**Review on Caesalpinia bonducella**

Monika, Shikhar Verma*, Vivek Srivastava, Prakash Deep  
Assistant Professor, Department of Pharmacognosy, Amity Institute of Pharmacy, Amity University, Lucknow Campus, India.  
*Corresponding author’s E-mail: sverma1@lko.amity.edu

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**ABSTRACT**

*Caesalpinia bonducella* L. is a medicinal plant belonging to the family caesalpiniaceae. It is a prickly shrub widely distributed all over the world especially in Indian tropical regions such as Kerala, Andaman and Nicobar Islands and Sri Lanka. Plants are the mother of all medicines. Nature has bestowed upon us an in exhaustible treasure of miracles that can heal and restore the balance caused by various anomalies that assault the human body. Man has learned from nature and tried to mimic its elements to re-establish the harmony in the ailing body. The practice of use of plants to alleviate pain and suffering incurred by various disorders and to accentuate health can be evidenced from various manuscripts through ages since the dawn of civilization and even beyond the time of inception of hieroglyphics. The plant *C. bonducella* grows avidly in a warm tropical climate and is found with high propensity throughout India. It is an evergreen plant with deep roots, woody-hard stem, oval-shaped, compound elliptical glossy leaves arranged alternately on either side of the branch. The plant bears dicotyledonous seeds with a characteristic odor. Various parts of the plant are loaded with various psychochemicals that have the potential to defeat a more than enough of anomalies like hyperlipidemia, spasms, immunomodulation, etc. to name a few. But this natural wonder drug is slowly slipping into the darkness of extinction due to a prolonged period of seed dormancy. The decreasing demography of the plant is due to the protracted period of dormancy of its seed coupled with overutilization of the plant parts for medicinal purposes and destruction of its habitat.

**Keywords:** *Caesalpinia bonducella*, physicochemical properties, chemical constituent, pharmacological studies, seeds.

**INTRODUCTION**

*Caesalpinia bonducella* L. plant (fig.1) is also known as “fever nut”, belongs to family caesalpiniaceae.1-3  
*C. bonducella* is a huge thorny shrub known to be a local of South India, Burma and Ceylon, especially along the ocean drift and up to 2500 ft. in hilly regions.4 *C. bonducella* used as a herbal medicine derived from Kingdom: Plantae, Order: Febales, Family: Caesalpiniacaeae, Genus: Caesalpinia, Species: *C. bonducella*; Part used: Seeds (Fig.2) of *C. bonducella* commonly known as Kakachika, Karanja. It is accounted in this literature that most parts of the plant has therapeutic properties, however, much has been studied with the seed and shell. The alkaloids in *C. bonducella* are known to be found in shell, seed and twigs. The active molecule bonducin is present in the seed as an incredible glycoside also saponins and terpenoids are additionally known to be found in seed.5

The seeds are reported to have anti-diabetic properties. The abundance of regular assets in India also, the rising number of diabetes patients will make ready for more up to date medication/subordinate treatments to deal with the disorder.6 Inflammation is regularly related with pain and includes the expansion of vascular penetrability, increment of protein denaturation and film modification. At the point when the cell undergoes damage, irritation of tissue turns into a guarded reaction described by redness, pain, heat, swelling and loss of capacity in the harmed territory. The shrub holding key to the treatment of many incurable or unmanageable ailments is at the verge of extinction due to a prolonged period of seed dormancy, overutilization of the plant parts for medicinal use and destruction of its natural habitat.

The shell is known to contain starch, fatty oil, sucrose, phytosterols, stearic, palmitic, oleic, linoceric, linolenic and a mixture of unsaturated acid. The protein and amino acid substance fluctuates.7 The administration of aggravation related sicknesses is of concern and may must be tended to utilizing plant extracts.8 Phytochemical analysis of powdered leaves of *C. bonducella* was carried out using extraction method.9 Lotion prepared from the plant extract has also been iterated in traditional Chinese medicine to be useful in the treatment of cellulitis. In spite of having such potential to be a cornerstone for the treatment and management of a plethora of disorders, the precious plant has been overlooked by the scientific community, populace, policymakers, and bureaucracy.

The plant is also known to possess antioxidant,10 antifilarial activity,11 anti-convulsive activity 12 and anti-microbial activity,13 antimalarial activity,14 antitumor activity15 anti-ulcer activity,16 immunomodulator activity17 and Anticataract activity.18

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TAXONOMIC CLASSIFICATION

Kingdom : Plantae
Phylum : Magnoliophyta
Division : Magnoliopsida
Class : Angiospermae
Order : Fabales
Family : Fabaceae / Caesalpiniaceae
Genus : Caesalpinia
Species : bonducella

Vernacular Name
The plant of significance, *C. bonducella*, is pronounced by different names by natives across the globe. In Hindi, the plant is known to be sagar gota, in English fever nut, bonducella nut and nicker nut, in Sanskrit valli, in Urdu akitmakit, in Bengali nata, in French bois and so forth.

Macrosopic Characteristics
The plant, *C. bonducella* has dark grey branches it also bears prickles, which are yellow in color, hard and straight.

Leaves
The shrub, *C. bonducella* has large sized leaves (30 to 60 centimeters long), which are very leafy and branched. The dorsal side of the leaf bears thorny petioles. The base of the leaf shows decreased pinnae with elongated mucronate point and has six to eight sets of pinnae with a couple of stipulary-spines.

Flowers
The plant exhibits very dense blooms, which are thin at the base and thick at the top with axillary racemes. The blossoms of the plant are generally 15 to 25 centimeters in length. The plant bears short pedicles in buds, which are nearly 5 millimeters in blooms and around 8 millimeters in fruits.

Seeds
The seeds, which are hard coated, are greenish or grey in color and are slightly compressed on one side because of close squeezing of adjacent seed. Seeds are round, black and marked with vertical cracks. Kernels of dry seeds are found to be disconnected from the testa, which is around 1 to 1.25 millimeters thick and comprises of three layers.

It shows hilum and micropyle shut to one another. Hilum enveloped by a dim region ordinarily with a whitish remainder to funicle. Micropyle is near the edges of a dim district. It contains a seeds coat that is dim greenish to grayish and fairly dim pale blue in nature.

Microscopic Characteristics

Seeds
On microscopically evaluation the seeds of the plant *C. bonducella* displayed many layers made up of vertical, columnar luminal cells. Cells of columnar palisade have powdery characteristics and cells of parenchyma are dark in color with thick bone molded walls and grains of starch loaded inside cells.

Traditional and Modern Uses
*C. bonducella* has been indicated in many diseases by aboriginal people around the world. The seeds have been used as a styptic and to treat conditions such as helminthiasis, colic pain, malaria, hydrocele, skin disorders, and inflammation. In Madras (Chennai) an ointment made from the powdered seeds of the pant in castor oil can effectively mitigate the symptoms of hydrocele and orchitis on external application. The oil obtained from the seeds of the plant has also been found to control bouts of convulsions and paralysis. In Guinea, the pounded seeds of the shrub are used as a vesicant. The powdered seeds when mixed with an equal part of pepper powder and given to malarial patients were found to possess feeble antiperiodic properties. But, was unable to appease the symptoms of malignant malaria.
A paste of the ground seeds in water, when given internally, has been found to be quite effective in cases of snake venom. Seeds of the plant, when crushed and powdered along with long pepper and taken with honey, has been found to act as a potential expectorant. In the West Indies, the roasted seeds have been used by the natives to treat the symptoms of diabetes. Powder of the kernel of the seed along with equal parts of black pepper when taken thrice a day in a dose of 15-30 grains for adults and 3-4 grains. For children, has been found to be very useful in all cases of simple, continued and intermittent fevers. Leaves and twigs of the plant have been used traditionally to treat tumors, inflammation, liver disorders and toothache. Leaves and juices of the climber have been used traditionally to alleviate conditions such as elephantiasis and smallpox. 29

Standardization Parameters

For the standardization parameters of *C. bonducella* followed by taste, colour, odour, LOD, total ash value, acid insoluble, water in soluble, sulphated ash, extractive value in hexane, foreign matter, extractive value in ethanol, extractive value in water, sulphatable ash, extractive value in chloroform see table 1. 31, 32, 33

**Table 1:** Physicochemical properties of *C. bonducella*

<table>
<thead>
<tr>
<th>S.N. O.</th>
<th>Parameters</th>
<th>Physicochemical properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Taste</td>
<td>Astringent</td>
</tr>
<tr>
<td>2</td>
<td>Colour</td>
<td>Light brown</td>
</tr>
<tr>
<td>3</td>
<td>Odour</td>
<td>Characteristic odour</td>
</tr>
<tr>
<td>4</td>
<td>Foreign matter (%)</td>
<td>0.979</td>
</tr>
<tr>
<td>5</td>
<td>Loss on drying (%)</td>
<td>8.83</td>
</tr>
<tr>
<td>6</td>
<td>Tot ash (%)</td>
<td>3.37</td>
</tr>
<tr>
<td>7</td>
<td>Acid insoluble ash (%)</td>
<td>0.49</td>
</tr>
<tr>
<td>8</td>
<td>Water soluble (%)</td>
<td>1.69</td>
</tr>
<tr>
<td>9</td>
<td>Sulphated ash (%)</td>
<td>4.37</td>
</tr>
<tr>
<td>10</td>
<td>Solubility in alcohol (%)</td>
<td>26.8</td>
</tr>
<tr>
<td>11</td>
<td>Extractive value in hexane (%)</td>
<td>4.3</td>
</tr>
<tr>
<td>12</td>
<td>Extractive value in chloroform (%)</td>
<td>2.58</td>
</tr>
<tr>
<td>13</td>
<td>Extractive value in ethyl acetate (%)</td>
<td>0.92</td>
</tr>
<tr>
<td>14</td>
<td>Extractive value in ethanol (%)</td>
<td>2.92</td>
</tr>
<tr>
<td>15</td>
<td>Extractive value in water (%)</td>
<td>6.7</td>
</tr>
</tbody>
</table>

**Phytochemistry**

Various parts of the plant, *C. bonducella* such as leaves, twigs, fruits, and stem were found to be rich in diverse alkaloids. 33 Though various parts of the plant contain lots of phytochemicals, the kernels of seeds have been studied elaborately. Many reports suggest the presence of some alkaloids, particularly natin in the plant. 34 But the result was not decisive with a degree of ambiguity. Bonducin was the first non-alkaloidal phytochemical to be found in the seeds of the plant, which is a sulfur-containing compound and is a glycoside. 35 The chemical structure of bonducin has been recently deciphered. Seeds of the plant was found to be rich in saponin and many enzymes such as urease, amylase, peroxidase, catalase, and protease. Twigs of the plant was found to be enriched with steroidal saponin. 36, 37

**Roots**

The shrub showed the presence of furanodi terpene of cassane and caesalpinina. The roots also showed the presence of Bonducellpins A, B, C, D and diosgenin. 38, 39, 40 The ethanolic extract of the bark of the climber revealed the presence of two new homo-isoflavonoids and five more natural products.

**Leaves**

*C. bonducella* leaves showed the presence of glucose, minerals such as phosphorous and calcium and pinitol. The leaves also exhibited the presence of phytochemicals brazilin and bonducin. 41, 42

**Chemical component**

Several valuable phytochemicals have been elicited from different parts of this plant such as the seeds have been found to contain neutral saponin, terpenoids, caesalpin, β-caesalpin, and α- caesalpin, seed Kernels are found to contain phyto steroids- sitosterol, heptocosane noncrystalline, bitter glycoside, bonducin, neutral saponin, leaves are found to have pinitol, glucose, calcium, brazillin, bark reveals the presence of homoisoflavanoids, 6-Omethylcaesalpinianone, and caesalpinianone, roots elaborate cassane furanoditerpene, caesalpinin, bonducellpins A, B, C , D, and diosgenin see table 2. 43, 44, 45

**Table 2:** Chemical component of *C. bonducella*

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Parts</th>
<th>Chemical constituent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Seed Kernel</td>
<td>Phytosterols- sitosterol, heptocosane noncrystalline, bitter glycoside, bonducin, neutral saponin</td>
</tr>
<tr>
<td>2.</td>
<td>Seed</td>
<td>Neutral saponin, terpenoids, caesalpin, β-caesalpin and α- caesalpin</td>
</tr>
<tr>
<td>3.</td>
<td>Leave</td>
<td>Pinitol, glucose, calcium, brazzilin</td>
</tr>
<tr>
<td>4.</td>
<td>Bark</td>
<td>Homoisoflavanoids, 6-Omethylcaesalpinianone, and caesalpinianone</td>
</tr>
<tr>
<td>5.</td>
<td>Root</td>
<td>Cassane furanoditerpene, caesalpinin, bonducellpins A, B, C , D, and diosgenin</td>
</tr>
</tbody>
</table>
Recent Pharmacological Studies

The presence of an array of phytochemicals in various parts of the plant prompted many pharmaceutical studies. But the plant still remains under-investigated and under-documented. More rigorous scientific investigations could reveal a deluge of unexplored phytochemicals with immense potential to harbingers new avenues and approaches in the field of clinical therapeutics. Various scientific texts have depicted different parts of the plant to possess significant properties see table 3.

Table 3: Recent pharmacological studies of seeds, leaves and flowers

<table>
<thead>
<tr>
<th>S.NO.</th>
<th>Plant part</th>
<th>Uses</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Seeds</td>
<td>Anti-inflammatory</td>
<td>47</td>
</tr>
<tr>
<td>2</td>
<td>Seeds</td>
<td>Antimicrobial</td>
<td>48</td>
</tr>
<tr>
<td>3</td>
<td>All parts</td>
<td>Immunomodulator</td>
<td>49</td>
</tr>
<tr>
<td>4</td>
<td>Seeds</td>
<td>Hypoglycemic and antidiabetic</td>
<td>50</td>
</tr>
<tr>
<td>5</td>
<td>Flowers</td>
<td>Analgesic</td>
<td>51</td>
</tr>
<tr>
<td>6</td>
<td>Leaves</td>
<td>Antioxidative stress</td>
<td>52</td>
</tr>
<tr>
<td>7</td>
<td>Seeds</td>
<td>Antidepressant</td>
<td>53</td>
</tr>
<tr>
<td>8</td>
<td>Seeds</td>
<td>Antipyretic</td>
<td>54</td>
</tr>
<tr>
<td>9</td>
<td>Seeds</td>
<td>Antiasthamatic</td>
<td>55</td>
</tr>
<tr>
<td>10</td>
<td>Leaves</td>
<td>Hepatoprotective</td>
<td>56</td>
</tr>
<tr>
<td>11</td>
<td>Young twigs and leaves</td>
<td>Anticancer</td>
<td>57</td>
</tr>
<tr>
<td>12</td>
<td>Leaves</td>
<td>Antifeedant</td>
<td>58</td>
</tr>
<tr>
<td>13</td>
<td>Seeds</td>
<td>Antidiabetic</td>
<td>59</td>
</tr>
<tr>
<td>14</td>
<td>Seeds</td>
<td>Antibacterial and cytotoxic effects</td>
<td>60</td>
</tr>
<tr>
<td>15</td>
<td>Leaves</td>
<td>Nephroprotective</td>
<td>61</td>
</tr>
<tr>
<td>16</td>
<td>Seeds</td>
<td>Hypolipidemic</td>
<td>62</td>
</tr>
<tr>
<td>17</td>
<td>Seeds</td>
<td>Antiallergic and antihistaminic actions</td>
<td>63</td>
</tr>
<tr>
<td>18</td>
<td>Seeds</td>
<td>Antifertility</td>
<td>64</td>
</tr>
<tr>
<td>19</td>
<td>Leaves</td>
<td>Antiproliferative and pro-apoptotic</td>
<td>65</td>
</tr>
<tr>
<td>20</td>
<td>Leaves</td>
<td>Anthelmintic</td>
<td>66</td>
</tr>
<tr>
<td>21</td>
<td>Seeds</td>
<td>Antiulcer</td>
<td>67</td>
</tr>
<tr>
<td>22</td>
<td>Seeds</td>
<td>Antimycobacterial Activity</td>
<td>68</td>
</tr>
<tr>
<td>23</td>
<td>Seeds</td>
<td>Anticataract</td>
<td>69</td>
</tr>
<tr>
<td>24</td>
<td>Leaves</td>
<td>Antidiarrhoeal</td>
<td>70</td>
</tr>
<tr>
<td>25</td>
<td>Seeds</td>
<td>Antifilaria</td>
<td>71</td>
</tr>
<tr>
<td>26</td>
<td>Leaves</td>
<td>Muscle contractile activity</td>
<td>72</td>
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<tr>
<td>27</td>
<td>Leaves</td>
<td>Antifungal and Antispasmodic</td>
<td>73</td>
</tr>
<tr>
<td>28</td>
<td>Seeds</td>
<td>Antiestrogenic activity</td>
<td>74</td>
</tr>
<tr>
<td>29</td>
<td>Seeds</td>
<td>Antidiuretic</td>
<td>75</td>
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<tr>
<td>30</td>
<td>Leaves</td>
<td>Antitumor</td>
<td>76</td>
</tr>
<tr>
<td>31</td>
<td>Seeds</td>
<td>Anxiolytic</td>
<td>77</td>
</tr>
<tr>
<td>32</td>
<td>Seeds</td>
<td>anticonvulsant</td>
<td>78</td>
</tr>
</tbody>
</table>
CONCLUSION

*C. bonducella* is widely distributed an evergreen, deep-rooted shrub with a hard and woody stem. Leaf of this plant is ovate shaped, compound elliptical with a glossy surface and arranged alternately on either side of the branches. Several valuable phytochemicals have been elicited from different parts of this plant such as the seeds have been found to contain neutral saponin, terpenoids, caesalpin, β-caesalpin, and α-caesalpin, seed Kernels are found to contain phytosterols- sitosterol, heptacosane noncrystalline, bitter glycoside, bonducin, neutral saponin, leaves are found to have pinitol, glucose, calcium, brazzillin, bark reveals the presence of homoisoflavonoids, 6-OMethylcaesalpinianone, and caesalpinianone, roots elaborate cassane furanoditerpene, caesalpinin, bonducelmins A, B, C, D, and diosgenin. These potent and sui generis phytochemicals show diverse pharmacological properties.

The review has reiterated the fact that different parts of *C. bonducella* contain a number of active metabolites which have the potential to treat a number of ailments. It has also been observed that different parts of the plant show different pharmacological activities owing to the presence of unique bioactive metabolites. But further scientific research and documentation are required to explore all possibilities and prospects the rich plant has to offer.

The data of recent research on pharmacological study has been compiled in this review. The seeds, bark and roots of the plant showed antidiabetic, antioxidant, anti-inflammatory, antiperspirant and analgesic activity. The flowers of *C. bonducella* possess analgesic activity. The seed kernels of *C. bonducella* possess antimalarial activity and the leaves of *C. bonducella* possess anti-tumour, antiallergic, antifungal activity. Although the plant is medicinally rich due to the abundance of potent phytochemicals still there is scope for further research. This wild plant is rich with medicinal importance biomarker compounds and proven with further research. This wild plant is rich with medicinal abundance of potent phytochemicals still there is scope for different pharmacological activities owing to the presence of unique bioactive metabolites. But further scientific research and documentation are required to explore all possibilities and prospects the rich plant has to offer.

REFERENCES

10. Shukla S, Mehta A, Mehta 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. 48(1), 2012, 61-64.
22. Khandagale P, Abhijeet V, Yunus PN, Ansari and Patil R. Pharmacognostic, physicochemical and phytochemical


40. Ghatak NG. Chemical examination of kernels of the seeds of Caesalpinia bonducella. Ind Aca of Sci. 4, 1934, 141.


42. Gogoi S and Yadav AK. In vitro and in vivo anthelmintic effects of Caesalpinia bonducella (L.) Roxb. leaf extract on hemoepileps diminuta (Cestoda) and Syphacia obvelata (Nematoda). J of Inter Ethno. 5(4), 2016, 427-433.


73. Khan, Ullah H., Ali, Khan I, Ullah A, Naz R and Gilani and Hassan A. Antibacterial, antifungal, and Ca antagonist effects of Caesalpinia bonducella, Natural Product Research. 25(4), 2019, 444-449.


