

Pharmacognostic, Physicochemical and Phytochemical Investigation of Root Bark of *Caesalpinia bonducella*

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Received: 19th Oct, 16; Revised: 5th Nov, 16; Accepted: 12th Dec, 16; Available Online: 15th January, 2017

ABSTRACT

Objective: To evaluate pharmacognostic, physicochemical and preliminary phytochemical of investigation of root bark of *Caesalpinia bonducella*. Methods: The present work embodies the investigations of pharmacognostic standards including macroscopic study, powder analysis and histochemical test along with physico chemical parameter study, fluorescence analysis, qualitative and quantitative chemical assay carried out as per methods recommended by the World Health Organization and standard laboratory procedures. The study will provide referential information for the correct identification of the crude-drug. Result: The detailed microscopy revealed the presence of cork, cortex, stone cell medullary ray's calcium oxalate crystal, starch grains, presence of tannins and alkaloids. Preliminary phytochemical screening of these plant materials revealed that presence of alkaloids, saponins, flavonoids, steroids, phytosterols and carbohydrates in aqueous and ethanol extracts. Conclusion: Thus, it was thought worthwhile to explore this plant on the basis of its standardization parameters. The study will provide referential information for the correct Identification of the crude-drug.

Keywords: *Caesalpinia bonducella*, pharmacognostic, physicochemical, preliminary phytochemical.

INTRODUCTION

Caesalpinia bonducella (L.) Flem. Fever nut; bonduc nut (Family: Caesalpinaceae) commonly known as Nata Karanja (Hindi), is a prickly shrub found throughout the hotter regions of India, Myanmar and Sri Lanka and is an important drug in traditional medicine like Ayurveda, Siddha, Unani and Homoeopathy¹.

All parts of the plant have medicinal properties so it is a very valuable medicinal plant which is utilized in traditional system of medicine. The plant has been reported to possess anxiolytic, antinociceptive, antidiarrhoeal, antidiabetic², adaptogenic, anthelmintic, anti-inflammatory, antimalarial³, antimicrobial, antipyretic, analgesic⁴, antibacterial⁵, antispasmodic, antioxidant, antiproliferative, antipsoriatic, antitumor⁶, larvacidal, muscle contractile, hepatoprotective, anticonvulsant and antifilarial activities.

In La Reunion and Madagascar (South Africa), the roots are considered febrifuge and anthelmintic, they are much used as an astringent in leucorrhoea and blennorrhagia. In Guinea, a decoction of the root is prescribed in fever^{7,8}.

The root-bark is good for tumours and for removing the placenta⁹. Bark of root possesses number of properties like febrifuge and anthelmintic etc. In Jamaica, it is used as rubefacient and as a local application for sores. The bark powder with honey is taken in cases of hernia. In Himachal Pradesh, the roots are used in intermittent fever and diabetes, taken in cases of hernia¹⁰. In Himachal Pradesh, the roots are used in intermittent fever and diabetes.

In recent years there has been a rapid increase in the standardization of selected medicinal plants of potential therapeutic significance. To ensure reproducible quality of herbal products, proper control of starting material is utmost essential. According to the World Health Organization, the macroscopic and microscopic description of a medicinal plant is the first step towards establishing the identity and the degree of purity of such materials and should be carried out before any tests are undertaken¹¹.

The main aim of the present work is to study the microscopic, physico-chemical standards and phytochemical analysis of the root bark of *Caesalpinia bonducella* (L.) Flem, which could be used for the proper identification of this drug.

MATERIALS AND METHODS

Plant collection and identification

The root-bark of *Caesalpinia bonducella* (L.) Flem were collected from Kasegaon, dist Sangli, Maharashtra India in March 2012. The plant was authenticated at Indian Council of Medical Research, ICMR, Belgaum By Dr Harsaha Hegde.

Reagent and Chemicals

All the chemicals and reagents used were of analytical grade, purchased from Sigma chemical co. (St Louis, MQ, USA) and Merck (Darmstadt, Germany).

Preparation of Extracts

The root bark powder of *Caesalpinia bonducella* were collected and shade dried. The dried root bark was

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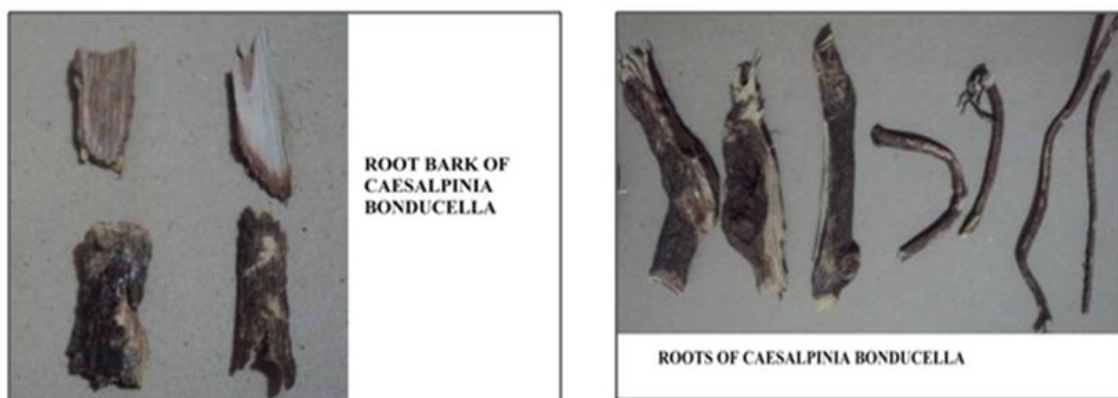


Figure 1: Macroscopic characteristic of *Caesalpinia bonducella*.

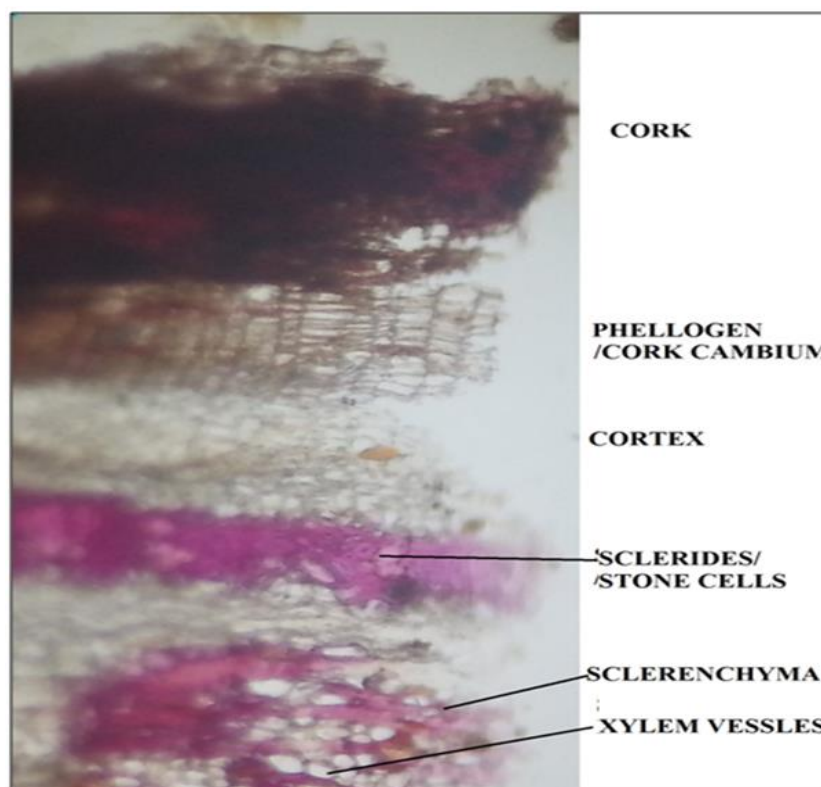


Figure 2: Microscopic characteristic of *Caesalpinia bonducella*.

Table 1: Ash value determination of *Caesalpinia bonducella*.

Name of plant	Total ash	Acid insoluble ash	Water soluble ash
<i>Caesalpinia bonduc</i>	7.78%	3.34%	6.16%

Table 2: Extractive value determination of *Caesalpinia bonducella*.

Name of plant	Extractive values (Percentage w/w)	
	Alcohol soluble extractive value	Water soluble extractive value
<i>Caesalpinia bonduc</i>	8.78%	10.34%

Table 3: Moisture content determination of *Caesalpinia bonducella*.

S. No.	Time (min)	% w/w of moisture content
1.	30	10.96
2.	45	10.78
3.	60	9.45
4.	75	9.26
5.	90	8.53

subjected to size reduction. The powdered drug was subjected to successive extraction with solvents in their ascending order of polarity i.e., petroleum ether (60-80%), Ethanol (70-90%) and distilled water. The extract were dried under reduced pressure and stored in air tight container in refrigerator.

Macroscopical characterization

Macroscopic characterization was done by using taking

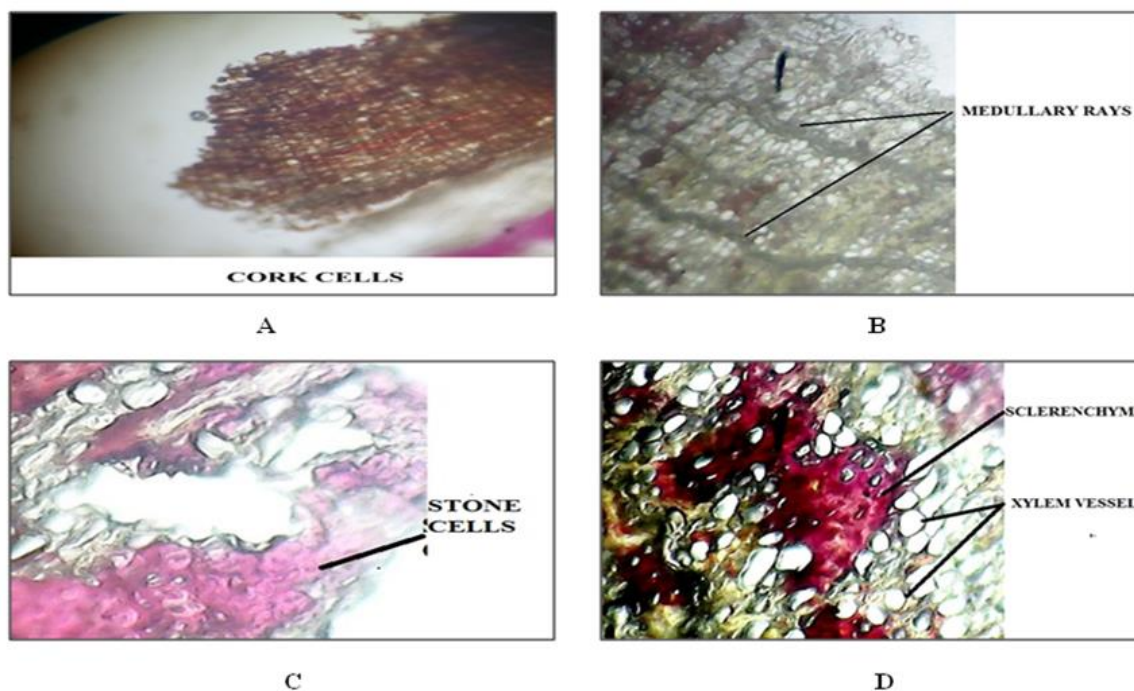


Figure 3: Microscopic Characters of *Caesalpinia bonducella* A) Cork cell B) Medullary rays C) Stone cells D) Sclerenchyma and Xylem vessel.

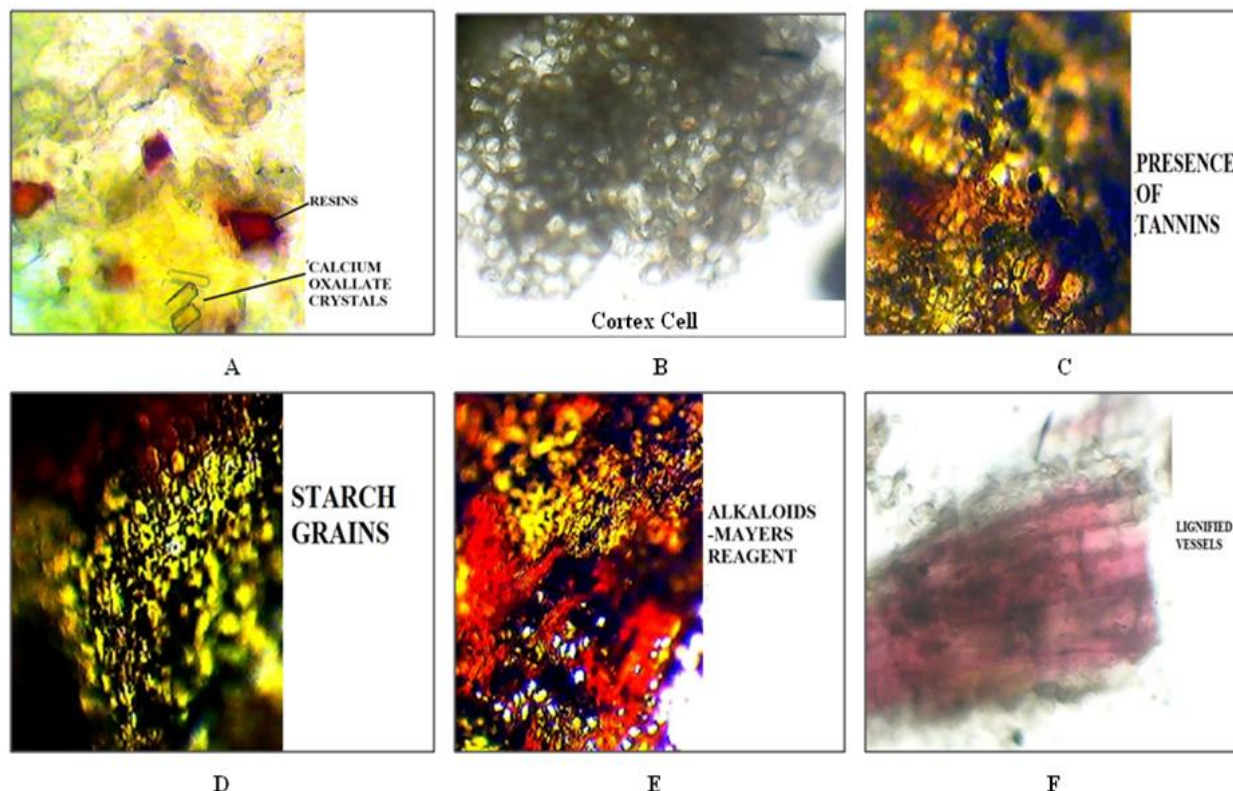


Figure 4: Microscopic Characters of *Caesalpinia bonducella* A) Resins and Calcium Oxalate Crystals B) Cortex cells C) Tannins D) Starch grains E) Alkaloids F) Lignified fibers.

organoleptic characterization as colour, odour, taste and was reported

Microscopical study

Fresh barks of root-bark of *Caesalpinia bonducella* were selected for the microscopical studies. Microscopic sections were cut by free hand sectioning. Numerous

temporary and permanent mounts of the microscopical sections of the bark specimen were made and examined microscopically. Histochemical reactions were applied with staining reagents on transverse sections and on root bark powder by reported methods^{12,13,14}. Photomicrographs of the microscopical sections were

Table 4: Fluorescence analysis determination of *Caesalpinia bonducella*.

S. No.	Treatment of powder	Visible light	Short wave	Long wave
1.	Root powder	Brown colour	No fluorescence	No fluorescence
2.	In methanol	Brown colour	No fluorescence	No fluorescence
3.	In ethanol	Dark Brown colour	No fluorescence	No fluorescence
4.	0.1NHCl	Dark Brown colour	No fluorescence	No fluorescence
5.	0.1N NaOH	Light Brown colour	No fluorescence	No fluorescence
6.	Dilute ammonia solution	Brown colour	No fluorescence	No fluorescence

Table 5: Preliminary phytochemical screening *Caesalpinia bonducella*.

S. No.	Test	Extracts	
		Aqueous	Ethanolic
1.	Alkaloids	+	+
2.	Steroid	-	+
3.	Flavonoids	+	+
4.	Terpenes	+	+
5.	Glycosides	-	+
6.	Saponins	-	+
7.	Sugars	+	+
8.	Tannins	+	+

taken with the help of MOTIC Digital Microscope, Mumbai, India, provided with MOTIC IMAGE PLUS 2.0 software.

Physicochemical Evaluation

Analysis of Physicochemical constants of the root bark powder has been done to evaluate the quality and purity of the drug. Various physicochemical parameters like total ash value, acid insoluble ash value, water soluble ash value, moisture content, alcohol and water soluble extractive value were calculated as per WHO guidelines. The information collected from these test was useful for standardization and obtaining the quality standards^{15,16}.

Fluorescence Analysis

Fluorescence characters of dried powdered roots of *Caesalpinia bonducella* were studied both in day' and UV lights the fluorescence analyses of drug powder were also studied by treating with acids, alkalis.

Preliminary Phytochemical Screening

The various extract of root bark of *Caesalpinia bonducella* was subjected to preliminary phytochemical screening for the detection of various phytoconstituents such as alkaloids, glycosides, tannins and phenolic compounds, flavonoids, steroids, saponins, proteins, amino acids, carbohydrates and triterpenoids^{17,18}.

RESULT AND DISCUSSION

The root powder of *Caesalpinia bonducella* was subjected to evaluate its total ash value, acid insoluble ash, water soluble ash, water soluble extractive value, alcohol soluble extractive value and moisture content. Each determination was carried out at triplets, that is three times to find the average value, the results which is been reported as

Macroscopic

The fresh root bark of *Caesalpinia bonducella* is pale brown in colour at the outer surface and dark reddish brown in colour at the inner surface having cracks and fissures as shown in Fig. 1.

Microscopic

The transverse section of the root bark shows the typical anatomical characteristics as layer of symmetrically arranged tabular cork cells arranged in 15 to 20 layers containing reddish brown matter, followed by Phellogen/cork cambium is compactly arranged radially in 10 to 15 layers Fig. 2.

The phellogen layer is followed by isodiametric thin walled parenchymatous cells defined as the cortex with scattered reddish brown oleoresin cells followed by a band of lignified, pitted rectangular and oval sclerenchyma/stone cells.

The stone cells originates into secondary phloem which consists of is a wide zone of tissue composed of xylem vessels, sclerenchyma pericyclic fibres which are present between medullary rays which are multiseriate and consists of parenchymatous cells containing starch grains, prisms of calcium oxalate crystals (Fig. 3).

Powder characters

Powdered root of *Caesalpinia bonducella* under the microscope showed, acicular calcium oxalate crystals, resinous matter, phloem fibers, stone cells, presence of tannins, starch grains and alkaloids at cellular level (Fig. 4).

Physicochemical parameters

The physicochemical constants are important parameters for detecting adulteration or improper handling of drugs. Various physicochemical parameters of the crude drug viz., ash value (Table 1), extractive values (Table 2) and moisture content (Table 3) have been summarized.

Fluorescence Analysis

The fluorescence analysis of the powdered drug was carried out and reported in following Table 4.

Preliminary Phytochemical Investigation

The result of qualitative phytochemical analysis of the crude extracts of *Caesalpinia bonducella* are shown in Table 5.

CONCLUSION

Standardization is essential measure for quality, purity and sample identification. Macromorphology and microscopy along with the Quantitative analytical microscopy is one of the simplest and cheapest methods to start with for establishing the correct identity of the source materials. Physicochemical and Chemical analysis of bark confirm the quality and purity of plant and its identification. Here the information collected was useful for further pharmacological and therapeutical evaluation along with the standardization of plant material.

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