

PHARMACOGNOSTICAL AND ANALYTICAL ANALYSIS OF ARTOCARPUS HIR- SUTUS LAM.-A FOLK PLANT

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ABSTRACT

Plants—the basis for life on earth— have been widely used as a source of medicine by man since ancient times. Most of the people depending on traditional medicine live in developing countries and they rely mainly on traditional herbal medicine to meet their primary healthcare needs. The Indian region is very rich in ethnobotanical heritage due to its rich cultural diversity. Over 16,000 species of higher plants occur in India, of which approximately 9,000 are known to be economically useful. Of these, 7500 are used for healthcare by various ethnic communities in India. *Artocarpus hirsutus* Lam.is one such folk plant which belongs to family moraceae and is being used by the traditional people to attain health benefits. It is highly used by the people of southern India as it is available in southern India. It is plant which has both economical as well as medicinal benefits as its wood is considered to be equal to that of timber and folk people use its leaf, seed, stem, bark for treatment. There is no documentation in Ayurvedic text as it is an extra pharmaco peel drug. So, this drug was taken for research so as to standardize this highly usable drug by folk people and can be incorporated in Indian system of medicine.

Keywords: *Artocarpus hirsutus* Lam., folk plant, standardization

INTRODUCTION

Artocarpus hirsutus Lam. is one among the five available five varieties of jackfruits. It is a non-classical drug which is used ethnobotanically in the southern part of India. It is an evergreen tree which is found in Southern part of India. The word Artocarpus means an evergreen Asiatic tree which are grown through the

tropics and hirsutus means prickly and hairy which completely resembles the morphological feature of the fruit of the plant. The plant is endemic to western Ghats but still holds medicinal importance. Its wood is used as timber to prepare furniture and boats in southern parts of India. It grows at an altitude ranging from sea

level at an elevation of 1000 meters in places with an annual rainfall of 1500 mm or more.¹ Commonly it is known as *Hebbalasu* in Kannada and *Anni* in Malayalam. The bark, Seeds, Leaf are of great medicinal importance. Traditional people are using these to treat many diseases like ulcers, wounds, joint pains, bulbocele *asthama* etc.

TAXONOMY AND ETHNOBOTANY

Taxonomically *Artocarpus hirsutus* Lam. belongs to angiosperms and the details are as follows²:

- Kingdom –Plantae
- Division-Angiosperms (unranked)
- Phylum-Eudicots (unranked)
- Class-Rosids (unranked)
- Order-Rosales
- Family-Moraceae
- Tribe- Artocarpeae
- Genus-*Artocarpus*
- Species-*hirsutus*
- Specie authority- Lam

It is a large evergreen tree up to 70 m in height with a straight clear bole and dense foliage, found up to an altitude 1200m in evergreen forest of peninsular India. The bark is grey in colour and the branches are strigose with tawny hair, leaves are up to 25x14 cm, broadly ovate, obovate or elliptic, subacute or very shortly acuminate at apex, rounded at base, pinnatifid, dark green, rusty – pubescent beneath; petiole up to 3 cm long, stipules are lanceolate. Inflorescence having male inflorescence narrow, cylindrical, up to 14 cm long, smooth while female inflorescence ovoid; peduncles stout. Syncarps- up to 15x10 cm, ovoid^{3,4,5}.

VERNACULAR NAMES OF *Artocarpus hirsutus* Lam.⁶

English – wild Jack

Kannada- *Hebbalasu, hebbe-lasu*

Malayalam- *Ayani, Ayaniplavu, Annali, Annili, Aini, Ayari*

Marathi- *Pat-phanas, Ranphanas*

Tamil- *Kattuppala. Akkini, Anjili*

Telugu- *Pejuta*

CULTIVATION AND PROPAGATION-

It can be propagated by using seeds which can be collected in the month of March to June. The viability of the seeds is up to 10 months. However, the seed germination is poor as it takes more than 40 days to germinate.

MATERIALS AND METHODS

COLLECTION OF SAMPLE

Fruits of *Artocarpus hirsutus* Lam. were collected from UJrakala, Karkala, and Hebri of Udupi district. The authenticity of fruits was confirmed by experts at SDM Centre for Research in Ayurveda and Allied Sciences, Udupi with the help of Pharmacognosist. Botanical characters were also compared with various floras. Thereafter, seeds were taken out from the fruit and were washed properly. Seed were sun dried and were used for further evaluation.

PRESERVATION OF SAMPLE

The collected seeds are dried and were stored in air tight containers at SDM Centre for Research in Ayurveda and Allied Sciences, Udupi for pharmacognostical & phytochemical studies. For microscopic examination sample was preserved in fixative solution FAA (Formalin 5 ml + Acetic acid – 5 ml + 70% Ethyl alcohol – 90 ml) for more than 48 h.

MACROSCOPY

Sun dried samples of *Artocarpus hirsutus Lam.* seed were keenly observed under naked eyes to record the specific botanical characters and it was also recorded using Canon Ixus digital camera with size indicating rulers.⁷

MICROSCOPY

The histology of *Artocarpus hirsutus Lam.* seeds including seed coat, testa and cotyledon was recorded following standard microscopy procedures.⁸ The preserved specimens were cut into thin transverse section using a sharp blade and the sections were stained with safranin. Transverse sections were photographed using Zeiss AXIO trinocular microscope attached with Zeiss AxioCam camera under bright field light. Magnifications of the figures are indicated by the scale-bars⁹

ANALYTICAL ANALYSIS

Artocarpus hirsutus Lam. seed oil was tested for analytical constants like specific gravity, refractive index, acid value, rancidity, saponification, un-saponification matter, viscosity, iodine value, peroxide value as per standard protocol.

HPTLC FINGER PRINTING

Sample preparation for HPTLC:

Sample obtained in the procedure for the determination of un-saponifiable matter is dissolved in 10 ml of chloroform this was followed for the sample of *Artocarpus hirsutus oil*, and chloroform soluble portion was used for HPTLC.

HPTLC:

4, 8, 12 μ l of the above sample was applied on a pre-coated silica gel F254 on aluminium plates to a band width of 8 mm using Linomat 5 TLC applicator. The plate was developed in Toluene – Ethyl acetate (9:1) and the developed plates were visualized under short UV and long UV,

and after derivatisation in vanillin-sulphuric acid spray reagent and scanned under UV 254nm, 366 nm and 620nm (post derivatisation). R_f, colour of the spots and densitometric scan were recorded^{10,11}.

RESULT:

MACROSCOPIC STUDY

Cylindrical to oval in shape, broader at centre and narrow at ends, 1.5 cm in length, 1 cm in width, Arillus is tough, shrivelled, covers the whole seed gets separated into an empty oval shaped translucent whitish yellow bag like structure exhibiting a distinct micropylar hole enriched by spherical elevation at broad, lateral side. This is previously covered by another transparent layer of covering which can be easily separated. The seed coat is brittle, dark reddish brown in colour. It doesn't get easily detached. The surface is regular with no striations. The upper surface is convex and the dorsal surface is concave. Hilum is distinct, circular, buff in colour located at lateral side near the broad basal end and lying adjacent to micropyle; Kernel is buff to creamish buff in colour. Fig (iA)

MICROSCOPIC STUDY –

TS passing through the centre of the seed is circular in outline, shows thin layer of Arillus encircling the narrow brown coloured testa and centrally located unequal sized horizontally placed cotyledons occupying the major area of the section.

LS is oval in outline, shows centrally located vertically placed, unequal sized cotyledon occupying the major area of the section encircled by testa and Arillus.

Detailed TS of the seed shows an outer Arillus consisting of a layer of broken, tubular cells of

epidermis, 3-4 layer of lignified cells of parenchymatous cells lying underneath it and inner zone of compactly arranged 4-5 rows of sclereids and stone cells of various sizes and thickness, followed by tangentially elongated celled layer of testa covered with the thin cuticle and a broad parenchymatous inner zone consisting of outer 3-5 rows of compactly arranged big sized angular cells filled with brown coloured pigment and inner 3-5 rows of small sized, irregular, sinuous walled tangentially running embedded with vascular bundles. Endosperm is not evident. Fig (I B)

TS of cotyledon shows an outer and inner epidermis enclosing the wide parenchymatous zone of mesophyll, the cells of the outer epidermis are smaller in size, light brown in colour, covered with thin cuticle and are embedded with fixed oil globule and aleurone grains, at places it penetrates to a short distance inside the cells of cotyledon; the cells of the inner epidermis unlike the outer one are embedded with the dark orange coloured pigments. The parenchymatous cells of mesophyll are loaded with simple starch grains, few aleurone grains and fixed oil globules and are biggest in size in the central region, 3-4 rows of cells lying underneath the lower epidermis containing aleurone grains only. (Fig I C)

ORGANOLEPTIC STUDY

The organoleptic characters of Ayurvedic drugs holds utmost importance. They help in the basic understanding of the drug which also corresponds to Panchendriya Pariksha of *Ayurveda*. Thereby organoleptic features of *Hebbalasu- Artocarpus hirsutus Lam.* seed kernel, powder and oil are explained in (table 1,)

ANALYTICAL PARAMETERS: -.

The Analytical test for *Artocarpus hirsutus Lam.* seed oil were done to record the following parameters according to the standard protocol which are recorded in (table 2)

HPTLC-

HPTLC finger print profile of ethanol extract of *Artocarpus hirsutus Lam.* has been obtained with suitable solvent system. The developed plates were visualized under UV light and white and then under light after derivatisation with vanillin sulphuric acid reagent. Rf, colour of the spots and densitometric scan at 254 and 366, 620 nm was recorded. On photo documentation, there were 12 spot under short UV, 4 spots under long UV and 5 spots under white light post derivatisation. Densitometric scan at 254 nm showed 11 peaks at Rf 0.01 (9.66%), 0.09 (4.99%), 0.12 (3.55%), 0.26 (1.89%), 0.32(22.61), 0.46(22.78), 0.61(15.84), 0.68(5.90), 0.77(2.67), 0.81(4.27) and 0.93(1.84). There were 4 peak at 366 nm with Rf 0.01 (1.17%), 0.53 (10.16%), 0.62(4.13) and 0.92 (84.54%). There were 10 peak at 620 nm with Rf 0.06(8.79), 0.13(8.30), 0.20(7.23), 0.27(6.87), 0.40(14.69), 0.50(21.99), 0.60(26.11), 0.70(1.69), 0.78(3.59) and 0.96(5.14) being represented in fig iii (A), (B), (C) respectively.

DISCUSSION

The macroscopic features recorded can be used for preliminary identification of the particular plant. In many of studies reported earlier, the macro-microscopic studies have been proved to be effective in establishing the authenticity and detection of adulterants/substitutes for herbal raw drugs. *Artocarpus hirsutus Lam.* is an angiosperm. Microscopic features

revealed outer layer of epidermis containing fibres groups cells and many layers of parenchyma, the innermost layers contained continuous layers of small sized stone cells, most of the parenchyma contains starch grains. And inner cotyledon contained of large parenchyma cells containing aleurone grains and oil globule. The characters were comparable to microscopic structures of dicotyledonous seeds. HPTLC photo documentation revealed presence of phyto constituents with different Rf values. Densitometric scan of the plates showed diagnostic bands under 254 nm, 366 nm and 620nm and post derivatisation. HPTLC fingerprinting is an effective technique of screening herbal raw drugs for authenticity and quality and standardisation.

Ayurveda *Acharyas* have opined to make use of the drug found in the vicinity but after thorough examination before incorporating in medicine. Folklore medicine has tremendous source of information regarding the utility of locally available plants for use as food or medicines. Such plants have to be properly explored and scientifically documented before putting it in use. *Artocarpus hirsutus* Lam. locally called as Hebbalasu of family Moraceae is not considered as a source for any classical Ayurvedic drug. There are many numbers of valuable plants which has to be explored to include in Ayurvedic Pharmacopoeia. These less explored plants need a systematic and scientific documentation. The current study has evolved standards for one of extra pharmacopoeial drug which is in verge of extinction.

CONCLUSION

Table 1: Organoleptic parameters analysis

PARAMETER	OBSERVATION					
	Seed Kernel	Seed powder	Seed oil			
	Dark brown	Light brown to sandy colour	Dark Yellow			
ODOUR	Characteristic	Characteristic	Characteristic sweet			
TASTE	Bitter(Katu), (Kashaya)	Astringent	Bitter(Katu), (Kashaya)	Astringent	Sweet(Madhura), (kashaya)	Astringent
TOUCH	Smooth, Non glabrous	Rough	Smooth			

Table 2: Analytical parameters analysis

Parameter	Results n = 3 %w/w
	<i>Artocarpus hirsutus oil</i>
Colour	Yellow green
Odour	characteristic
Refractive index	1.47156
Specific gravity	0.9471
Rancidity	Fat is not oxidised
Acid value	1.09
Saponification value	171.10
Iodine value	103.26
Unsaponifiable matter (%)	5.83
Peroxide value	6.76

Fig (i)



Fig I A-Macroscopy of seed

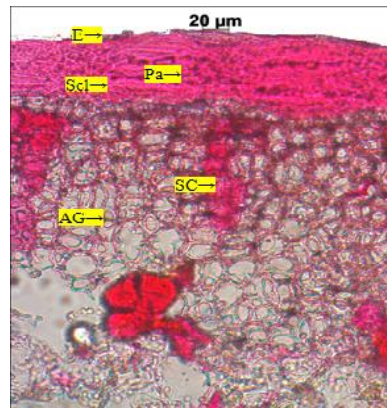


Fig I B-T.S of Arillus

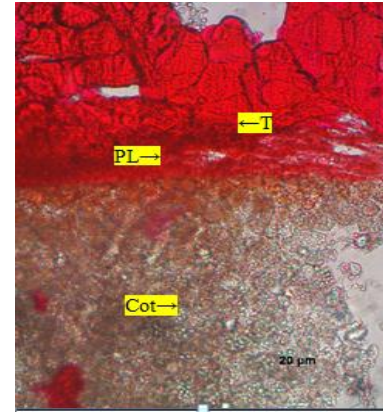


Fig 1 C- T.S of testa and cotyledon

Where AG – aleurone grains; Cot – cotyledon; E – epidermis; Pa – lignified parenchyma; PL – pigment layer; SC – stone cells; Scl – sclereids; T – testa.

Fig ii - HPTLC photo documentation of Chloroform extract of *Artocarpus hirsutus* oil
Solvent system – Toluene: Ethyl Acetate (9.0: 1.0)

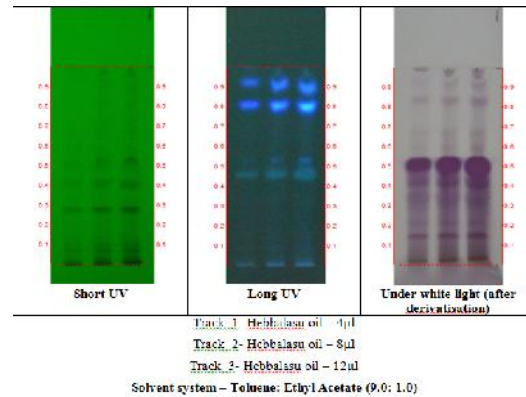
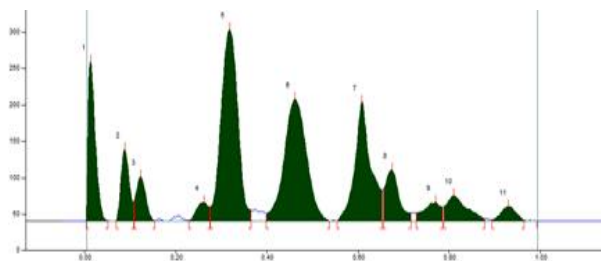


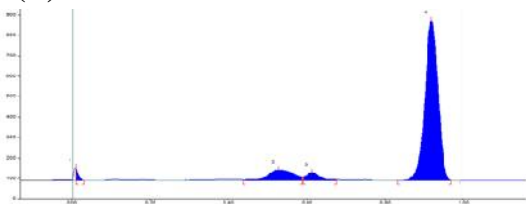
Fig iii (A) Densitometric scan at 254nm



Peak	Start Position	Start Height	Max Position	Max Height	Max %	End Position	End Height	Area	Area %
1	0.00 Rf	0.0 AU	0.01 Rf	219.4 AU	19.10 %	0.05 Rf	0.3 AU	2514.7 AU	9.66 %
2	0.07 Rf	0.2 AU	0.09 Rf	97.9 AU	8.52 %	0.11 Rf	25.9 AU	1299.2 AU	4.99 %
3	0.11 Rf	27.7 AU	0.12 Rf	81.4 AU	5.35 %	0.15 Rf	0.2 AU	923.3 AU	3.55 %
4	0.23 Rf	1.1 AU	0.26 Rf	25.5 AU	2.22 %	0.28 Rf	19.5 AU	491.3 AU	1.89 %
5	0.28 Rf	19.6 AU	0.32 Rf	263.1 AU	22.90 %	0.37 Rf	15.3 AU	6924.9 AU	26.61 %
6	0.40 Rf	10.6 AU	0.46 Rf	167.0 AU	14.53 %	0.54 Rf	0.1 AU	6027.7 AU	22.78 %
7	0.55 Rf	0.3 AU	0.01 Rf	163.7 AU	14.25 %	0.05 Rf	42.7 AU	4121.0 AU	15.04 %
8	0.66 Rf	43.3 AU	0.68 Rf	70.3 AU	6.12 %	0.72 Rf	10.9 AU	1536.6 AU	5.00 %
9	0.73 Rf	11.2 AU	0.77 Rf	25.7 AU	2.24 %	0.79 Rf	19.0 AU	694.0 AU	2.67 %
10	0.79 Rf	19.4 AU	0.81 Rf	35.1 AU	3.06 %	0.88 Rf	3.1 AU	1111.5 AU	4.27 %
11	0.90 Rf	2.0 AU	0.93 Rf	19.6 AU	1.71 %	0.97 Rf	0.7 AU	478.3 AU	1.84 %

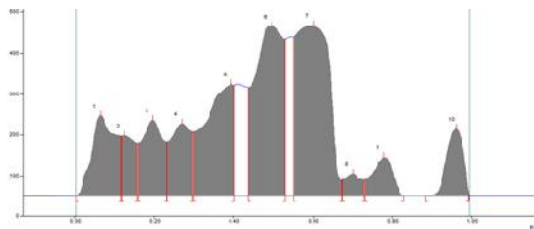
Hebbalasu oil (12µl)

Fig iii (B) Densitometric scan at 366nm



Peak	Start Position	Start Height	Max Position	Max Height	Max %	End Position	End Height	Area	Area %
1	0.01 Rf	57.8 AU	0.01 Rf	57.8 AU	5.25 %	0.03 Rf	0.2 AU	256.8 AU	1.17 %
2	0.44 Rf	3.0 AU	0.53 Rf	46.2 AU	5.20 %	0.59 Rf	17.4 AU	2285.0 AU	13.16 %
3	0.59 Rf	17.4 AU	0.62 Rf	37.9 AU	4.10 %	0.88 Rf	3.4 AU	922.1 AU	4.13 %
4	0.83 Rf	0.0 AU	0.92 Rf	781.4 AU	84.45 %	0.97 Rf	0.3 AU	13854.2 AU	84.54 %

Hebbalasu oil (12µl)

Fig iii (C) Densitometric scan at 620nm

Peak	Start Position	Start Height	Max Position	Max Height	Max %	End Position	End Height	Area	Area %
1	0.30 Rt	0.3 AU	0.06 Rt	197.5 AU	9.26 %	4.12 Rt	47.6 AU	8566.2 AU	6.79 %
2	0.12 Rt	147.8 AU	0.13 Rt	149.1 AU	6.99 %	4.16 Rt	39.8 AU	3898.7 AU	3.30 %
3	0.16 Rt	131.6 AU	0.20 Rt	186.5 AU	8.75 %	4.23 Rt	33.9 AU	7045.8 AU	7.73 %
4	0.23 Rt	133.5 AU	0.27 Rt	177.2 AU	8.31 %	4.38 Rt	57.9 AU	6695.2 AU	6.57 %
5	0.30 Rt	157.0 AU	0.40 Rt	274.9 AU	12.85 %	4.44 Rt	71.2 AU	14347.3 AU	14.89 %
6	0.44 Rt	295.8 AU	0.50 Rt	415.1 AU	19.47 %	4.53 Rt	85.0 AU	21425.7 AU	21.99 %
7	0.55 Rt	390.3 AU	0.60 Rt	477.1 AU	19.60 %	4.67 Rt	39.8 AU	25258.1 AU	26.21 %
8	0.58 Rt	40.4 AU	0.70 Rt	54.9 AU	2.58 %	4.73 Rt	40.1 AU	1645.8 AU	1.69 %
9	0.73 Rt	40.4 AU	0.78 Rt	95.0 AU	4.45 %	4.83 Rt	0.6 AU	3484.8 AU	3.59 %
10	0.89 Rt	0.0 AU	0.96 Rt	164.7 AU	7.73 %	4.99 Rt	12.7 AU	5010.6 AU	5.14 %

Hebbalasu oil (12µl)

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