

Pharmacological Benefits of *Caesalpinia bonducella* L.

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Abstract: One member of the Caesalpinaceae family of medicinal plants is *Caesalpinia bonducella* L. The plant can be found throughout India. The bush is a big prickly one. It is well-liked in traditional medical systems such as Unani, Siddha, Homoeopathy, and Ayurveda. It has been regarded as a key treatment for a number of ailments in Indian traditional plant medicine. It has been stated that the plant possesses different components of the *C. bonducella* plant have antiviral, antimalarial, antifungal, antioxidant, anticancer, antipyretic, antifertility, and antimalarial properties, among others. After more research, it can be said that *C. bonducella* may turn out to be the greatest source of medication for a variety of illnesses in the future. Therefore, efforts have been made to gather and collate data regarding the customary applications of different *C. bonducella* sections in diverse infirmities, chemical components from different sections, and the successful application of different extracts in the treatment of distinct illnesses.

Keywords: Antioxidant activity, Antiviral activity, Antimalarial activity, Antidiabetic activity

I. INTRODUCTION

The greatest significant impact on people's health worldwide is made by herbal medicines. Understanding the specific ingredients in herbal remedies that work well for a range of conditions is necessary. Several confirmations demonstrate the importance of the medicinal herbs used in the various traditional frameworks [1]. Many medicinal plants are used to treat a variety of illnesses, including digestive problems, heart problems, metabolic problems, liver problems, renal problems, and central nervous system problems [2]. Phytochemicals are as necessary for plant assurance as they are for human health insurance against various diseases [3]. Only 5% of the 300,000 plant species found in the globe have been studied in experiments for potential medical use. Experts have observed that underdeveloped countries often use medicinal plants to treat illnesses, particularly in areas without access to hospitals [4]. *Caesalpinia bonducella* is ordered under the group of Caesalpinaceae. It is otherwise called *C. bonducella* Flem and *C. crista* Linn. Generally it is called Fever Nut, Bonduc Nut and Nicker Nut also [5]. *Caesalpinia bonducella* (roxb) is commonly used in the Indian traditional medical system, known as Ayurveda, for its antiperiodic, antipyretic, calming, anthelmintic, and antimalarial properties. It is also used for a variety of infections, including skin conditions, hydrocele, leprosy, spasms, orchitis, paralysis, and analogous nervous complaints. It is also said to possess antimicrobial, anticancer, antioxidant, and antidiabetic properties [6]. Six In Chinese traditional medicine, it is beneficial to set up the moisturizer for the treatment of agony-type cellulitis[7].

II. TRADITIONAL AND THE MODERN USES

The seed is useful in treating leprosy, colic, hydrocele, malaria, and skin ailments. It is also said to be styptic, laxative, and anthelmintic, and it fixes irritations. An external ointment for hydrocele and orchitis is supplied in Madras, Chennai, using ground seeds combined with castor oil [8][9][10][11]. In the treatment of hydrocele, the seeds are said to be explicit, febrifuge, anthelmintic, tonic, and antibleorrhagic. The seeds oil is applied to paralysis and convulsions. The beat seeds are considered vesicant in Guinea. When the powdered seeds were mixed with an equal amount of pepper powder and given to malaria patients, it was discovered that the seeds had only modest antiperiodic effects. They made no significant progress in malignant malaria. The seeds are pulverized in water and injected intraperitoneally. The seeds don't act as a counteragent for snake venom [12][13]. When consumed with honey, powdered seeds and long peppers have a strong expectorant effect. Alum-coated seeds and arecanut powder are good dentifrices that aid with gum boils, elastic gums, and other issues. The cooked seeds are used as anti-diabetic agents in the West Indies [8][14]. In every typical case of basic, preceded, and irregular fevers, the seed kernel is highly beneficial and significant. Adults take the kernel powder mixed with a small amount of dark pepper three times a day, while youngsters take it three times a day in a portion of 15–30 grains.

The Indian Pharmaceutical Codex 16 established the 15–18 grain portion of powder as authoritative. It is reported to cause excessive perspiration, which lowers fever. When combined with sugar and goat milk, kernel powder produces excellent outcomes for liver disorders [15]. Roasted kernel extract was used to treat asthma. Children incapable of digesting breast milk were given the kernel concentration or powder together with ginger, salt, and honey for a powerful stomachic effect. Keler paste helps reduce swelling from boils and other similar conditions. In situations of acute orchitis, ovaritis, and scrofula, a cake made of thirty powdered kernel grains fried in ghee and given twice daily provides a major remedy.

Root found in Madagascar and La Reunion; considered anthelmintic and febrifuge, the roots are mostly used as an astringent for leucorrhoea and blennorrhagia [8][10][11][14][16]. In Guinea, when a person has a fever, a root decoction is advised. The root bark can be used to treat malignancies and to remove the placenta during childbirth [12]. Numerous symptoms, including fever, intestinal worms, amenorrhoea, coughing, and anthelmintic properties, are associated with root bark. It is used locally to wounds and used as a rubefacient in Jamaica. Generally, liver problems, inflammation, and tumors are treated with leaves and twigs. They have also been applied to the management of toothaches. Squeezes and leaves have long been used to treat smallpox and elephantiasis [17].

III. PHARMACOLOGICAL ACTION

A. Antioxidant activity

The *C. bonducella* seed ethanolic concentrates had a high concentration of phenolic components and were ready to be used as reducing agents, free radical quenchers to stop the radical chain reaction, and repressive agents [18]. DPPH was used to confirm the ethanol leaf extract of *Caesalpinia bonduc*'s possible antioxidant activity. The findings show that the plant's cytotoxic properties could be enhanced by its antioxidant activity, which warrants further investigation [19]. *Caesalpinia bonducella* seed extract in chloroform demonstrates antioxidant action [20].

B. Anticancer activity

When *Caesalpinia bonducella* is compared to anti-cancer medications that have previously been approved, both the binding energy and the interactions with the proteins are very similar. Additionally, these phytochemical isolates have favorable ADMET features, suggesting that they can be considered safe and potentially turned into effective commercial anticancer medicines [21].

C. Antiviral Activity

The ethanolic extract of the stem and root showed anti-Vaccinia virus activity [22]. The leaf aqueous extract of *Caesalpinia* possesses anti-amyloidogenic capability. A study revealed that Latakaranj's aqueous extract may break down the prepared fibrils and prevent Abeta from aggregating from monomers and oligomers [23].

D. Antipyretic Activity

When rats were exposed to Brewer's yeast-induced pyrexia, the *Caesalpinia bonducella* seed kernel extract had a significant antipyretic effect. Its concentrate exhibited effective central pain relief action in the tail flick and hot plate techniques. The study concluded that there is considerable antipyretic and antinociceptive activity in the ethanolic extract of *Caesalpinia bonducella* seed kernel, which supports its use in the treatment of pain and pyretic illnesses [24]. *C. bonducella* seed oil is a good source of antipyretic agent [25].

E. Antifungal Activity

Aspergillus niger, *Fusarium oxysporum*, *Candida albicans*, and *Alternaria solani* are all susceptible to the high to moderate antifungal activity of the aqueous and ethyl acetic acid extracts of *C. bonducella* seeds. It suggests that *C. bonducella* may be able to manage significant fungal infections. A few bioactive compounds found in *C. bonducella* seeds, such as oils, saponins, sterols, glycosides, tannins, alkaloids, phenols, resins, and flavonoides, may be the cause [26].

F. Antifilarial Activity

In animal models, the seed portion of *C. bonducella* showed adequate levels of micro-, macro-, and female-sterilizing activity against *L. sigmodontis*, as well as micro-, and female-sterilizing viability against *B. malayi*. These results indicate that this plant may provide a lead for the development of new antifilarial tranquilizers [27].

G. Antimalarial Activity

Cold ethanol, aqueous and hot ethanol extracts of seeds of *Caesalpinia bonducella* showed 56%, 65% and 76% growth inhibition of *P. falciparum* respectively. It supports antimalarial activity of *C. bonducella* [28].

H. Neuroprotective Activity

In comparison to the usual medication (Vitamin E), the methanolic and aqueous extract of *Caesalpinia bonducella* (Roxb) has demonstrated considerably neuroprotective activity. Various extracts of *Caesalpinia bonducella* (Roxb) exhibit noteworthy antioxidant activity because of their potential multi-effects, including significant protection against oxidative damage. Its ability to inhibit lipid peroxidation and increase resistance to oxidative damage may be responsible for this protective effect [29].

I. Diuretic Activity

Urine output rose in a dose-dependent manner in both the *C. bonducella* aqueous and methanol concentrations. When compared to the methanol extract, the greatest increase in urine excretion for the aqueous concentration was 300 mg/kg. Research offers a numerical foundation for understanding the Moroccan population's customary usage of *C. bonducella* as a diuretic [30].

J. Antifertility Activity

The giving of a test medication Significant antiimplantation, anti-estrogenic, anti-abortion, and anti-ovulatory properties are exhibited by *Caesalpinia bonducella*. *Bonducella Caesalpinia* Linnaeus, Roxb. Root Bark (ERb) is an anti-fertility substance that can be used to induce sterility [31].

K. Hepatoprotective activity

With normal hepatic cords, no signs of necrosis, and less fatty infiltration, the animals treated with hydroalcoholic concentrate of *Caesalpinia bonducella* leaves showed liver security against the toxicant. Herbal hepatoprotective agents such as the hydroalcoholic extract are effective. The presence of phenolic and flavonoid chemicals in the leaf extract as secondary metabolites could be the plausible explanation for this activity [32]. The co-administration of CCl₄ and CB extract resulted in a considerable improvement in the condition by considerably lowering the levels of total protein, bilirubin, AST, ALT, and ALP in the curative and preventative groups, respectively. This demonstrates how well the CB keeps the hepatocellular components' structural and functional integrity. The histological results further suggest that in rats with liver cirrhosis generated by CCl₄, CB extract therapy can restore the liver architecture. CCl₄-induced fatty degeneration; CB treatment can stop or reverse liver necrosis and fibrosis [33].

L. Immunomodulatory activity

Strong immunostimulant *Caesalpinia bonducella* stimulates both innate and acquired immunity. The total WBC, RBC, hemoglobin, and platelet counts were all significantly increased by the administration of *Caesalpinia bonducella* ethanolic seed concentrate. Additionally, the myelosuppressive effects of cyclophosphamide were restored. [34] The percentage of neutrophil adherence to nylon fibers increased noticeably when the immunomodulatory potential of the *C. bonducella* seed ethanolic extract was evaluated. Because of its immunomodulatory properties, *C. bonducella* has potential benefits in preventing autoimmune diseases. [35] An examination of the aqueous concentrate of *C. bonducella* seeds on cell intervened and humoral immune system components in rats resulted in a change in delayed-type hypersensitivity and an increase in hemagglutinating antibody titer, suggesting that the concentrate may be a potential immunostimulatory agent [36]. A notable increase in the percentage of neutrophil adherence to nylon filaments was observed upon oral administration of the ethanolic seed concentrate of *Caesalpinia bonducella* (200–500 mg/kg) for the purpose of evaluating its immunomodulatory potential. It also showed that antibody titre levels increased in a dose-dependent manner. [37]

M. Anti-diabetic activity In rats with diabetes, glibenclamide and both polar concentrates (ethyl acetic acid and aqueous) showed good hypoglycaemic effects in addition to reversing the changes in lipid and liver glycogen levels caused by diabetes. As far as the non-polar concentrates were concerned, the ether extricate showed a slight antidiabetic effect, but the petroleum ether extract was unable to show any [38]. Watery, ethanol, and chloroform extracts had shown good protection and brought the blood glucose levels in the glucose tolerance test to normal. In diabetic rats given alloxan, the largest drop in blood glucose was observed after three hours at a dose level of 250 mg/kg of body weight. The level of assurance in the long-term treatment of diabetic rats induced by alloxan was assessed on days 0, 3, 5, 7, and 10 by measuring blood glucose, triglycerides, cholesterol, and urea levels [39].

Oral treatment of 300 mg/kg of *Caesalpinia bonducella* petroleum ether and ethanolic seed concentrates resulted in strong antihyperglycemic action as well as a marked reduction in BUN levels [40]. In mice with hyperglycemia, alloxan-induced diabetes, and normal blood glucose levels, the hydroalcoholic concentrate of *Caesalpinia bonducella* seed significantly reduced blood glucose levels [41]. *Caesalpinia bonducella* seed hydroethanolic concentrate showed that it lowered fasting blood glucose levels [42]. In diabetic rats, *Caesalpinia bonducella* leaf extracts significantly decreased plasma GOT (glutamic oxaloacetic transaminase), GPT (glutamic pyruvic transaminase), and LDH (lactate dehydrogenase) activities. This suggests that the hydroalcoholic extracts of *Caesalpinia bonducella* leaves may prevent diabetic-related hepatic injury [43].

IV. CONCLUSION

Based on numerous scientific studies, *Caesalpinia bonduc* is a plant with enormous biological potential. Numerous compounds found in the plant exhibit a broad range of pharmacological and therapeutic properties. To isolate and identify the various compounds found in the plant that will be employed for countless applications for human wellbeing in the near future, more investigation and assessment are required.

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