

# Anti-Inflammatory Activity on *C. Bonducella*

Miss. Shinde P. K, Korade S. N, Korade. P. S

JBVP's Vidya Niketan Collage of Pharmacy, Lakhewadi, Indapur, Pune, Maharashtra, India.

**Abstract:** *Caesalpinia bonducella L.* is a thorny species within the *Caesalpinaceae* family, native to tropical regions such as Sri Lanka, Kerala, and the Andaman and Nicobar Islands. Historically, its leaves and seeds have served as traditional remedies for multiple ailments owing to their fever-reducing, microbe-fighting, and blood-sugar-lowering characteristics. The present investigation evaluated an aqueous extract derived from the whole nut to identify phytochemical elements, specifically focusing on flavonoids, alkaloids, and phenols. To assess the extract's therapeutic potential, researchers conducted a series of laboratory experiments: Anti-inflammatory power via human red blood cell (HRBC) membrane stabilization Antidiabetic action through alpha-amylase enzyme inhibition Antioxidant capacity via DPPH free radical scavenging Antimitotic effects using a green gram growth restriction test Antimicrobial profile through agar disk diffusion Chemical analysis confirmed the presence of bioactive constituents, notably alkaloids, flavonoids, and saponins. These results confirm the biological efficacy of the complete *Caesalpinia bonducella L.* nut extract possesses significant antimitotic, antioxidant, antibacterial, anti-inflammatory, and antidiabetic properties.

**Keywords:** *Caesalpinia bonducella*; Bioactive compounds; Phytotherapy; In-vitro analysis

## I. INTRODUCTION

*Caesalpinia bonducella L.*, popularly referred to as the fever nut, nicker nut, or bonduc nut, is a member of the *Caesalpinaceae* family. This plant has a deep-rooted history in traditional healing, appearing in both ancient Ayurvedic texts and regional folklore (1-3). For instance, in the Malabar area, practitioners of Siddha medicine have long used it to treat skin conditions like psoriasis. This thorny, large shrub is native to South India, Sri Lanka, and Myanmar, typically found in coastal areas or at higher elevations in hilly terrain(4).

While various parts of the shrub offer health benefits, scientific research has focused heavily on its seeds and their outer shells (5-6). These components are rich in natural compounds; the shell and seeds contain an alkaloid called Natin, while the seeds hold a potent glycoside known as Bonducin, along with beneficial saponins and terpenoids(7). The outer shell contains natural oils, starch, sucrose, and plant sterols. It also has several fatty acids including stearic acid, palmitic acid, oleic acid, linocerac acid, linolenic acid, along with a blend of other low-molecular-weight unsaturated acids. The amount of protein and amino acids present ranges between approximately 7.43% and 25.35% (8).

These seeds are said to possess anti-diabetic effects. Type 2 diabetes is a long-term metabolic condition that impacts individuals of all age groups worldwide. The disease involves elevated blood sugar levels and can result from multiple factors. A key reason is reduced or insufficient insulin secretion. Managing Type 2 diabetes typically focuses on limiting the conversion of carbohydrates into glucose and blocking its absorption through the intestinal lining into the bloodstream. With India's rich availability of natural resources and the growing diabetic population, there is potential to develop new medicines or supportive treatments for controlling this condition (9). Inflammation is commonly linked to pain and leads to higher vascular permeability, greater protein denaturation, and changes in cell membranes. When tissue is damaged, the body initiates inflammation as a protective reaction, which shows up as redness, pain, heat, swelling, and reduced function in the affected region. Controlling diseases related to inflammation remains important, and plant-based extracts may offer a potential approach for treatment(10). Documented therapeutic attributes of this species include antioxidant (11), antifilarial (12), anticonvulsant (13), and antimicrobial benefits (14). In addition, it shows antimalarial (15), antitumor (16), anti-ulcer (17), immunomodulatory (18), and anticataract potential (19). Due to the growing prevalence of diabetes, inflammatory disorders, and cancer, alternative therapeutic approaches are



necessary to tackle these health concerns. Since research on the water extract of *Caesalpinia bonducella* L. shell and seed remains limited, we assessed its pharmacological characteristics(20).

**PLANT PROFILE:**



Fig 1: C.bonducella Fruit.



Fig 2: C.bonducella Plant.

Synonyms: *Caesalpinia bonduc*, *Guilandina bonducella*, *Guilandina bonduc*, and *Caesalpinia crista*.

Biological Source: The biological source of *Caesalpinia bonducella* is the entire large, prickly shrub. All parts of the plant, including the root, stem, leaves, and seeds, are recognized for their medicinal value.

Family: Fabaceae (or Caesalpinaceae).

Geographical Source: It is native to large parts of Africa, Asia, and the Americas.

**MORPHOLOGICAL FEATURES OF CAESALPINIA BONDUCELLA:**

Table 1:

| Parameters  | Caesalpinia bonducella leaf |
|-------------|-----------------------------|
| Colour      | Light brown                 |
| Shape       | Bipinnately compound leaves |
| Surface     | Glabrous and glossy         |
| Size        | 30 to 60 cm                 |
| Leaf length | 2.0 to 5.0 cm               |
| Leaf width  | 0.8 to 2.2 cm               |

**MACROSCOPIC CHARACTERISTICS:**

*C. bonducella* is a plant with grey branches. It also produces prickles that are yellow in color and have a hard and straight shape.



**Leaves:**

*C. bonducella* is a shrub with big leaves (30 to 60 centimeters long), which are very leafy and branched. The dorsal surface of the leaves is made up of thorny petioles. On the base of the leaf, there is decreased pinnae with elongated mucronate point and contains six to eight sets of pinnae along with a few stipulary spines (21).

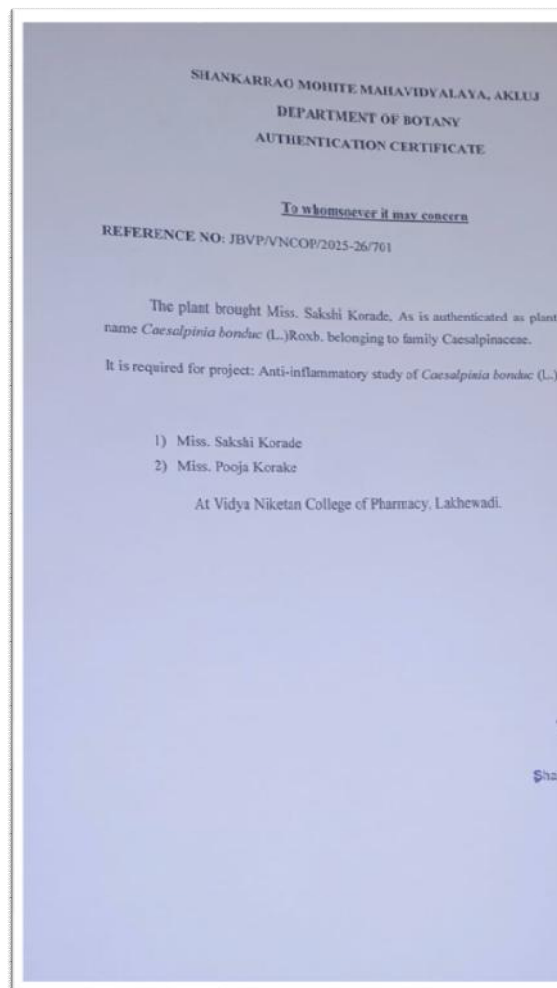
**Flowers:**

The flowers are found to be very dense with axillary racemes, which are thin at the base and thicker towards the tip. Flowers of the plant are typically of 15-25 centimeters long. In buds, there are short pedicles in the plant, and in blooms, they have a length of 5 millimeters, whereas in fruits, their length is about 8 millimeters (22).

**Seeds:**

They have very hard and dark brown colored seed coats and are flattened on one side due to compression caused by adjacent seeds. Seeds are spherical in shape, black-colored, and having vertical fissures. Dry kernels can easily be separated from the seed testa which is approximately 1 to 1.25 millimeters thick and is made up of three layers (23). It has hilum and micropyle that are closed to each other. Hilum surrounded by a faint area while the rest of the hilum is white-colored. The micropyle lies at the border of a faint area (24).

**Authentication:**



**MATERIALS AND METHODS:**

**Plant Material Collection and Sample Preparation:**

Freshly collected leaves of *C. bonducella* were acquired from a commercial supplier located at Pandharpur, Solapur, India. The collected plant material underwent drying under the shade prior to processing due to its significance for the retention of its phytochemical compounds. Once dried, the leaves were made into a powdered form through grinding and sieving.

**Preparation of Aqueous Leaf Extract:**

The preparation of aqueous extract was based on the method described by Shukla et al. (20). The extraction of the leaf extracts was done using a Soxhlet apparatus. After multiple extraction cycles, the extract was evaporated to get the final extract.

**EXTRACTION OF CAESALPINIA BONDUCELLA**



Fig 3: Extraction of *C. bonducella* in Soxhlet apparatus.



**PREPARATION OF EXTRACTION:**

The leaves of the plant were collected, cleaned, and dried. After that, they were ground into a fine powder using a grinding machine, after which the extraction process takes place and weighs the material obtained.



Fig 4. Extraction process of *C. bonducella* on Water bath.

**Pharmacological Activity:**

In vitro studies on the *Caesalpinia bonducella* plant extract:

Egg Albumin Denaturation method:

Protocol:

The reaction mixture was prepared in 5 mL volume containing 0.2 mL egg albumin powder, 2.8 mL phosphate buffered saline ( PBS, pH 6.4) and 2 mL different concentrations (100, 200, 300, 400 and 500 microgram/ ml) of the drug. The same amount of double distilled water was used as the control. Then both were incubated at 37°C for 15 minutes in BOD incubator and heated to 70°C for 5 minutes. Their absorbance was then measured at 660 nm by taking vehicle as the blank. Diclofenac sodium in concentrations of 100, 200, 300, 400 and 500 microgram/ ml was taken as the standard drug and its absorbance determined. Percentage inhibition was calculated by using the following formula:

% inhibition = 100 X [ Vt / Vc-1] Where,

Vt = absorbance of the test sample,

Vc= absorbance of control Each trial was done in triplicate and the average was taken.





Fig. 5. Standard Dilutions.

Table 2: Effect of against egg albumin denaturation C.bonducella V/S effect of aspirin albumin.

| Sr.No | Dilutions (mg/ml) | Concentrationn ( $\mu\text{g/ml}$ ) | % Inhibition of C.bonducella extract. | % Inhibition of Aspirin extract. |
|-------|-------------------|-------------------------------------|---------------------------------------|----------------------------------|
| 1.    | 0.5               | 100 ( $\mu\text{g/ml}$ )            | 25.67                                 | 29.03                            |
| 2.    | 1.0               | 200 ( $\mu\text{g/ml}$ )            | 45.71                                 | 45.16                            |
| 3.    | 1.5               | 300 ( $\mu\text{g/ml}$ )            | 60.07                                 | 61.29                            |
| 4.    | 2.0               | 400 ( $\mu\text{g/ml}$ )            | 73.26                                 | 93.54                            |
| 5.    | 2.5               | 500 ( $\mu\text{g/ml}$ )            | 84.51                                 | 158.06                           |





Fig 6: UV Visible Spectroscopy.

**Result:**

The aqueous extract of *Caesalpinia bonducella* exhibited significant biological activity in multiple in-vitro experiments. Phytochemical analysis confirmed the presence of bioactive compounds like alkaloids, flavonoids, phenols, and saponins. The extract showed considerable anti-inflammatory effects by stabilizing human red blood cell membranes, antioxidant properties through the DPPH free radical scavenging test, antidiabetic activity by inhibiting alpha-amylase, antimicrobial effects using the agar disc diffusion method, and antimitotic properties as observed in tests involving green gram growth inhibition. These results suggest that the whole nut extract has strong therapeutic potential and supports its traditional use in medicine.

**II. CONCLUSION**

This study concludes that the aqueous extract of *Caesalpinia bonducella* contains various pharmacologically active phytochemicals that contribute to its anti-inflammatory, antioxidant, antidiabetic, antimicrobial, and antimitotic effects. The observed biological activities support the traditional use of the plant in herbal medicine and indicate its potential as a source for developing new therapeutic agents. Further research, such as isolating the active components and conducting clinical trials, is recommended to confirm its safety, effectiveness, and underlying mechanisms of action.

**REFERENCES**

1. Manikandaselvi S, Vadivel V, Brindha P. *Caesalpinia bonducella* L. A nutraceutical plant. *Journal of Chemical and Pharmaceutical Research*. 2015;7(12):137-42.
2. Kannur DM, Paranjpe MP, Sonavane LV, Dongre PP, Khandelwal KR. Evaluation of *Caesalpinia bonducella* seed coat extract for anti-inflammatory and analgesic. *J Adv Pharm Technol Res*. 2012;3(3):171-5.
3. Khare CP. *Indian Medicinal Plants: An Illustrated Dictionary*. New York: Springer Science+ Business Media. 2007;107-8.



4. The Wealth of India: A Dictionary of Indian Raw Materials and Industrial Products; Raw Materials and Industrial Products, Part II. In "C." B. N. Sastri. New Delhi, India: Council of Scientific and Industrial Research. 1950;2:1951.
5. Ghatak NG. Chemical examination of kernels of the seeds of *Caesalpinia bonducella*. Proc Indian Acad Sci. 1934;4:141.
6. Iyenger MA, Pendse GS. Anti-diarrheal activity of the nuts of *Caesalpinia bonducella* Fiem. Indian J Phar. 1965;27:307.
7. Tummin KMC. Chemical examination of seeds of *Caesalpinia bonducella* Fiem.
8. J Indian Chem Soc. 1930;7:207.
9. Chopra RN, Chopra IC, Verma BS. Supplement to Glossary of Indian Medicinal Plants, Publication and Information Directorate (CSIR), New Delhi. 1969.
10. Vedavyasa S, Ahamad RN. Antihyperlipidemic Effect of Alcoholic Seed Extract of *Caesalpinia Bonduc* In Alloxan Induced Diabetic Male Albino Rats. International Journal of Diabetic and Endocrinology. 2015;4(1):1-9.
11. Shukla S, Mehata A, Mehata P, Vyas SP, Shukla S, Bajpai VK. Studies on antiinflammatory, antipyretic and analgesic properties of *Caesalpinia bonducella* F. seed oil in experimental animal models. Food and Chemical Toxicology.2012;48(1):61-4.
12. Sachan NK, Verma S, Sachan AK, Hussain A. An investigation of antioxidant activity of *Caesalpinia bonducella* seeds. Annals of Pharmacy and Pharmacological Sciences. 2010;1(2):88-91.
13. Gaur RL, Sahoo MK, Dixit S, Fatma N, Rastogi S, Kulshreshtha DK, et al. Antifilarial activity of *Caesalpinia bonducella* against experimental filarial infection. Indian Journal of Medical Research. 2008;128(1):65-70.
14. Ali A, Venkat Rao N, ShalamM, Shivaraj GT, Shantakumar SM. Anticonvulsive effect of seed extract of *Caesalpinia bonducella*. Iranian Journal of Pharmacology and Therapeutics. 2009;8(2):51-5.
15. Billah MM, Islam R, Khatun H, Parvin S, Islam E, Islam SA, et al. Antibacterial antidiarrhoeal and cytotoxic activities of methanol extract and its fractions of *Caesalpinia bonducella* (L) Roxb leaves. The Official Journal of the International Society for Complementary Medicine Research. 2013;13(1):101
16. Irshad S, Mehata A, Mehata P. Antimalarial activity of three Pakistan medicinal plants. Pakistan Journal of Pharmaceuticals Sciences. 2011;24(4):589-91.
17. Gupta M, Mazumder UK, Kumar RS, Sivakumar T, Vamsi ML. Anti-tumor activity and antioxidant status of *Caesalpinia bonducella* against Ehrlich ascites carcinoma 2in Swiss albino mice. Journal of Pharmacological Science. 2004;94(2):177-84.
18. Ansari JA, Ahmad S, Jameel M. Effect of *Caesalpinia bonducella* L. on ulcer and gastric secretions in pylorus legated rat model. Journal of Drug Delivery and Therapeutics. 2012;2:102-4.
19. Shukla S, Mehta A, John J, Mehta P, Vyas SP, Shukla S. Studies on immunomodulatory activities of ethanolic extract of *Caesalpinia bonducella* seeds. Journal of Ethnopharmacology. 2009;125(2):252-6.
20. Kurmi P, Konwar M, Das S. In vitro anticataract activity of ethanolic extract of seed kernel of *Caesalpinia bonduc* on goat. Pharma Science Monitor. 2015;6(1):244-53.
21. Gogoi S, Yadav AK. In vitro and in vivo anthelmintic effects of *Caesalpinia bonducella* (L.) Roxb. leaf extract on *Hymenolepis diminuta* and *Syphacia obvelata*. Journal of Intercultural Ethnopharmacology. 5(4), 2016, 427-433.
22. Khandagale P, Abhijeet V, Yunus PN, Ansari and Patil R. Pharmacognostic, physicochemical and phytochemical investigation of *Caesalpinia bonducella* [L.] roxb. Seed. International Journal of Pharmacy and Biological Sciences. 8(34), 2018, 461-468.
23. Vikhe S and Nirmal S. Evaluation isolation and characterization of chemical constituents from *C. bonducella* L. seed. Pravara Journal of Science & Technology. 1(1), 2017.
24. Kokate C.K., Practical Pharmacognosy, 4th edition, Vallabh Prakashan, Delhi,1997, 107 - 111

