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Evaluations of Phytochemicals of Different Parts of Plant *Albizia lebbeck*

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Abstract: ***In present study, different phytoconstituents of different parts of plant Albizia lebbeck were obtained by sequential extraction from 50 g dry weight of various plant parts using chloroform, methanol, and aqueous solvents; the greatest extractive values were found in the stem bark (7.57% yield) and seeds (6.72% yield).***
Proteins, polysaccharides, glycosides, and phenolics are examples of polar chemicals that are abundant, as seen by the predominance of aqueous extracts in all sections. Significant carbohydrate presence (++ in stem bark and seeds by Fehling's test), high proteins (positive biuret test except for stem bark non-aqueous extracts), as well as specific fats/oils (positive neutralisation in seeds, leaf/stem bark methanol) were all confirmed by qualitative testing. Quantitative tests indicated that stem bark was outstanding in soluble sugars (5.988 ± 0.9576 mg/gdw), starch (4.328 ± 0.5139 mg/gdw), and proteins (5.944 ± 0.6115 mg/gdw); seeds dominated in proteins and lipids (15.06 ± 0.6813 mg/gdw); and leaves dominated in carotenoids (1.482 ± 0.1193 mg/gdw).
While leaves emphasise photosynthesis, these metabolite patterns highlight stem bark and seeds as nutrient sources for structural support, germination, and nutritional/pharmaceutical potential.
Keyword: phytoconstituents, Albizia lebbeck, carbohydrate, proteins, fats.

I. INTRODUCTION

"Medicinal plant" refers to a diverse group of plant species used to treat sickness or discomfort. Medicinal plants are an important and fundamental source for the herbal and pharmaceutical industries, and they contribute significantly to the global health protection of millions of people.

The use of medicinal plants as an important source of relief from illnesses can be traced back to five millennia in the form of written documents of the early civilization in China, India and Near East, but undoubtedly it is an art as old as mankind (Verma *et al.*, 2023). According to Abubakar and Haque, (2020), plants are still an essential part of healthcare today and are anticipated to be a plentiful source of safe medications in the future.

Phytochemicals are substances extracted from plants that are produced by various plant parts, such as roots, stems, bark, rhizomes, leaves, flowers, fruits, and seeds, throughout different stages of cellular metabolism (Gajbhiye *et al.*, 2025; Obika and Obika, 2023). Several types of phytochemicals exist, including alkaloids, phenols, flavonoids, tannins, sterols, carbohydrates, lipids, proteins, and their derivatives, as well as nucleic acids (Balkrishna *et al.*, 2022). These phytochemicals have been used in traditionally by tribal people from a long back in herbal medicines.

These phytochemical studies are important so as to validate and commercialize the use of these phytochemicals in formation of new drugs and medicines (Ibrahim and Abdul-Hafeez, 2023; Sharma *et al.*, 2022).

Albizia lebbeck L., scientifically referred to as Indian Siris or Koko, is an annual tree from the Fabaceae (formerly Leguminosae) family of legumes. In order to identify different plant ingredients, the plant materials undergo first phyto-chemical screening (Ullah *et al.*, 2020). Previous studies have dealt with the phytochemicals of various plant parts, including nutrients, glycosides, alkaloids, anthraquinones, essential oils, flavonoids, terpenoids, steroids, saponins, phenolics, and tannins (Joshi *et al.*, 2023). All plant parts, including root, leaves, flowers, bark, and seed, are useful in Indian traditional medicine in the treatment of several health ailments, for example, allergies, asthma, bronchitis, arthritis, fractures, gingivitis, gum inflammation, toothache, hemorrhage, leprosy, leukoderma, malaria, night blindness, scorpion sting, snakebite, and syphilis (Brylinski *et al.*, 2023).

Using solvents of increasing polarity, such as chloroform, methanol, and aqueous extracts, the physico-chemical evaluation of various plant parts of *Albizia lebbeck* (leaves, seeds, and stem bark) was conducted to ascertain the nature and distribution of extractable phytoconstituents. Initial screening tests for phytochemicals could be useful for identifying bioactive substances, which might ultimately aid in the discovery and creation of novel medications.

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II. METHODOLOGY

The various parts of the plant, such as the leaves, seeds, and stem bark of *Albizia lebbeck (*L.) Benth, were gathered from the Jaipur district. The various plant parts—leaves, seeds, and stem bark—were cleaned with tap water, let too dry at room temperature in the shade, crushed with an electronic grinder to a fine powder, and then placed in airtight containers. The experimental materials, each weighing 100 g, were soxhlet extracted after the 24 to 36 hours using various solvents, such as methanol, chloroform, and water.

To assess the content of lipids, proteins, and carbohydrates, each test sample underwent further processing. Biochemical such as total soluble sugar (Loomis and Shull, 1937), starch (Dubois *et al.*, 1951), lipids (Jayaraman, 1958), proteins (Lowry *et al.*, 1951) and pigments like chlorophyll (Arnon, 1949) and carotenoid (Kirk and Allen 1965) carried out both qualitatively and quantitatively.

III. RESULTS AND DISCUSSIONS

Different profiles for each plant part were obtained by sequential extraction using chloroform, methanol, and aqueous solvents from 50 g dry weight. Differential solubility of phytoconstituents is displayed by the considerable variation in extractive yield across plant sections and solvents. Stem bark (7.57%; chloroform: 2.38 g, pale green; methanol: 1.57 g, blackish; aqueous: 3.62 g, green non-sticky, brown viscous) and seeds (6.72%; chloroform: 1.14 g, pale green; methanol: 1.69 g, blackish; aqueous: 3.89 g, green, reddish brown) had the highest percentage of extractives. All plant components exhibit a high concentration of aqueous extractives, which indicates that polar substances including proteins, polysaccharides, glycosides, and phenolics are abundant.

Numerous primary metabolites have a role in pharmaceutical drugs as precursors or pharmacologically active metabolites (Tesfaye, 2021; Goorts *et al.*, 2021). Fehling's test for carbohydrates (rusty brown or crimson ppt) was positive in seeds and stem bark (stronger in stem bark, ++), but negative in leaf extracts. This implies that, in comparison to leaves, seeds and stem bark are better sources of carbohydrate reserves. With the exception of stem bark chloroform/methanol, the biuret test for proteins (pale purple) was consistently positive in all sections and solvents. The results of the neutralisation test for fats and oils (soap production) varied; it was lacking in other areas but positive in seed extracts, leaf methanol, and stem bark methanol.

Stem bark exhibited the highest concentrations of soluble sugars (5.988 ± 0.9576 mg/gdw), starch (4.328 ± 0.5139 mg/gdw), and proteins (5.944 ± 0.6115 mg/gdw). While leaves contain minimal amounts to assist photosynthesis, the buildup of carbohydrates in stem bark might help in structural and metabolic processes. The greatest protein concentration was detected in seeds (5.944 ± 0.6115 mg/gdw), followed by stem bark and leaves. This enhances the nutritious value of seeds, which need large amounts of protein to germinate. It can also be utilized in future for enhancing food quality.

Seeds showed a higher lipid content (15.06 ± 0.6813) than leaves (8.942 ± 0.2190) and stem bark (9.142 ± 0.5450). Nutritional importance can be determined by the correlation between oil-rich Leguminosae seeds and seed lipid dominance. Chlorophyll (a+b) was detected only in leaves (1.482 ± 0.1193 mg/gdw), confirming their primary photosynthetic function. Carotenoids were present in all parts but were highest in leaves. Some secondary metabolite families such as carotenoids and flavonoids are also involved in plant reproduction and in cell pigmentation in flower and seed, which attract pollinators and seed dispersers.

Table: Isolated Primary metabolites contents (mg/gdw) from different plant parts *Albizia lebbeck*

Primary metabolites	Leaves	Seed	Stem Bark
Soluble sugars	4.642 ± 0.3111	2.881 ± 0.5419	5.988 ± 0.9576
Starch	2.388 ± 0.2265	1.876 ± 0.2058	4.328 ± 0.5139
Protein	4.744 ± 0.3319	5.944 ± 0.6115	4.429 ± 0.2213
Lipid	8.942 ± 0.2190	15.06 ± 0.6813	9.142 ± 0.5450
Chlorophyll a+b	1.482 ± 0.1193	0.00	0.00
Carotenoids	0.8100 ± 0.05468	0.3080 ± 0.07269	0.5300 ± 0.03130

mg/gdw: miligram / per gram dry weight

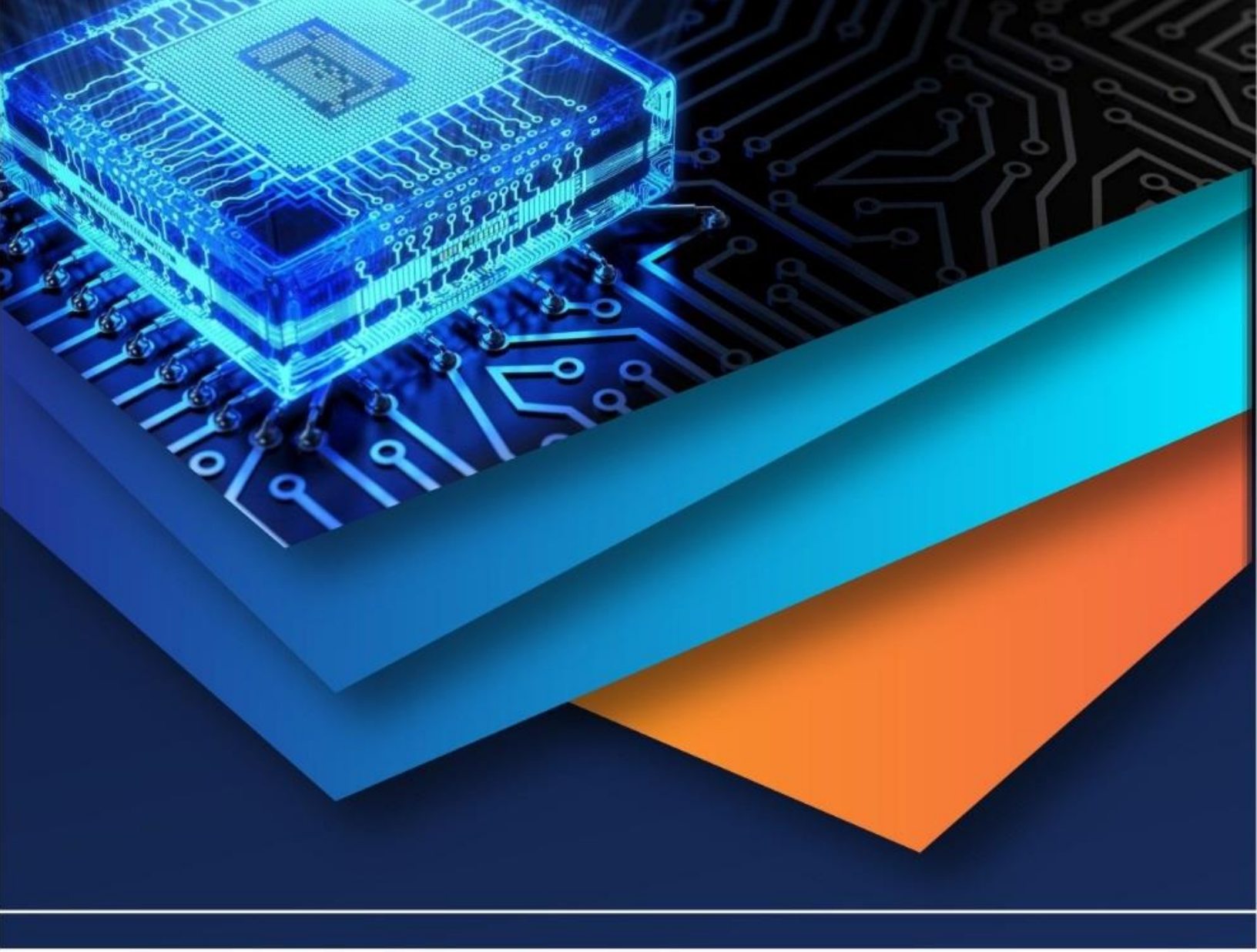
IV. CONCLUSION

This investigation suggests that different plant parts have different main metabolite profiles, with stem bark and seeds appearing as major suppliers of extractives, proteins, lipids, and carbohydrates—essential for metabolic reserves, nutritional improvement, and medicinal precursors. Promising bioactive potential is suggested by high aqueous yields and polar chemical abundance, especially in polar fractions. In contrast, leaves specialise in photosynthetic pigments, which is consistent with their physiological function. These results demonstrate the plant's nutritional importance (e.g., oil-rich seeds similar to Leguminosae) and encourage focused use of stem bark and seeds for medication development or food fortification.

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