

PRELIMINARY PHYTOCHEMICAL INVESTIGATION OF *SEMECARPUS ANACARDIUM* LINN.SHAILESH S. BAHIR*¹, SANDESH R. WAYAL¹, SONALI A. BARKE¹, TUSHAR T. SHELKE², SHIVSHANKAR M. GUNJEGAONKAR², SUNIL P. HADKE³, JAYENDRASING P. BAYAS³

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ABSTRACT

The present study was aimed at detailed pharmacognostic and physicochemical investigation of the plant *Semecarpus anacardium* Linn. (Family: Anacardiaceae). This study based on morphological and microscopical evaluation, determination of physicochemical constants of leaves and stems of the plant *Semecarpus anacardium* Linn. which gives idea about the proper identification, collection and investigation of the plant.

The powdered drug of leaves and stems of the plant were subjected to determination of moisture content, ash values, extractive values and foreign organic matter. The results of analysis shows that the moisture content (55.40 ± 0.0702 & 45.10 ± 0.005774) and foreign matters (7.15 ± 0.7976 & 5.12 ± 0.2) of the leaves and stems of the plant should be controlled during processing. The extractive value of leaves and stems was found to be more in ethanol (65.33 ± 10.017) and water (73.3 ± 0.05774) respectively. Therefore ethanolic and aqueous extracts of the leaves and stems respectively were prepared using the soxhlet extraction method and these extracts were used for phytochemical investigation. The phytochemical investigation shows the presence of alkaloids, carbohydrates, flavonoid glycosides and tannins and phenols which could be responsible for therapeutic properties of the plant or the plant parts.

The study of *Semecarpus anacardium* Linn leaves and stem provides the detail pharmacognostic data in various values which is helpful in its standardization of the plant. The pharmacognostic features investigated on *Semecarpus anacardium* Linn in the present study may serve as tool for validation of the raw material.

Keywords *Semecarpus anacardium* Linn, Soxhlet extraction method, Ethanolic/ Aqueous extract phytochemical investigation

INTRODUCTION

Now a day's Indian knowledge about herbal medicines is gaining comprehensive and is accepted globally. In Ayurveda, almost all medicines are prepared from plant parts either in crude state or by using plant preparations. In other parts of the world, the term Complementary and Alternative Medicine (CAM) is used for various forms of traditional drugs which can be defined as any treatment used in conjugation (complementary) or in place of (alternative) standard medical treatment. In alternative medicinal system, medicinal plant preparations have found widespread use particularly in the case of diseases those are not satisfying to treatment by modern method [1]

Semecarpus anacardium Linn is a chemotaxonomic characteristic of family Anacardiaceae and it is distributed in sub-Himalayan region, tropical and central parts of India. This plant is a plant well-known for its medicinal value in Ayurvedic and siddha system of medicine. In Ayurveda, the fruit is considered a *rasayana* for longevity and rejuvenation (is processed before use as it is toxic in nature). The plant is known as "Bhallatak" in India and was called "Marking Nut" by Europeans, because it was used by washer-men to mark cloth, as it imparts a water insoluble mark to the cloth. It is also known as "Ker-beeja" in Kannada and "Bibba" in Marathi. The use of bhilwa nut is reported from very ancient times all over the world. The several scientific studies have been conducted on different parts of the plant to evaluate its medicinal value. The present review summarizes the pharmacognostic studies of the leaves and stems of *Semecarpus anacardium* Linn [2]

Plant Review [3]

It is a moderate-sized deciduous tree which is 15–25 m in height with grey bark exfoliating in small irregular flakes and is found in the outer Himalayas and hotter parts of India up to 3500 ft. height. The plant is found in abundance in Assam, Bihar, Bengal and Orissa, Chittagong, Central India and Western Peninsula of East Archipelago, Northern Australia.

The leaves of the plant are simple alternate, obviate – oblong, 30–60 cm long and 12–30 cm broad, rounded at the apex. The flowers are greenish white, in panicles and appear with new leaves in May and June which are easily recognized by large leaves and the red blaze exuding resin, which blackens on exposure. The nut is about 2.5 cm long, ovoid and smooth lustrous black. It is frequently found in drier rather than damp localities. The fruit ripens from December to March and are 2–3 cm broad. The bark is grey in color and exudes an irritant secretion on incising.



Fig. 1:- Plant of *Semecarpus anacardium* Linn.

The different parts of *Semecarpus anacardium* Linn reported to contain glycosides, steroids, triterpenoids and alkaloids. A variety of nut extracts preparations *S. anacardium* are effective against many diseases viz. anti-arthritis, anti-tumors, infections, anti-inflammatory etc activity and wound healing activity. In present study attempt was made to establish pharmacognostic parameter which could be proposed as parameters to establish the authenticity of *S. anacardium* Linn and can possibly help to differentiate the drug from its other species.

MATERIALS AND METHODS

Procurement & Authentication

The stems and leaves of *Semecarpus anacardium* Linn were collected in the month of July 2011 from the village of Mulshi, Pune & authenticated at Botanical Survey of India (B.S.I.) Pune. [(Ref. No.- BSI/WRC/Tech./2011) & Voucher Specimen No. - SHABSEA3].

Drying of Stems and Leaves

The collected plant materials were dried in shade for 7 days. These dried crude drugs were coarsely powdered in grinder and stored in airtight container separately for further study.

Organoleptic Evaluation [4]

The freshly collected plant parts were evaluated for organoleptic properties by observing with naked eyes.

Microscopic and Histological Evaluation [5]

The leaves and stems were boiled with water until soft. Free hand fine sections of both leaves and stems were cut transferred on slides cleared by warming with chloral hydrate and mounted in glycerin. The lignified and cellulosic tissues were distinguished by chemomicroscopical evaluation. The surface characteristics of leaves were also observed.

Powder Microscopic study [6]

A few drops of chloral hydrate solution was added to samples of powdered plant material on a slide, covered with a glass slip and

heated gently over a microbunsen. Vigorous boiling was avoided. The slide was examined under the microscope. When the clearing process is completed a drop of glycerol solution was added which will prevent crystallization of the mounting agent on cooling.

Proximate Analysis [7, 8]

The powdered drugs of leaves and stems of *S. anacardium* Linn were subjected to the determination of moisture content, ash values, extractive values and foreign organic matters.

Extraction and Isolation [9, 10]

The powdered drugs of leaves and stems were extracted with ethanol and water respectively by continuous successive soxhlet extraction process for 12-15 hrs. After complete extraction solvent was distilled off and residual extract was kept in desiccators for complete removal of the solvent. The dried extract was stored in appropriate container for phytochemical evaluation.

Preliminary Photochemical Evaluation [11]

The dried crude drug extracts were subjected to preliminary phytochemical screening for the detection of major chemical groups as given by the standard procedure.

RESULT AND DISCUSSION

The morphological, microscopical and physiological parameters presented in this paper may be proposed as parameters to establish the authenticity of *Semecarpus anacardium* Linn and can possibly help to differentiate the drug from its other species.

Organoleptic Evaluation

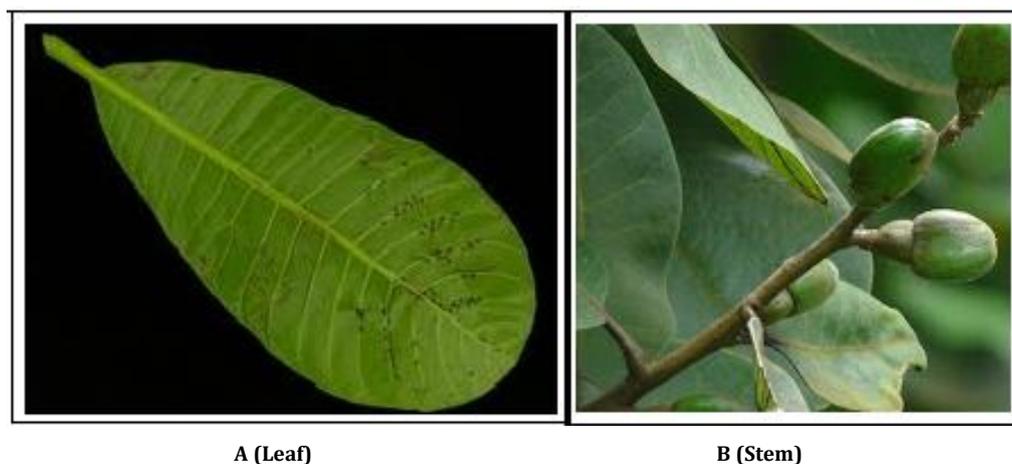


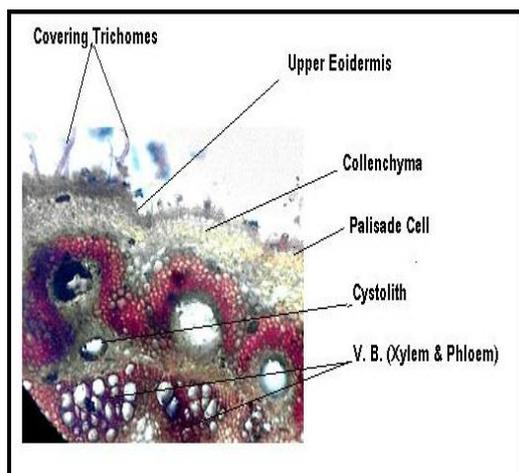
Fig. 2: Morphological characteristics of leaf and stem of *Semecarpus anacardium* Linn.

The leaf and stem of *Semecarpus anacardium* Linn were evaluated for following organoleptic properties.

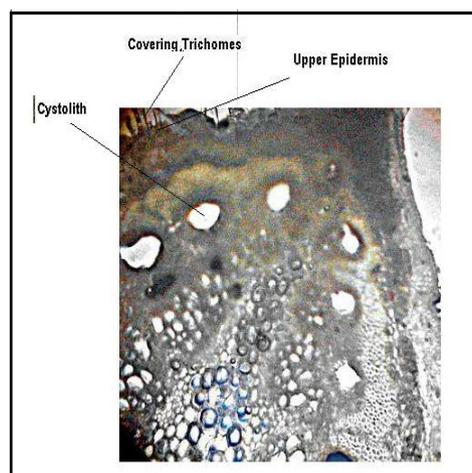
Table 1: Organoleptic properties of leaf and stem of *Semecarpus anacardium* Linn.

Sr. No.	Property	Characteristics of Leaf	Characteristics of Stem
1	Specification	Fresh Adult Leaves	Fresh Matured Stem
2	Colour	Pale Green	Gray to Greenish
3	Odour	Characteristics	Characteristics
4	Taste	Bitter	Pungent Bitter
5	Size	Lamina is 30-60 cm long and width is 5-6 cm	50 - 55 cm long
6	Shape	Oblong and Obviate	Irregular
7	Surface	Glabrous and Dull	Silky and Hairy
8	Texture	Brittle	Fleshy
9	Margin	Entire	-
10	Apex	Apiculate to Obtuse	-
11	Base	Symmetrical	-
12	Venation	Reticulate Palmate	-
13	Petioles	Short	-

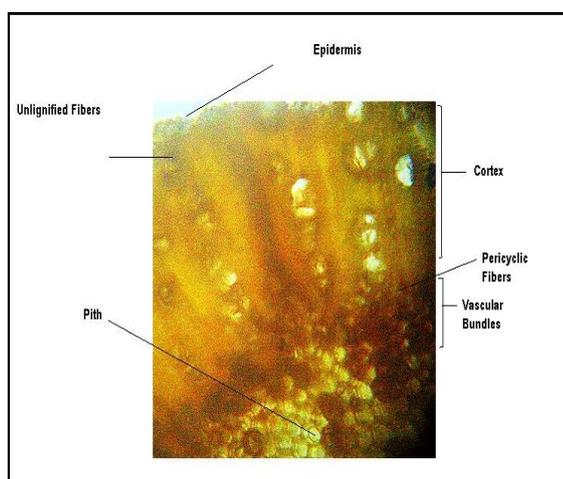
Microscopic and Histological Evaluation



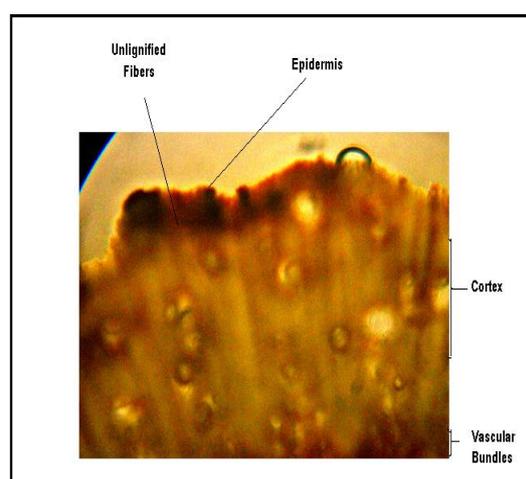
A) Staining with Phloroglucinol + HCL



B) Staining with Hydrochloric Acid

Fig. 3: T. S. of Fresh Leaf of *Semecarpus anacardium* Linn

A) Staining with Phloroglucinol + HCL



B) Staining with Sudan III

Fig. 4: T. S. of Dried Stem of *Semecarpus anacardium* Linn

The thin sections of fresh leaf and dried stem of *Semecarpus anacardium* Linn were taken and observed for microscopical and chemo-microscopic characteristics. The lamina of the leaf is dorsiventral in nature. The unicellular covering trichomes were observed at the upper epidermis and the stomata of a leaf were distributed mainly on the lower epidermis. The mesophyll tissue of the dorsiventral leaf is differentiated into upper elongated palisade parenchyma and lowers round spongy parenchyma. Vascular bundle was observed on middle part of the T. S. with lignified xylem and un-lignified phloem (Figure No. 3-A). The few cystoliths cells were observed in cortical parenchymatous cell (Figure No. 3-B).

The fine section of dried stem shows presence of single layered epidermis with thick and smooth cuticles (Figure No. 4-B). The cortex consists of few layers of thin walled cellulosic parenchyma below epidermis. Few bunches of rounded cells were observed in the cortex which are non-lignified cells. Lignified pericyclic fibers were found below to the cortex (Figure No. 4-A). Lignified xylems and non-lignified phloem parenchyma were observed lower part of the T. S. The large, thin walled, lignified big polygonal parenchymatous cells with intracellular spaces were present at lower surface.

Powder Microscopic study

The study of surface and powdered characteristics of leaf and stem shows the presence of unicellular ribbon shaped covering trichomes and sunken stomata. The lignified xylems cells were observed in chemo-microscopic surface preparation. Pericyclic fibers and cuticles was prominent in powdered microscopy

Proximate Analysis

The percentage yield of crude extracts of leaves and stems were found to be more in ethanol and water respectively. Therefore these solvents were used for extraction purpose for further study.

Table 2: The percentage yield of various extracts of *Semecarpus anacardium* L.

Sr. No.	Solvent used for extraction	Extractive Values in %	
		Leaves	Stems
1	Ethanol	11.4%	12.60%
2	Solvent ether	6.42%	2.40%
3	Acetone	3.24%	0.50%
4	Water	0.52%	47.10%

The determination of moisture content gives idea about stability and susceptibility of crude drug toward bacterial growth.

Table 3: Determination of moisture content of powdered drugs of *Semecarpus anacardium* Linn

Parameter	Moisture Content (Mean % w/w \pm S.D)	
	Leaves	Stem
Total Moisture Content	55.40 \pm 0.0702	45.10 \pm 0.005774

Ash values are important to determine quality and purity of a crude drug. This gives an idea of the earthy matter or the inorganic composition and other impurities present along with the drug.

Table 4: Determination of ash values of powdered drug of *Semecarpus anacardium* Linn

	Ash Values (Mean % w/w \pm S.D)	
	Leaves	Stem
Total Ash	0.73 \pm 0.0585	0.13 \pm 0.0503
Acid Insoluble Ash	0.37 \pm 0.337	0.116 \pm 0.02887
Water Soluble Ash	0.33 \pm 1.762	0.033 \pm 0.005774

The extractive values are very useful for the determination of exhausted or adulterated drug species. The ethanol and water soluble extractive values were found to be high in leaf and stem respectively. This study will play vital role in future studies for the isolation of its various constituents which may prove to be pharmacologically active.

Table 7: Preliminary phytochemical screening of *Semecarpus anacardium* L.

Sr. No	Test	Ethanolic extract of leaves	Aqueous extract of stem
1	Alkaloid		
	Mayer's test	+	+
	Hager's test	+	+
2	Carbohydrates		
	Molisch's test	+	+
	Fehling test	+	+
3	Fats and oil		
	Solubility test	+	-
	Filter paper test	+	-
4	Tannins and Phenols		
	Saponification test	+	-
	Ferric chloride test	+	+
5	Flavonoid glycosides		
	Lead acetate solution test	+	+
	Lead acetate test	+	+
6	Saponin glycoside		
	Shinoda test	+	+
	Hemolytic test	+	+
7	Cardiac glycoside		
	Foam test	-	+
	Hemolytic test	-	+
	Legals test		
	Baljet test	+	-
	Legals test	+	-

+ Denotes the Presence of the Respective Group of Compounds

CONCLUSION

The study of *Semecarpus anacardium* Linn leaves and stem provides the detail pharmacognostic data in various values which is helpful in its standardization and authenticity of plant. The leaves and stem of *Semecarpus anacardium* Linn were used as a medicinal drug by local people to treat various ailments, disease without standardization. The standardization of a crude drug is an essential part to establish the correct identity and authenticity of the medicinally useful plant.

Table 5: Determination of extractive values of powdered drug of *Semecarpus anacardium* Linn

Parameters	Extractive Values (Mean % w/w \pm S.D)	
	Leaves	Stems
Ethanol soluble	65.33 \pm 10.017	40.1 \pm 0.012
Water soluble	52.33 \pm 61.015	73.3 \pm 0.05774
Methanol soluble	64.33 \pm 80.05	63.2 \pm 0.051
Pet. Ether soluble	44.33 \pm 4.072	45.4 \pm 0.052
Ether soluble	43.77 \pm 7.76	23.1 \pm 0.05774
Acetone soluble	41.57 \pm 11.08	40.0 \pm 0.00
Chloroform soluble	43.75 \pm 18.032	42.23 \pm 0.03

The determination of foreign organic matters gives idea about contamination of plant parts with insect, moulds or other animals. The high content of foreign organic matters indicates that plant material is not coming from the original part.

Table 6: Determination of foreign organic matters of powdered drug of *Semecarpus anacardium* Linn.

Parameter	(Mean % w/w \pm S.D)	
	Leaves	Stems
Total Foreign organic matter	7.15 \pm 0.7976	5.12 \pm 0.2

The preliminary phytochemical screening of ethanolic extract of leaves and aqueous extract of stems of the plant shows presence of alkaloids, carbohydrates, fats and oils (in leaves), glycosides, tannins and phenols, flavonoid glycosides, saponin glycosides (in stems) and cardiac glycosides (in leaves). The active constituents of the plant parts could be responsible for their pharmacological activity.

The results of these investigations could inform about the proper identification, collection and investigation of the plant. The pharmacognostic features investigated on *Semecarpus anacardium* Linn in the present study may serve as tool for validation of the raw material and its standardization.

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