

PHARMACOGNOSTIC PROFILES OF LEAVES OF CAESALPINIA BONDOC. (L.) ROXB.

M. Kundu*¹, R. Mazumder², M.D. Kushwaha³ and G.S. Chakraborty²

¹Govt. Polytechnic, Uttarkashi, Uttarakhand, 249193

²Department of Pharmaceutical Technology, Noida Institute of Engineering and Technology, Greater Noida, Uttar Pradesh 201306.

³P.G.College Uttarkashi, Dist: Uttarkashi, Uttarakhand.

*Address for Correspondence

Mintu Kundu

Lecture, Govt. Polytechnic,

Uttarkashi

Dist: Uttarkashi,

Uttarakhand

249193

Email: mintu_phytochem@yahoo.co.in

Summary

The present study is aimed at development of physicochemical parameters and to investigate the active principle present in *Caesalpinia bonduc*. *Caesalpinia bonduc* (Cucurbitaceae) commonly known as Ivy Gourd is an important plant used against various disorders in indigenous system of medicine such as antioxidant, antidiabetic, laxative, used in the treatment of rheumatoid arthritis and immune system modulator. Thus from the extensive literature survey it was revealed that no reports were available on microscopic evaluation, standardization parameters and chemo profile of *Caesalpinia bonduc* and to check the identity and purity of the drug. The present work embodies the investigations carried out to establish methods for quality control of drugs as per WHO guidelines which includes macroscopical features, physicochemical parameters like loss on drying, foreign matter, extractive value, ash value and to investigate the phytochemical present in the extract in the preliminary level with respect to thin layer chromatography were also carried out for the quality control of the drug. Thus, it was thought worthwhile to explore this plant on the basis of these standardization parameters. The study will provide referential information for the correct identification of the crude drug.

Keywords: *Caesalpinia bonduc*, standardization, phytochemical studies, extraction

Introduction

Caesalpinia bonduc (L.) Roxb. (Caesalpinioideae) is a perennial plant producing annual stems up to several meter long distributed throughout India, near the sea-coasts, especially Bengal, Bihar, Mumbai and whole of Southern India (1). The plant grows as a hedge plant up to 15 m in height and in altitudes up to 1000 m. The plant is widely used in our Traditional System of Medicine to treat various ailments with respect to heal mankind. It is mainly used to treat diseases like rheumatoid arthritis, as antileprotic, antidiabetic, antiperiodic, antidiabetic, antipyretic and in immune system (2). The fixed oil obtained from the expressed seeds is used as a remedy for discharges in ear and also to remove freckles from the face as a cosmetic product (3). The leaves of the plants have the activities as liver and gastric tonic, fungicidal, anticonvulsant (4).

The plant contains a number of secondary metabolites namely sitosterol, caesalpins, bonducin, caesane, flavonoids (5). Seeds contain saponin as bonducin, bitter substance as phytosterinin. The kernels contain homoisoflavone-bonducellin, cassane furanoditerpenoid as bonducellin E, F and G. (6, 7). Considering the significance of this plant, the present investigation is directed to remain some pharmacognostic parameters of the leaves as a whole and its powdered form.

Material and Method

Plant material

The leaves of *Caesalpinia bonduc* (L.) Voigt. (Caesalpiniaceae) were collected in the month of April and May from Purnia district, Bihar, India and were authenticated by the taxonomist of Central National Herbarium, Botanical Survey of India, Shibpur, Howrah, India bearing herbarium reference number CNH/1-I (44)/2006/ Tech II/996. The herbarium was prepared and kept in the Department for future reference. The collected leaves were washed; shade dried and was pulverized with mechanical pulveriser for size reduction. It was then passed through mesh 40 and the fine powder was collected and used for the experiment and preparation of extract.

Pharmacognostical Studies

Morphological Studies were carried out by using simple determination technique, the shape, size, color, odor, margin and apex.

Leaf constants

Various leaf constant such as vein termination number, vein islet number, palisade ratio, stomatal number and stomatal index were studied with the help of microscope (8).

Physico chemical parameters

The parameter was done to evaluate the percentage of total ash, water soluble acid insoluble ash were calculated as per Indian Pharmacopoeia. The extract of the powdered leaves were prepared with the different solvents for the study of extractive value. Fluorescence analysis was also carried out for the powder (9, 10).

Preliminary phytochemical analysis

For the Preliminary phytochemical analysis, the extract was prepared by weighing 100gm of dried powdered leaf and were subjected to maceration with different solvents as per the Polarity, Petroleum ether, Benzene, Chloroform, Ethyl acetate, Ethanol, Methanol and finally with Aqueous. The extracts were filtered in each step, concentrated, and the solvent was removed by rotary evaporator. The extracts were dried over desiccator and the residues were weighed. The presence and absence of the primary and secondary phytoconstituents was detected by usual prescribed methods (11, 12).

Result and Discussion

Macroscopic Characters of Leaf: The macroscopical features of the leaf are tabulated in table 1 as shown below.

TABLE 1: MACROSCOPIC CHARACTERS OF CAESALPINIA BONDOC LEAVES

Constants	Features
Leaf	Compound
Shape	Elliptical
Size	2-3 cm in length and 1-2 cm in wide
Colour	Fresh leaves are green and in the dry state greyish green
Surface	Upper surface glabrate and lower surface hispid
Base	Symmetric
Margin	Entire
Apex	Obtuse
Venation	Unipinnate and bipinnate
Orientation	Coriaceous
Texture	Fibrous
Odour	Characteristic
Taste	Slightly pungent

TABLE 2: MICROSCOPIC CHARACTERS OF CAESALPINIA BONDOC LEAVES

Parameters	Range	Average
Vein-islet number	5-7	6
Palisade ratio	14-18	16
Stomatal index	10-14	12

Fluorescence Analysis

The powder drugs were subjected to fluorescence analysis as per the standard procedure. The results are provided in the tables listed below

TABLE 3: FLUORESCENCE ANALYSIS OF LEAVES POWDER OF CAESALPINIA BONDUC WITH VARIOUS CHEMICAL REAGENTS UNDER UV AND VISIBLE LIGHT (9).

Reagents	UV Short(254 nm)	UV Long(366 nm)	Visible light
Powder as such	Bluish green	Light green	Green
Powder with (IN) NaOH sol.	Brownish green	Light green	Brownish green
Powder with picric acid	Bluish green	Dark green	Yellowish green
Powder with acetic acid	Light blue	Very light green	Light green
Powder with (IN) HCl solution	Light blue	Very light green	Light green
Powder with 5% FeCl ₃ solution	Blackish blue	Light green	Brownish green
Powder with HNO ₃ & NH ₃ solution	Dark blue	Light brown	Brownish green
Powder with IN NaOH in methanol	Brownish black spot	Dark brown green spot	Brown with green spot
Powder with methanol	Deep green	Blackish brown	Very dark green
Powder with 50% HNO ₃ solution	Bluish black spot	Light brown	Light brown

TABLE 4: BEHAVIOUR PATTERN OF POWDERED CAESALPINIA BONDUC LEAVES ON TREATMENT WITH DIFFERENT CHEMICAL REAGENTS (9).

Reagents	Observation
Powder as such	Light green
Powder with acetic acid	Light green
Powder with conc. sulphuric acid	Light Black
Powder with conc. nitric acid	Dark brown
Powder with conc. hydrochloric acid	Brownish green
Powder with ferric chloride solution	Greenish red
Powder with 5% iodine solution	Light green
Powder with ammonia solution	Green
Powder with aqueous sodium hydroxide solution (I N)	Brownish green
Powder with picric acid solution	Greenish brown

Physicochemical Parameters

The powdered drug was evaluated for its physico-chemical parameters like Ash values: Acid Insoluble ash, water soluble ash, water insoluble ash, extractive values (Alcohol and water soluble values), loss on drying and foreign matter (9). All the results are tabulated below.

TABLE 5: PHYSICAL CONSTANT VALUES OF CAESALPINIA BONDOC LEAVES.

Physico chemical Constants	% Yield (w/w)*
Total ash	10.34
Acid soluble ash	7.65
Acid insoluble ash	1.09
Water soluble ash	4.13
Water insoluble ash	6.24
Drying on loss	1.29
Foreign matter	1.54

*Each value is an average of three determinations

Preliminary Phytochemical Analysis

The ethanolic extract was subjected to preliminary phytochemical analysis for their presence of the constituents. It showed the presence of alkaloids, tannins and proteins were found to be present in aqueous extract where as Steroids and saponins were also found in Alcoholic extract.

Conclusion

The need of standardization of crude drugs demand a lot in towards era for identification and authentication of the drug but due to certain prevailing problems the importance of it is lost in vane. Thus, the lack of standardization technique fails to identify the dug from its originality which there by exploits the usage of drug from its Traditional System of medicine. The plant *Caesalpinia bonduc* is used widely for curing various diseases like diabetes and gives a serves as an aid to treat humans. Thus a perfect protocol was designed for its Authentication and identification on the basis of Microscopy and chemical analysis. Thus the present investigation was aimed and the results were found to be significant and encouraging towards the goal for Standardization. The results of different pharmacognostic analysis (macroscopic and microscopic studies, physical constant values and extractive values determination, powder analysis with different reagents, fluorescence analysis and preliminary phytochemical screening have been done; will help in future for proper identification of *Caesalpinia bonduc* in intact form or in a powdered form

TABLE 6: PHYTOCHEMICAL SCREENING OF EXTRACTIVES FOR THE PRESENCE OF ACTIVE CONSTITUENTS IN CAESALPINIA BONDUC LEAVES (12).

Extracts	Amino acid	Alkaloids	Steroids	Triter- penoids	Saponin	Flavonoids	Tannins	Anthraquinone
Petroleum ether	-	-	-	+	-	-	-	-
Benzene	-	-	-	+	-	-	-	-
Chloroform	-	-	-	+	-	-	-	-
Ethyl acetate	-	-	-	+	-	-	-	-
Ethanol	-	+	-	+	-	-	-	-
Methanol	-	+	-	+	-	-	-	-
Water	-	+	-	+	-	-	-	-

+ indicate presence of secondary constituents, - indicate absence of secondary constituents.

TABLE 7: EXTRACTIVE VALUES OF CAESALPINIA BONDUC LEAVES WITH DIFFERENT SOLVENTS BY MACERATION METHOD (13).

Sovent	% Yield (w/w) *	Colour of extractive
Pet ether (60-80 °C)	0.92	Yellowish green
Benzene	1.22	Greenish brown
Chloroform	2.43	Dark green
Acetone	3.18	Green
Ethanol	6.54	Green
Methanol	8.75	Dark green
Water	12.34	Dark brownish green

*Each value is an average of three determinations

Acknowledgements

The authors wish to thank Technical Education Uttarakhand for providing all facilities, Botanical Survey of India, Shibpur, Howrah (W.B.) for the authentication of specimen.

References

1. Khare CP. Indian Medicinal Plants, an illustrated dictionary, Springer publication, Berlin.
2. Nadkarni KM. Indian Materia Medica, 3rd edition, Popoular Book Depot, India.
3. Chopra RN, Nayar SL, Chopra IC. Glossary of Indian Medicinal Plants, CSIR Publications, Delhi, India.
4. Kirtikar KR, Basu BD. Indian Medicinal Plants, 2nd edition, International Book Distributor, Dehradun, India.
5. Chopra RN, Chopra IC, Handa KL, Kapur LD. Indigenous Drugs of India. 2nd edition, Academic Publisher, Calcutta, India.
6. Purushottaman KK, Kalyani K, Subramainan K, Shanmuganathan SP. Structure of bonducellin, A new homoisoflavone *caesalpinia bonducell*, Indian Journal of Chemistry. 1982; 21 B: 383.
7. Pudhom K, Sommit D, Suwankitti N, Petsom A. Cassane Furanoditerpenoids from the seed kernels of *Caesalpinia bonduc* from Thailand, Journal of Natural Product. 2007; 70:1542-1544.
8. Kokate CK. Practical Pharmacognosy, Vallabh Prakashan, New Delhi.
9. Raghunathan K, Mitra R. Pharmacognosy of Indigenous Drugs, Vol -I & II, Central Council for Research in Ayurveda & Siddha, New Delhi, India.
10. Trease GE, Evans WE. Pharmacognosy, 12th Edn. ELBS Publishcation, New-York.
11. Harbone JB. Phytochemical Methods- A guide to Modern Techniques of Plant Analysis, Chapman and Hall, London.
12. Tyler VE, Brady LR, Robbers JE. Pharmacognosy. 9th edition, Lea & Febiger Publication, Philadelphia.
13. Agrawal SS, Pridhavi M, Herbal Drug Technology. 1st edition, Universities Press, Hyderabad.