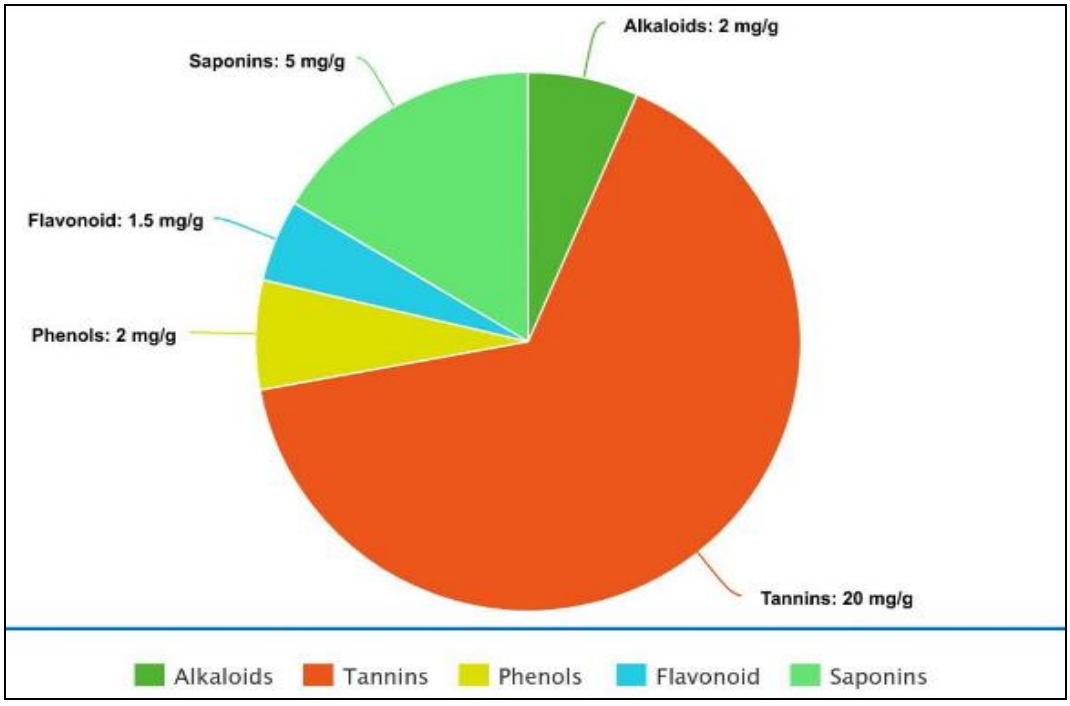
Table 3: Physico-chemical study of both seed and stem bark of Shirish *Albizia lebbeck*

Sr. No.	Test name	Result (Seeds)	Result (Stem bark)
1.	Foreign matter (%w/w)	Nil	Nil
2.	Total ash	4.83%	3.65%
3.	Acid insoluble ash	0.64%	0.2%
4.	Alcohol soluble Extractive	45.76%	13.7%
5.	Water soluble extractive	42.3%	6.9%
6.	Moisture content	7.6%	9.5%

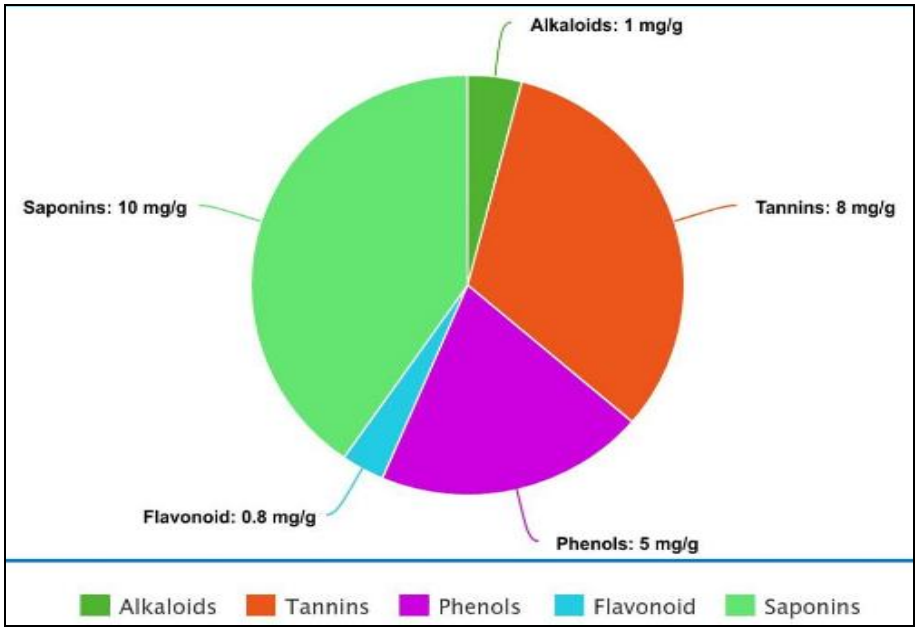
Phyto-Chemical Study
Phytochemicals are bioactive compounds produced by plants, and they play a crucial role in the medicinal properties of these plants [8]. This phytochemical study focuses on identifying and quantifying the key bioactive compounds present in the seeds and stem bark of Shirish under methanolic extract.

Table 4: Phytochemical test of Stem bark and Seeds of Shirish *Albizia lebbeck* under methanolic extract

Sr. No.	Tests	Functional Group	Observations	Results (Stem bark)	Results (Seeds)
1.	Dragendroff's test	Alkaloids	No brown ppt.	Present (2mg/g)	Present (1 mg/g)
2.	Dil. $FeCL_3$	Tannins	Blue brownish colour	Present (20 mg/g)	Present (8 mg/g)
3.	Neutral $FeCL_3$	Phenols	Violet colour	Present (2mg/g)	Present (5 mg/g)
4.	Lead acetate	Flavonoid	Yellow colour	Present (1.5mg/g)	Present (0.8 mg/g)
5.	Shaking in test tube	Saponins	Frothing with Honeycomb appearance	Present (5mg/g)	Present (10 mg/g)



A. Phytochemicals in Stem bark



B. Phytochemicals in Seeds

Pie Chart: Shows Comparative study of Phytochemicals of seeds and stem bark of Shirish

Comparative study of Phytochemicals of seeds and stem bark of Shirish (*Albizia lebbeck*)

- **Alkaloids:** Present in both stem bark and seeds; higher concentration in stem bark.
- **Flavonoids:** Detected in both; higher in stem bark.
- **Saponins:** Present in both; higher in seeds.
- **Tannins:** Found in both; higher in stem bark.
- **Phenols:** Detected in both; higher in seeds.

Discussion

The physicochemical analysis reveals that the stem bark and seeds of *Albizia lebbeck* exhibit distinct differences in moisture, ash content, and extractive yields, which influence their use in herbal formulations. Seeds have a higher extractive yield and total ash content, which may contribute to different therapeutic properties compared to the stem bark.

The phytochemical analysis shows that both plant parts contain valuable bioactive compounds, though in varying concentrations. The stem bark exhibits higher levels of flavonoids, tannins and alkaloid, suggesting greater anticancer and anti-inflammatory potential. Conversely, the seeds have higher saponin and phenolic content, which may be beneficial for its antimicrobial and immunostimulant properties.

Conclusion

This comparative study provides valuable insights into the physicochemical and phytochemical profiles of *Albizia lebbeck* stem bark and seeds. The results highlight the distinct characteristics and potential therapeutic uses of each plant part. These findings indicate that both the stem bark and seeds have unique therapeutic potentials. The stem bark may be more suited for anticancer and anti-inflammatory applications, while the seeds may be preferable for formulations requiring antimicrobial properties. Further research into the isolation and characterization of specific bioactive compounds could enhance the development of targeted herbal treatments.

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