Review Article

A Comprehensive Insight into the Phytochemical, Pharmacological Potential, and Traditional Medicinal Uses of *Albizia lebbeck* (L.) Benth.

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1. Introduction

Medicinal plants and their derived natural products have long served as the primary healthcare requirements of millions of populations for centuries. Among these medicinal plants, many plants have been scientifically documented and validated for their exceptional medicinal efficacy. The genus *Albizia* comprises 150 taxonomically accepted species, which are widely distributed in Asia, Africa, and Australia, as well as tropical and subtropical America [1]. *Albizia lebbeck* mainly grows in the Indian subcontinent and Myanmar (Burma) and is also widely distributed in Western and Southeast Asia, Australia, Northern and West Africa, throughout the Caribbean, Central America, and the northern and eastern regions of South America (Figure 1) [2]. This species is reported to have incredible therapeutic properties, and it is utilized in several countries throughout the world to treat a variety of diseases and disabilities. The plant has been traditionally used against various diseases such as ulcers, night blindness, respiratory disorders, skin disorders, snake, bite, piles, and leprosy [3–5]. It is also used against gonorrhea, scorpion bite, gum problems, cough, pharyngitis, and so on [6–8]. In Sanskrit nomenclature, it is known as Sirisha, Bhandi, and Sirisa,
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while it is also entitled in many other languages throughout the world, for example, Acacia amarilla, cabellos de ángel, and lengua de mujer in Spanish; Bois noir and Vielfelline in Franz; Darash in Urdu; Karuva Gei and Vagei in Tamil; Khago and Ka se in Thai. In Burmese, it is spelled Kokko; Lebbek, siris tree, and woman’s tongue tree in English; Mara in Sinhalese; Sarin and Shrin in Punjabi; Siris, Sirlish, and Sirisha in Bengali; Siris and Sirisha in Hindi; Sultanualasjar in Arabic; and Tekik in Javanese [2, 9].

It is a deciduous tree that is mostly found in the garden or along the roadside and grows from sea level to 1500 m elevation, attaining height up to 18 m. *A. lebbeck* contains numerous phytochemicals related to alkaloids, anthraquinones, essential oils, flavonoids, glycosides, phenolics, phytosterol, saponins, steroids, and triterpenoids [9–13]. According to various pharmacological studies, this species exhibited excellent antinociceptive, anti-inflammatory [11], anticancer [9], antimalarial [14], antiallergic [15], anti-hyperglycemic [16], antidiabetic [17, 18], wound healing [19], nootropic [20], and neuroprotective activities such as anti-Parkinson’s and anti-Alzheimer activities [12, 21]. Furthermore, zinc oxide nanoparticles synthesized from *Albizia lebbeck* stem bark extract caused concentration-dependent organoprotective effect by changing mean body weight, alanine aminotransferase, serum alkaline phosphatase, urea, creatinine, bilirubin, protein, globulin, albumin, total cholesterol, triacylglycerol, and low- and high-density lipoprotein [22]. Other than its medicinal applicability, it is also used for reforestation of degraded sites, fuelwood plantations, and agroforestry systems in Asia [2].

This species contains a huge number of phytochemicals, out of which several phytochemicals have excellent medicinal properties and also showed tremendous pharmacological activities. There are a couple of compounds that have been exposed to pharmacological examinations and deficiently summed up with dispersed and scant data accessible on traditional uses. Additionally, there has been a lack of information that relates the pharmacological attributes of this plant to its ethnomedicinal applications. Likewise, patented formulations and safety profiles have been inadequately explored.

Even though many studies have been published on the biological activity of *A. lebbeck* extracts and their phytoconstituents [23–25], none of the reviews has been published with comprehensive information on pharmacological activities and elaborative insights of countrywise medicinal uses as well as different medicinal systemwise therapeutic potential. This prompted us to write this study, which covers botanical description, taxonomy, geographic distribution, medicinal usage, phytochemistry, and pharmacological qualities of *A. lebbeck*. The obtained information on phytochemicals, therapeutic uses, and pharmacological credits would optimistically assist the scientific community in planning safe tests that incorporate bioactive mixtures.

2. Materials and Methods

For this paper, an inclusive literature search was conducted up to January 2021. To identify appropriate statistics on the botanical description, traditional medicinal uses, phytochemistry, and pharmacological activities of *A. lebbeck*, information was retrieved from various resources, including Google Scholar, Science Direct, PubMed, and literature books. The keywords used for the database were “Albizia lebbeck,” “Medicinal Uses,” “Traditional Uses,” “Botany,” “Chemical Constituents,” “Pharmacology,” and “Biological Activities” with Boolean operators. Database that was unsuccessful in meeting the inclusion and quality criteria required in traditional uses, phytochemistry, and pharmacological attributes was excluded. The scientific name of the plant was authenticated by different databases like “the plant list” and “plants of the world online” (http://www.plantsoftheworldonline.org; http://www.thepplantlist.org/).

3. Botanical Description

*Albizia lebbeck* grows as a deciduous tree with a length up to 18 m and a straight bole. Its bark is brownish-gray in color. The leaves of the plant are bipinnate, which are alternately arranged on the smooth, green twigs. The leaves turn a deep yellow color before falling during the dry season. The inflorescence is of corymb type with 30–40 flowers. Flowers are dimorphic, puberulent, and fragrant white to greengish-yellow in color. Calyx and Corolla are funnel-shaped; their pod is pale, flat, and straw-colored and remains on trees after a long-time of ripening. Seeds are brown, ellipsoidal (4–12) cm × 6–7 mm, and their pleurogram is parallel to margins of the seed [2]. The picture of *A. lebbeck* plant and its different parts is shown in Figure 2.

4. Traditional Medicinal Uses

*A. lebbeck* has been used in various countries of Africa, Asia, and Australia for the prevention of scabies, lung ailments, piles, bronchitis, abdominal tumors, cough, eye disorders, and so on. It is recommended in several medicinal systems, for example, Ayurveda, Sidha, and Unani medicine (Table 1) [11, 14, 31]. It has been used in numerous traditional uses; among them, it is mostly used in the treatment of respiratory disorders with 16%, skin disorders with 11%, and gastrointestinal disorders and oral disorders with 7% (Figure 3). In all these ethnomedicinal and traditional entities, the plant is ordinarily used to treat asthma, bronchitis, diarrhea, and gum inflammation with 4.88%, piles with 4.27%, parasitic infestation and snakebite with 3.66%, ulcer, scorpion sting, leprosy, and boils with 3.05%, and abdominal tumor, arthritis, cough, dysentery, night blindness, and poisoning with 2.44% in various countries. 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 [10, 15, 26]. The bark is the most used plant part with 33.33% usage, followed by leaves, flower, seed (16.67%), root (9.52%), root bark, stem, and pods (2.38%) (Figure 4). *A. lebbeck* has many
therapeutic values such as astringent, pectoral, rejuvenation, and tonic [31].

According to the Ayurvedic Pharmacopoeia of India (2016), the stem bark possesses therapeutic uses such as Pama (eczema), Kustha (leprosy), Kandu (pruritus), Visarpa (erysipelas), Kasa (cough), Vrana (ulcer), Sotha (inflammation), Svasa (dysnea), Musaka Visa, Sita Pitta (urticarial), Raktadusti (hypertension), Pinasa (catarrh), Vismajvara (irregular fever), Pratisyaya (common cold), Sarpdansa (snakebite), Visadusti, Suryavarta (migraine), Ardhabhedeaka (headache in half side of the head), KrmiRoga (worm infestation), and Netrabhiasanda (conjunctivitis). It retains various properties and actions; for example, Rasa is Madhura (sweet), Katu (pungent), Tikta (bitter), and Kasaya (astringent); Guna is Laghu (lightness); Virya and Vipaka are Anusna (lukewarm) and Katu (pungent), respectively; and Karma is Sothahara (alleviate swelling), Tridosahara (pacifies the three doshas), Visghna (neutralizing poison), Tvagdosa (skin disease), and Varnya (skin lightening). A. lebbeck has been widely used as an ingredient in several polyherbal formulations, for example, Vajraka Taila, Dasanga Lepa, Ayakrti, Devadavvaravista, and Brhanmaricyadi Taila [32]. Bark and flowers are helpful in arthritis, and they are used in the Siddha system [18]. About 5–6 g of fresh leaves and 4–5 g of misree (refined sugar) in 1 glass of water, ground in a clay pot, can be taken 3 times a day to prevent tuberculosis. Fresh leaves are chewed, and then their extract from the mouth is poured into the eyes after filtration with a clean thin piece of cloth to soothe the reddishness of the eyes. 10–15 g of seeds is ground in a clay pot with water and consumed twice a day after filtration for the cure of boils by Sindh Indigenous people [33]. Moreover, the Bhils tribes used powder of crushed stem bark that can be applied on boils and pimples and paste of leaves and bark to cure insect bite and scorpion sting [8].

The stem bark paste is applied on ulcer and flower decoction and leaves for gargling to cure weak and spongy gums and chronic pharyngitis by the Meena tribe [8]. The Zulu tribes from Africa use bark and roots in the treatment of scabies, inflamed eyes, piles, and bronchitis [11]. In Tibetan traditional medicine, it is recommended in the treatment of kapha, pitta, poisoning, erysipelas, and ulcer [34]. In Taiwan, it is used as an anthelmintic, diuretic, stimulant, and tonic [35]. The people of Tamil Nadu use plants to fix bone fractures. The tribal communities in Himachal Pradesh and Kashmir use plants to relieve inflammation [28]. It is commonly called Shiris, Koroi, and Parrot tree in Bangladesh and has been used by the local people in the treatment of ophthalmia. Additionally, its barks and seeds are used as astringent and are given in piles, diarrhea, toothache, and gum problems. Further, bark and leaf decoctions are recommended against bronchial asthma and other allergic disorders [36]. Moreover, saponins of A. lebbeck have been reported to be used in Alzheimer’s and Parkinson’s disease treatment [37]. The ethnomedicinal uses, including data from various countries and medicinal practices of A. lebbeck, are given in Table 2.

5. Phytochemistry

Phytochemical studies of A. lebbeck have exposed the presence of various chemical constituents, including alkaloids, phenols, flavonoids, saponins, phytosterols, and terpenes [14]. Besides, seeds are good source of protein 2.272%, lipids 0.27%, fatty acid (linolenic acid, oleic acid, palmitic acid, and steric acid), tetradecane, hexadecane, phytol, monadecane, eicosane, vitamin E, stigmastadiene, and octadecane [21, 45]. Complex triterpenoid saponin, that is, 21-[(2E,6S)-6-[6-deoxy-4-O-[(2E,6S)-6-hydroxy-2-(hydroxymethyl)-(hydroxymethyl)-6-methyl-1-oxo-2,7-octadieny]]-[(β-D-
glucopyranosyl]-2-(hydroxymethyl)-6-methyl-1-oxo-
2,7-octadienyl]-[β-D-glucopyranosyl]oxy]-2,6-dimethyl-1-oxo-
2,7-octadienyl]oxy]-16-hydroxy-3-[[O-β-D-xylopyr-
anosyl-(1→2)-O-α-L-arabinopyranosyl-(1→6)-2-(acetyl-
lamino)-2-deoxy-β-D-glucopyranosyl]oxy]-3β, 16α, 21β-
olean-12-en-28-oic acid O-α-L-arabinofuranosyl-(1→4)·
O-β-D-glucopyranosyl-(1→3)]. O-6-deoxy-α-L-mann-
opyranosyl-(1→2)-β-D-glucopyranosyl ester, is iso-
lated from the bark [46]. Other than that, leaves contain 
essential oil in which 2-pentylfuran (16.4%), (E)-geranyl 
acetone (15.46%), (E)-α-ionone (15.45%), and 3-Octa-
none (11.61%) are abundantly found [11]. The present 
review suggests that the majority of phytochemicals 
contained in A. lebbeck should be explored and isolated 
from its bark and seeds, and additionally, other parts 
should be investigated too in the wake of the maximum 
utility of this plant to mankind.

The bark contains albiziasaponins (A–E) and leb-
beckoside C, which possesses anticancer activity [9, 38]. 
Lebeckosides A–B isolated from root showed an inhibitory 
effect on high-grade human brain tumor cells [31]. However, 
the seed contains lebeckalysin (hemolysin), which pos-
sesses potent antitumor and antimicrobial effects [47]. 
Flavonoids (geraldone, luteolin, and isookanin) were

**Figure 2:** Leaves, flowers, and pods of *Albizia lebbeck* (source: Patanjali Herbal Museum).
Table 1: Ethnomedicinal uses of different parts of A. lebbeck in various traditional medicinal systems.

| Parts used       | Medicinal system          | Mode of administration | Ethnomedicinal uses                                                                 | References |
|------------------|---------------------------|------------------------|-----------------------------------------------------------------------------------|------------|
| Bark             | Indian traditional medicine |                        | Asthma, bronchitis, arthritis, gingivitis, toothache, allergies, leukoderma, leprosy, snakebites, malaria, and fractures | [15, 26]  |
| Leaves           |                           | Night blindness and syphilis |                                                                                   | [26]       |
| All parts        |                           | Snakebite, scorpion sting, hemorrhage, and gum inflammation |                                                                                   | [10]       |
| Bark and flowers | Siddha system             | Arthritis              |                                                                                   | [18]       |
| Flowers          | Traditional Chinese medicine |                        | Anxiety, depression, and insomnia                                                 | [27]       |
|                  | Ayurveda                  |                        | Nasya, pittaja, prameha, asthma, arthritis, burns, diarrhea, edema, poisoning, bronchitis, consumption, night blindness, respiratory disorders, skin disorders, snakebite, and scorpion sting | [3, 4, 27–29] |
| Root             |                           | Wounds                 |                                                                                   | [30]       |
| Bark             |                           | Bronchitis, leprosy, paralysis, gum inflammation, and helminthic infection |                                                                                   | [3]        |
| Leaves           | Poulace                   | Night blindness and ulcer |                                                                                   | [3]        |
| Flower           | Juice                     | Poisoning, hikka (hiccup), shwasa (asthma), and eye disease |                                                                                   | [16]       |
| Seed             |                           | Piles and diarrhea      |                                                                                   | [5]        |

Figure 3: Percentage of reported ethnomedicinal uses of A. lebbeck against myriad diseases.
isolated from the bark having the capability of inhibiting the α-glucosidase and α-amylase activity [17]. Among reported chemical compounds, 45 bioactive molecules have been discussed in the pharmacological section. These studies suggested that most of the phytochemicals have been isolated from bark and seeds, and other parts are still needed to be explored. Plenty of molecular structures of various phytochemicals are procured from PubChem, and their detailed information is given in Table 3 and Figure 5.

6. Pharmacological Activities

Several pharmacological studies showed that extracts/fraction/compounds of leaves, bark, and flower of Albizia lebbeck (L.) Benth exhibited significant antiallergic activity, anticancer, anticonvulsant, antidiabetic, anti-inflammatory, antimicrobial, antinociceptive, antioxidant, antiparasitic, antivenom, neuroprotective, nootropic, antipyretic, antidiarrheal, ovicidal, adulticidal activity estrogenic, and wound healing activities. The foremost pharmacological attributes, extract/fraction/compound extracted from different parts of the plant, investigational doses, experimental models, and their results have been given in Figure 6, and pharmacological activities are also described as follows.

6.1. Antiallergic Activity. Ethanolic extract (200 mg/200–250 gm b. w., p.o.) of A. lebbeck stem bark exhibited excellent antiallergic activity in toluene-2,4-diisocyanate- (TDI-) sensitized allergy model Brown Norway rats and HeLa cells expressing endogenous H1R with a significant decrease in the numbers of sneezing, nasal rubbing, and mRNA expression which have been found to elevate TDI-induced H1R and HDC, although the least doses of extract (0.1 to 10 μg/ml) also reduced PMA- or histamine-induced upregulation of H1R mRNA in HeLa cells [48]. Besides, catechin present in the ethanolic extract from A. lebbeck bark showed potent activity by modulating histamine release and cytokine expression. In vitro, chloroform, methanol, and water extracts of leaf and bark showed a significant mast cell stabilizing effect with 19.71–59.69% against compound 48/80 [15, 51].

6.2. Anticancer Activity. Bark and leaves of A. lebbeck showed a potent anticancer effect from diverse cell lines. A saponin-rich fraction from the bark of A. lebbeck exerted antiproliferative activity via MTT assay in human breast cancer cell line MCF-7 by inhibiting the growth with IC₅₀ 1 μg/ml and inducing apoptosis at 10 μg/ml by promoting activation of caspases 3 and 8. Furthermore, in shell-less chick embryo culture assay, there was a significant (p < 0.05) reduction in the number of extremities, nodes, junctions, and total branches length between 0 and 3 hr and 0–6 hr of drug exposure (0.1, 0.5, and 1 μg/ml) and elevation of chromosomal aberration observed [40]. In another study, lebeckosides A and B isolated from the root showed significant cytotoxic activity against U-87 MG, TG1 high-grade human brain tumors cells with IC₅₀ 3.46, 1.36, and 2.10, 2.24 μM, respectively [31]. The isolated compounds lebeckosides A and B are responsible for initiating apoptosis in the cancerous cell by the activation of caspase 8 (Figure 7). Apart, crude methanol extract from leaves exerted a cytotoxic effect on hepatocarcinoma (HepG2) cancer cell line with IC₅₀ 24.03 μg/ml [52]. In another study, gold nanoparticles isolated from aqueous leaf extract of A. lebbeck showed cytotoxicity against HCT-116 colon cancer cells with IC₅₀ 48 mg/ml and also induced apoptosis by increased
ROS production, decreased ΔΨm, apoptotic morphological changes by AO/EtBr, and altering pro- and antiapoptotic protein expressions [53].

6.3. Anticonvulsant Activity. The methanolic fraction of chloroform soluble part of the ethanolic extract of A. lebbeck (20, 40, or 100 mg/kg i.p.) exhibited remarkable anticonvulsant activity against pentylenetetrazole-induced convulsions and maximum electroshock in mice by delaying the onset of spasms and clonic convulsions. Fraction also delayed the latency to stage 4 significantly in lithium-pilocarpine-induced seizures. Moreover, in electrical kindling, fractions decreased the behavioral score. However, the fraction showed no protective effect against strychnine-induced convulsions [54]. Furthermore, 200 and 400 mg/kg (p.o.) ethanolic extract of A. lebbeck leaves demonstrated a considerable anticonvulsant effect by reducing the duration of hind limb extensor in the MES model and delaying the onset of convulsions in the PTZ mode [55].

Table 2: Medicinal uses of A. lebbeck in different countries of the world.

| S. no. | Country               | Parts used                       | Mode of administration | Medicinal uses                                                                 | References |
|--------|-----------------------|----------------------------------|------------------------|--------------------------------------------------------------------------------|------------|
| 1      | Zulu of Southern Africa | Bark and roots                   | —                      | Dysentery, diarrhea, bronchial asthma, eczema, insect bite, allergy, piles, hernia, malaria, gonorrhea, scrofulous swellings, carache, antiprotocoal, andanthelmintic | [11]       |
| 2      | Africa                | Leaves, stem bark, pods, and seeds | —                      | Abdominal tumors, boils, cough, eye disorders, and lung ailments                | [31]       |
| 3      | Asia                  | Stem                                | —                      | Diarrhea, gastroenteritis, hemorrhoids, bronchitis, leprosy                     | [31]       |
| 4      | Bangladesh            | Bark, seed, and leaves             | Decoction              | Anxiety, depression, and insomnia                                              | [27]       |
| 5      | China                 | Flowers                            | Powder and juice       | Astringent, tonic, restorative, and anus pain                                 | [40, 41]  |
| 6      | India (Bhils and Meena tribes) | Stem bark, flowers, and leaves    | Powder, paste, and decoction | Bone fractures, Abdominal tumors, Snakebite, scorpion sting, hemicrania, strengthen gum, ophthalmia, cough, bronchitis, asthma, prevent conception in women, anus pain, night blindness, astringent, piles, diarrhea, dysentery, gums ailment (spongy and ulcerated gums), emollient for boils, eruption, carbuncle, swelling, eye disease, and scrofulous enlargement of glands | [9, 10, 6, 40, 43] |
| 7      | India (tribes of Himachal Pradesh and Kashmir) | Bark, flowers, seeds, and roots   | —                      | Bone fractures, Abdominal tumors                                               | [9]        |
| 8      | Myanmar (Burma)       | Root, leaves, flowers, bark, and seed | Bark aqueous extract (leaf), decoction (seed), ointment, and powder | Fever, pain, epilepsy, and inflammation                                          | [11]       |
| 9      | Nigeria               | Bark and leaves                    | Aqueous extract        | Dyenserty, diarrhea, and ulcer                                                  | [44]       |
| 10     | Philippines           | Bark and leaves                    | Decoction              | Anthelmintic, diuretic, stimulant, tonic, and vermifuge                         | [35]       |
| 11     | Taiwan                | Bark                                | —                      | Kapha, pitta, poisoning, erysipelas, and ulcer                                  | [34]       |
6.4. Antidiabetic Activity. The bark of *A. lebbeck* demonstrated noteworthily antidiabetic activity. The methanol extract (200, 350, and 620 mg/kg) exhibited antihyperglycemic activity against streptozotocin-nicotinamide stimulated type II diabetes mellitus rats by significantly decreasing the level of serum glucose, creatinine, urea, cholesterol, triglycerides, LDL-cholesterol, and VLDL-cholesterol and increasing plasma insulin level, hepatic glycogen content, and HDL-c levels [17,18]. and VLDL-c and increases plasma insulin level, hepatic production of blood glucose, BUN, SCr, GSP, TC, TG, LDL-c, melanoctin, okanin, oleanolic acid, (+) pinitol, polyphenols, saponins (lebbekanin A-H) g-sitosterol, and triterpenoids Oleanane-type saponins (lebeckosides A and B)

Alkaloids, flavonoid (geraldone, luteolin, isookanin, epicatechin, and procyanidins B-2, B-5, and C-3), glycoside (albinos, lebbeckalysin), oleane triterpene (albiziasaponins A–E), phenols, phytosterols, saponins, and triterpenoid saponin (lebeckoside C, 21-[[((2e,6S)-6-[6-deoxy-4-O-[[2(2e,6S)-6-hydroxy-2-(hydroxymethyl)-6-methyl-1-oxo-2,7-octadienyl]-[[β-D-galactopyranosyl] oxy]-2-(hydroxymethyl)-6-methyl-1-oxo-2,7-octadienyl]-[[β-D-glucopyranosyl] oxy]-2,6-dimethyl-1-oxo-2,7-octadienyl][oxy]-16-hydroxy-3-[[O-β-D-xyleneopyranosyl-(1 → 2)-O-α-L-arabinopyranosyl-(1 → 6)-2-(acet-ylamino)-2-deoxy-β-D-glucopyranosyl][oxy]-\(6\)-beta-galactopyranosides), friedelan-3-one, (3β,16α,21β)-olean-12- en-28-oic acid O-α-L-arabinofuranosyl-(1 → 4)-O-β-D-glucopyranosyl-(1 → 3)-O-6-deoxy-α-L-mannopyranosyl-(1 → 2)-β-D-glucopyranosyl ester)

**Table 3: Chemicals constituents of A. lebbeck.**

| Chemical compounds | Plant part | References |
|--------------------|------------|------------|
| Alkaloids (budmunchamisines L1-L6), α-amyrine, catechins, echinocystic acid or acacic acid, flavonoids (kaempferol, quercetin, and quercetin 3-O-alpha-rhamnopyranosyl (1 → 6)-beta-glucopyranosyl (1 → 6)-beta-galactopyranosides), friedelan-3-one, (−)-leucopelargonidin, lupeol, melanoctin, okanin, oleanolic acid, (+) pinitol, polyphenols, saponins (lebbekanin A-H) g-sitosterol, and triterpenoids | Plant | [15, 28, 48] |
| Oleane-type saponins (lebeckosides A and B) | Roots | [31] |
| Alkaloids, flavonoid (geraldone, luteolin, isookanin, epicatechin, and procyanidins B-2, B-5, and C-3), glycoside (albinos, lebbeckalysin), oleane triterpene (albiziasaponins A–E), phenols, phytosterols, saponins, and triterpenoid saponin (lebeckoside C, 21-[[((2e,6S)-6-[6-deoxy-4-O-[[2(2e,6S)-6-hydroxy-2-(hydroxymethyl)-6-methyl-1-oxo-2,7-octadienyl]-[[β-D-galactopyranosyl] oxy]-2-(hydroxymethyl)-6-methyl-1-oxo-2,7-octadienyl]-[[β-D-glucopyranosyl] oxy]-2,6-dimethyl-1-oxo-2,7-octadienyl][oxy]-16-hydroxy-3-[[O-β-D-xyleneopyranosyl-(1 → 2)-O-α-L-arabinopyranosyl-(1 → 6)-2-(acet-ylamino)-2-deoxy-β-D-glucopyranosyl][oxy]-\(6\)-beta-galactopyranosides), friedelan-3-one, (3β,16α,21β)-olean-12- en-28-oic acid O-α-L-arabinofuranosyl-(1 → 4)-O-β-D-glucopyranosyl-(1 → 3)-O-6-deoxy-α-L-mannopyranosyl-(1 → 2)-β-D-glucopyranosyl ester) | Bark | [4, 12, 14, 17, 38, 46, 47] |
| Alkaloids, glycosides, saponin (albiziahexoside) steroids, tannins, terpenoids, flavonoids (kaempferol 3-O-a-rhamnopyranosyl(1/6)-b-glucopyranosyl(1/6)-o-galactopyranoside, quercetin 3-O-a-rhamnopyranosyl(1/6)-b-glucopyranosyl(1/6)-b-galactopyranoside, kaempferol, and 3-rhamnosyl (1 → 6) glycosyl (1 → 6) galactoside) | Leaves | [4,49,50] |
| Alkaloids, anthraquinones, eicosanoids, fatty acid (linoenic acid, oleic acid, palmitic acid, and steric acid), flavonoids, glycosides, nonadecane, octadecane, phenolics, phytol, saponins (glycosaponins), steroids, stigmastadiene, tetradecane, and vitamin E | Seed | [10,21,45] |
| 3′,5-Dihydroxy-4′,7 dimethoxy flavone and N-benzoyl-L-phenyl alaninol | Pod | [19] |
| Albigenic acid | Bean | |

6.5. Anti-Inflammatory Activity. Administration of leaf essential oil (100, 200, and 400 mg/kg) caused significant inhibition of carrageenan-induced edema [11]. Leaves aqueous and ethanolic extract showed anti-inflammatory effect at 200 mg/kg with percentage inhibition of 39.36% and 42.55% in carrageenan-induced paw edema and also reduced granuloma formation with 38.55% and 42.33%, respectively [49]. In another study, petrol ether and ethanol extracts (400 mg/kg) exhibited maximum inhibition of carrageenan-induced inflammation with percentage inhibition of 48.6% and 59.57%; dextran-induced group 45.99% and 52.93%; cotton pellet-induced models 34.46% and 53.57%, and Freund’s adjuvant-induced animal group 64.97% and 68.57%, respectively [28], while bark petroleum ether: ethyl acetate: methanol extract (1 : 1 : 1) significantly (p < 0.001) reduces carrageenan-induced rat hind paw edema at 400 mg/kg with 36.68% [56]. Moreover, n-hexane, dichloromethane, ethyl acetate, and n-butanol fraction from flowers reduce inflammation in carrageenan-induced paw edema. Among tested fractions, the most potent activity was shown at 1 g/kg by dichloromethane (71.6%) followed by ethyl acetate (60.3%) [37].

6.6. Antimicrobial Activity. The zinc nanoparticle from the stem bark of *A. lebbeck* demonstrated activity against *B. cereus*, *S. aureus*, *E. coli*, *K. pneumoniae*, and *S. typhi*, with inhibition zones ranging from 1 to 10.57 mm, with *S. typhi* showing maximum inhibition at 0.1 M, which was comparable to ciprofloxacin (12.53 mm) [57]. In another study, ethanolic extract of root exerted antibacterial activity against *E. coli*, *S. flexneri*, *P. aeruginosa*, *S. typhi*, *K. pneumonia*, *S. boydii*, *S. aureus*, and *E. faecalis* with 9.05–15.77 mm [58]. In another study, petroleum ether, ethyl acetate, and methanol extracts from the stem bark and leaves exhibited antimicrobial activity against *S. typhi* with inhibition zones ranging from 1 to 10.57 mm, with *S. typhi* showing maximum inhibition at 0.1 M, which was comparable to ciprofloxacin (12.53 mm) [57]. In another study, ethanolic extract of root exerted antibacterial activity against *E. coli*, *S. flexneri*, *P. aeruginosa*, *S. typhi*, *K. pneumonia*, *S. boydii*, *S. aureus*, and *E. faecalis* with 9.05–15.77 mm inhibition range, where *S. typhi* showed maximum inhibition followed by *S. flexneri* (15.50 mm) at 200 mg/ml with MIC 0.20 and 0.39 mg/ml, respectively [30]. Similarly, petroleum ether, ethyl acetate, and methanol extracts from the stem bark and leaves exhibited antimicrobial activity against selective microbes among Gram-positive bacteria, that is, *B. polymyx*, *B. subtilis*, *M. megaterium*, *S. lutea*, and *S. aureus*; Gram-negative bacteria such as *V. mimicus*, *V. cholera*, *S. typhi*, *S. boydii*, *S. flexneri* type 1, *S. dysenteriae*, *P. aeruginosa*, *K. pneumoniae*, *E. coli*, and *P. vulgaris*; fungal
Albigenic acid  Albizinin  Catechin
Friedelan-3-One  Geraldone  Isookanin
Kaempferol  Leucopelargonidin  Quercetin
Luteolin  Melanoxetin  Okanin

Figure 5: Continued.
**Figure 5: Continued.**
strains as *C. arrizae*, *A. fumigatus*, *A. Niger*, *R. oryzae*, *C. albicans*, *C. krusei*, and *Saccharomyces cerevisiae*. Stem bark extract was shown to have action with a zone of inhibition of 6–14 mm, with ethyl acetate extract having the best activity against *B. subtilis*, *S. typhi* (14 mm), and *C. arrizae* (10 mm). However, leaves extract had an antimicrobial activity with a zone of inhibition of 3–23 mm, whereas methanolic extract demonstrated the highest effective action against *S. typhi* at 500 mg [19, 58]. Moreover, leaves crude ethanolic extract at 10 mg/ml exerted activity against *S. aureus* (6 mm) and *E. coli* (7.5 mm), with IC₅₀ 7.97, 5.62 mg/ml [52].

6.7. Antinociceptive Activity. Essential oil isolated from leaves significantly inhibited nociceptive mediators at both neurogenic and inflammatory phases in the formalin hind paw with an average of 44% and 100% at 200 and 400 mg/kg, respectively [11]. Leaves aqueous and ethanolic extract was
administered orally to evaluate analgesic activity by eddy’s hot plate and tail-flick test. In the hot plate method, a significant elevation was observed in the mean basal reaction time, and an elevation in the latency time was found in the tail-flick method [26]. In another study, among n-hexane, dichloromethane, ethyl acetate, and n-butanol fraction from flower, only dichloromethane fraction (1 g/kg) significantly increases in pain threshold in the hot plate test [37]. Bark petroleum ether: ethyl acetate: methanol extract (1 :1 :1) showed a significant reduction in the number of writhes by 52.4% and significant elongation of tail flicking time with 61.48% at 400 mg/kg [56].

6.8. Antioxidant Activity. Increased production of reactive oxygen species is a cause of most human diseases, including cardiovascular disease and cancer. Cells enable upregulation of antioxidant defenses and other protective systems against mild oxidative stress, although severe stress can harm the integrity of DNA, proteins, and lipids and lead to cell death by apoptotic or necrotic mechanisms [59]. Therefore, the antioxidant effect of *A. lebbeck* is evaluated. Geraldone, isoookanin, and luteolin isolated from the bark of the plant are tested for DPPH-free radical scavenging assay, where geraldone showed the best activity (IC_{50} 21.5 μM) [17]. These isolated compounds are able to neutralize the free radicals, including RNS and ROS, by activating antioxidant enzymes (Figure 7). Zinc oxide nanoparticles from the stem bark exhibited the most potent antioxidant effect against hydrogen peroxide-free radical with IC_{50} 48.5 μg/ml [57]. Petroleum ether, ethyl acetate, and methanol barks extracts of *A. lebbeck* were evaluated for DPPH-free radical scavenging activity, where ethyl acetate (81.13%) and methanol extract (78.23%) showed high radical scavenging activity, followed by petroleum ether (74.82%) at 100 μg/ml [58]. Additionally, leaves crude methanol extract showed DPPH and ABTS radical scavenging activity with IC_{50} 34.22 and 108.7 μg/ml, respectively [52].
Table 4: Pharmacological activities of various parts of *A. lebbeck*.

| S. no. | Pharmacological activity | Extract, fraction, and isolate | Parts used | Dose/mode of administration | Standard | Study model/parameter | Result | Ref. |
|-------|--------------------------|--------------------------------|------------|-----------------------------|----------|----------------------|--------|------|
| 1     | Antiallergic activity    | Ethanol extract                | Stem bark  | 50 to 300 mg/kg, p.o.       | DSGC (50 mg/kg, i.p.) | **Mast cell stabilization, compound 48/80-induced systemic anaphylaxis** | Dose-dependent mast cell stabilization activity at 200 and 300 mg/kg dose extract protected the degranulation (53 and 61%, resp.). There was significant protection from degranulation (compound 48/80 induced) of mast cells, dose-dependent, that is, 61 and 74% of inhibition of histamine release at 200 and 300 mg/kg, respectively. All the extracts showed significant mast cell stabilization activity. However, methanolic and water extracts of the bark showed the maximum activity along with the leaf methanolic extract. | [15] |
|       |                          | Chloroform, methanol, and water extracts | Leaf and stem bark | 50 μg/ml | 1% DMSO | **In vitro mesenteric mast cell stabilization against compound 48/80** | Dose-dependent mast cell stabilization activity at 200 and 300 mg/kg dose extract protected the degranulation (53 and 61%, resp.). There was significant protection from degranulation (compound 48/80 induced) of mast cells, dose-dependent, that is, 61 and 74% of inhibition of histamine release at 200 and 300 mg/kg, respectively. All the extracts showed significant mast cell stabilization activity. However, methanolic and water extracts of the bark showed the maximum activity along with the leaf methanolic extract. | [51] |
| 2     | Anti-Alzheimer’s activity | Hydromethanolic extract        | Seed       | 100–300 mg/kg, p.o.         | Galantamine 0.5 mg/kg | Morris water maze, open field, hole board, Y maze, and T-maze test | **In vivo aluminum chloride (100 mg/kg, p.o.)-induced Alzheimer’s disease in Wistar albino rats** | Fraction inhibits the growth of MCF-7 with IC₅₀ 1 μg/ml | [21] |
|       |                          | Saponin-rich fraction          | Bark       | 10 μg/ml                     | Staurosporine 1 μg/ml | Apoptosis assay | Extract significantly improved the memory and cognitive impairments, GSH, SOD, CAT, and AChE | [21] |
|       |                          | Zinc oxide nanoparticles       | Stem bark  | 5, 25, 50, and 100 μg/ml    | Tamoxifen | Shell-less chick embryo culture assay | Reduction in number of extremities, nodes, junctions, and total branches length between 0 and 3 hr and 0 and 6 hr of drug exposure | [9] |
|       |                          | Lebbeckosides A-B              | Root       | 0.1, 0.5, and 1 μg/ml       | Tamoxifen | Chromosomal aberration (CA) assay | Total chromosomal aberrations | [57] |
| 3     | Anticancer activity      | Crude methanol extract         | Leaves     | 1, 10, 25, 50, 75, 100, 125, and 150 μg/ml | Tamoxifen | In vitro MTT assay against human hepatocarcinoma (HepG2) cancer cell line | Extract significantly decreased the cell viability with IC₅₀ 24.03 μg/ml | [52] |
|       |                          | Methanolic extract             | Bark       | 200, 350, and 620 mg/kg/day, p.o. | Metformin 45 mg/kg | Streptozotocin-nicotinamide-induced type II diabetes mellitus using female Sprague-Dawley rats | Extract significantly decreased the level of serum GLU, creatinine, ursa, triglycerides, cholesterol, low-density lipoprotein-cholesterol, and very low-density lipoprotein-cholesterol and increased high-density lipoprotein levels | [16] |
| 4     | Antidiabetic activity    | Geraldone, isookanin, and luteolin | Bark       | Acarbose 10 mg/ml           | In vitro α-glucosidase and α-amylase inhibitory assay | Extract significantly decreased the level of serum GLU, creatinine, ursa, triglycerides, cholesterol, low-density lipoprotein-cholesterol, and very low-density lipoprotein-cholesterol and increased high-density lipoprotein levels | All three compounds significantly inhibit the α-glucosidase and α-amylase enzymes | [17] |
|       |                          | Methanol/ dichloromethane extract | Stem bark  | 100–400 mg/kg               | Glibenclamide 1 mg/kg | In vivo streptozotocin-induced diabetic rats using male albino Wistar rats | Significant reduction of blood glucose, BUN, Scr, GF, TC, TG, LDL-c, and VLDL-c and increasing plasma insulin level, hepatic enzymes, SOD, CAT, GSH, and HM-c | [18] |
| 5     | Antidiarrheal activity   | Aqueous methanol extract       | Seed       | 2.5–5 mg/kg i.p.            | Loperamide 1 mg/kg i.p. | In vivo castor oil-induced diarrhea using albino rats and mice | Extract significantly inhibited the cathartic effect of castor oil in a dose-dependent manner | [63] |
| S. no. | Pharmacological activity | Extract, fraction, and isolate | Parts used | Dose/mode of administration | Standard | Study model/parameter | Result | Ref. |
|--------|--------------------------|-------------------------------|------------|----------------------------|----------|----------------------|--------|------|
| 6      | Anti-inflammatory activity | Essential oil | Leaves | 100–400 mg/kg p.o. | Ibuprofen 100 mg/kg | In vivo carrageenan-induced edema in Wistar rats | Extract significantly and dose-dependently inhibited edema | [63] |
|        |                          | Aqueous and ethanol extract | Leaves | 50–200 mg/kg, p.o. | Diclofenac 20 mg/kg and indomethacin 10 mg/kg | In vivo carrageenan-induced paw edema and cotton pellet-induced granuloma models using Wistar rats | Dose-dependent and significant inhibition of inflammation | [49] |
|        |                          | Petroleum ether, chloroform, and ethanol extract | Bark | 100, 200, and 400 mg/kg p.o. | Indomethacin 10 mg/kg | In vivo carrageenan- and dextran-induced rat paw edema; cotton pellet-induced granuloma; adjuvant-induced arthritis using female Wistar rats | Dose-dependent and significant inhibition of inflammation | [28] |
|        |                         | n-Hexane, dichloromethane, ethyl acetate, and n-butanol fraction | Flower | 0.25 and 1 g/kg, i.p. | Diclofenac sodium 20 mg/kg | In vivo carrageenan-induced paw edema using Wistar rats | All fractions showed significant inhibition | [37] |
|        |                          | Petroleum ether: ethyl acetate: methanol extract (1:1:1) | Bark | 200 and 400 mg/kg p.o. | Phenylbutazone 100 mg/kg | In vivo carrageenan-induced rat hind paw edema using long-Evans rats | Dose-dependent and significant inhibition of inflammation | [56] |
|        |                          | Ethanol extract | Root | 0.01 M, 0.05 M, and 0.1 M | Ciprofloxacin 10 μg/disc for bacteria, griseofulvin 25 μg/disc for fungi | In vitro agar disc diffusion method using Bacillus subtilis, Staphylococcus aureus, Escherichia coli, Shigella flexneri, Pseudomonas aeruginosa, Staphylococcus aureus, and four clinical bacterial isolates Salmonella typhi, Klebsiella pneumoniae, Shigella boydii, and Enterococcus faecalis | Extract showed strong activity with inhibition zone ranging from 1 to 10.57 mm | [57] |
|        |                          | Petroleum ether, ethyl acetate, and methanol extracts | Stem bark | 300 μg/disc | Ciprofloxacin 10 μg/disc for bacteria, griseofulvin 25 μg/disc for fungi | In vitro disc diffusion method using Escherichia coli, Staphylococcus aureus, Vibrio mimicus, V. Cholera, Salmonella typhi, Shigella boydii, S. flexneri type-I, S. dysenteriae, Pseudomonas aeruginosa, Klebsiella pneumoniae, and Escherichia coli extract | Extract showed activity against all tested bacteria with a zone of inhibition ranging from 9.05 to 15.77 mm and MIC 0.20–1.56 μg/ml | [30] |
| 7      | Antimicrobial activity   | Petroleum ether, ethyl acetate, and methanol extract | Stem bark | 50, 100, 200, and 500 μg/ml | Tetracycline, streptomycin, erythromycin, lincomycin, rifampicin, norfloxacin, and gentamicin | In vitro agar disc diffusion method using Bacillus subtilis, Klebsiella pneumonia, Proteus vulgaris, Pseudomonas aeruginosa, Salmonella typhi, and Staphylococcus aureus | Pet, ether and ethyl acetate extract showed activity against selective microbes with ZOI ranging from 6 to 14 mm. Methanol extract is only active against S. cerevisiae (8 mm) | [58] |
|        |                          | Petroleum ether, ethyl acetate, and methanol extract | Leaves | 5.0, 100, 200, and 500 μg/ml | Ampicillin 10 mg/ml, streptomycin 10 mg/ml, and gentamicin 20 mg/ml | In vitro agar disc diffusion method using Bacillus subtilis, Klebsiella pneumonia, Proteus vulgaris, Pseudomonas aeruginosa, and S. flexneri | Among extracts, methanolic extract showed strong activity with a zone of inhibition ranging from 11 to 23 mm at 500 μg/ml | [19] |
|        |                          | Crude methanol extract | Leaves | 10 mg/ml | Ciprofloxacin 10 μg/disc for bacteria, griseofulvin 25 μg/disc for fungi | In vitro disc diffusion method using Bacillus subtilis, Escherichia coli extract | Extract showed potent antibacterial activity against S. aureus and E. coli with ZOI 6 and 7.5 mm, respectively | [52] |
|        |                          | Essential oil | Leaves | 100–400 mg/kg p.o. | Piroxicam 10 mg/kg p.o. | In vivo formalin hind paw in Wistar rats | Extract inhibited nociceptive mediators at both neurogenic and inflammatory phases | [11] |
|        |                          | Aqueous and ethanol extract | Leaves | 50–200 mg/kg, p.o. | Pentazocine 15 mg/kg | In vivo Eddy’s hot plate and tail-flick test in Wistar rats | Both extracts showed a significant and dose-dependent increase in the mean basal reaction time in the hot plate test and latency of the tail flick response | [26] |
| 8      | Antinociceptive activity | n-Hexane, dichloromethane, ethyl acetate, and n-butanol fraction | Flower | 0.25 and 1 g/kg, i.p. | Aspirin 200 mg/kg | In vivo hot plate method using male albino white mice | Only dichloromethane fraction (1g/kg) significantly increases in pain threshold | [37] |
|        |                          | Petroleum ether: ethyl acetate: methanol extract (1:1:1) | Bark | 200 and 400 mg/kg p.o. | Aminopyrine 50 mg/kg | Acetic acid induced writhing test using Swiss albino mice | Extract showed a significant and dose-dependent reduction in the number of writhes | [56] |
|        |                          |                           |          |                           | Morphine 2 mg/kg | Radiant heat tail-flick method using Swiss albino mice | Extract showed significant depression of tail flicking time | [56] |
| S. no. | Pharmacological activity | Extract, fraction, and isolate | Parts used | Dose/mode of administration | Standard | Study model/parameter | Result | Ref. |
|-------|--------------------------|--------------------------------|------------|----------------------------|----------|-----------------------|--------|------|
| 9     | Antioxidant activity     | Zinc oxide nanoparticles      | Bark       | 0.01, 0.05, and 0.1 M      | Ascorbic acid | H<sub>2</sub>O<sub>2</sub>-free radical scavenging assay | IC<sub>50</sub> 48.7, 60.2, and 48.5 μg/ml, respectively | [57] |
|       |                          | Geraldone, isookanin, and luteolin | Bark       |                            | Trolen    | DPPH radical scavenging assay |        |      |
|       |                          | Petroleum ether, ethyl acetate, and methanol extracts | Bark       | 20–100 μg/ml              | Ascorbic acid | DPPH- and H<sub>2</sub>O<sub>2</sub>-free radical scavenging assay | Extracts showed DPPH- and H<sub>2</sub>O<sub>2</sub>-free radical scavenging activity with IC<sub>50</sub> values of 66.63, 57.25, 60.21, 70.93, 64.69, and 68.99 μg/ml, respectively | [58] |
|       |                          | Crude methanol extract       | Leaves     | 1, 10, 25, 50, 75, 100, 125, and 150 μg/ml | Ascorbic acid | DPPH and ABTS radical scavenging assays | Extract exhibited DPPH and ABTS radical scavenging activity with IC<sub>50</sub> values of 34.22 and 108.7 μg/ml, respectively | [52] |
| 10    | Antiparasitic activity   | Ethanolic extract            | Bark       | 5–100 μg/ml               | Chloroquine 5 mg/kg | In vitro antimalarial activity against *Plasmodium falciparum* (CQ) sensitive (MRC2) and CQ resistant (RKL9) strains | IC<sub>50</sub> = 8.2 and 5.1 μg/ml against MRC2 and RKL9 strains | [14] |
|       |                          | Methanolic extract           | Pericarp   | 20 mg/ml                  | Chloroquine, miltefosine, benznidazole, and suramin | In vitro antimalarial activity against *Plasmodium falciparum*, *Leishmania infantum*, *Trypanosoma cruzi*, and *T. brucei* | | |
| 11    | Anti-Parkinson’s activity| Aqueous methanolic extract   | Seed       | 100–300 mg/kg             | Sinemet-levodopa 100 mg + carbidopa 25 mg/kg per oral | In vivo haloperidol-induced catalepsy Assessment of catalepsy, hang test, and narrow beam walk test | Extract improved the motor functions and showed significant improvement in catalepsy, time latency, no. of exploration, ↑ SOD, CAT, and GSH | [12] |
| 12    | Antipyretic activity     | n-Hexane, dichloromethane, ethyl acetate, and n-butanol fraction | Flower     | 0.25 and 1 g/kg, i.p.     | Aspirin (200 mg/kg) | In vivo Brewer’s yeast-induced pyrexia using albino mice | | |
| 13    | Antivenom activity       | Methanolic extract           | Seed       | 1: 1–1: 100 w/w           | *Echis carinatus* venom (ECV) induced local toxicity in Swiss albino mice in vivo and proteolytic and hyaluronidase activities in vitro | | |
| 14    | Estrogenic activity      | n-Hexane, dichloromethane, ethyl acetate, and n-butanol fraction | Flower     | 200 and 500 mg/kg i.p.    | 17-β-Estradiol (0.32 μg/animal/day) | In vivo uterine weight using female Albino mice | | |
| 15    | Wound healing activity   | Ethanolic extract            | Root       | 250, 500, and 750 mg/kg p.o. | Vitamin E 200 mg/kg | In vivo incision and excision wound models in nulliparous and nonpregnant healthy female rats | | |

**Table 4: Continued.**
6.10. Antivenom Activity. Albizia lebbeck is used traditionally as medicine in the treatment of snakebite, and several researchers have experimentally evaluated the medicinal use of A. lebbeck against snakebite [9, 10, 31]. One of the studies revealed that seed methanolic extract exhibited significant (p < 0.0001) antivenom activity with inhibition of ECV protease and hyaluronidase with IC$_{50}$ 36.32 μg, 91.95 μg at 1:100 w/w, respectively. Moreover, extract neutralizes (p < 0.0001) ECV-induced hemorrhage with ED$_{50}$ 26.37 μg, myotoxicity by reducing serum creatinine kinase with ED$_{50}$ 37.5 μg (p < 0.0001), and lactate dehydrogenase 31.44 μg (p = 0.0021) levels at 1:50 w/w [10].

6.11. Neuroprotective Activity. The symptoms of Alzheimer’s disease include deterioration of memory, judgment, and decision-making power which reduces impairment in the orientation of physical surroundings and language [61]. It was observed that seed hydroethanolic extract (100–300 mg/kg orally) reduced biochemical oxidative stress and improved functional outcomes of behavioral studies by improving memory and cognition functions via inhibiting anticholinesterase, thereby preserving acetylcholine concentration [21]. The second most common neurodegenerative disease is Parkinson’s disease which causes parkinsonism that occurs due to the loss of neurons in the substantia nigra and elsewhere in association with the presence of ubiquitinated protein deposits in the cytoplasm of neurons and thread-like proteinaceous inclusions within neurites [61]. The anti-Parkinson activity was evaluated by performing behavioral and biochemical oxidative stress assay in Wistar albino rats. It was observed that the plant extract can be able to ameliorate motor function and prevent biochemical damage in brain cells [12].

6.12. Nootropic Activity. The n-butanol fraction (10 and 25 mg/kg) from dried leaves of A. lebbeck exhibited excellent nootropic activity in mice by using the elevated plus maze and passive shock avoidance paradigm. On both doses, the inflexion ratio (IR) was increased significantly, while IR was found to decrease at the utmost dose (50 mg/kg) after 24 h after exposure as well as on day 9 in the passive avoidance test. Moreover, the fraction (10, 25, and 50 mg/kg) dose-dependently reduced the lithium-induced head twitches and at 50 mg/kg significantly potentiated and prolonged the haloperidol-induced catalepsy [20].

6.13. Miscellaneous Activity. Ovicidal and adulticidal activities were studied against Culex quinquefasciatus, Aedes aegypti, and Anopheles stephensi from hexane, benzene, chloroform, ethyl acetate, and methanol extracts; among tested extracts, methanolic extract obtained from the leaf and seed showed absolute mortality at 200, 250, 150, and 300, 375, and 225 ppm against Ae. aegypti, C. quinquefasciatus, and An. stephensi, respectively. Methanolic leaf extract showed the highest adulticidal activity against An. stephensi with LC$_{50}$ 65.12 ppm [62]. n-Hexane, dichloromethane, ethyl acetate, and n-butanol fraction from flower were evaluated for antipyrexic activity. The most potent effect was shown by dichloromethane followed by ethyl acetate at 1 g/kg with a reduction of 8°C and 5°C, respectively [37]. Aqueous methanol extract from seed (5 mg/kg i.p.) almost entirely inhibits the castor oil-induced diarrhea [63]. The pharmacological profile of various parts of A. lebbeck is shown in Table 4.

7. Conclusion

Albizia lebbeck is an Ayurvedic plant and has been widely utilized in the treatment of anorectal, eye, gastrointestinal, genital, inflammatory, neurological disorders, oral disorders, respiratory, skin, urinary disorders, and venereal diseases across the world. Different parts of the plant have been used, but bark appears to be the most often used plant part in the employment of traditional medicine. However, in support of its therapeutic uses, more scientific clinical trials extensively are necessary. The phytochemical studies revealed an abundance of saponins with other chemicals, for example, flavonoids, phenols, and glycosides. A. lebbeck has been studied for many pharmacological activities against allergy, cancer, convulsant, diabetes, inflammation, parasitic infestation, snake venom, nootropic, pyrexia, diarrhea, and so on, and there remains still a scarcity of information on the mechanism of action. Additionally, it is worth noting that even though A. lebbeck has been used in the treatment of various ailments, it is an ingredient in several Ayurvedic formulations; nonetheless, studies are required to evaluate the possible toxicities or adverse effects. In forthcoming research, studies should target the discovery of the chemical compounds responsible for the therapeutic action, which comprise the mechanisms of action.

Conflicts of Interest

The authors declare no conflicts of interest with regard to the submitted work.

Authors’ Contributions

Acharya Balkrishna performed diconceptualization n, funding acquisition, and provided resources. Ms. Sakshi performed data curation, visualization, formal analysis, and writing the original draft. Mr. Mayur Chauhan performed
data curation and formal analysis. Dr. Anurag Dabas performed conceptualization, supervision, investigation, validation, and review and editing of the paper. Dr. Vedpriya Arya did project administration, supervision, and review and editing of the paper.

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