RESEARCH ARTICLE

Pharmacognostic and Preliminary Phytochemical Investigations of *Borassus flabellifer* Linn. Flowers

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ABSTRACT

Borassus flabellifer Linn. commonly known as palmyra pam. The main purpose of the present work was to conduct systematic investigation of various extracts of *B. flabellifer.* Linn. flowers. The flowers of *B. flabellifer Linn.* belonging to family Areaceae were collected from Pune district. Authenticated at Botanical Survey of Pune. In this study *B. flabellifer.* Linn. flowers were evaluated for morphological characteristics, powdered microscopy, pharmacognostic investigation, preliminary phytochemical investigation as per World Health Organization (WHO) guidelines. The soxhlet apparatus was used for extraction, along with petroleum ether, ethyl acetate, chloroform and a hydro-alcoholic solvent. Flowers were also extracted by cold maceration. Morphologically flowers were showed a yellowish-brown color, sweet, pleasant taste. Powdered microscsopy was showed presence of fibres, vessels, crystals of calcium oxalate, starch grains. Pharmacognostic investigation shows foreign matter-Nil, total ash, water-soluble, acid-insoluble, sulphated ash was observed to be 3.5, 0.5, 0.5, 4.5%, respectively. LoD was found to be 4.6%. Petroleum ether, ethyl acetate, chloroform, ethanol and water-soluble extractive values were observed to be 0.2, 2.6, 0.4, 5.8 and 7.6%, respectively. Fluorescence analysis was also done. Extract contains carbohydrates, proteins, steroids, triterpenoids, glycosides, flavonoids, tannins and phenolic compounds. Present study could be helpful for the proper identification and further research work.

Keywords: *Borassus flabellifer*. Linn. WHO guidelines, Preliminary phytochemical investigation.

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INTRODUCTION

Borassus flabellifer Linn. is a tall tree of about 20 to 30 meters (Figure 1).[1,2] The roots are hairy, cooling, stem is black,[3] bark of the tree burnt act as a good dentifrice,[4] the leaves are fan-shaped petioles,[5] flowers are yellow in colo which born in spadices,[6] the fruits are large and contain fibrous threads. There are three nuts-like portions in the seed. Leaves, fruits, roots, inflorescence, and flowers of plant shows different types of pharmacological actions. The flowering stalks juice is used in diabetes.[7] The stalk of the dry flowering shoot is very useful for enlarged liver and spleen.[8] Stalk juice of flowers is stimulant, cooling and shows laxative properties.[9]

Literature survey reveals that *B. flabellifer.* Linn. havinganti-arthritis,[10] antioxidant,[11-13] anti-inflammatory,[14,15] anticancer,[16,17] antifungal,[18] antimicrobial[19] properties. Activated carbons are produced from flowers.[20] Parts of plant also exhibit antidiabetic,[21] antibacterial,[22,23] antipyretic,[24] anthelmintic, and immunomodulatory activities.[25] Different parts of plant used as a source of carbohydrates, iron, fat, thiamin, riboflavin, protein and vitamin C.[26]

MATERIAL AND METHOD

Pharmacognostic Study

Organoleptic evaluation

The flowers of *B. flabellifer Linn.* were investigated for its macroscopic characteristics which include color, odor, taste, shape, size and texture.[27]

Microscopical powdered characteristics

For the observation, powder from dried flowers was used. The drug was stained with phloroglucinol & HCl (1:1), dil. iodine, dil. acetic acid, Sudan Red –III separately.[28]

Fluorescence analysis of drug

Powder was exposed to UV radiation at visible, short and long wavelength.

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Figure 1: *B. flabellifer* plant

Foreign matter determination

The plant material is spread on white paper. Using a magnifying lens (5^X), foreign matters are removed and the percentage is recorded.[28]

Physical Constants Determination

Ash value

- *Total ash value*

Weight and tared silica crucible was taken. Weighed about 2 g of *B. flabellifer* Linn. flowers power into the crucible. Burned for 4 hours at a temperature of 450°C. The formula below was used to determine the total ash value.[29]

$$\% \text{ Total ash value} = \frac{\text{Wt. of total ash}}{\text{Wt. of crude drug taken}} \text{ X } 100$$

- *Water-soluble ash*

The entire ash was boiled for five minutes in 25 mL of water, filtered and the insoluble residue was collected before being cleaned with hot water and burned to a consistent weight. The ash that dissolved in water was computed.[28]

$$\% \text{ Water soluble ash value} = \frac{\text{Wt. of total ash - Wt. of water insoluble ash}}{\text{Wt. of crude drug taken}} \text{ X } 100$$

- *Acid- insoluble ash*

Boil the entire amount of ash in 25 mL of diluted hydrochloric acid for 5 minutes, then filter and gather the insoluble residue, wash with hot water ignited in crucible and weigh after cooling. The amount of acid-insoluble ash was computed.[29]

$$\% \text{ Acid insoluble ash value} = \frac{\text{Wt. of acid insoluble ash}}{\text{Wt. of crude drug taken}} \text{ X } 100$$

- *Sulphated ash*

After precisely weighing 1 g of the material, it was added to the crucible. It was burned till it was black. After heating the residue to 800°C, 1-mL of concentrated sulfuric acid was added and allowed to cool. After letting the crucible cool, few hot droplets of strong sulfuric acid were added. As mentioned before, ignited, cooled and weighed. The percentage of sulphated ash was computed.[28,32]

LoD

1.5 g of the powdered *B. flabellifer Linn.* flowers placed in porcelain dish which was previously weighed. Then place in hot air oven heated at 105°C, recorded the weight after every 30 minutes up to the two successive readings difference is not more than 0.5 mg. Cool and weighed.[28]

Extractive value

- *Alcohol soluble extractive value:-*

For the first 6 hours, 5 g of powder were macerated in 100 mL of alcohol for 24 hours. After the extract was filtered, 25 mL of it evaporated. The extractive value soluble in alcohol was computed.

- *Petroleum ether soluble extractive value:-*

Alcohol was not used in the above technique; instead, petroleum ether (40–60°C) was used.

- *Ethyl acetate extractive value*

Alcohol was not used in the above technique; instead, ethyl acetate was used.

- *Chloroform soluble extractive value*

Alcohol was not used in the above technique; instead, chloroform was used.

- *Water soluble extractive value*

Alcohol was not used in the above technique; instead, water was used.[28,29]

Extraction

Petroleum ether extract

The plant parts were ground into fine powder (44 size mesh) using a grinder after the flowers were harvested from Pune and dried in the shade for 30 days at 21 to 30°C. About 50 grams of powdered *B. flabellifer Linn.* flowers were extracted using a soxhlet device at temperatures below 60°C for 12 hours using 300 mL of petroleum ether. Solvent was filtered and then evaporated on an electric water bath.

Ethyl acetate extract

After the petroleum ether extraction powder was taken out from extractor and dried. Continued for extraction, at 77°C with 300 mL ethyl acetate for 12 hours.

Chloroform extract

After the ethyl acetate extraction powder was taken out from extractor and dried. Continued for extraction, at 61°C with 300 mL chloroform for 12 hours.

Hydro alcoholic extract

After the chloroform extraction powder was taken out from extractor and dried. Continued for extraction, at 80°C with 300 mL hydro-alcoholic solvent for 18 hours.

Ethanolic extract by cold maceration

About 50 gm powder of *B. flabellifer Linn.* flowers kept for extraction, for 7 days by cold maceration in ethanol.

Preliminary phytochemical investigation

A concentrated extract weighing around 500 mg was dissolved in 100 mL of a solvent, such as ethanol, hydro-alcohol, chloroform, petroleum ether, ethyl acetate. Stir the

Figure 2: Flowers of *B. flabellifer*

Table 1: Organoleptic evaluation

S. No.	*Morphology*	*Observation*
1	Colour	Light gold, yellowish brown.
2	Taste	Sweet and pleasant.
3	Shape	Semi-circular clusters.
4	Size	Less than 1 cm long.
5	Texture	Smooth and shiny.

solution till the extract is completely soluble in respective solvent. Then phytochemical investigation was carried out for phytopharmaceuticals.[26,31]

Physiochemical Analysis

Physiochemical tests of powdered *B. flabellifer Linn.* fowers were carried out with different reagents.[29,30]

Florescence analysis

The powdered *B. flabellifer Linn.* flowers were subjected to fluorescence analysis.[26,27]

RESULTS AND DISCUSSION

Organoleptic Evaluation

In this work flowers of *Borassus flabellifer* Linn. were investigated for the morphological characteristics, which were observed are given in Table 1. Flowers of *Borassus flabellifer* Linn. are as shown in Figure 2.

Microscopical Powdered Characteristics

Powered microscopy shows presence of lignified cells, starch grains, oil cells, oxalate crystals. Microscopical powdered characteristics, which were observed, are given in Table 2.

Fluorescence Analysis of Drug

Fluorescence analysis is given in Table 3 which shows yellowish brown fluorescence as shown in Figure 3. A natural product produces fluorescence with different chemical under the ultra violet light hence some crude drugs are generally evaluated qualitatively. It is one of the important parameters of evaluation.

Determination of Foreign Matter

Foreign matter is given in Table 4 which was nil as shown in Figure 4.

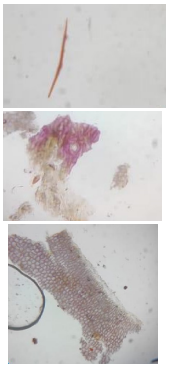
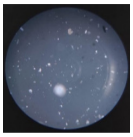
Determination of Physical Constants (Ash Value)

Physical parameters Observation was noted in Table 5.

Determination of LoD

Moisture content was determined by LoD method observation was noted in Table 6.

Table 2: Microscopical powdered characteristics

S. No.	*Reagent*	*Observation*	*Characteristics*	*Cell/cellular content*
1	Phloroglucinol + HCL (1:1)	Pink color	Lignified cells, trichomes, fibres, vessels.	
2	Dil. iodine solution	Black color	Starch grain	
3	Dil. acetic acid	Insoluble crystal	Calcium oxalate crystals	
4	Sudan Red -III	Red color	Oil globules	

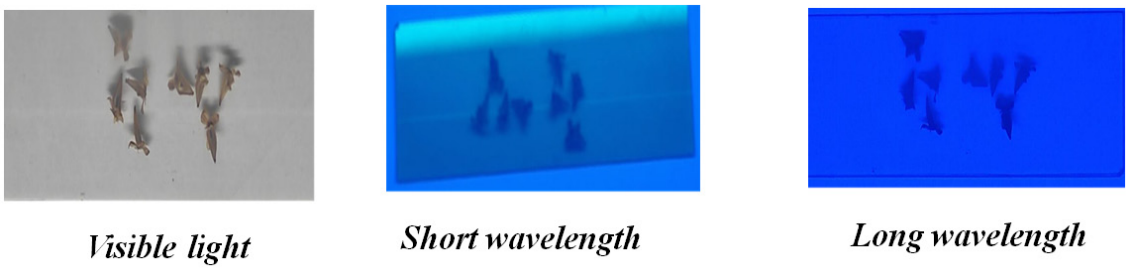


Figure 3: Fluorescence analysis

Table 3: Fluorescence analysis of flowers of *B. flabellifer* Linn.

S. No.	*Visible light*	*Short wave length*	*Long wave length*
1	Pale yellow	Yellowish brown	Dark brown

Table 4: Determination of foreign matter

S. No.	*Determination of foreign matter*
1.	Nil

Table 5: Determination of ash value

S. No.	*Ash value*	*Values (%) w/w*
1	Total ash	3.5
2	Water soluble	0.5
3	Acid insoluble	0.5
4	Sulphated ash	4.5

Table 6: Determination of LoD

S. No.	*Determination of LoD*
1.	4.6%

Table 7: Determination of extractive value

S. No.	*Name of solvent*	*Weight of empty evaporating dish*	*Weight on evaporation*	*Extractive value*
1	Petroleum ether	68.94	68.95	0.2
2	Ethyl acetate	60.02	60.15	2.6
3	Chloroform	67.59	67.61	0.4
4	Ethanol	67.03	67.32	5.8
5	Water	67.42	67.80	7.6

Table 8: Percentage yield of extract

S. No.	*Name of solvent*	*Weight of empty evaporating dish*	*Weight on evaporation*	*% Yield*
1	Petroleum ether	47.6	48.6	1.6
2	Ethyl acetate	76.2	76.6	0.8
3	Chloroform	80.4	80.8	0.8
4	Hydro-alcoholic	81.45	75.76	11.38
5	Ethanol (Cold maceration)	62.4	69.6	13.6

Table 9: Preliminary phytochemical investigation

S. No.	*Test for*	*PET*	*EA*	*CH*	*HA*	*ETH*
1	Carbohydrates	-	+	-	+	+
2	Proteins	-	-	-	+	+
3	Steroids	+	+	+	-	-
4	Triterpenoids	+	+	+	-	-
5	Glycosides	+	+	+	+	+
6	Flavonoids	-	+	-	+	+
7	phenolic compounds, Tannins	+	+	+	+	+

PET: - Petroleum ether, EA: -Ethyl acetate, CH: -Chloroform, HA: -Hydro-alcoholic, ETH: - Ethanol (Cold maceration)

Table 10: Physiochemical analysis

S. No.	*Reagents*	*Observation*
1	Powder	Pale Yellowish brown
2	Powder + Ammonia solution	Yellowish brown
3	Powder + Glacial acetic acid	Pale Yellow
4	Powder + 5% KOH	Yellowish brown
5	Powder + Conc. HNO_3	Orange
6	Powder + 5% Ferric chloride	Yellowish green
7	Powder + Conc. H_2SO_4	Black
8	Powder + 5% NaOH	Reddish brown
9	Powder + Picric acid (Aq. Sol.)	Yellow
10	Powder + Conc. HCl	Light orange

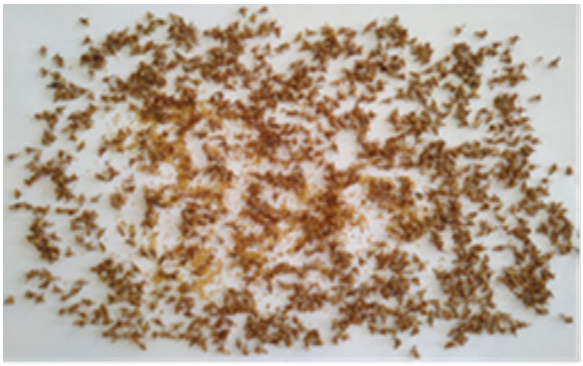


Figure 4: Foreign matter determination

Table 11: Florescence analysis

S. No.	*Reagents*	*Observation (Under short wavelength)*	*Observation (Under long wavelength)*
1	Powder	Yellowish	Light yellow
2	Powder + HNO_3 + NH_3	Yellowish green	No fluorescence
3	Powder + Methanol	Greenish yellow	Light yellowish brown
4	Powder + 50% HCl	Yellowish green	No fluorescence
5	Powder +5% iodine solution	Yellowish green	No fluorescence
6	Powder +5% Ferric chloride	Yellowish green	No fluorescence
7	Powder + Petroleum ether	Yellowish green	Pale yellow
8	Powder + Chloroform	Yellowish green	Pale yellow
9	Powder + 50% H_2SO_4	Light yellowish	No fluorescence
10	Powder + Picric acid	Yellow	No fluorescence
11	Powder + 50% HNO_3	Light yellowish green	No fluorescence
12	Powder +1 N NaOH in water	Brownish green	Pale yellow
13	Powder+1NNaOH in methanol	Yellowish green	No fluorescence

Extractive value

The water-soluble extractive values, ethanol, petroleum ether, ethyl acetate, and chloroform were noted and are shown in Table 7.

Percentage yield of extract

The percentage yields obtained from the extraction were given in Table 8. In comparison to the yield obtained from polar solvents, the percentage yield achieved from non-polar solvents was lower.

Preliminary Phytochemical Investigation

The phytochemical testing shows presence of glycosides, steroids, Carbohydrates, Protein, flavonoids and Phenolic compounds given in Table 9.

Physiochemical analysis

Physiochemical tests of powdered drug and observed colour were given in Table 10.

Florescence analysis

Florescence analysis is the important parameter of evaluation of crude drug, powdered drug was evaluated for florescence analysis observations were given in Table 11.

CONCLUSION

The current study focuses on phytochemical and pharmacognostic analysis. Testing for phytochemicals reveals the presence of phenolic compounds, proteins, glycosides, carbohydrates and flavonoids. The presence of these secondary metabolites may be the cause of the crude drug's pharmacological effects. Present study could be help to preparation of monograph and for further research work.

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