IJPSR (2022), Volume 13, Issue 8 (Review Article)

INTERNATIONAL JOURNAL OF PHARMACEUTICAL SCIENCES AND RESEARCH

Received on 31 March 2022; received in revised form, 15 July 2022; accepted, 20 July 2022; published 01 August 2022

COMPREHENSIVE STUDY OF *ACACIA LEUCOPHLOEA* (ROXB.): TRADITIONAL USES, PHYTOCHEMISTRY AND PHARMACOLOGICAL SIGNIFICANCE

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Keywords:

Acacia leucophloea, Herbal remedies, Ayurvedic medicine, Pharmacological actions

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ABSTRACT: Herbal remedies have been utilized in medical practice for thousands of years and are recognized notably as a significant and widely available resource for health treatment. Traditional botanicals and herbal supplements have been deemed to be mild, non-toxic and even safe due to their natural nature. *Acacia leucophloea* (Roxb.) Willd. belongs to the family Mimosaceae, recognized as a diverse resource of components possessing bioactive qualities. The various parts of Acacia species are used as local treatments for diverse ailments. Especially, the bark is historically utilized for treating several illnesses in the Ayurveda system of medicine. Tanning is found in the bark of Acacia species, and fatty oil is found in the seeds. Analgesic, anti-inflammatory, anti-viral and anti-bacterial properties of *A. leucophloea* stem bark are used to treat inflammatory conditions such as bronchial inflammation and coughing, biliousness of the skin and leucoderma. *Acacia leucophloea* has a wide range of potential uses and this review focuses on its pharmacological effects in particular.

INTRODUCTION: From ancient times, the plant domain has been a rich source of bioactive chemicals for treating many diseases [1]. Because natural remedies have fewer adverse effects than synthetic ones, medicinal plants have long been employed [2].

QUICK RESPONSE CODE

DOI: 10.13040/IJPSR.0975-8232.13(8).3154-62

This article can be accessed online on www.ijpsr.com

DOI link: http://dx.doi.org/10.13040/IJPSR.0975-8232.13(8).3154-62

Many medicinal plants are found in many nations and towns across the world [3]. The locals have used these plants for many years for the cure of various diseases [4]. In tropical & sub-tropical areas of South and Southeast Asia, the *Acacia leucophloea* (Roxb.) Willd. tree is a huge thorny one.

It may be found in several sections of the Indian states like Karnataka, Tamil Nadu & Andhra Pradesh. Its distinctive white bark and broad umbrella-like crown make it easy to spot [5]. In the semi-arid Aravalli hills of Rajasthan, India, *Acacia leucophloea* naturally thrives [6]. It's called "Safed

Kikkar" or "Raunj" in the area because of the robust, heavy, and hardwood it produces, which is utilized for farm equipment and as lumber [5]. It is common practice to employ the Acacia plant's various parts as herbal medicines to treat various diseases [7]. Especially the bark is historically utilized in the ayurvedic medicine system to treat numerous ailments. Tannin and fatty oil are found in the seeds and bark of *Acacia* species [8]. During dry seasons, the leaves and pods are traditionally fed to livestock. *Acacia leucophloea* has long been a component of the traditional Indian medicinal system [9]. The bark of *Acacia leucophloea*, on the other hand, may contain active principles that can treat gastrointestinal and respiratory problems [10]. It is generally known as "safed babul" in Pakistan and is a small tree that may be found in arid locations. Barks are used traditionally as an astringent, expectorant, and antipyretic. They have also used for snake bites as an antidote & to treat bronchitis, coughing, vomiting, wounds, ulcers, diarrhoea and dysentery, dental caries, stomatitis & skin diseases [11, 12, 13, 14].

They are also used to prevent infections & to treat anthelmintics. Psoriasis is treated with an extract of the plant's stem bark and leaves, applied twice daily [15]. Fever and stomachaches can be treated with leaf juice while bleeding piles can be treated with a mixture of leaf juice and cow's milk [16]. Boiled, roasted, or cooked seeds and pods of these plants have long been used by diverse ethnic cultures [17]. They have been studied as possible functional food, and the phytochemicals in these seeds provide health benefits in addition to their high nutritional content. In plants, phenolics are molecules that range from simple to highly polymerized, and are secondary metabolites that accumulate throughout time. Numerous epidemiological studies have found a link between phenolic-rich food consumption and a lower risk of developing chronic illnesses [18]. All components of plants are traditionally employed against cancer, inflammation, ophthalmia, leprosy, and bleeding piles [19]. The seeds' nutritional composition has also been studied, with fatty acids in the oil, proteins, and amino acids all found in the seeds. Anthraquinones may be found in the roots of *Acacia leucophloea* [20]. The leaves are thought to have hypotensive, CNS-depressant, antisyphlitic, and antimicrobial properties, while the gum is demulcent [21].

Diverse Acacia Species and Their Phyto-constituents: There are more than 1500 species worldwide, with around 1200 of these endemics in Australia. It has been used for a variety of ailments in the past. Traditional Indian healers have used acacia species to treat various diseases. More than 100 different kinds of bioactive compounds can be found in Acacia species. These compounds include flavonoids and alkaloids. They also include phenolic compounds. Many powerful and potent medications can be found in plants, which are utilized medicinally in various countries. Acacia species are said to have traditional therapeutic uses for various plants. The detailed description of plant taxonomy is highlighted in **Table 1**. Different plant sections have distinct differences in the phytochemical composition and pharmacological effect. Although numerous species of the Acacia genus have been identified, only a few are known to have medicinal use, the most notable of which is *Acacia nilotica* L, *Acacia farnesiana*, *Acacia polycantha*, and Acacia Leucopholea [22-26].

TABLE 1: ILLUSTRATION OF TAXONOMICAL CLASSIFICATION, COMMON NAME AND PLANT DESCRIPTION OF *ACACIA LEUCOPHLOEA* [27]

Taxonomical Classification	
Kingdom	Plantae
Phyllum	Tracheophyta
Class	Equisetopsida C. Agardh
Order	Fabales
Family	Fabaceae
Genus	Acacia
Species	*Acacia leucophloea* (Roxb.) Willd.
Common Names	
English	Distiller's Acacia, White babul
Hindi	Safed Kikkar, Nimbar, Reonja, Ronjh
Bengali	Safed Babul
Kannada	Bellada, Nayibela, Tapala
Malayalam	Chenkaringali
Marathi	Himvar
Sanskrit	Arimedah, Shwetbarhura
Tamil	Sarai
Telugu	Tella Tum.
Plant Description	
Bark	Yellow to yellowish-brown, rough
Leaves	Grey, straight, puberulous
Flowers	Yellow or yellowish-white, 1 mm across, sessile, in heads arranged in terminal panicles
Fruit	A pod 6-15 x 0.8-1 cm, flat, strap-shaped, straight or sometimes curved

Phytoconstituent of *Acacia leucophloea:* Lipids, crude protein, tannin, oxalic acid and carbohydrates are found in *Acacia leucophloea* leaves and seeds. Oil content ranges from 17 to 20% in the kernel. *Acacia leucophloea* ethanolic extracts contain secondary metabolites such as steroids, alkaloids, polysaccharides, polyphenols, and mucilage **Table 2.** *Acacia leucophloea* contains protocatechuicacid-4-glucoside, quercetin 3-rhamnose, quercetin 3-glycoronide, and rutin, as well as catechin and proanthocyanidin. It's been noticed that this plant contains diterpenoids like leucophleol, leucoxol, and leucophleoxol **Fig. 1** & **2** [28-35].

TABLE 2: DETAILED DESCRIPTION OF CHEMICAL CONSTITUENTS PRESENTED IN VARIOUS PARTS OF *ACACIA LEUCOPHLOEA*

Part of Plant	Chemical constituents	References
Bark	Natural Cellulosic fibre, Catechin, leuco-fisetinidin, Gallic acid, ferulic acid, syringic acid, and O-methyl epicatechin	28, 29
Leaves & Flowers	Carbohydrates, aspartic acid, linoleic acid, γ-tocopherol	30, 31
Seeds	Globulins, albumins, amino acids like threonine, valine, isoleucine and lysine	32,33
Root Bark	Leucophleol, leucophleoxol	34
Root	Carbohydrates, glycosides, amino acids, flavonoids,tannins, alkaloids, steroids, Anthraquinones	20, 35

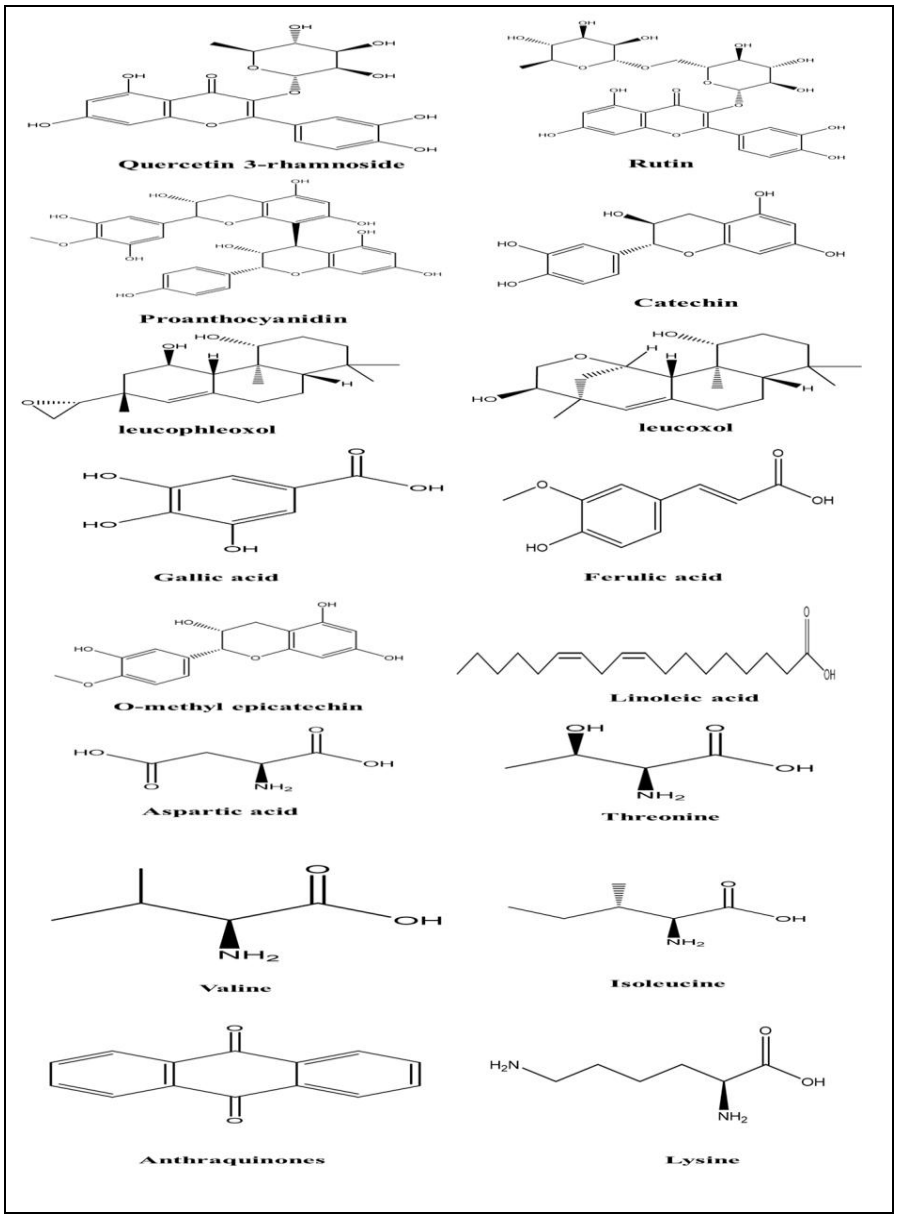

FIG. 1: CHEMICAL STRUCTURE OF ACTIVE CONSTITUENTS OF *ACACIA LEUCOPHLOEA*

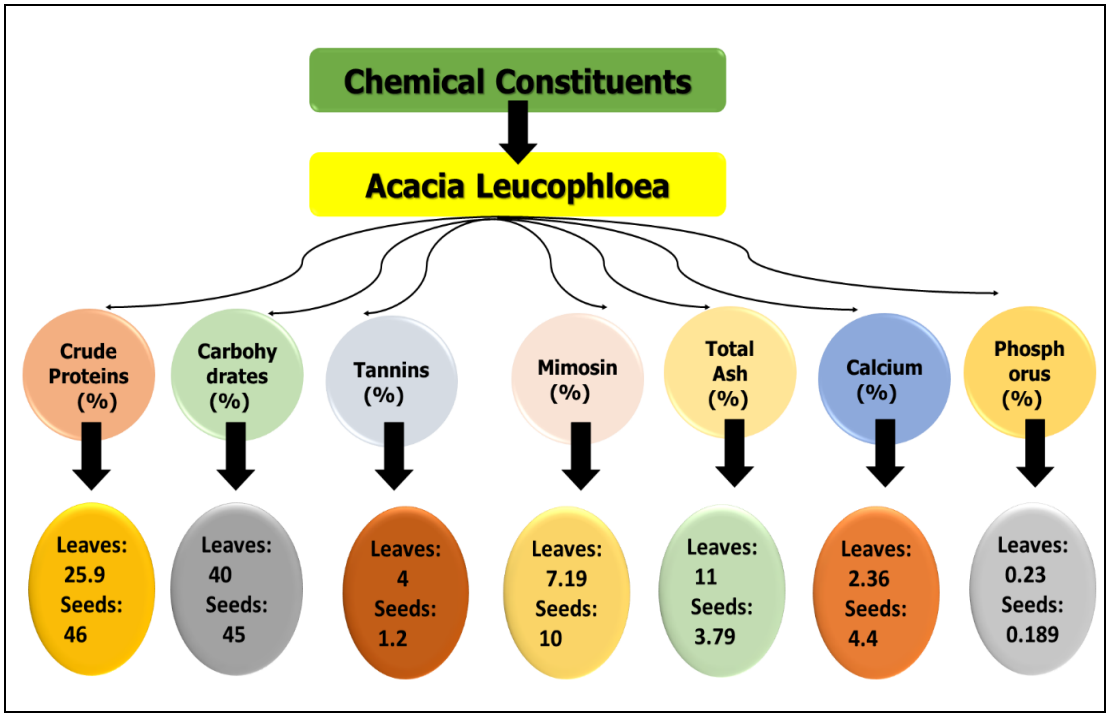

FIG. 2: CHEMICAL CONSTITUENTS OF *ACACIA LEUCOPHLOEA* LEAVES AND SEEDS

Traditional Uses: Antipyretic and expectorant properties have been found in the bark of *Acacia leucophloea*. The various diseases that can be treated with Acacia leucophloea include vomiting, diarrhea, ulcers wounds, *etc* [36]. Bark of the plant used as an antibacterial, anthelmintic, cough suppressant, and plasma purification properties of the plant's bark Aside from skin problems like leprosy, it is used to treat periodontal bleed, mouth sores, dry coughs, and fevers, as well as snakebites and diabetic febrile conditions such as diabetes. This plant's gum and bark decoction have traditionally been used to treat menstruation irregularities. The tree's inner bark is used to make dyes and tannins [12]. Leaves are used to treat harmful bites and stings in Burma. Cough is treated in Malaysia by pounding the young leaves with rice and applying a thin paste around the neck. It's also used to cure measles by rubbing it all over the body. Scurf is treated with a mixture of leaf ash and coconut oil applied to the body. Leaves are used to cleanse the body with an herbal bath. Seeds are used as Anthelmintic and as a diabetic treatment in Indonesia. The roasted seeds are used to assist improve menstrual flow in the Philippines [22].

Essential Elements Present in *Acacia leucophloea*:

Food: After the seeds have germinated, they are prepared as a vegetable and eaten like spinach. They have a crude protein content of 27% of their dry mass. Crude fat (5%), crude fiber (7%), ash (4%), and total crude carbohydrates (58%) make up the other significant nutritional components. Minerals including calcium, magnesium, phosphorus, iron, and manganese are abundant in the seeds. Globulins and albumins make up the majority of seed proteins. Cysteine, methionine, tyrosine, and phenylalanine are among the essential amino acids that have been shown to be deficient compared to the FAO/WHO/UNO recommended pattern. Unsaturated fatty acids such as linoleic acid (51 percent) predominate in lipids [32]. **Fodder:** A. leucophloea is a valuable dry-season fodder and pasture tree throughout its range. Cattle and goats eat several plants' leaves, delicate shoots, and seeds. Crude protein and crude fiber are both 15% in leaves. The sole feed should not be utilized as a single source of food owing to the toxicity of hydrocyanic acid.

Fuel: It's popular as firewood and may be used to make charcoal [37].

Fiber: Rope and fishing nets both employ inner bark fibers [28].

Pharmacognostic Study of *Acacia leucophloea*

Stem Bark: Formally, it was 0.5-1 cm outwardly yellowish-grey or virtually black (with longitudinal

fissures) and light brown to reddish-brown (with a striated and fibrous internal surface) with an irregularly peeling bark that was firm and rough. Xylem parenchyma and pericycle parenchyma can be seen in a cross-section of the bark, cork cells, thin-walled cortical cells, phellogens, and phelloderms pierced by medullary rays. Approximately, 4-8 layers of thin-walled, square to rectangular cells comprise the stem bark. Some thin-walled cells contain prismatic calcium oxalate crystals; phloem fibers are thin-walled with tapering ends; crystal fibers are elongated and thick-walled, and each chamber contains several calcium oxalate crystals. The powder usually contains calcium oxalate crystals in the form of tiny prisms, as well as cork cells, xylem parenchyma, and fiber remnants, according to microscopic examination [38].

Root: The root was reported to be 18-25 cm in length and 2-2.5 cm in thickness. The exterior part of the root was brown, while the interior was reddish-orange. In developed roots, the outer layer was easily peeled away from the surface. Hand-breakable fractures with a little fibrous material. It had a pleasant aroma and a little bitter taste. To show the phloem region, the root's Transverse section (T. S.) was round and exhibited the outer cork, secondary cortex, and stellar region, as well as abundant and well-developed stolen phloem fibres. The outer cork was packed with brown and red cell content with several layers, a brownish-red colour, and a thin wall. Single-layered cork cambium. It was made up of numerous layers of thin-walled parenchymatous cells, ranging from spherical to polygonal, with simple starch grains filling some of the cells. One to two layers of stone cells were found in the cortex. Polygonal to rectangular stone cells with a tiny lumen. Some of the cells in the cortex were primarily reddish in colour. Phloem fibers were found in large clusters near the cortical region's post-phloem region. There are multiple layers of thin-walled cells in the phloem. Cambium was made up of only one layer. The xylem vessels were conspicuously visible since it was well-developed. The cells of the medullary rays biseriate as a single unit. Additionally, reddish material was seen in the xylem vessels. The root's light pink powder had a sweet smell, a slightly bitter taste, a rough and fibrous texture and a rough texture; it was also visually pleasing.

As a result of the treatment process, from several literature surveys, we found in the powder: starch grains, fragments of abundant xylem vessels with simple pitts, crystal fibers, xylem fibres in bundles, phloem fibres, medullary ray cells, cork cell fragments, parenchymal cells containing red cell content. There were also several crystals, xylem, and phloem fibers to be found [35].

Pharmacological Activities:

Antimicrobial Activity: Shahid SA *et al.,* 2012 investigated methanolic extract of seeds, flowers, roots, and pods of the plant *Acacia leucophloea* for their antibacterial and antifungal activities using the in-vitro method. The antibacterial acidity was tested against six bacterial species (gram positive and gram-negative) and antifungal activity was tested against six fungal stains. The extract showed potent antibacterial activity against all tested microorganisms using gentamicin and gatifloxacin as standard. The plant extract also showed antifungal activity against all the tested strains compared with Itraconazole and Amphotericin B. The results suggested good antibacterial and antifungal activity of the plant [39].

Antioxidant Activity: Sowndhararajan K *et al.*, 2013 evaluated the antioxidant activity of barks of *Acacia leucophloea*. The acetone extract showed good activity in DPPH, ABTS and hydroxyl radical scavenging; Ferric reducing/antioxidant power Assay; metal chelation; peroxidation inhibition, and phosphomolybdenum reduction. The results revealed that the acetone and methanol extract of the plant has good antioxidant activity [40].

Anti-platelet Activity: Imran I *et al.,* 2012 studied methanolic extract of the bark of the *Acacia leucophloea* for its anti-platelet activity against the adenosine 5' diphosphate (ADP) induced human platelet aggregation. The results suggested bark crude methanolic extract consists the antiplatelet activity [41].

Gastrointestinal and Respiratory Activities: Imran *et al.,* 2011 Studied methanol extract of bark of *Acacia leucophloea* with *in-vitro* experiments using isolated rabbit jejunum and guinea-pig ileum for its gastrointestinal and respiratory activities. The extract showed dose-dependent activity in both isolated preparations.

The result suggested that extract possesses spasmolytic as well as bronchodilator activities [17].

Wound Healing Activity: Suriyamoorthy S *et al.,* 2021 investigated*Acacia leucophloea* Willd. Bark extracts for Wound healing activity. The wound healing potential of an ethanolic extract-based ointment 2% and 5% (w/w) of *Acacia leucophloea* bark was tested in wistar male rats' models (Incision & Excision), using betadine ointment as standard. *Acacia leucophloea* ethanolic extract ointment showed significant wound healing activity, wound contraction, and the period of epithelialization and no risk to human health [42].

Anti-diabetic & Anti-hyperlipidemic Activity: Madhavi M *et al.,* 2014 investigated anti-diabetic & anti-hyperlipidemic potential of *Acacia leucophloea* in streptozotocin-nicotinamide induced type II diabetes in rats. Animals were treated with *Acacia leucophloea* extracts at daily doses of 200 and 400 mg/kg for a period of 14 days, which significantly reduced the induced changes in glucose, lipid profile, body weight parameters, *etc*. and showed significant benefits [43].

Antipyretic Activity: Gupta R *et al.,* 2021 studied the antipyretic activity of methanolic extract by using the yeast-induced pyrexia method. There was a significant drop in rectal temperature from 38.24°C to 37.97°C following 30 min of treatment with bark extract (100mg/kg), indicating that varying doses of bark methanolic extract elicit a reduction in body temperature for up to 2 hours after delivery [44].

Experimental Work and Clinical Finding of *Acacia leucophloea:* Arthanarieswaran VP *et al.,* 2015 carried out an analysis that studied the characteristics of fiber isolated from the bark of the *Acacia leucophloea* plant and its therapeutic potential of physicochemical properties. Thermal investigations utilizing the TG and DTG methods revealed that the AL fibers disintegrated at 220°C with a kinetic activation energy of 73.1 kJ/mol at a density of 1385 kg/m3 and tensile strength of 317–1608 MPa, and Young's modulus of 8.41–69.61 GPa was discovered in the AL fibers [45].

Sharma P *et al.,* 2018 developed *in-vitro* micropropagation system for *Acacia leucophloea* (Roxb.). Using cotyledonary node segments as explants, it was found that Murashige and Skoog's media containing growth regulators best elicited axillary bud proliferation. *In vitro*-grown seedlings aged 20 to 25 days produced a maximum of 4.5 shoots per explant when media were supplemented with 1.0 mg. The combination of 2.0 mg kinetin, 0.5 mg BAP, and 0.05 mg indole-3-acetic acid produced the most shoots per explant. When additional cultures of shoots were undertaken with the same fresh media and mother explant, the mean number of shoots per node was found to be 14. The shoots inoculated on MS medium with 1.0 mg indole-3-butyric acid resulted in roots in more than 80 percent of the cases. It was found that the protocol was extremely reliable [5]

Zia-Ul-Haq M *et al.,* 2013 examine the chemical composition and antioxidant capability of *Acacia leucophloea* Roxb's different sections using methanolic extracts. Studies on seed and pod composition revealed carbohydrates to be important constituents. The maximum quantity of calcium and the lowest amount of zinc were identified despite variances in mineral composition across the leaves, pods, and seeds. Aspartic acid was found to be the primary amino acid, whereas proline was shown to be the secondary. Globulin was found to be more prevalent than the other protein components. In the oil from both pods and seeds, linoleic acid was the main fatty acid, whereas α-tocopherol was the primary tocopherol component found in the same oil. Furthermore, the extracts from all three areas studied showed strong antioxidant activity. *A. leucophloea* appears to have a considerable amount of antioxidant capacity based on the findings of this investigation. The biologically active principles will be further defined by phytochemical research to be carried out in the future [46].

Vijayakumari K *et al.,* 1994 analyzed *acacia leucophloea* for the proximate composition, minerals, protein fractions, seed protein amino acid profiles, the fatty acid composition of lipids, and antinutritional compounds were examined. The crude protein content was 26.5 g 100 g^{-1}. Crude lipid, 5.13; crude fiber, 6.78; ash, 4.12; total crude carbohydrates, 57.5. Minerals including calcium, magnesium, phosphorus, iron, and manganese were abundant in the seeds. The globulins and albumins made up the majority of the seed protein fractions.

Cystine, methionine, tyrosine, and phenylalanine were below the FAO/WHO/UNO suggested levels, whereas threonine, valine, isoleucine, and lysine were all above it. Unsaturated fatty acids like linoleic acid (51% of total lipids) predominate in the lipids. Researchers also looked at antinutritional compounds, including total free phenols, tannins, and L-DOPA and haemagglutinating activities [32].

Jhade D. *et al.,* 2012 performed drug screening, phytochemical evaluation, and *in-vitro* free radical scavenging potential on *Acacia leucophloea* root. Carbohydrates, glycosides, amino acids, flavonoids, tannins, alkaloids and steroids were detected in the aqueous extract, whereas glycosides, amino acids, flavonoids, tannins, alkaloids, and steroids were identified in the ethanolic extract. In a superoxide scavenging model, an ethanolic extract of *Acacia leucophloea* displays maximum inhibition. The activity of the aqueous extract was nearly identical to that of the ethanolic extract, but the petroleum ether extract had weak suppression of superoxide scavenging activity [47].

In-vitro-derived *Acacia leucophloea* shoots were used by Sharma P *et al.,* 2021 to create a technique for root induction. Roots were stimulated with a medium containing 50% nutrients, 3.0% sucrose, 1.0% indole-3-butyric acid and 200mg activated charcoal (AC), induced in Murashige and Skoog. More than 88% of shoots might develop roots if AC is added. During hardening and acclimatization, the rooted plantlets were free of callus, which meant they fared better [48]. The activity of *Acacia leucophloea* leaf extract was examined by Gupta R *et al.,* 2011 in various solvents such as hexane, methanol, and water. A tube dilution experiment and a Kirby bauer disc diffusion assay were used to test the extract's antibacterial activity. According to the study's findings, the methanolic extract has antimicrobial potential against *E. coli* and *S. aureus* in particular [49].

CONCLUSION: Indian herbalists believe the *Acacia leucophloea* Roxb shrub to be extremely therapeutic. *Acacia leucophloea* has been the subject of several pharmacognostic studies in the past. There are several disorders for which the Traditional System of Medicine uses *Acacia leucophloea* and is widely utilized in treating these ailments. This study aims to establish pharmacognostic standards that may be used to verify the authenticity of a medicine. These findings will assist scientists, researchers, and pharmacologists in better understanding the medicinal potential of entire plants.

ACKNOWLEDGEMENT: Authors would like to Thank Principal and management of GGITS-Jabalpur, SCOP- Gharaun, Shri Rawatupra Sarkar University-Raipur, SPJCOP-Jamner, PRPCOP-Amravati and Budelkhand University, Jhansi.

CONFLICTS OF INTEREST: The authors declare no conflicts of interest.

Funding: No funding was received for this compilation

REFERENCES:

1. Phillipson J: Phytochemistry and medicinal plants. Phytochemistry 2001; 56(3): 237-243.
2. Tungmunnithum D, Thongboonyou A, Pholboon A and Yangsabai A: Flavonoids and Other Phenolic Compounds from Medicinal Plants for Pharmaceutical and Medical Aspects: An Overview. Medicines 2018; 5(3): 93.
3. Gowthami R, Sharma N and Pandey R: Status and consolidated list of threatened medicinal plants of India. Genet Resour Crop Evol 2021; 68: 2235-2263.
4. Muthu C, Ayyanar M and Raja N: Medicinal plants used by traditional healers in Kancheepuram District of Tamil Nadu, India. J Ethnobiology and Ethnomedicine 2006; 2: 43.
5. Sharma P, Babel P, Goswami N and Purohit SD: Micropropagation of *Acacia leucophloea* (Roxb.) Willd.: a multi-purpose legume tree. Proceedings of the National Academy of Sciences, India Section B: Biological Sciences 2018; 88(4): 1329-35.
6. Singh G: Enhancing growth and biomass production of plantation and associated vegetation through rainwater harvesting in degraded hills in southern Rajasthan India. New Forests 2012; 43: 349-364.
7. Anywar G, Kakudidi E, Byamukama R, Mukonzo J and Schubert A: Indigenous traditional knowledge of medicinal plants used by herbalists in treating opportunistic infections among people living with HIV/AIDS in Uganda. Journal of Ethnopharmacology 2020; 246: 112205.
8. Seigler D: Phytochemistry of *Acacia sensual* to, Biochemical Systematics and Ecology 2003; 31 (8): 845-873.
9. Murugan K, Senthilkumar B, Senbagam D and Al-Sohaibani S: Biosynthesis of silver nanoparticles using *Acacia leucophloea* extract and their antibacterial activity. Int J Nanomedicine 2014; 9:2431-2438.
10. Nusrat S, Geoffrey E, Philip G and Hassan K: Obied, Phytochemistry, Ethnomedicine and Pharmacology of Acacia, Studies in Natural Products Chemistry 2018; 57: 247-326.

11. Selvanayagam Z, Gnavavendhan G, Balakrishna K, Bhima R and Usman A: Survey of medicinal plants with antisnake venom activity in Chengalpattu district, Tamilnadu, India. Fitoterapia 1995; 66: 488-494.
12. Anjaneyulu E, Ramgopal M, Hemalatha S and Balaji M: Phytochemical analysis, anti-microbial and antioxidant activity of the bark extract of *Acacia leucophloea* L. Global Journal of Biotechnology and Biochemistry 2010; 5: 231-236.
13. Pullaiah T: Medicinal Plants in India. Regency Publications New Delhi 2002; 1: 15.
14. Purohit S, Sharma A, Prajapati N and Kumar T: A Handbook of Medicinal Plants. A Complete Source Book. Agrobios Jodhpur 2003, 5.
15. Patil D and Aher U: Folkloric healthcare in Buldhana district of Maharashtra (India). Journal of Phytology 2010; 2: 1-8.
16. Alagesaboopathi C: Ethnomedicinal plants and their utilization by villagers in Kumaragiri Hills of Salem district of Tamil Nadu, India. African Journal of Traditional Complementary and Alternative Medicines 2009; 6: 222–227.
17. Imran I, Hussain L, Zia-Ul-Haq M, Janbaz K, Gilani A, De Feo V. Gastrointestinal and respiratory activities of *Acacia leucophloea*. J of Ethnopharma 2011; 138(3): 676-82.
18. Pabich M and Materska M: Biological Effect of Soy Isoflavones in the Prevention of Civilization Diseases. Nutrients. 2019; 11: 1660.
19. Khandekar U: GC-MS analysis of extract of *Acacia leucophloea* plant. International Journal of Creative and Innovative Research in All Studies 2020; 1(2): 4.
20. Saxena M and Srivastava S: Anthraquinones from the Roots of *Acacia leucophloea*. Journal of Natural Products 1986; 49(2): 205-209.
21. Khare C: Indian Medicinal Plants. An Illustrated Dictionary. Springer 2007.
22. Deshmukh S and Bhajipale N: A Review on Acacia species of therapeutics importance, International Journal of Pharmaceutical and Biological Science Archive 2018; 6(4): 24-34.
23. Mann A, Gbate M and Umar A: Medicinal and economic plants. Jube Evans books and publication, Bida Nigeria. 2003; 160.
24. Nadkarni K: The Indian Plants and Drugs. New Delhi. Shrishti Book Distributors 2005; 4: 5.
25. Bino R, Kingsley S. Aravinth V and Brindha P: Anti-Diabetes Activity of *Acacia farnesiana* (L.) Willd in Alloxan Diabetic Rats. International Journal of Pharm Tech Research 2013; 5(1): 112-118.
26. Okpanachi A, Adelaiye A, Dikko A and Kabiru M: Evaluation of the Effect of Aqueous, methanolic Stem Bark Extract of *Acacia polyacantha* on Blood Glucose Levels of Alloxan Induced Diabetic Wistar Rats International Journal of Animal and Veterinary Advances 2010; 2(3): 59-62.
27. https://indiabiodiversity.org/species/show/30997 [accessed o 6th march 2022]
28. Arthanarieswaran V, Kumaravel A and Saravanakumar S: Characterization of New Natural Cellulosic Fiber from *Acacia leucophloea* Bark. International Journal of Polymer Analysis and Characterization 2015; 20(4): 367-376.
29. Sulaiman C, Nasiya K and Balachandran I: Isolation and mass spectroscopic characterization of phytochemicals from the bark of *Acacia leucophloea* (Roxb.) Willd. Spectroscopy Letters 2016; 49(6): 391-395.
30. Wankhade M and Mulani R: preliminary phytochemical screening and chromatographic fingerprint analysis of *Acacia leucopholea* roxb. Methanolic leaf and bark extract by HPTLC technique. Indo American Journal of Pharm Research 2015; 4(1): 184-191.
31. Leela V and Ilavarasan R: Phytochemical and Quality Assessment of *Acacia nilotica* Linn and *Acacia leucophloea* willd Flowers. Pharmacog J 2017; 9(6): 721-724
32. Vijayakumari K, Siddhuraju P and Janardhanan K: Nutritional assessment and chemical composition of the lesser known tree legume, *Acacia leucophloea* (Roxb.) Willd. Food Chemistry 1994; 50(3): 285-288.
33. Adiamo O and Netzel M: Acacia seed proteins: Low or high quality. A comprehensive review. Comprehensive Reviews in Food Science and Food Safety 2020; 19(1): 21-43.
34. Cano F, Rodríguez. Diterpenoids from *Acacia leucophloea*: Revision of the Structures of Leucophleol and Leucophleoxol. Journal of Natural Products 2001; 64 (7): 899-902.
35. Jain S, Sharma P, Jhade D, Sharma NK, Paliwal P and Ahirwar D: Pharmacognostic screening and phytochemical evaluation of *Acacia leucophloea* root. Int J Green Pharm 2011; 5: 155-159.
36. Bhadoria B and Gupta R: A note on hydrocyanic acid content in *Acacia leucophloea* (Roxb.) Willd. Current Science 1981; 50: 689-690.
37. Amanullah M, Somasundaram E, Alagesan A, Vaiyapuri K and Pazhanivelan S: Evaluation of Some Tree Species for Leaf Fodder in Tamil Nadu, Research Journal of Agriculture and Biological Sciences. 2006; 2(6): 552-553.
38. Gupta A, Gupta R and Aiswarya G: Pharmacognostical Investigations on *Acacia leucophloea* Stem. International Journal of Pharmaceutical Sciences ad Research 2010; 1 (10): 160-163.
39. Shakir A and Najma F: Antimicrobial screening of Albizia lebbeck (l.) Benth. and *Acacia leucophloea* (Roxb.) African Journal of Pharmacy and Pharmacology 2012; 6(46): 3180-3183.
40. Kandhasamy S, Jince M and Sellamuthu M: Antioxidant and Free Radical Scavenging Activities of Indian Acacias: *Acacia leucophloea* (Roxb.) Willd, *Acacia ferruginea* Dc, *Acacia dealbata* Link. and Acacia Pennata (L.) Willd, International Journal of Food Properties 2013; 16(8): 1717-1729.
41. Imran I, Liaqat H, Sagheer A, Nasir R, Shahid R, Ghulam A and Muhammad Y: Antiplatelet activity of methanolic extract of *Acacia leucophloea* bark. Journal of Medicinal Plants Research 2012; 6(25): 4185-4188.
42. Sembian S, Kalidass S, Femina W and Karthikeyan G: Evaluation of wound healing activity of *Acacia leucophloea* bark in rats, *Revista brasileira* de Farmacognosia Brazilian Journal of Pharmacognosy 2012; 22(6): 1338-1343.
43. Madhavi M, Kiran S and Ramesh D: Evaluation of Antidiabetic, Antihyperlipidemic and Antioxidant Activities of *Acacia leucophloea* in Streptozotocin-Nicotinamide Induced Type II Diabetic in Rats. Global Journal of Pharmacology 2014; 8(1): 64-72.
44. Gupta R, Kumar A, Aiswarya G and Singh J: Antipyretic Activity of methanol extract of acacia leucophloea roxb bark. International Journal of Plant Animal and Environmental Sciences 2021; 2(1): 138-40.
45. Arthanarieswaran V, Kumaravel A and Saravanakumar S: Characterization of new natural cellulosic fiber from Acacia leucophloea bark. International Journal of Polymer Analysis and Characterization 2015; 20(4): 367.

46. Zia-Ul-Haq M, Ćavar S, Qayum M, Khan I and Ahmad S: Chemical composition and antioxidant potential of *Acacia leucophloea* Roxb. *Acta botanica* Croatica 2013; 72(1): 133-44.
47. Jhade D, Jain S, Jain A and Sharma P: Pharmacognostic Screening, Phytochemical Evaluation and In-Vitro free radical Scavenging Activity of Acacia leucophloea Root. Asian Pacific J of Trop Biomed 2012; 2(2): 501-5.
48. Sharma P, Trivedi R, Purohit S. Activated charcoal improves rooting in in-vitro derived *Acacia leucophloea* shoots. Int J Plant Develop Biol 2012; 6:47-50.
49. Gupta R, Gupta AK, Singla RK, Aiswarya G. Preliminary investigation of antimicrobial property of *Acacia leucophloea* leaves extract. International Journal of Phytomedicine 2011; 3(3): 308.

How to cite this article:
Setia A, Sharma M, Nagdev S, Alok S, Mude G, Verma M, Behere S, Golani P and Lodhi DS: Comprehensive study of *Acacia leucophloea* (Roxb.): traditional uses, phytochemistry and pharmacological significance. Int J Pharm Sci & Res 2022; 13(8): 3154-62. doi: 10.13040/IJPSR.0975-8232.13(8). 3154-62.