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Assessment of the Pharmacognostical Phytochemicals and Antidiabetic properties of the *Acacia nilotica Linn and Acacia leucophloea Willd* : A Comprehensive Review

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ABSTRACT

The plant Acacia arabica, also called babul, is native to Egypt and is found across the tropical and subtropical plains of India, Sri Lanka, and Sudan. It is a member of the Fabaceae family. Nearly every component of it—root, bark, leaves, flowers, gum, pods, etc.—is utilized in medicine. Furthermore, reports of polyphenolic substances in bark and pods have also been recorded. A. arabica is used in traditional medicine to treat bleeding disorders, prolapse, leucorrhea, and other conditions. Experimental research on the plant revealed antihypertensive, antispasmodic, antibacterial, antifungal, and antioxidant properties. The goal of this study is to thoroughly examine and highlight the pharmacological, phytochemical, and ethnomedical applications of Acacia arabica that have been documented to far. Astringency, tonicity, wound healing, aphrodisiac, expectorant, resolvent, and antispasmodic actions are only a few of the medicinal properties of A. nilotica. A. nilotica is a potential source of a variety of bioactive compounds with distinct pharmacological properties and therapeutic uses, according to published publications' in vivo, in vitro, and clinical research. Among the several pharmacological activities include anti-inflammatory, analgesic, antibacterial, antidiabetic, and antihypertensive properties. According to this review, scientific studies have shown that A. nilotica has medicinal effects.

KEYWORDS: Phytochemical, pharmacological, ethnomedicine, A. nilotica, antidiabetic, Anti-inflammatory

1. INTRODUCTION

With the exception of pancreas transplantation, maintaining normoglycemia, preventing diabetic complications, and managing other pathological features are challenging despite the various therapeutic options now available for diabetes mellitus. But finding the necessary donor is challenging and quite costly. As a result, there is a clear need for alternative medicine sources and diabetes treatment methods. Research on traditional antidiabetic herbs for diabetes prevention and treatment has been determined to be the most effective approach.

Due to the fact that several botanical preparations have been shown to have positive benefits on diabetes management, including increased insulin production, improved insulin binding, reduction of glucose absorption, etc. Numerous herbal supplements have been investigated and employed as possible treatment tools for diabetes and its associated problems.

Only a tiny percentage of the approximately 600 traditional plant remedies for diabetes that have been documented in India have undergone scientific and medical investigation to determine their effectiveness. Certain herbal extracts have been shown to have an antidiabetic impact in Type-II diabetes models in both humans and animals. The most researched in this area and often used medicinal plants for diabetes therapy are listed below. Aloe vera, Momordica charantia, Azardiractha indica, Panax sps, Gymea sylvestre, Trigonella foenum-graecum, Pterocarpus marsupium, and Syzigium cumini. Coccinia cordifolia, Phyllanthus emblica, and Allium sps. Due to its antidiabetic properties, Acacia nilotica and Acacia leucophloea blossoms are crucial in this situation. Thus, the current study's goal is to identify the phytoconstituents found in the blooms of Acacia nilotica and Acacia leucophloea and assess their potential as antidiabetic agents.

1.1. Epidemiology of Diabetes mellitus

Because epidemiology sheds light on risk factors, prevalence patterns, and disease burden, it is essential to comprehending and treating diabetes. Epidemiological research makes it easier to spot trends and changes in the prevalence of diabetes. Large-scale research also identifies risk variables that influence the pathophysiology of the illness. These studies take into account a variety of factors, including environmental factors, lifestyle choices, food habits, and genetics.

Type 1 diabetes, an autoimmune disorder primarily affecting children and young adults, accounts for about 10% of all diabetes cases globally. In contrast, type 2 diabetes, which affects

90–95% of people with diabetes, is more common among adults and is linked to insulin resistance. The global prevalence of diabetes has been on a sharp rise. In 2000, approximately 2.8% of the world's population was affected by diabetes, a figure projected to increase to 4.4% by 2030. This alarming rise is driven by sedentary lifestyles, unhealthy diets, and an aging global population.

In the United States, diabetes affects a significant portion of the population. According to the January 2011 National Diabetes Fact Sheet, 25.8 million people, accounting for 8.3% of the U.S. population, were diagnosed with diabetes. Of these, 1.9 million new cases were reported among adults aged 20 and above. The prevalence rates for men and women stood at 11.8% and 10.8%, respectively. Global estimates predict that the total number of diabetes cases could double within 20 years, reaching 180 million.

The prevalence of diabetes varies across countries and economic regions. In wealthier nations, diabetes is more common among individuals aged 60 and above, whereas in developing countries, it affects people aged 40 to 60. By 2030, diabetes prevalence is expected to increase by 54%, reflecting an annual growth rate of 2.2%, nearly double the global population growth rate. Alarmingly, China and India are projected to have the highest diabetes burden, with a combined total of approximately 154 million affected individuals.

The prevalence of diabetes also differs across regions and population groups. For example, the prevalence rate among the Indian diaspora (2.2%) is higher than that of European populations (1.2%). Within India, southern states like Tamil Nadu report a higher prevalence (10.4%) compared to Maharashtra (8.4%) and Jharkhand (5.3%). Regionally, diabetes prevalence rates vary from 12.1% in North America to 8.1% in Europe, 4% in Africa, and 1% in Asia.

Multiple logistic regression analyses have identified several key risk factors for diabetes. Age, male sex, urban residence, family history of diabetes, hypertension, abdominal and generalized obesity, and socioeconomic status have all been significantly associated with an increased risk of developing diabetes. Additionally, similar risk factors, including age, family history, obesity, hypertension, and socioeconomic status, have been linked to the development of prediabetes (Wild et al., 2004).

1.2. Classification of diabetes

Diabetes mellitus is broadly classified into two primary types: type 1 and type 2 diabetes. Type 1 diabetes, also known as juvenile diabetes, is characterized by a severe deficiency of insulin due to the autoimmune destruction of pancreatic β-cells. In contrast, type 2 diabetes is marked by insulin resistance combined with inadequate insulin production. Type

1 diabetes accounts for approximately 5–10% of the global diabetic population, making it significantly less common than type 2 diabetes. The autoimmune nature of type 1 diabetes is evidenced by the presence of specific autoantibodies. These include islet cell autoantibodies, insulin autoantibodies, glutamic acid decarboxylase (GAD) autoantibodies, and autoantibodies targeting tyrosine phosphatase proteins IA-2α and IA-2β. These autoantibodies serve as biomarkers indicating immune-mediated destruction of pancreatic β-cells. Additionally, genetic predisposition plays a vital role in the development of type 1 diabetes. The condition is strongly associated with the Human Leukocyte Antigen (HLA) system, particularly the DQA and DQB gene variants, which are key genetic contributors to disease susceptibility.

Each person with type 1 diabetes has a variable rate of β cell distraction. Children and newborns showed rapid cell death, whereas adults showed gradual cell death. Compared to hyperglycemia, ketoacidosis was the initial sign of the illness in children and adolescents. Others had mild hyperglycemia when fasting, which quickly progresses to severe hyperglycemia and ketoacidosis. There is no known because for certain type 1 diabetics, who have persistent insulinopenia, are at risk for ketoacidosis, and show no signs of autoimmunity, all of which are characteristics of idiopathic diabetes. Multiple genetic predispositions and poorly defined environmental variables contribute to the autoimmune damage of diabetes. Additionally, these people are at risk for developing other autoimmune diseases (Mayorov et al., 2011).

1.3. Type 2 Diabetes

Insulin resistance and a relative lack of insulin production are characteristics of type 2 diabetes. The majority of people with type 2 diabetes are fat, and insulin resistance is a result of obesity. The exact aetiology of this kind of diabetes is unknown, and there is no indication of autoimmune distraction in the β cells. One of the factors contributing to the development of type 2 diabetes is an elevated proportion of body fat, which is mostly distributed in the abdominal area, in individuals who are not obese. Because hyperglycemia develops slowly and is typically recognized after additional issues have occurred, this kind of diabetes is often not diagnosed for a long time.Type 2 diabetes is more prevalent across all ethnic groups and has a strong hereditary component. Nevertheless, the disease's genetic makeup is more nuanced and unclear: The development of diabetes mellitus involves multiple interconnected physiological dysfunctions, which contribute to abnormal glucose metabolism. These key mechanisms include: a) Reduced Insulin Secretion: The β-cells of the islets of Langerhans in the pancreas produce insufficient amounts of insulin, leading to impaired glucose uptake by cells. b)

Excessive Glucagon Release: The α-cells of the pancreatic islets secrete an abnormally high amount of glucagon, promoting increased blood glucose levels. c) Enhanced Hepatic Glucose Production: The liver increases gluconeogenesis and glycogenolysis, resulting in elevated glucose release into the bloodstream. d) Neurotransmitter Imbalance and Insulin Resistance in the Brain: Disruption of brain neurotransmitter signaling reduces the body's ability to regulate glucose and contributes to insulin resistance. e) Increased Fat Breakdown (Lipolysis): Excessive lipolysis releases free fatty acids into the bloodstream, which further exacerbates insulin resistance. f) Elevated Renal Glucose Reabsorption: The kidneys increase the reabsorption of glucose, which prevents its excretion in urine, leading to higher blood glucose levels. g) Reduced Incretin Response: The small intestine shows a diminished incretin effect, thereby decreasing insulin secretion in response to meals. h) Impaired Glucose Uptake in Peripheral Tissues: Skeletal muscle, liver, and adipose tissue exhibit reduced glucose uptake due to insulin resistance, resulting in hyperglycemia (Ojha et al., 2019).

1.4. Plant Profile

1.4.1. Ethnobotanical description

A. nilotica L. is a perennial tree that grows to a height of 2.5–10 m. With dark to black stems, branches extend out to produce a thick, flat, or rounded crown. The bark is rich red-brown, tough, and cracked. In young trees, axillary pairs of thin, straight, light grey spines (thorns) typically measure 3–12 pairs and are 5–5.7 cm long. Pinnae are 2-11 pairs, with 7-25 pairs of leaflets per pinnae; leaves are bipinnate, 30-40 mm long, and frequently include 1-2 petiolar glands.

At the nodes of both leafy and leafless branchlets, peduncles gathered. Profusion of golden yellow flowers in globules with a diameter of 1.2 to 1.5 cm. Pods are 5–15 cm long on a pedicel, straight or slightly curved, and 0.5–1.2 cm broad. The constrictions between the seeds resemble a string of pearls, and when they are young and indehiscent, they are soft; when they mature, they become hard and black. The smooth, sub-circular, deep blackish-brown seeds have an areole that is 6-7 mm long and 4.5-5 mm diameter. The bark is thick and cracked, with a scattering of branches. The plant contains the sticky, orange-brown resinous material [11, 13-16].

1.4.2. Classification

Vernacular names

Bengal - Babla

English - Indiangum, Arabictree, Babultree

Hindi - Babula, Babura, Kirkar

Kananda - Karijali. Gobbli

Malayalam - Karivelan, karuvelum

Tamil - Karuvelamaram, Karivelei, Karuvael,

Telugú - Nallatumma, Tumma, Tuma

Acacia leucophloea willd Taxonomical Classification

Kingdom - Plantae

Phyllum -Tracheophyta

Class -Equisetopsida C. Agardh Order Fabales

Family -Fabaceae Genus Acacia

Species -Acacia leucophloea (Roxb.) Willd.

1.5. Medicinal properties of *A. nilotica* in traditional medicine

1.5.1. Extract of pods (Aqaqia): When the uterus and anus emerge, the pod extract helps to push them back and avoid leucorrhea [7, 11, 13, 15, 22]. Additionally, it helps with istarkha rehm, or vaginal laxity [7]. If applied topically, it tightens the perineum [13]. Redirecting the diseased stuff that is headed toward the organ is also beneficial [11]. Haemorrhagic diarrhea is prevented by it [7]. When combined with roghan gul (rose oil), it inhibits infantile diarrhea [10, 15]. When administered externally to the body, it results in dryness [13]. If applied topically to the skin in conjunction with gulab (rose), it stops sweat from smelling bad [11, 13].

When used orally or as an enema, it induces constipation [7, 13]. It helps with hemorrhagic diarrhea and intestinal abrasions [7, 11, 13]. It keeps the joints from becoming flabby [7]. Along with gulab and aas, it can be used externally to anus irritation [10]. It cures eye problems and improves and fortifies eyesight [7, 11, 15]. It relieves erysipelas and conjunctivitis and is also used in pterygium medications [7, 13, 15]. It stops hair loss and turns hair black [7, 11, 13, 15, 19]. It helps with cold-induced cracks and provides a clear complexion [7]. It is appropriate for those with dysentery and diarrhea [15]. All bleeding disorders can benefit from it [11, 13, 15]. When combined with gulab and aas, it lessens excessive perspiration [10, 11, 13, 16]. When used with egg white, it helps with fire burns, pimples, whitlow (paronychia), and heated swellings [7, 8, 13, 15, 16]. In the form of zaroor (powder), it helps with oral ulcers and

bleeding gums [7]. It helps with premature ejaculation and spermatorrhea [18, 19]. Bilious diarrhoea is prevented [11]. The powdered pods are beneficial in treating urogenital problems and impotence [23].

1.5.2. Flowers: It works well as a remedy for insanity and as a tonic for diarrhea and dysentery. It has been observed that the blooms lower body temperature [14]. Flowers and bark in powdered form are helpful for seminorrhea and early ejaculation [18].

1.5.3. Leaves: The leaves' decoction is used as an astringent for the intestines, to treat bronchitis, to mend fractures, and to treat eye conditions [14]. Children's injured eyes were treated with bruised leaves. Burnt leaf paste works well as an itch reliever [9]. Tender leaves mashed into a pulp are used as a wash for hemorrhagic ulcers and wounds, and as a gargle for spongy gums and sore throats [9].

. An astringent, leaves extract is injected to relieve the irritation of acute leucorrhea and gonorrhea. Additionally, damaged leaves that have been made into a poultice and applied on ulcers have astringent and stimulating properties [4]. When the tender leaves and growing tips are mixed into a paste with water and sugar and taken in the morning and evening, it acts as a cough-relieving demulcent [4]. When diarrhea occurs, the tender leaves that have been crushed into a pulp are used as an astringent [12].

1.5.4. Bark: The bark is a potent astringent with a high tannin content; its decoction is frequently used as a mouthwash and gargle for syphilitic and malignant conditions [4]. Bark infusion (1½ ounces to 1 pint water) is administered twice daily in amounts of 1½ to 2 ounces to those with diabetes mellitus and persistent diarrhea. When conjunctivitis occurs, the eye is irrigated with a mixture of milk and bark juice [4]. Bark decoction is frequently used as an astringent remedy for uterine prolapse, gonorrhea, cystitis, vaginitis, and leucorrhea [9].

1.5.5. Gum: When a fever is accompanied by diarrhea and dysentery, quinine and powdered gum might be helpful [4]. It also helps with diabetes [23] and eliminates bleeding as well as vaginal and urine discharges. In situations of fever that are worsened by diarrhea and dysentery, powdered gum combined with quinine is helpful; it is also administered to burns and scalds when combined with egg white [9].

1.5.6. Fruits: In cases of opthalmia and dysentery, the fruits are prescribed. [14].

1.5.7. Seeds: Seed extract was discovered to have overall bodily vigor [28].

1.5.8. Root: Root powder helps heal wounds, relieve burning sensations, and treat leucorrhea [30]. [31] Many plant components are used to treat leprosy, cholera, syphilis, earaches, hair

loss, and dysentery [23]. When the sensitive growing tips are rubbed into a paste with water and sugar, they have a demulcent effect and can help with coughing. [4]

1.6 Chemical constituents:

Stearic acid, kaempferol-3-glucoside, isoquercetin, and leucocyanidin are found in flowers, whereas 32% of tannin is found in leaves and fruits [27, 32]. Twenty percent of the bark is tannin. Several polyphenolic substances have been found and reported, including gallic acid, (+) dicatechin, quercetin, and ∞-amyrin and ß-sitosterol [9, 33]. [23, 32] Additionally, sucrose is present in the bark [2, 32]. Tannin is also present in babul pods, ranging from 12–19% in the whole pod to 18–27% after the seeds are removed. Gallic acid, m-digallic acid, (+) catechin, and robidandiol are among the polyphenols found in pods; other polyphenols include chlorogenic acid, m-digallic acid, and galloylated flavan-3-4-diol [4, 33].

L-arabinose, galactose, and moisture make up 1.8% of the gum. Four aldobiouronic acids and L-rhamnose. L-arabinose, 3-O-ß-L-arabinopyranosyl, and arabinose are also present [4, 32, 33]. In addition, it includes oxidative enzymes, calcium, polysaccharides, potassium, sugar, moisture, ash, magnesium salts, and malic acid [9, 32]. Chlorides are found in wood [5]. The following values (dry basis) were obtained from the seeds' analysis. Moisture 8.83, total ash 4.7, calcium 673.0, phosphorous 420.0, iron 4.95, niacin 3.17, ascorbic acid 4.51, thiamine 0.24 mg/100 ml, crude protein 26.5, fat 3.3, N-free extract 62.9, and crude fiber 2.7.

Histidine 3.7, lysine 4.3, methionine 0.4, cystine 0.49, leucine 8.8, valine 4.2, and threonine 3.39/16 g are the essential amino acid makeup of the seed protein. When seeds are extracted using petroleum ether, brownish oil (6.7%) is produced. Saturated acids make up 27.4%, oleic acid 30.5%, and linoleic acid 42.1% of the oil [27]. Both have 32% tannin [34], and gallic acid is also present in fruit [23]. Hentriacontane, lapachol, n-hentriacontanol, sitosterol, octacosanol, betulin, and ß-amyrin are all found in the root [30, 33]. Stearic acid, leucocyanidin, isoquercetin, and kaempferol-3 glucoside are all found in flowers [32].

1.7. Pharmacological Activity

1.7.1 Antihypertensive activity: A methanol extract of Acacia nilotica pods was found by Gilani et al. (1999) to have a reduction in arterial blood pressure at doses ranging from 3 to 30 mg/kg. Additionally, it inhibits force rate concentration in rabbits and guinea-pigs by blocking calcium channels [30]. According to Amos S. et al. (1999), the isolated guinea-pig ileum exhibits spasmogenic activity when exposed to an aqueous extract of Acacia nilotica seeds. An increase in calcium influx that causes muscular spasm might be the mechanism [36].

1.7.2 Antimutagenic activity: According to Arora S. et al. (2003), Acacia nilotica acetone extract shown antimutagenic action against sodium azide, the S9-dependent mutagen 2-aminofluorene (2AF), and direct acting NPD mutagens. The plate incorporation method is used to ascertain this mutagenic activity. Several strains of Salmonella typhimurium are used in the Ames Salmonella histidine reversion test [37].

1.7.3 Antibacterial activity: In a comparative analysis of the antimicrobial activity of Acacia species and A. nilotica, Mohan Lal Saini et al. (2008) found that the methanolic extract of the former showed the highest activity against Salmonella typhi, Staphylococcus aureus, and Escherichia coli (bacteria); Candida albicans and Aspergillus niger (fungus) [38].

A research by Deshpande SN (2013) on the ethanol and petroleum ether extract of Acacia nilotica stem bark revealed the highest antibacterial activity against Salmonella paratyphi B, Escherichia coli, Staphylococcus aureus, Proteus vulgaris, Proteus mirabilis, and Klebsiella pneumonia. The findings demonstrate that both extracts had an inhibitory effect on the aforementioned pathogens. However, the ethanol extract was more active than the comparable petroleum ether extract [39].

Using the agar diffusion technique, Banso A. (2009) demonstrated the antibacterial efficacy of the Acacia nilotica extracts against Shigella sonnei, Escherichia coli, Bacillus subtilis, Streptococcus viridians, and Staphylococcus aureus. Although Bacillus subtilis is the most vulnerable to the plant extract, this investigation demonstrates antibacterial action against all of the aforementioned species [41].

1.7.4 Antifungal activity: According to the findings of Mahesh B et al. (2008), the antifungal activity of Acacia nilotica methanolic and aqueous extracts ranges from 34.27±1.45 to 93.35±1.99 [42].

1.7.5 Antiviral activity: The plant's crude leaf extract demonstrated in vitro antiviral efficacy against the Turnip mosaic virus, according to Singh R et al. (1972). On the hosts Chenopodium amaranticolor (93.77%) and C. album (80.2%), the number of lesions decreased [43].

1.7.5 Antimicrobial activity: The antibacterial activity of methanolic and aqueous extracts of Terminalia chebula, Mimusops elengi, Achyranthes aspera, Acacia catechu, Acacia arabica, and Glycyrrhiza glabra was evaluated against six dental infection microorganisms, including Candida albicans, Lactobacillus acidophilus, Staphylococcus aureus, Staphylococcus mutans, Staphylococcus salivarius, Staphylococcus sanguis, Staphylococcus salivarius, Staphylococcus salivarius, Staphylococcus aureus, Staphylococcus aureus, and

Staphylococcus mutans. Synergistic antibacterial effects were demonstrated by these plants' phytochemical studies [44].

Khan R (2009) investigated the antimicrobial properties of crude ethanolic extracts of five plants against ATCC strains of Streptococcus mutans, Klebsiella pneumoniae, Candida albicans, and multidrug resistant (MDR) strains of Escherichia coli, as well as various microorganism stains. A. nilotica has a minimum inhibitory concentration range of 9.75-313ÂµÂg/ml [45]. Acacia nilotica has been shown to have antimicrobial action against S. aureus, B. subtilis, and E. coli by Mashram N et al. (2009). The leaf and bark extracts were most effective against E. Coli and had zones of inhibition ranging from 7.5–16 mm and 8–15.5 mm, respectively [46].

1.7.5 Antidiabetic (Hypoglycemic effect) activity: Wadood A et al (1989) examined the A. nilotica ssp. Normal rats given indica for a week showed a hypoglycemic effect (blood sugar decreased by 25.05%), however alloxanized diabetic rats showed no discernible hypoglycemic effect (blood sugar decreased by 2.14%). Legumes' direct or indirect stimulation of the islets of Langerhans' β-cells to secrete more insulin was the cause of their hypoglycemic effect [47].

1.7.6 Antioxidant activity: Agrawal S. (2010) investigated the antioxidant activity of a plant's methanolic extract, finding that it was 9.88 µg/ml [48]. According to Sultana B. (2007), several bark extracts from Acacia nilotica linn showed a range of 49% to 87% DPPH radical scavenging activity and a 44–90% suppression of linoleic acid oxidation [49].

Singh R. (2010) investigated the fractionation of methanol extract and extracted a fraction, AN-2, which was determined to be a coumarin derivative, or umbelliferone, using spectroscopic methods such as mass spectroscopy and NMR. The DPPH, site-specific and non-site-specific deoxyribose, chelating power, reducing power, and lipid peroxidation tests were among the antioxidative activities that were investigated and carried out in vitro. Umbelliferone's antioxidative action was shown to be dose dependent up to 100 µg/ml before leveling off without causing any further activity to rise. Umbelliferone's isolation and antioxidant capacity from A. Nilotica have never been documented before [50].

1.7.7 Antidiarrhoeal Activity: According to Agunua A. et al. (2005), they looked at the usage of medicinal plants—Acacia nilotica, Acanthospermum hispidum, Gmelina arborea, Parkia biglobosa, and Vitex doniana—in Kaduna State, Nigeria, for the treatment of diarrhea. The perfused isolated rabbit jejunum and castor oil-induced diarrhea in mice were the subjects of this investigation. Although this was not consistent across all plants, it was typically seen that the aqueous methanol extracts (0.5, 1.0, 2.0, and 3.0 mg/ml) had a dose-dependent reaction in the isolated rabbit jejunum. At low dosages (0.5, 1.0 mg/ml), Gmelina arborea and Vitex

doniana exhibited concentration-dependent relaxation; but, at higher doses (2.0, 3.0 mg/ml), they did not exhibit any discernible relaxation. Biphasic effects were seen in other extracts. For instance, 3.0 mg/ml of Acacia nilotica soon induced contraction after initial relaxation. Extracts of Acacia nilotica and Parkia biglobosa (100, 200 mg/kg) demonstrated 100% protection against castor oil-induced diarrhea, but Vitex doniana exhibited a dose-dependent effect. [51]

1.7.8 Antiplasmodial activity: The antiplasmodial activity of A. nilotica's aqueous root extract in mice was examined. Organization for Economic Cooperation and Development (OECD) guideline 423 was used to investigate the extract's acute toxicity. Chloroquine-sensitive Plasmodium berghei NK 65-infected mice were used to study the suppressive activity, curative, and preventive effects. There were five groups, each with five mice. Ten milliliters of distilled water per kilogram of body weight was given to group 1, which served as the control; 100, 200, and 400 milligrams of extract per kilogram of body weight were given to groups 2, 3, and 4, respectively; and five milligrams of chloroquine per kilogram of body weight was given to group 5.

Oral administration was used for the dosages. In the suppressive, curative, and preventive assays, the extract demonstrated considerable, dose-dependent chemo-suppressive action against the parasite at all dosages. This is similar to the group that received chloroquine treatment. In comparison to the untreated group, the extract also increased the average survival duration of the treated mice. In mice, the extract's oral median lethal dosage (LD_{50}) was 5000 mg/kg body weight. The study's findings demonstrated the anti-plasmodial efficacy and safety of Acacia nilotica's aqueous root extract [54].

CONCLUSION

Since ancient times, Acacia arabica has been used in traditional medicine to cure a variety of illnesses. Its antidiabetic, antihypertensive, antispasmodic, antibacterial, antifungal, antiplaque, antioxidant, antiplasmodic, antiviral, catalytic, and galactagogue properties have all been demonstrated in experimental research. The conventional medical system's assertions have been validated by scientific research. To make it a mainstream medication, more thorough clinical studies are required to investigate its therapeutic potential.

Actually, experimental research work have looked at a number of pharmacological characteristics, such as antioxidant, antidiabetic, and anti-inflammatory qualities. The species' abundance in secondary metabolites, including as terpenoids, polyphenols, and alkaloids, has also been shown in several investigations. These provide credence to its extensive use in

conventional medicine. However, it should be noted that there is a dearth of study on the fractionation and isolation of its constituent parts.

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