ĀRYAVAIDYAN

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the most precious is health

Vaidyaratnam P.S. Varier's
Arya Vaidya Sala, Kottakkal, Kerala

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VAIDYARATNAM P.S.VARIER'S
ARYA VAIDYA SALA, KOTTAKKAL

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LITERARY STUDY
Āryavaidyan, Vol. XXXII, No. 2, November 2018 - January 2019, Pages 05 - 08

Kḷeda: a theoretical exploration

Prasad M.

ABSTRACT: Kḷeda is a word that we meet with very frequently in āyurveda literature. But as a technical term, it is not properly defined or explained. It's positioning among the entities like doṣa, dhātu and mala is also a grey zone. In this note it is tried to understand the term in a descriptive manner taking sufficient leads from the literature and by generating additional inferential inputs from them.

Key words: Kḷeda, Sneha, Rasa

Introduction

The word 'kḷeda' originates from the root 'kḷid' which means 'to make wet'. So, kḷeda is something which makes things wet. The word is not always used to mean a dravya. It can be a state as well. It is observed that snigdha (sneha) is the property which makes things wet and anything with snigdha property may be called as a sneha. So kḷeda is a representation of sneha. Sneha is the property of jalabhūta. That way, kḷeda is attributable to jala.[1]

Initial understanding

Human body is said to be 'snehasāra'[2] which means that the essence of the body is sneha. It is also known that the doṣa, dhātu and mala constitute body.[3] Unlike dhātu and the mala, the doṣa lack perfect physical and perceivable forms. Taking the dhātu, which are responsible for the sustenance of the body, into consideration, it is observed that they exist in two forms: the poṣya and the poṣaka. The poṣya form of a dhātu is that which is determined by factors like prakṛti, sāra, etc. and is fully formed as the individual edges past his adolescence. The dhātu are continuously getting consumed for the sustenance of the body. As a result of this, a deficit of dhātu may set in. Prompt replenishment is needed to address this issue. Otherwise, a stage of dhātukṣaya evolves, which shall lead to the destruction of body. This 'topping up' of dhātu is achieved through food. This form of the dhātu made out of the food is understood as the 'poṣaka' form. Though the major responsibility of transforming the food into the dhātu is attributed to agni, the contributory roles played by other factors (Samāna vāyu, kḷedakakapha, etc.) have been well acknowledged. Continuous transformation from one form to the other is the key process all over here. Digging a little deeper, the statement that the life is an outcome of the paramount process of continuous transformation of 'food into body', may seem aggrandized, but is an undeniable truth. In this transformation process, the consumption of food, division of the consumed into 'sāra and kiṭṭa', assimilation of sāra and expulsion of kiṭṭa, form the different phases. The kiṭṭa form, which is produced as a derivative of the transformation process, is termed as mala. The mala are expelled in succession to their formation. These mala, through specific duties performed in the time span between their formation and expulsion, contribute significantly to the sustenance of the body. Thus, the dhātu and mala constitute the physical and perceivable form of the body.

All kāryadravya are made out of the five bhūta. It is proposed that in the making of a kāryadravya, the basic material contributed by pṛthvi is held together by jala, arranged in the space provided by ākāśa, in the specific shape as decided by vāyu and then subjected to pāka by agni.[3a] Śarīra, as a kāryadravya, does not make any exemption in this regard. Pṛthvi is the material cause and jala is the binding principle

here. So śarīra may be, of course metaphorically, considered as a mass of sneha made out of pṛthvi and jala. And that could be the very idea behind the notion of considering puruṣa as snehasāra.

The idea of Kḷeda

The essence formed as a result of the primary transformation process of food- known as the āhārasāra- serves as the raw material for the formation of rasadhātu. This rasa may be considered as the poṣaka part of rasadhātu. The sāra part formed as a result of primary transformation of āhāra is thought to be a new dravya. This has its seat in āmāśaya. When it is driven into the rasavahasrotas, it is christened technically as rasadhātu. The fact that rasadhātu and āhārasāra are named separately, despite being the same in composition, is worth a thought. The significance of this transition is that the sāra is heterogenous to the basic sneha of the śarīra whereas rasa is homogenous. This is an important understanding by many means. It may be remembered that there exists a pool of sneha within the body, which comes into existence from the very beginning of life and continues to exist till the end. This is not a new idea. The authors have documented its presence in many situations. The mentioning of udaka, ambu, saumya dhātu, etc. in various contexts is indicative of this snehabhāva. This pool of sneha is unique by default. Perhaps the avalambaka kapha may be considered as the core centre of this snehabhāva. This pool of sneha is pervasive throughout the body, serving as the fundamental raw material required for transformation of dhātu; and most importantly, it works as a receptacle for the 'spill over' sneha within the system of dhātu. It has been explained that in order to serve as the raw material for dhātu formation, this snehabhāva is assimilated and stored in the respective dhātvāśaya according to the need. In this context, this snehabhāva gets the name 'kalā'.[3b] In fact this sneha seems to be the poṣya bhāva of rasadhātu. But seldom have we found such an explanation in the literature. Conventionally the term rasadhātu is used to address only that rasa which is formed out of the āhāra, which is 'poṣaka', and is transported through the 'rasāyanī'. Probably, the primary pool of sneha is not assigned to be known as dhātu for the reason that it re-assimilates and accommodates the 'spill over' sneha forms, which are produced as the derivative of transformation, thereby showing the potential of malinīkaraṇa/mala ('malinīkaraṇāt mala'). Alternatively, however, this collection of sneha is technically termed as 'kḷeda'. To make the idea of kḷeda clear we may put it in two statements:1. Fundamentally, rasadhātu is responsible for the replenishment of kḷeda and the other dhātu are formed from kḷeda ('the concept of kalā') 2. The mala which are formed as the derivative in the transformation processes are in the form of sneha and these mala are added on to the pool of kḷeda existing in the body which later get expelled out from the body through well-controlled and structured mechanisms.

Kḷeda v/s Rasa

Now, we may have a look into some of the similarities and differences existing between rasadhātu and kḷeda. Rasa is transported throughout the body by means of specific channels. These are named rasvaha srotas or rasāyanī. On the other hand, there are no such channels described in the case of kḷeda. However it is interesting to note that the so-called udakavaha srotas can be regarded as the one, which transports kḷeda in the body. Also, while the rasa exists in dhātu form, kḷeda shows the characters of both dhātu and mala. The qualities of rasa (which is the poṣaka) resonate in the kḷeda (which is the poṣya) inherently. But a statement that the qualities of kḷeda will be reflected in the rasa will hardly be right. Apart from its avatar as the principle that nourishes the reserve of kḷeda of the body, it seems that the rasadhātu hardly has any stable existence. On the other hand, kḷeda may be considered relatively stable.

Vipāka in Kḷeda

We have already seen that āhārasāra is considered as heterogeneous whereas rasadhātu is homogeneous with respect to human body and also that the qualities of rasadhātu shall be reflected in the kḷeda. Now, let us have a peep into the formation of rasa. In āhārasāra, which is the essence formed after pāka,

there are only three significant rasa (tastes) namely madhura, amḷa and kaṭu. They are known as the three vipākarasa. This can be true in the case of rasadhātu as well. So, subsequently, these three rasa show their manifestation in the śarīra kḷeda too. Accordingly, we can visualize three states of kḷeda, *viz*, madhurakḷeda, amḷakḷeda and kaṭukḷeda. Since these three rasa represent the tridoṣa, it can be stated that the proper and sound state of these three kḷeda forms are responsible for health and any departure from this optimum leads to illness. These three kḷeda forms, madhura, amḷa and the kaṭu, endow the body with specific functions; madhura by providing the structural stability and compactness, amḷa by igniting and maintaining the agni, and kaṭu by influencing the status of srotases.

It may be a matter of interest to note that any activity or condition in the koṣṭha shall reflect in the śarīra-kḷeda as well. Accordingly in the first phase of digestion, which is basically kapha predominant, the kḷeda shows an inclination towards madhura. Similarly, it inclines towards amḷa and kaṭu in the next two stages (pacyamāna and pakva) of digestion respectively. This is a normal event .[1a] Contrarily, if there are permanent imbalances of the digestive factors prevailing in the koṣṭha, especially the agni, combined with habituation of improper eating habits (aśanadoṣa) and unwholesome foodstuffs, it is quite obvious that it would result in the permanence of a doṣaduṣṭi in kḷeda. This can further serve as a root cause for all sorts of diseases. This is an important point in diagnosis and treatment on many diseases. Such a picture of kḷeda is also the key to unlock many unaddressed questions like, why agni is considered as the main focus of attention in cikitsa? why laṅghana becomes a major type of cikitsa? and a lot more.

Kḷedanirharaṇa

Expulsion of kḷeda (kḷedanirharaṇa) is seen to be a major step that assures the successful completion of upakrama. The extent of this practice ranges from a small duṣṭavraṇa, where a local presence of kḷeda is detectable, to the most complicated prameha where there is extensive presence of morbid kḷeda. It is interesting to note that śilājatu, which is considered as one of the best drugs used in pramehacikitsa, is also one among the best drugs that can facilitate expulsion of kḷeda from the body. When we state that śilājatu is the drug of choice in diseases originating in vasti (vastijeṣu girijam..), it may be noted with care that the diseases mentioned are not the ones which originate in the organ called vasti but those which involves the function of 'kḷedavahana'. The same picture should be born in mind when we state that prameha is a disease having its root in vasti. From the bold statement that all diseases can be cured by śilājatu, it may be interesting to note that a kḷeda-centred samprāpti can be delineated for all diseases which can be read out between the lines in the literature. A proper understanding of kḷeda may help a clinician to understand even the subtlest elements involved in the samprāpti of a disease. And the best tool for the same could be mūtraparīkṣa. We should not forget that a thorough assessment of mūtra indirectly gives us a picture of the nature of kḷeda in the body, thereby rendering us with the knowledge about the inner niche of the body.

Kḷeda in samprāpti and cikitsa

A picture of kḷeda is brought into the topic of discussion, in one or the other context, during the explanation of almost all the diseases. Raktapitta, śvāsa, tṛṣṇā, mūtraroga, kuṣṭha, diseases showing abhiṣyanda nature, etc. are all examples in this regard. In the context of diseases with kḷeda, lasīka and śithilamedas as dūṣya, all the descriptions made there, in fact, point to the changes happening to the śarīra kḷeda, directly or otherwise. The condition of kḷeda during the procedure of snehapāna, and the management protocol suggested to counteract the complications of snehapāna, are points worth recollecting here. While prescribing a bṛmhaṇa therapy for a person weakened by medicines, it should be understood that this bṛmhaṇa therapy is aimed exclusively at the restoration of the lost kḷeda, thereby

replenishing the kḷeda reserve in the body. This is also significant in 'apunarbhavacikitsa'.

As mentioned earlier, mūtraparīkṣa stands out as an important tool for the assessment of kḷeda in the body. Different observations have been recorded in the texts regarding mūtra with respect to its quantity, colour, odour, turbidity, etc. A deeper thought about such a picture of kḷeda may provide one with better inspirations to pursue the technique of mūtra parīkṣa deeply. Ofcourse, a better understanding of mūtra-parīkṣa can help one to sharpen the ideas of dhātu, dhātvagni, and status of doṣa.

Kḷeda in Uras

Like in the inner body, kḷeda is also present in the external body, spreading all over the skin and the external openings/orifices (tvak and bāhya srotas). Sveda, one among the trimala, hold the kḷeda over the skin, and makes it snigdha. The uras (chest region), which is considered as the centre for avalambaka kapha may be considered as the centre for the kḷeda reserve too. Structurally, all the organs residing within the uras host the kḷeda and thereby get the blessings of sneha. The two phuphphusa, hṛdaya and the junction of these three (known as trika) are the major considerations here. The phuphphusa contribute their role in the explusion of kḷeda through the act of breathing in and out. Skin, within its limits, does the same.

Conclusion

Kḷeda is the fundamental collection of sneha in the body. It keeps the entire body moistened (kḷedane) and holds all the elements together (cūrṇādi piṇḍībhāvahetuta). It is regarded as a dūṣya for its potential to get afflicted by doṣas and as a mala for two reasons, viz., its capacity to pollute the system and its nature of getting eliminated systematically. But, kḷeda is the basic principle of sneha in the body that sustains life. The terms used in the literature like ambu, udaka, lasīka, soumya dhāthu, mūtra, rudhira, sveda, vasā, etc. in different contexts are suggestive of some or the other form of kḷeda. The nature and built of rasadhātu, the poṣaka principle, reflects in the nature and built of kḷeda. The principle called kalā which is residing in the 'factories' of dhātu and sacrifice itself as the fuel, is also nothing but kḷeda. Any effort to evaluate the kḷeda will invariably make the understanding of the body more vivid and precise.

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PHARMACOGNOSTIC STUDY
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Pharmacognostic features of bark drugs, *Bauhinia variegata* L. and *Bauhinia purpurea* L. - sources of Kāñcanāra

Mamata K. V. and Suma Mallya V.

ABSTRACT: *B. variegata* (śveta) and *B. purpurea* (rakta) are said to be the two sources used in the name of kāñcanāra bark in Indian System of Medicine. Authentic marks provided through pharmacognostic study help in proper identification of bark sample. Bark samples of test drug collected from matured trees in proper season were cleaned from extraneous matter. Macro-microscopic, physico-chemical study and HPTLC (High Performance Thin Layer Chromatography) photo-documentation of these bark samples were done and the results were documented separately. Rhytidoma, with lenticels found over *B. variegata* (śveta), whereas the other one does not had any external appendages. Intercepted medullary rays with suberized cork layer with parenchymatous prismatic crystals were found in *B. variegata*, whereas layer of cork, phellogen, cortex with spharaphide, phloem parenchyma with idioblasts were the microscopic features of *B. purpurea*.

Key words: *Bauhinia variegata* L., *Bauhinia purpurea* L., Pharmacognostic, Kāñcanāra, HPTLC

Introduction

Kāñcanāra is a popularly used bark drug in Indian System of Medicine since centuries. Botanically it is correlated with *Bauhinia* species belonging to family Ceasalpinioideae.[1] *Bauhinia* is a genus of shrubs and trees distributed throughout the tropical region of the world.[2] Few texts like Bhāvaprakāśanighaṇṭu had mentioned two types of kāñcanāra ie. śveta (white) and rakta (red); authentically which can be correlated with *Bauhinia variegata* L. and *Bauhinia purpurea* L.[3,4]

Śveta kāñcanāra is a moderate sized deciduous tree with vertically cracked grey bark, found commonly in Punjab, Western Peninsula and Assam.[5] Bark of this tree is said to be astringent, antihelmenthic used externally in scrofula and skin diseases. Indian system of medicine marks its benefits in lymphadenitis and goiter.[6] Beta sitosterol, lupeol and flavones glycosides are the major phytochemical constituents found to be present in this.[7]

Rakta kāñcanāra, medium sized evergreen ornamental tree, which bears fragrant flowers of purple or deep rose to liliac from September to December.[8] Traditional claim suggests its benefits in diarrhea, ulcers and fractured bones. This tree is found commonly in Himalayas, Northern parts of India, Assam and Khasi hills. Few experimental studies conducted from its stem bark exhibited thyroid function stimulating action in experimental animals.[9]

Bhāvaprakāśa mentions clearly about the two types of kāñcanāra which is beneficial in arbuda (tumor), gaṇḍamāla (thyroid) and apaci (lymph adenitis).[10] Identity parameters of a plant part used in therapeutics is one among the prime issues related to drug research.[11] With this background a study has been planned to generate macro-microscopic and physico-chemical standards along with HPTLC of these two commonly used drugs.

Materials and methods

Collection and authentication of plant material:

Bark pieces of *Bauhinia variegata* L. and *Bauhinia purpurea* L. were collected from matured trees in the month of November from Manipal, without damaging the cambium and sample was deposited at the Pharmacognosy unit of SDM Centre for Research in Ayurveda and Allied Sciences, Udupi (Voucher

no: sdmrc.16081201). Bark pieces were cleaned from extraneous matter, few parts were kept in formalin acetic acid solution for microscopic study. Rest of the pieces were shade dried and powder was prepared and preserved for further study.[12]

Macroscopic evaluation: Morphological characters of both bark pieces were studied separately, as per visual observation and the protocols of Ayurvedic Pharmacopoeia of India. These samples were keenly observed under naked eye to record the specific botanical characters and it was also recorded using Canon digital camera with size indicating rulers.[13]

Microscopic evaluation: The preserved bark pieces of two samples were cut into thin transverse section using a sharp blade and the sections were stained with saffranine. Transverse sections were photographed using Zeiss AXIO trinocular microscope attached with Zeiss AxioCam camera under bright field light. Magnification of the figures was indicated by the scale-bars.[14]

Physico-chemical standards: The powder prepared out of *Bauhinia variegata* and *Bauhinia purpurea* was observed for pharmacopoeial constants like loss on drying at 105^0C, total ash, acid insoluble ash, alcohol soluble extractive and water soluble extractive as per standard protocol.[15]

HPTLC: One gram of powdered samples of test drug was dissolved in 10 ml ethanol and kept for cold percolation for 24h and filtered. 6 and 9µl of the above samples were applied on a pre-coated silica gel F254 on aluminum plates to a band width of 7 mm using Linomat 5 TLC applicator. The plate was developed in Toluene: Methanol (5.0: 1.5). The developed plates were visualized in UV 254nm and 366nm and then derivatised with vanillin sulphuric acid reagent and scanned under UV 254nm, 366nm and 620nm post derivatisation. R_f, colour of the spots and densitometric scan was recorded.[16]

Results

Macroscopy: *Bauhinia variegata* L. bark pieces were curved or channeled, 1-10 cm in length, 2-3cm in width and 1-2cm thickness. Outer surface was rough and showed patches of rhytidome and round oval protuberances of the lenticels. Inner surface was smooth, longitudinally striated, reddish in colour, taste astringent and without any characteristic smell.

Bauhinia purpurea L. bark pieces were long thin, curved, chanelled, 5-10 cm in length, 1-2 cm in width, 1-2 cm in thickness, outer surface rough and yellowish white in colour. Inner surface was smooth, reddish brown, fibrous and astringent in taste. Figure 1

Figure 1

Macroscopic view of the two varieties of kāñcanāra

Bauhinia variegata L. (Śveta)

Bauhinia purpurea L. (Rakta)

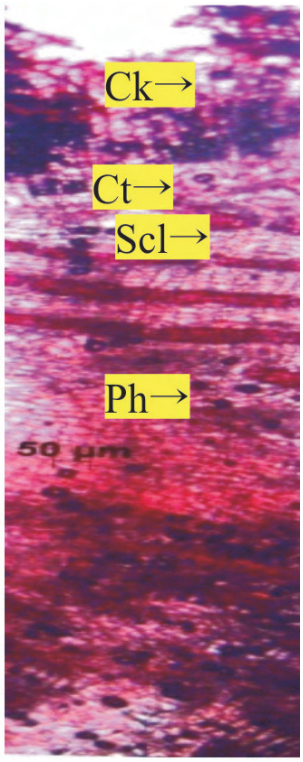
Microscopy: TS (Transverse section) of bark *Bauhinia variegata* L. composed of suberized cork which was four to five layers, cortex was parenchymatous with plenty of prismatic cluster and rosette crystals of calcium oxalate, groups of fibres, stone cells and sclereids of various size and shapes. Phloem was very wide containing groups of thick walled fibres, pitted stone cells, sclereids, parenchyma embedded with prismatic crystals of calcium oxalate, rosette crystals, spaheraphides, idioblasts and on the inner phloem there were tangentially running groups of fibres, sieve tubes and companion cells were also present at times. Phloem parenchyma was intercepted by medullary rays. Figure 2.

TS of bark *of Bauhinia purpurea* L. showed cork cells thick walled 5 to 6 rows suberized containing stones cells in groups, followed by phellogen in two rows. Cortex was narrow and contained spharaphides at times. Phloem region mainly consisted of phloem parenchyma. Medullary rays were not arranged uniformly and groups of stone cells were arranged in tangential rows. Idioblasts were also present in this region of phloem. The stone cell bands in this region were continuous and in certain rows separated by medullary rays. Groups of phloem fibres were scattered in the phloem region. Phloem parenchyma consisted of starch grains. Figure 3.

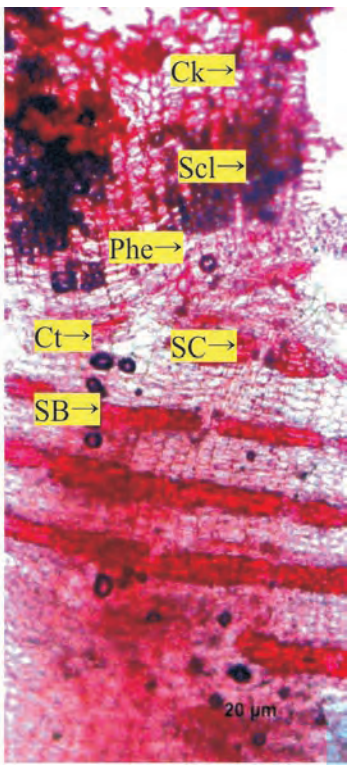
Figure 2

Microscopy of Śveta kāñcanāra (*Bauhinia variegata* L.)

2a. Stem bark

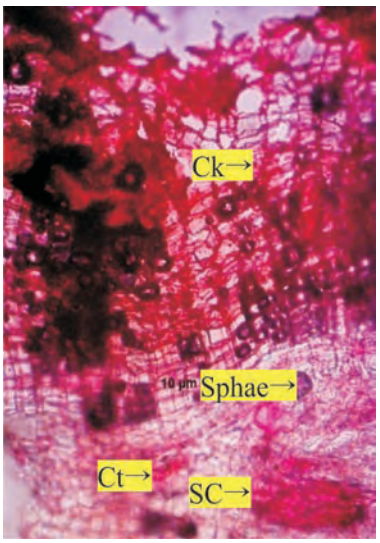


2b. Cork, Cortex and Stone cell band

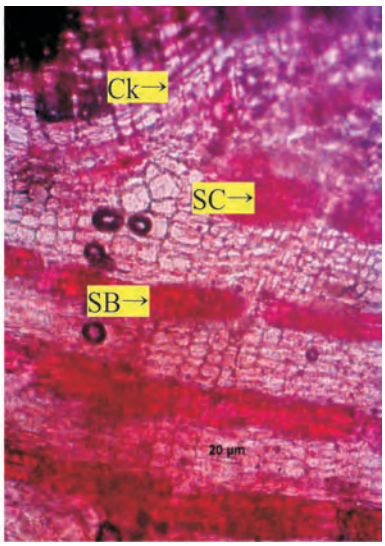


Ck-cork; Ct-cortex; Ph-phloem fibres; Phe-phellogen; SB-stone cell band; Scl-sclereids; SC-stone cells.

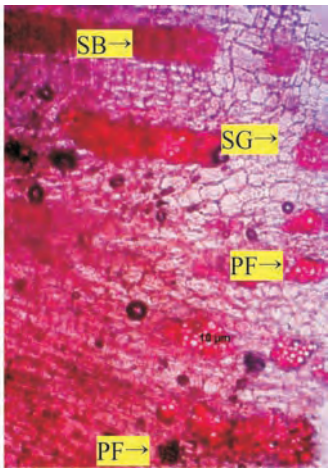
2c. Cork and Cortex



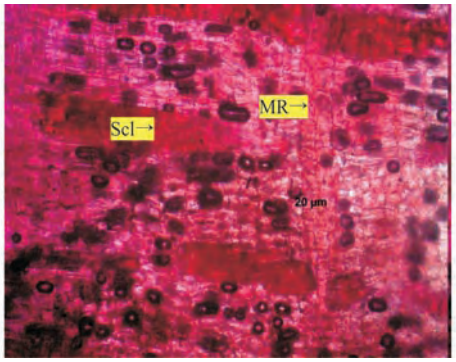
2d. Stone cell band



2e. Phloem fibres Stone cell band



2f. Medullary rays

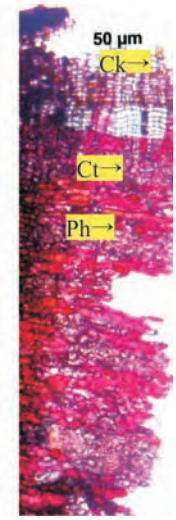


Ck-cork; Ct-cortex; MR-medullary rays; PF-phloem fibres; SB-stone cell band; Scl-scleroids; SC-stone cells; SG-starch grains; Sphae - spheraphides

Figure 3

Microscopy of Rakta kāñcanāra (*Bauhinia purpurea* L.)

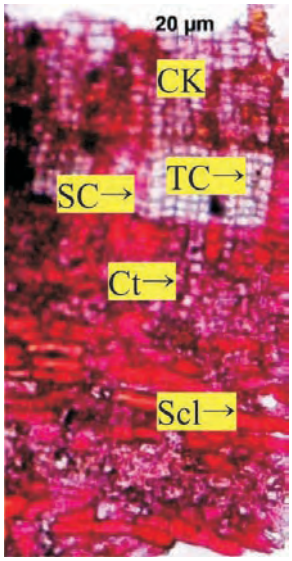
3a. T.S of stem bark



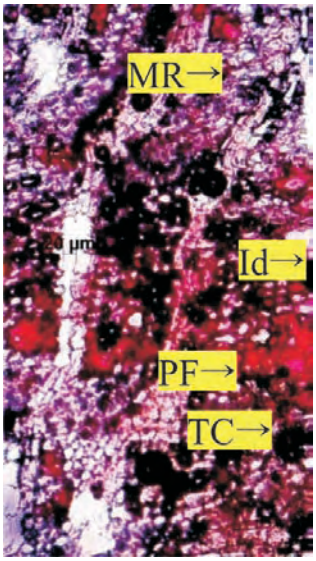
3b. A portion of bark enlarged

Ck- cork; Ct- cortex; Pa- parenchyma; Ph- phloem

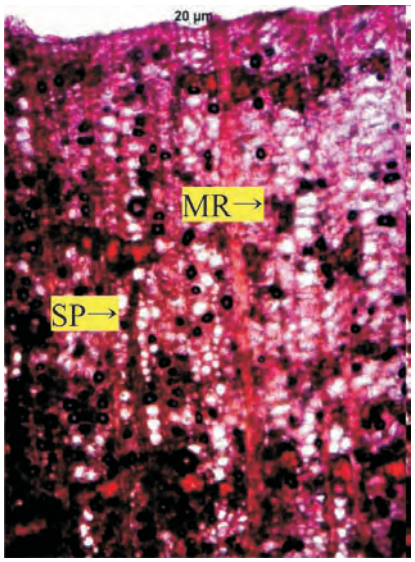
3c. Cork and Cortex



3d. Region of Medullary rays and fibres

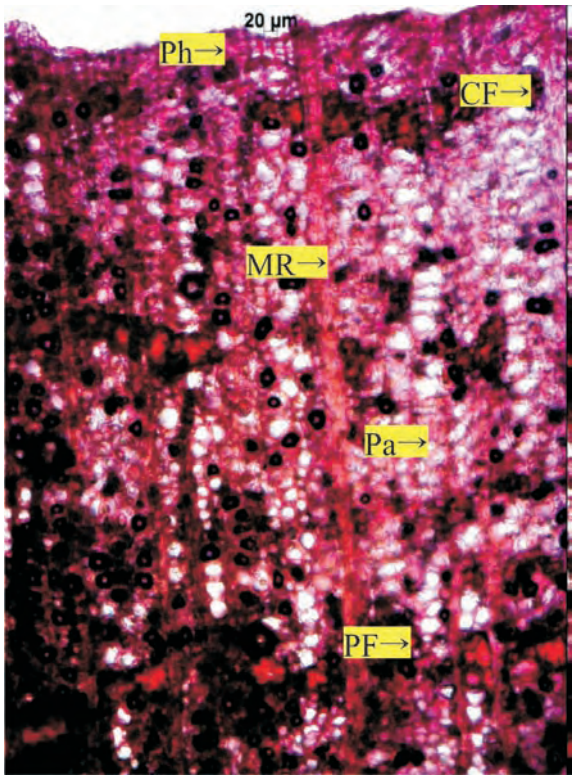


3e. Medullary rays in the secondary phloem region

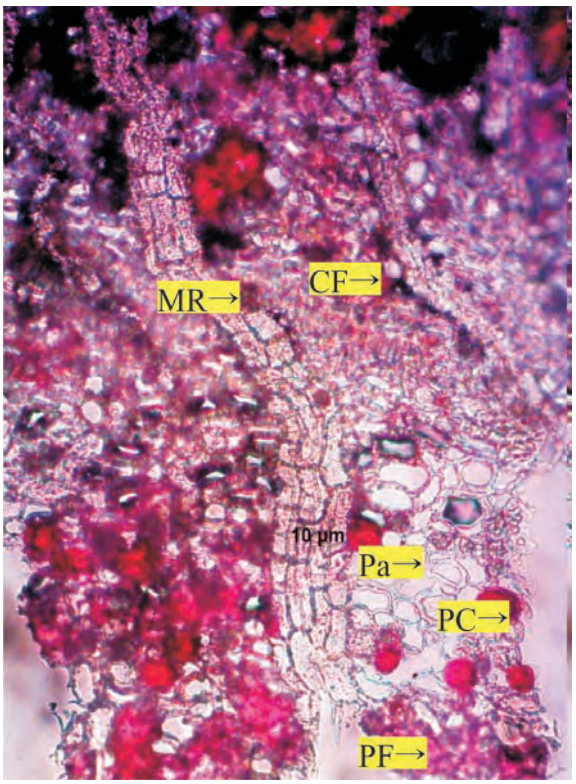


Ck-cork; Ct-cortex; Id-Idioblasts; MR-medullary rays;
Pa-parenchyma; PF-pericyclic fibres; Ph-phloem; SC-stone cells; Scl-sclereids;
SP-secondary phloem; TC-tannin containing cells.

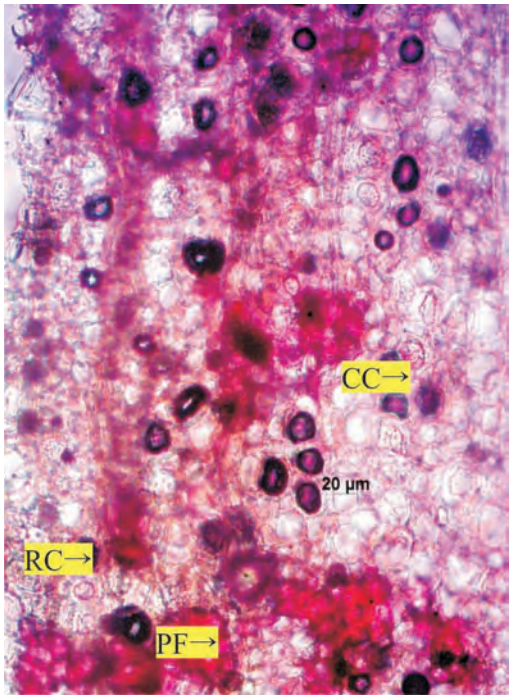
3f. Secondary phloem region



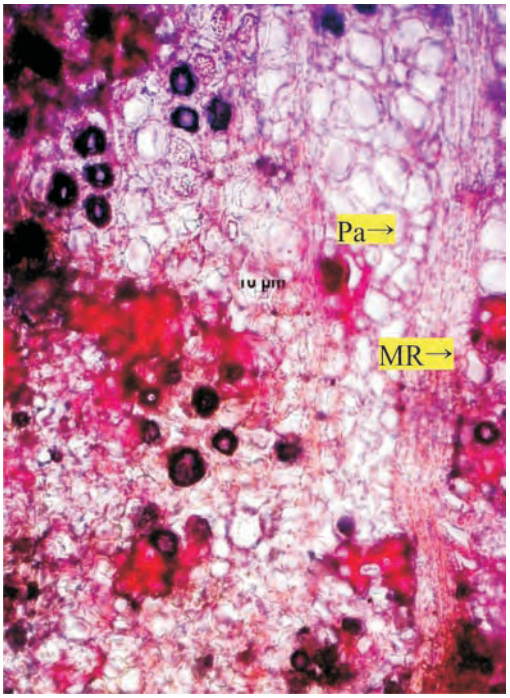
3g. Medullary rays and Fibres



3h. Rosette crystals and Phloem fibres



3i. Medullary rays and Phloem parenchyma



CC-cluster crystals; CF-crystal fibres; MR-medullary rays; Pa-parenchyma; PF-pericyclic fibres; Ph-phloem; RC-rosette crystals.

Physico-chemical analysis

Physico-chemical standards furnish purity and authenticity of crude drug. Bark pieces of *Bauhinia variegata* L. and *Bauhinia purpurea* L. were tested for loss on drying at105°C, total ash, acid insoluble ash, ethanol and water soluble extractive as per standard protocol. The results have been displayed. Table 1.

HPTLC

HPTLC of ethanolic extract of two samples have been carried out and photo documentation, R_f values and densitometric scan of test procedure was recorded. The findings are displayed in respective tables and figures. (Tables 2 and 3 and Figures 4, 5, 6, 7 and 8). Results have shown much similarity between samples. *B. variegata* was found to have more spots than *B. purpurea*.

Table 1

Physico-chemical standards of *Bauhinia variegata* L. and *Bauhinia purpurea* L.

Sl. No.	Parameters	*B. variegata*	*B. purpurea*
1.	Loss on drying	14.06 ± 0.01	14.28 ± 0.00
2.	Total ash	12.27 ± 0.14	16.91 ± 0.26
3.	Acid insoluble ash	0.26 ± 0.03	0.48 ± 0.12
4.	Water soluble ash	2.53 ± 0.12	1.52 ± 0.08
5.	Alcohol soluble extractive value	1.28 ± 0.00	1.50 ± 0.13
6.	Water soluble extractive value	8.59 ± 0.07	8.50 ± 0.35

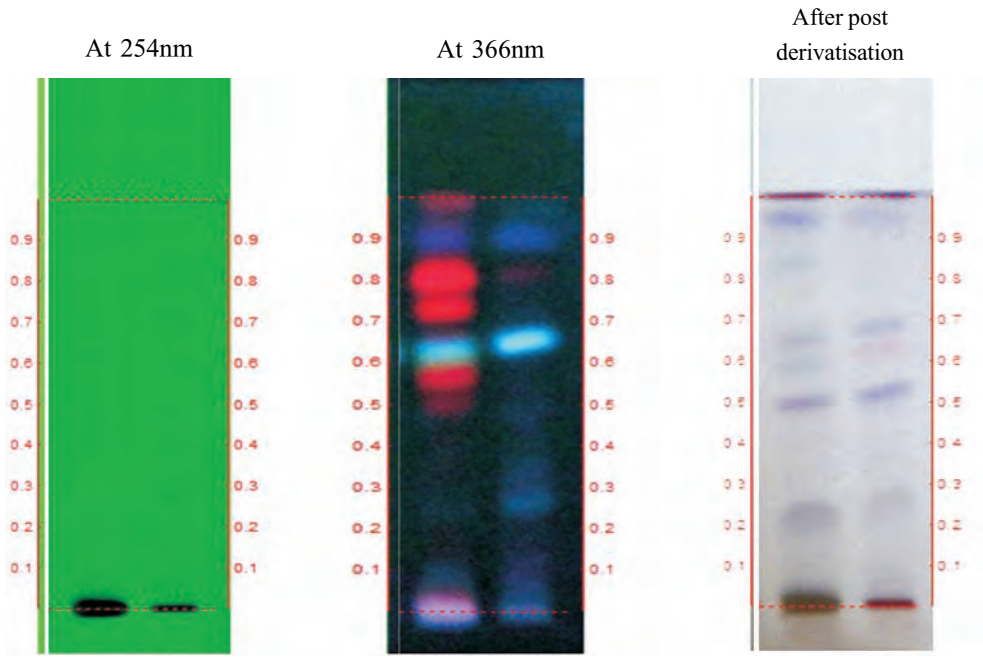
Table 2

R_f values of all the samples

At 254 nm		At 366 nm		After Derivatisation	
-	-	0.11 (F. blue)	-	-	-
-	-	-	-	0.23 (D. Purple)	0.23 (D. Purple)
-	0.27 (D. green)	-	0.27 (F. blue)	-	-
-	-	-	0.37 (F. blue)	-	-
-	-	-	-	0.42 (L. Purple)	-
-	-	0.50 (F. red)	0.50 (F. blue)	0.50 (D. Purple)	0.50 (D. Purple)
-	-	0.57 (F. red)	-	-	-
-	-	-	-	0.59 (L. blue)	-
0.63 (D. green)	-	0.63 (F. red)	-	-	0.63 (D. Pink)
-	-	-	0.65 (F. blue)	0.65 (D. Purple)	0.65 (D. Purple)
0.69 (D. green)	-	-	-	-	-
-	0.72 (D. green)	0.72 (F. red)	-	-	-
0.75 (D. green)	-	-	-	0.75 (D. Purple)	-
0.82 (D. green)	-	0.82 (F. red)	0.82(F. red)	-	-
-	-	-	-	0.84 (D. Purple)	-
-	-	0.91 (F. purple)	0.91 (F. blue)	-	-
-	-	-	-	0.95 (D. Purple)	0.95 (D. Purple)

Figure 4

HPTLC photo documentation of alcoholic extract of *B. variegata* L. *and B. purpurea* L.



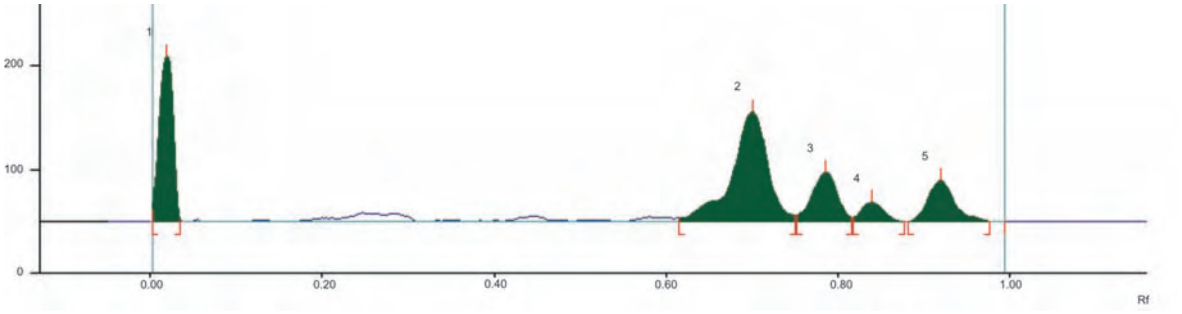
Track 1 - *B. variegata* L. 9µl, Track 2 - *B. purpurea* L. 9µl

Solvent system: Toluene: Ethyl acetate (5:1.5)

Figure 5

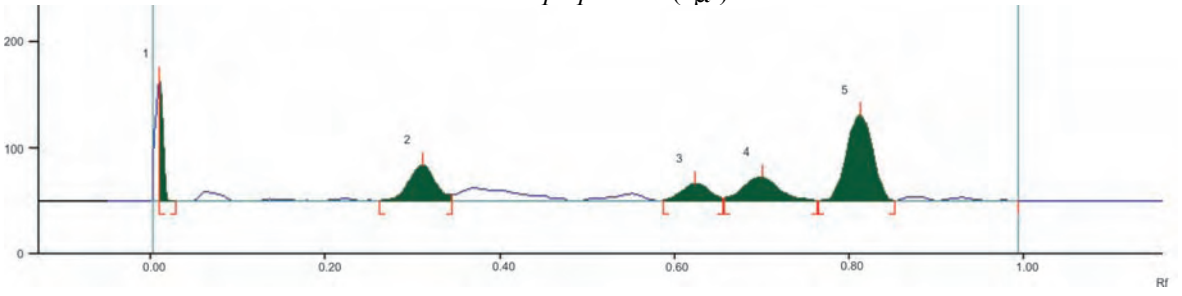
Densitometric scan of the sample at 254nm

5a. *B. variegata* L. (9µl)



Track 5 ID *B. variegata* L.									
Peak	Start Position	Start Height	Max Position	Max Height	Max %	End Position	End Height	Area	Area %
1.	0.00Rf	11.2AU	0.02Rf	159.1AU	43.01%	0.04Rf	1.3AU	1868.0AU	25.77%
2.	0.62Rf	3.5AU	0.70Rf	105.5AU	28.52%	0.75Rf	5.7AU	3155.8AU	43.54%
3.	0.75Rf	5.9AU	0.79Rf	47.4AU	12.81%	0.82Rf	4.1AU	1001.7AU	13.82%
4.	0.82Rf	4.3AU	0.84Rf	18.3AU	4.95%	0.88Rf	0.3AU	345.2AU	4.76%
5.	0.88Rf	0.2AU	0.92Rf	39.6AU	10.70%	0.98Rf	0.0AU	877.2AU	12.10%

5b. *B. purpurea* L. (9µl)



Track 6 ID *B. purpurea* L.									
Peak	Start Position	Start Height	Max Position	Max Height	Max %	End Position	End Height	Area	Area %
1.	0.01Rf	114.5AU	0.01Rf	114.5AU	42.81%	0.03Rf	0.0AU	433.5AU	10.97%
2.	0.26Rf	0.3AU	0.31Rf	33.8AU	12.62%	0.35Rf	5.6AU	735.1AU	18.61%
3.	0.59Rf	0.7AU	0.62Rf	16.4AU	6.12%	0.66Rf	2.9AU	378.6AU	9.58%
4.	0.66Rf	3.0AU	0.70Rf	22.5AU	8.39%	0.76Rf	0.1AU	671.5AU	17.00%
5.	0.77Rf	0.2AU	0.81Rf	80.4AU	30.06%	0.85Rf	0.2AU	1731.7AU	43.84%

3-D Chromatogram at 254nm

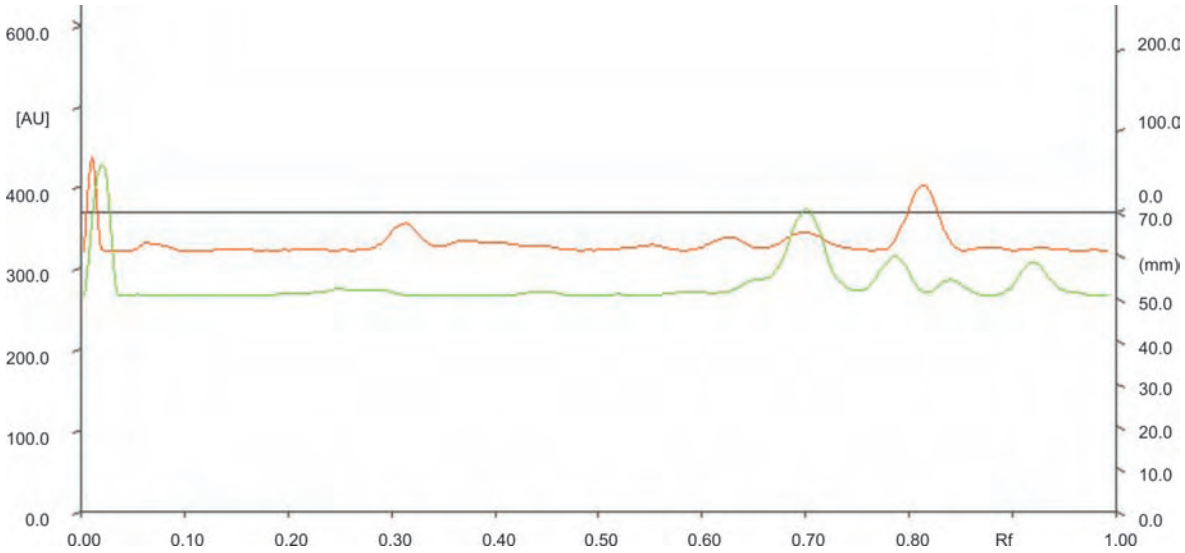
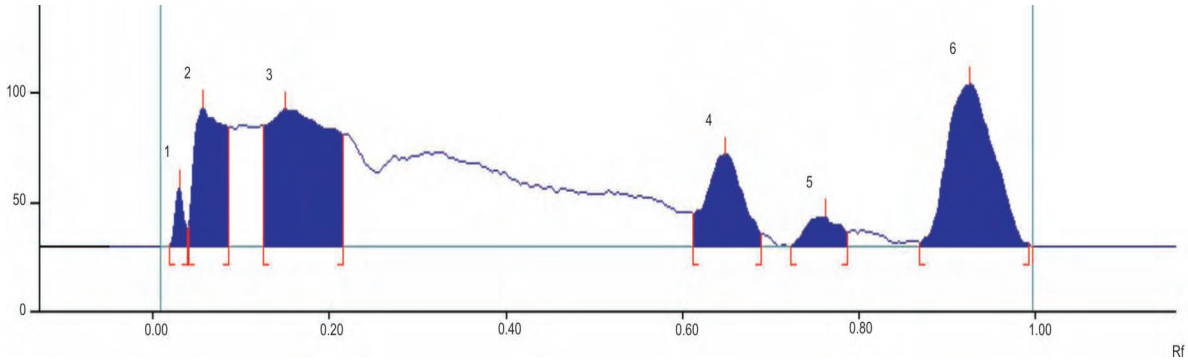


Figure 6

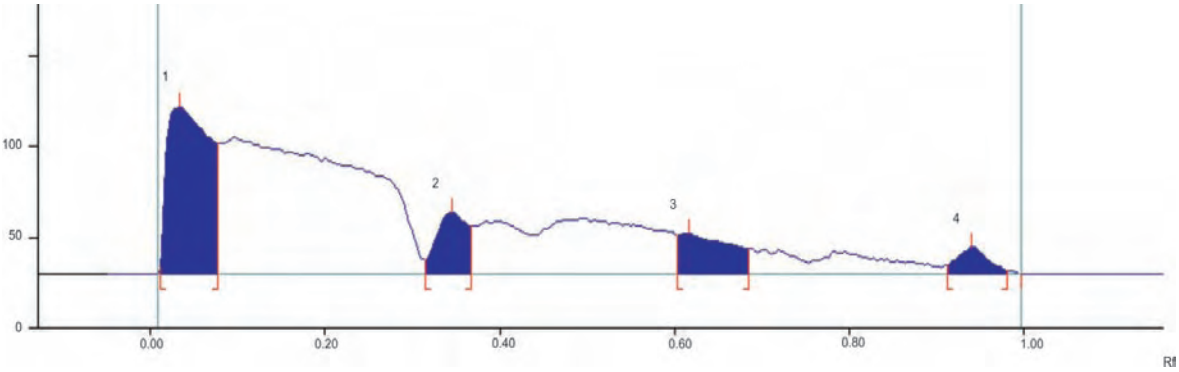
Densitometric scan of the sample at 366nm Hg fl

6a. *B. variegata* L. (9µl)



Track 5 ID *B. variegata* L.									
Peak	Start Position	Start Height	Max Position	Max Height	Max %	End Position	End Height	Area	Area %
1.	0.02Rf	0.7AU	0.03Rf	27.0AU	9.53%	0.04Rf	7.4AU	188.2AU	2.01%
2.	0.04Rf	9.3AU	0.06Rf	63.3AU	22.37%	0.09Rf	54.6AU	15.7.2AU	16.06%
3.	0.13Rf	55.1AU	0.15Rf	62.9AU	22.22%	0.22Rf	51.4AU	3268.7AU	34.83%
4.	0.61Rf	15.1AU	0.65Rf	42.0AU	14.85%	0.69Rf	6.0AU	1240.3AU	13.22%
5.	0.72Rf	0.2AU	0.76Rf	13.7AU	4.85%	0.79Rf	6.7AU	370.8AU	3.95%
6.	0.87Rf	1.9AU	0.93Rf	74.1AU	26.18%	0.99Rf	1.4AU	2808.6AU	29.93%

6b. *B. purpurea* L. (9µl)



Track 6 ID *B. purpurea* L.									
Peak	Start Position	Start Height	Max Position	Max Height	Max %	End Position	End Height	Area	Area %
1.	0.01Rf	3.5AU	0.03Rf	91.7AU	56.19%	0.08Rf	71.6AU	3213.1AU	59.70%
2.	0.31Rf	7.7AU	0.35Rf	33.8AU	20.74%	0.35Rf	26.2AU	860.0AU	15.98%
3.	0.60Rf	20.9AU	0.62Rf	22.4AU	13.74%	0.69Rf	14.0AU	932.9AU	17.33%
4.	0.91Rf	5.0AU	0.94Rf	15.2AU	9.33%	0.98Rf	1.5AU	376.4AU	6.99%

3-D Chromatogram at 366nm Hg Flu at 366nm

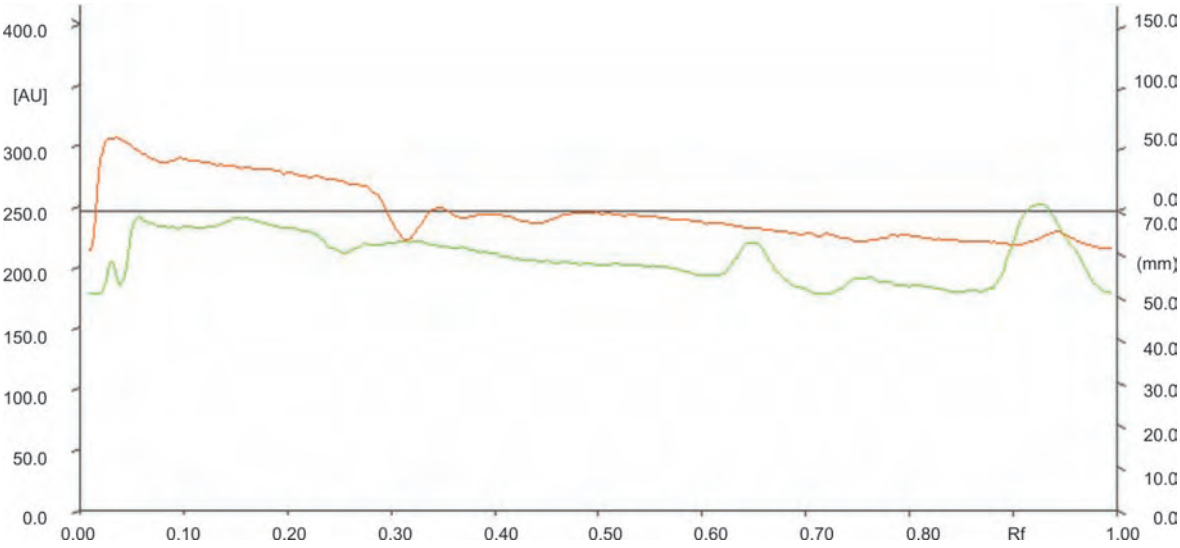
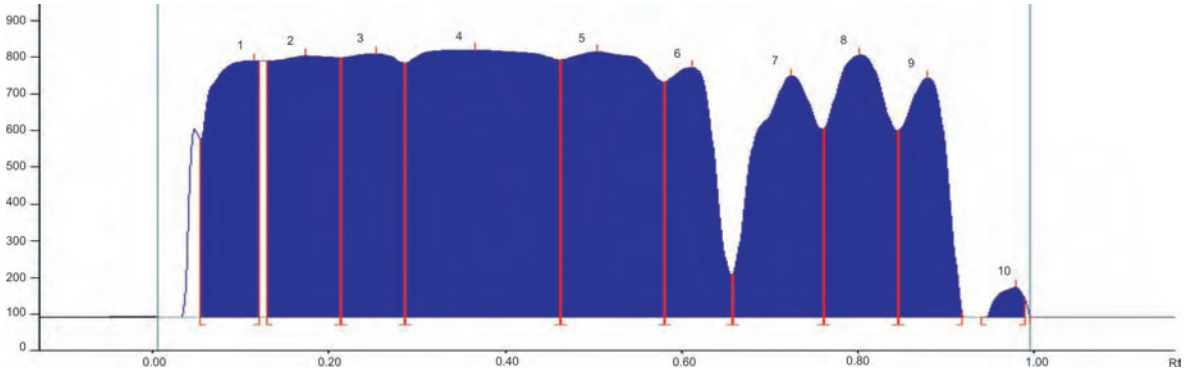


Figure 7

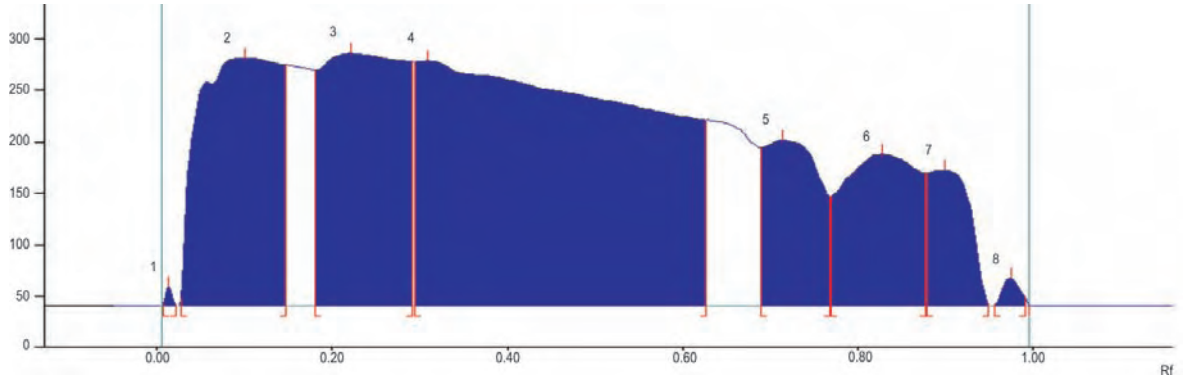
Densitometric scan of the sample at 366nm Hg Abs

7a. *B. variegata* L. (9µl)



Track 5 ID *B. variegata* L.									
Peak	Start Position	Start Height	Max Position	Max Height	Max %	End Position	End Height	Area	Area %
1.	0.05Rf	482.5AU	0.11Rf	698.2AU	10.97%	0.12Rf	97.6AU	28141.6AU	8.21%
2.	0.13Rf	697.9AU	0.17Rf	712.0AU	11.18%	0.21Rf	07.0AU	37448.7AU	10.92%
3.	0.21Rf	707.0AU	0.25Rf	717.8AU	11.28%	0.29Rf	92.4AU	31990.5AU	9.33%
4.	0.29Rf	692.4AU	0.37Rf	728.3AU	11.44%	0.46Rf	01.4AU	79187.1AU	23.09%
5.	0.46Rf	701.6AU	0.50Rf	723.3AU	11.36%	0.58Rf	41.2AU	51337.7AU	14.97%
6.	0.58Rf	641.8AU	0.61Rf	680.7AU	10.69%	0.66Rf	16.2AU	25329.6AU	7.39%
7.	0.66Rf	120.7AU	0.73Rf	657.1AU	10.32%	0.76Rf	11.5AU	32668.7AU	9.53%
8.	0.76Rf	513.7AU	0.80Rf	714.3AU	11.22%	0.85Rf	07.6AU	33333.9AU	9.72%
9.	0.85Rf	509.4AU	0.88Rf	651.7AU	10.24%	0.92Rf	10.9AU	21838.7AU	6.37%
10.	0.94Rf	0.0AU	0.98Rf	82.6AU	1.30%	0.99Rf	51.9AU	1631.2AU	0.48%

7b. *B. purpurea* L. (9µl)



Track 5 ID *B. purpurea* L.									
Peak	Start Position	Start Height	Max Position	Max Height	Max %	End Position	End Height	Area	Area %
1.	0.01Rf	0.9AU	0.01Rf	18.5AU	1.53%	0.02Rf	1.4AU	98.2AU	0.10%
2.	0.03Rf	6.4AU	0.10Rf	241.2AU	19.93%	0.15Rf	34.0AU	16012.0AU	16.43%
3.	0.18Rf	228.9AU	0.22Rf	245.5AU	20.28%	0.29Rf	37.2AU	16828.0AU	17.26%
4.	0.30Rf	237.1AU	0.31Rf	238.3AU	19.69%	0.63Rf	80.3AU	43216.1AU	44.34%
5.	0.69Rf	153.6AU	0.71Rf	161.1AU	13.31%	0.77Rf	06.5AU	7374.1AU	7.57%
6.	0.77Rf	106.5AU	0.83Rf	147.4AU	12.18%	0.88Rf	28.8AU	9147.7AU	9.38%
7.	0.88Rf	129.0AU	0.90Rf	131.8AU	10.89%	0.95Rf	00.9AU	4430.5AU	4.55%
8.	0.96Rf	0.6AU	0.98Rf	26.5AU	2.19%	0.99Rf	07.8AU	365.3AU	0.37%

3-D Chromatogram at 366nm Hg Abs

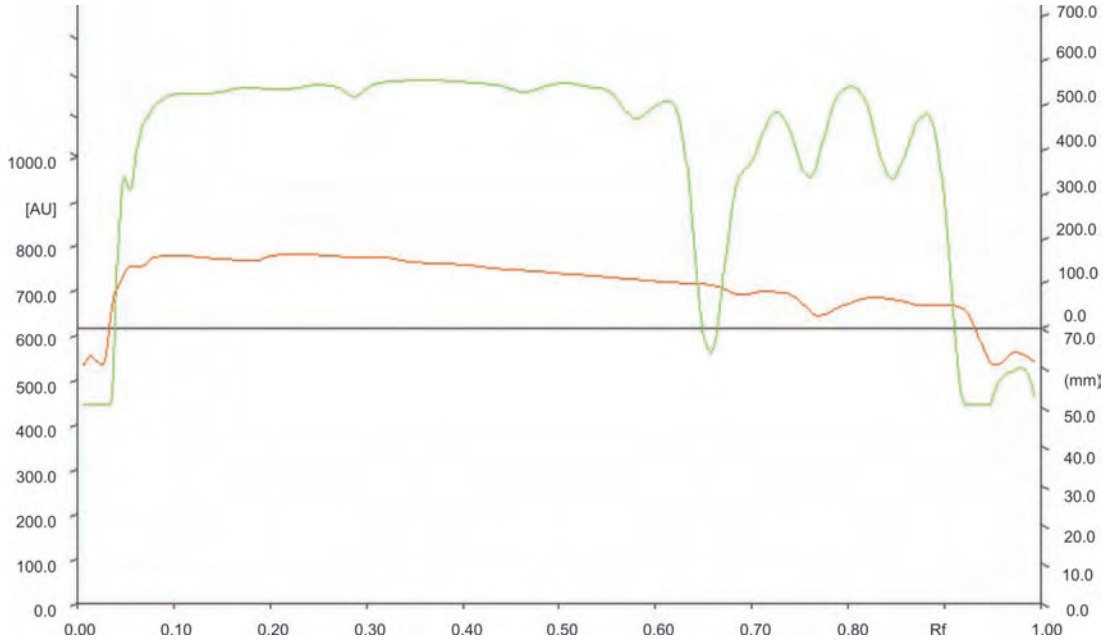
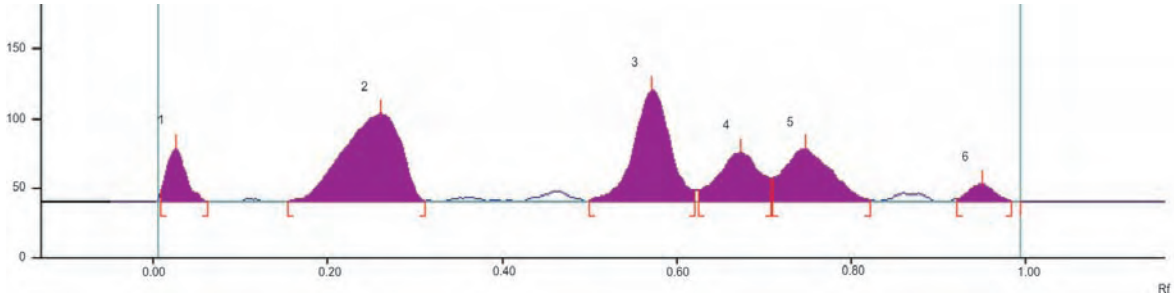


Figure 8

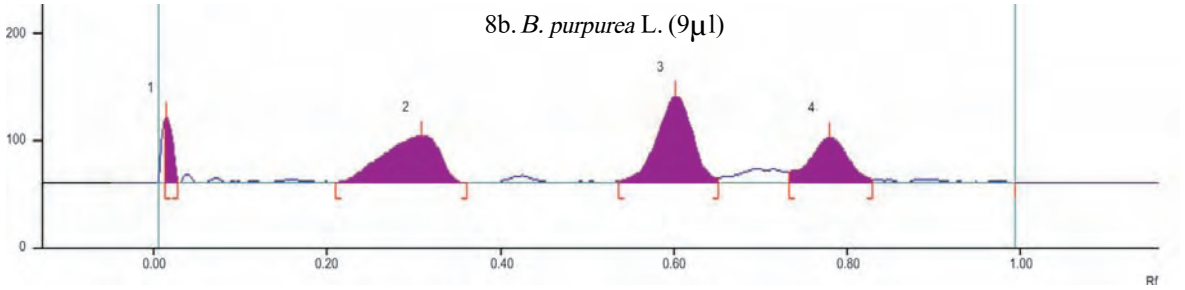
Densitometric scan of the sample at 620nm

8a. *B. variegata* L. (9µl)



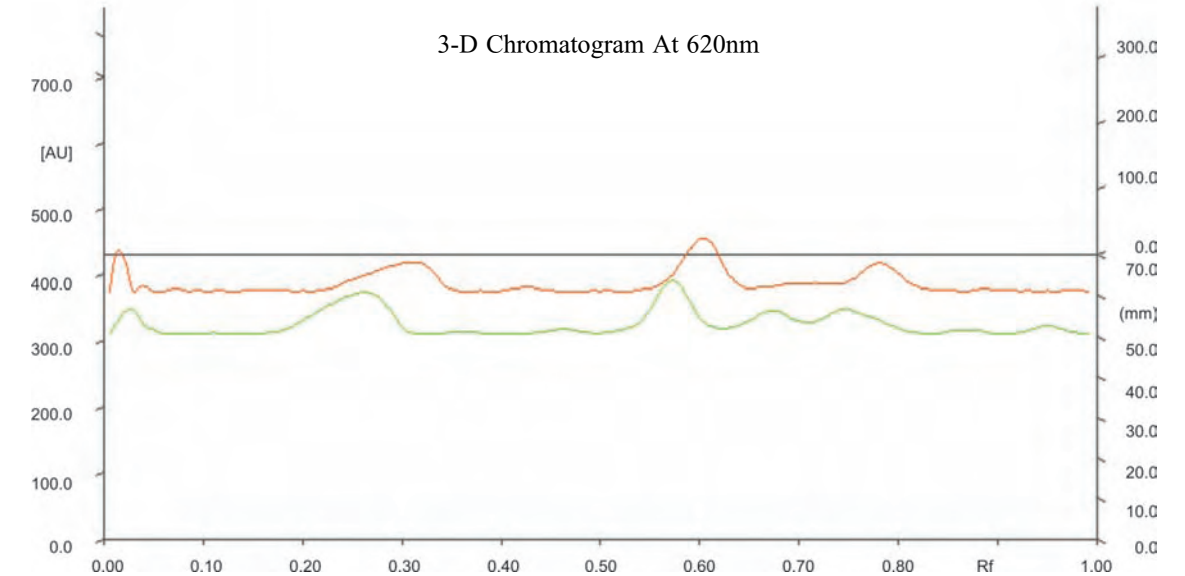
Track 5 ID *B. variegata* L.									
Peak	Start Position	Start Height	Max Position	Max Height	Max %	End Position	End Height	Area	Area %
1.	0.01Rf	7.3AU	0.03Rf	38.1AU	14.35%	0.06Rf	0.0AU	600.0AU	06.76%
2.	0.15Rf	0.4AU	0.26Rf	62.7AU	23.62%	0.31Rf	0.5AU	2993.6AU	33.68%
3.	0.50Rf	0.8AU	0.57Rf	79.3AU	29.87%	0.62Rf	8.2AU	2363.6AU	26.59%
4.	0.63Rf	8.3AU	0.67Rf	34.8AU	13.11%	0.71Rf	16.8AU	1193.9AU	13.43%
5.	0.71Rf	17.0AU	0.75Rf	38.0AU	14.30%	0.82Rf	1.4AU	1470.5AU	16.54%
6.	0.92Rf	1.7AU	0.95Rf	12.6AU	4.75%	0.99Rf	0.5AU	266.3AU	3.00%

8b. *B. purpurea* L. (9µl)



Track 6 ID *B. purpurea* L.									
Peak	Start Position	Start Height	Max Position	Max Height	Max %	End Position	End Height	Area	Area %
1.	0.01Rf	58.8AU	0.01Rf	61.1AU	26.87%	0.03Rf	3.2AU	397.8AU	06.43%
2.	0.21Rf	0.6AU	0.31Rf	43.5AU	19.13%	0.36Rf	0.1AU	2063.7AU	33.35%
3.	0.54Rf	1.6AU	0.60Rf	80.4AU	35.32%	0.65Rf	4.6AU	2379.8AU	38.46%
4.	0.73Rf	10.7AU	0.78Rf	42.5AU	18.69%	0.83Rf	3.3AU	1346.7AU	21.76%

3-D Chromatogram At 620nm



Discussion

Kāñcanāra, a novel herbal medicine in glandular disorders, belongs to the genus *Bauhinia* and family Ceasalpinioideae. The bark of this tree is used mainly in Indian system of medicine. There are many sub-species of *Bauhinia* which are used as sources of kāñcanāra; *Bauhinia variegata* L. and *Bauhinia purpurea* L. are used as sources of śveta and rakta kāncanāra as per Bhāvaprakāśanighaṇṭu (lexicon).[17]

Proper detection of a plant material with scientific paraphernalia forms a necessary step in the standardization process.[18] Macroscopic proceedings and microscopic findings record with pictorial atlas provide reference standard of that herbal drug in future researches.

On naked eye observation, the bark pieces of B. *variegata* L. were more thick, channeled have shown patches of rhytidoma and round oval protuberances of the lenticels. Whereas B. *purpurea* L. bark pieces were long thin, curved, channeled and without any external appendages.

Anatomically, suberized cork layer with parenchymatous layer of prismatic crystals of calcium oxalate, stone cells, sclerides are the characteristic features of bark of *B. variegata* L.. Wide phloem containing groups of stone cells, sphaeraphides, idioblasts with intercepted medullary rays are the features of this sample.

Bark of *B. purpurea* L. shows 5-6 layered cork cells, phellogen layer, cortex bearing sphaeraphides. Tangentially arranged groups of stone cells and were idioblasts found at the region of phloem parenchyma.

Contamination with physical matters and chemical nature of a plant drug will be tested by physico-chemical standards. Total ash value of *B. purpurea* was found quite high (16.91 $\pm$ 0.26) than that of B. *variegata* (12.27 $\pm$ 0.14). Rest of physicochemical standards; like loss on drying, acid insoluble ash and water soluble ash have shown almost similar values.

HPTLC photo documentation of ethanolic extract of both samples has been carried out with Toluene: Methanol (5.0: 1.5) as solute and the developed plates were visualized in UV at 254nm, 366nm and 620 nm. *B. variegata* has shown more peak values like 4, 7 and 8 at 254, 366 and 620nm respectively. *B. purpurea* exhibited comparatively less peaks ie, 2, 6 and 5 peaks at 254, 366 and 620nm wavelengths. The above results help in marking these two bark materials.

Conclusion

Authentic quality features of natural resources are the priority areas related to herbal drug development. Macroscopic features and cell structures figured with its cell inclusions of two sources of kāñcanāra ie. śveta (*Bauhinia variegata* L.) and rakta (*Bauhinia purpurea* L.) add contributions to the drug development area.

Acknowledgement

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EXPERIMENTAL STUDY

Āryavaidyan, Vol. XXXII, No. 2, November 2018 - January 2019, Pages 24 - 29

Biological and enzymatic assay of madhupāka with Triphalā rasa (honey cooked with juice of triphala) in obesity - an experimental study

Pooja Hassan G., Kavita M. B., BaskaranV. and Arunkumar Ranganathan

ABSTRACT: Old honey is beneficial in obesity as part of food as well as therapy as per classical texts of āyurveda. Many of the medicines related to obesity are also prescribed with honey as adjuvant. Madhupāka is a classical āyurveda preparation having indications of obesity (with juice of triphalā) and ulcers (with milk and juice of haridrā/turmeric). To evaluate the biological (radical scavenging activity and lipid peroxidation inhibition assay) and enzymatic assay (pancreatic lipase inhibition and á-glucosidase inhibition) of madhupāka with triphalā rasa. Honey was purchased from a local vendor from Hassan, India, and stored in dry and dark place for one year to make it old. The juice of triphalā was prepared from dry triphalā as per classical version in āyurveda. This was cooked with old honey to prepare madhupāka. Biological assay and enzymatic assay were done as per the protocol. Among the biological assay, radical scavenging activity (DPPH) was 97.76% and lipid peroxidation inhibition was 89.72%. In the enzymatic activity assay, IC50 value of pancreatic lipase inhibition was 10.89 mg/ml and that of á-glucosidase inhibition was 5.57 mg/ml and 9.28 mg/ml in water extract and methanol extract respectively. Madhupāka with triphalā rasa (MPT) gives a promising, three dimensional drug approach in treating sthaulya (over-weight and obesity) and its complications. It addresses inhibition of both the enzymes that metabolize carbohydrates and lipids. However, the mechanism of its action needs further study.

Key words: Āyurveda, Lipid peroxidation, Madhu, Madhupāka, Obesity, Pancreatic lipase inhibition

Introduction

Madhu, commonly known as honey, is used in two forms as per āyurveda *viz*., navīna madhu (freshly collected) and purāṇa madhu (one-year-old).[1,1a,2,2a] Purāṇa madhu is sthaulyaghna (anti-obese), medoghna (avoids accumulation of fat excessively), rūkṣa (dry), atilekhana (sacrificient), anabhiṣyandi (non-secretary) and tridoṣaghna (pacifies tridoṣa).[1b] Triphalā is combination of three different fruits *viz*., harītaki (*Terminalia chebula* Retz.), āmalaki (*Phyllanthus emblica* Linn.) and vibhītaki [*Terminalia bellirica* (Gaertn.) Roxb.] in equal quantity.[3,2b,4] The properties of triphalā are kḷedahara (removes unwanted aqueous content), medohara (avoids accumulation of fat excessively), pramehaghna (antidiabetic), kaphāsrajit (pacifies kapha and rakta) and rasāyana (rejuvinative).[3,5]

Obesity explained as atisthaulya in āyurveda is a major global health problem which is non-communicable and preventable with a dietary and lifestyle measures.[6] It is also known to be a risk factor for the development of metabolic disorders, type-II diabetes, systemic hypertension, cardio-vascular disease, dyslipidemia and atherosclerosis. Worldwide prevalence of overweight and obesity is 39% in women and men aged 18 and over as per WHO in 2016.[7] Madhupāka is a classical āyurveda preparation having indications of obesity (with juice of triphalā) and ulcers (with milk and juice of turmeric).[1c] Hence, a study was taken up to evaluate the biological and enzymatic assay of madhupāka with triphalā rasa.

Methodology

Materials used: All standards and pancreatic lipase were purchased from Sigma-Aldrich, St. Louis, USA.

Methanol, acetonitrile, dichloromethane, ethyl acetate and acetone were of HPLC grade and were purchased from Sisco Chem. Ltd., Mumbai, India. All other chemicals and standards mentioned in the test were of analytical grade and were purchased from Sisco Laboratories, Mumbai, India.

Samples of honey were collected from a local vendor from Hassan, India. Triphalā was collected from Sri Dharmasthala Manjunatheshwara Pharmacy, Udupi, India.

Sampling and sample preparation: Honey procured was stored separately in a dark room at room temperature for one year to make old honey (OH).

Preparation of triphalā juice (triphalā rasa)[8]: One part of triphalā was added with eight parts of water (RO filtered water). This was cooked on a low flame and reduced to one fourth and filtered. The liquid portion was used as triphalā rasa.

Preparation of madhupāka[1d]: Eight parts (800ml) of old honey (purāṇa madhu) was added with nine parts (900ml) of water (RO filtered water) and 17 parts (1700ml) of triphalā rasa. Kept over low flame and stirred repeatedly till madhu attains features of syrup (pāka lakṣaṇa).

Pāka lakṣaṇa[8]: Pakvamadhu (cooked honey) should sink when dropped in water, should be smooth and sticky to touch and when applied over a cloth, it should stick to cloth.

The experiments were conducted with madhupāka prepared with triphalā rasa (MPT) *vs* plain old honey (OH) and triphalā rasa (TR) where OH was used as control for biological activity assays. For enzymatic assay, both OH and triphalā rasa (TR) were used as controls.

Biological activity assays

1. Radical scavenging activity: DPPH method: Radical scavenging activity was done by the procedure of Duh and Yen [1997].[9] Radical scavenging activity of the sample against stable DPPH (2,2-diphenyl-2-picrylhydrazyl hydrate, Sigma-Aldrich Chemie, Steinheim, Germany) was determined spectrophotometrically. When DPPH reacts with an antioxidant compound, which can donate hydrogen, is reduced. The change in colour from deep violet to light yellow was measured at 517 nm on a UV/ visible light spectrophotometer (Spectronic Genesys 8, Rochester, USA). Radical scavenging activity of the sample was measured by slightly modified method of Duh and Yen, as described below. In brief, 250µl of each sample was added with 1 ml of methanol and mixed well. To this mixture, 4ml of 0.5mM methanolic solution of 2, 2-diphenyl- 2-picrylhydrazyl (DPPH) was added and vertexed. This mixture was kept for incubation in room temperature for 20 min in dark. The absorbance was read at 517nm. The radical scavenging activity is expressed as percentage decrease in the absorbance of DPPH against that of blank.

2. Assay for inhibitory effect on lipid peroxidation: Assay for inhibitory effect on lipid peroxidation was done by Halliwell and Gutteridge method.[10] Liver weight 10% [1g of liver in 10ml of 0.9% NaCl] was homogenized and centrifuged for 15min at 2000 rpm at 40^0C. 250µl of each sample were taken and to this 250µl NaCl of 0.9% was added. Blank was prepared with 500µl of NaCl. This mixture was added with 1ml of KCl and 0.3ml of liver homogenate and mixed well. Then 100µl of Fecl3 was added and kept for incubation at 37^0C for 30 minutes. Then it was added with 2ml of ice cold HCl reagent and mixed well followed by incubation at 80^0C for 15 min, allowed to cool and absorbance was read at 532 nm. Inhibitory effect on lipid peroxidation is expressed in percentage.

Enzyme assays

1. Pancreatic lipase inhibition activity: This was done according to the method reported by Kim et al.[11] An enzyme buffer was prepared by the addition of 2 mg/ml porcine pancreatic lipase (Sigma-Aldrich)

in buffer containing 10 mM MOP (Morpholine-propanesulfonic acid) and 1 mM EDTA, pH 6.8. The reaction mixture contained 169µl of Tris buffer (100 mM Tris-HC1 and 5 mM $CaCl_2$, pH 7.0), samples of various concentrations (50-250µg/ml), 50µl of enzyme solution and incubated for 15 minutes. Then add 50µl and incubate for 30 minutes and absorbance was read at 405 nm.

Inhibition (%) =100-[(B-b) / (A-a)*100]

where, A is the activity without inhibitor, a is the negative control without inhibitor, B is the activity with inhibitor, and b is the negative control with inhibitor. The results were expressed as an average (n = 4).

2. á-glucosidase inhibition assay: The inhibitory activity of prepared samples against rat intestinal á-glucosidase was determined according to the method of Li et al (2009)[12] using 4-nitrophenyl á-D-glucopyranoside (PNPG) as substrate. The reaction mixture contained 120µl of 0.05 M phosphate buffer (pH 6.8), 50µl of 3mM PNPG, samples of various concentrations (50-300 µg/ml) and 50µl of á-glucosidase solution (25 mg/ml) in a 96-well plate. The plate was incubated at 37^0C for 40 min, followed by the addition of 50µl of 0.67 M Na_2CO_3 to stop the reaction.

Enzyme activity was determined by measuring the release of p-nitrophenol from the PNPG substrate. The reaction was monitored by change of absorbance at 405 nm. á-glucosidase activity was calculated relative to control wells without inhibitor added and expressed as a percentage of that value. Each assay was performed in triplicate, and results are presented as the mean ± standard deviation from at least three independent experiments.

Results

Biological activity assays: Radical scavenging activity (DPPH) in OH was 32.11% and that in MPT was 97.76%. The Lipid per oxidation inhibition in OH was 77.91% and that in MPT 89.72%. Madhupāka with triphalā rasa had higher radical scavenging activity and lipid peroxidation inhibition when compared to control. The details are shown in Table1.

Table 1
Results of biological activity
(Radical scavenging activities)

Sl.No	Name of the experiment	OH[a]	MPT[b]
1.	Radical scavenging activity (DPPH)	32.11%	97.76%
2.	Lipid peroxidation inhibition	77.91%	89.72%

a. OH =Old honey;
b. MPT =Madhupāka with triphalā rasa

Pancreatic lipase inhibition: The IC_{50} value of pancreatic lipase inhibition in controls, OH and TR were 108.46 mg/ml and 105.11 mg/ml respectively while that in MPT was 10.89 mg/ml. The pancreatic lipase inhibition is higher with lower IC_{50} value. Here, madhupāka with triphalā rasa had lower IC_{50} value when compared to the controls. The details are shown in Table 2.

Table 2
Results of pancreatic lipase inhibition analysis

Experiment	OH[a]	TR[b]	MPT[c]
Pancreatic lipase inhibition IC_{50} value(mg/ml)	108.46	105.11	10.89

a.OH=Old honey; b.TR=Triphalā rasa;
c. MPT=Madhupāka with triphalā rasa).

á-glucosidase inhibition: The IC_{50} value of á-glucosidase inhibition in water extract of old honey was 5.23 mg/ml and that of methanol extract 6.52 mg/ml; in water extract of triphalā rasa was 15.1 mg/ml and that of methanol extract 13.2 mg/ml; in water extract of madhupāka with triphalā rasa 5.57 mg/ml and that of methanol extract 9.28 mg/ml. á-glucosidase inhibition was almost same in old honey and madhupāka with triphalā rasa in water extract as well as methanol extract. The details are shown in Table 3.

Table 3
Results of á-glucosidase inhibition analysis

Experiment	OH[a]	TR[b]	MPT[c]
á-glucosidase inhibition	WE[d]= 5.23	WE[d]= 15.1	WE[d]= 5.57
IC_{50} value (mg/ml)	ME[e]= 6.52	ME[e]= 13.2	ME e=9.28

a.OH =Old honey; b.TR =Triphalā rasa; c. MPT=Madhupāka with triphalā rasa. d. WE = Water extract; e. ME = Methanol extract

Discussion

Radical scavenging activity: The possible reason for increased radical scavenging activity is due to the high content of phenolics and flavonoids contributed by triphalā in MPT. Also, processing by heat increased 5-Hydroxymethylfurfural (HMF), phenolics and flavonoids.[13,14,15] The preparation of MPT involved boiling of honey. The boiling point of honey is 160^0F which is approximately 71^0C. As Turkmen et al. (2006)[16] reported that increased heat treatment leads to development of antioxidant activity which has positive effects on human health in honey due to formation of Maillard reaction products. Naik et al. (2005)[17] studied on *in vitro* anti-oxidant activity of triphalā and reported that triphalā has a high synergistic anti-oxidant activity. Thus, it was understood that processing with triphalā rasa increased the antioxidant activity of OH from 32.11% to 97.76% in MPT.

Anti-lipid peroxidation activity: Anti-lipid peroxidation activity observed in this study in MPT is due to increased radical scavenging activity and reducing power as reported earlier. Nagai et al. (2006)[18] in their study on honey reported that different species of honey demonstrate antioxidant activities against lipid peroxidation on meat or muscle membrane by scavenging the hydroxyl radicals and superoxide anions at the stage of initiation and termination of peroxy radicals.

Pancreatic lipase inhibitory assay: Kim et al. (2010)[19] also reported similar inhibitory studies using Morus bombycis root extract. The findings indicate MPT can be exploited for commercialization to prepare an anti-obese formulation. It is evident from the results that water extract of MPT exhibited a good pancreatic lipase inhibition which may be due to the presence of bio-actives like phenols, flavonoids in madhu and triphalā. The results indicate that MPT prevented pancreatic lipase activity and hence could be considered as hypolipidemic medicament as mentioned in classical medicine.

á-glucosidase inhibitory assay: The IC_{50} value of á-glucosidase inhibition for OH, TR and MPT in water extract was 5.23 mg/ml, 15.1 mg/ml and 5.57 mg/ml and that in methanol extract 6.52 mg/ml, 13.2 mg/ml and 9.28 mg/ml respectively. By definition, IC_{50} is the concentration of drug at which 50% of the target is inhibited. Therefore, the lower the IC_{50} of the drug under trial, the less it needs to achieve the desired effect and less likely the drug will be to have some off-target effect. It can be understood as lower the IC_{50}, the more potent is the molecule. Here, the water extract of MPT was less than TR and almost equal to OH. The results indicate that water extract of MPT prevented á-glucosidase activity and hence could be considered as hypoglycemic medicament as mentioned in āyurveda. Similar results were reported by Tadera et al. (2006)[20] using flavonoids. Hence, it can be considered in the management of sthūla madhumehi.

However, mechanism of inhibition for both pancreatic lipase and á-glucosidase or binding affinity of active compounds from the MPT needs scientific validation along with drug (molecular biology studies). Therefore, MPT or its active components could be a dietary source for delaying glucose related obesity complications.

The action of old honey is well known at the level of adipose tissue (medodhātu) by removal of excessive fluid, adipose tissue (chedana) and scraping up off excessive adipose tissue (lekhana). *In-vitro* pancreatic lipase and á-glucosidase inhibitory potential of MPT shows that its action is also witnessed at the level of

digestion (pācana). MPT has higher antioxidant activity due to addition of triphalā rasa which in turn shows the efficacy of the compound to prevent the complications due to obesity like diabetes.

Madhupāka with triphalā rasa (MPT) can act as a promising anti-obese neutraceutical product. However, further clinical studies are to be done to prove its nutraceutical effectiveness in today's time.

Conclusion

Madhupāka with triphalā rasa (MPT) gives a promising nutraceutical approach in treating sthaulya (overweight and obesity) and its complications. Hence, addressing inhibition of both the enzymes that metabolize the carbohydrates and lipids like glucosidase and lipase, MPT helps in ameliorating the overweight and obesity. It can thus be given to a person with overweight and obesity, also in diabetic with overweight and obesity. However, the mechanism of its action needs further study, by which the therapeutic use of MPT would be of medical and nutritional relevance in the treatment of obesity and its complications like diabetes.

Limitations of the study

The biological activity of triphalā rasa is well established in published literatures. Hence, it was not included in the study for biological activity. Also, the temperature at which MPT was prepared was not measured.

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LITERARY STUDY
Āryavaidyan, Vol. XXXII, No. 2, November 2018 - January 2019, Pages 30 - 38

Anatomical significance in the design of Yantra (blunt surgical instruments) by ācārya Suśruta

Maya Mukundan

ABSTRACT: Ācārya Suśruta is regarded as a proficient surgeon and the text, Suśrutasamhita is a comprehensive manuscript dealing with the wide-ranging aspects of practical surgical measures and midwifery, in addition to the other branches of āyurveda. The present study gives a description of the yantra or blunt surgical instruments explained by ācārya and the anatomical considerations that he has displayed in their explanation. This may help to explore whether the anatomical knowledge adequate to perform the surgical practices existed during the ancient period. The expertise of ācārya in human anatomy can also be exposed in the description of the surgical instruments and their practical applications.

Key words: Ācārya Suśruta, Yantra, Anatomy

Introduction

Suśrutasamhita, the major surgical text from the Vedas and is the most advanced compilation of surgical practices of its time (7th century B.C). Ācārya Suśruta was probably the first surgeon in the world to systematize surgical instruments and describe in detail their method of manufacture, quality control, maintenance, defects and specific usage in the diagnosis and treatment of diseases. Samhita gives a list of blunt (101 numbers) and sharp (20 numbers) surgical instruments and also suggests that a surgeon, by his own knowledge and cleverness, may devise new instruments to facilitate the performance of the surgical actions. Most of the instruments designed by ācārya are having a shape similar to the faces of various birds, animals, parts of plants or certain commonly used armaments.

It is seen that much more undetected proficiency of ācārya in understanding human anatomy can be explored in the contexts of descriptions of surgical instruments. Many studies have described the importance of the surgical measures in Suśrutasamhita, but no study has described the anatomical expertise shown by ācārya in designing the surgical instruments. Hence, the present study was proposed to discover the unseen anatomical knowledge in Suśrutasamhita while describing the minute details of instruments and this will enable to establish that anatomical knowledge was much developed during his period.

Review of literature

Yantra are blunt instruments used for extracting śalya (foreign body) from the body.[1] The term 'yantra' denotes any instrument for holding or restraining or fastening.[2] Loha (metal) is the material prescribed in the samhita for making yantra and it is also proposed that any material which resembles the loha in properties can also be used.[1a]

Ācārya has enumerated the blunt instruments into six varieties. They are svastikayantra, sandamśa-yantra, tāḷayantra, nāḍīyantra, śalākayantra and upayantra.[1b]

Svastikayantra: Ācārya has described 24 types of svastikayantra which are used for extracting foreign bodies from bones. They are cruciform instruments, 18 aṅgula in length (approximately 30.5 cm) and have three parts:

1. Mukha (head or operating end) resembling the faces of certain carnivorous animals and bills of birds of prey. Ācārya has enumerated 24 varieties of animals and birds (9 animals and 15 birds).

2. kīla (nail, junction) having the shape of 'masūra' or cotyledon of a lentil.

3. vāraṅga (grahaṇasthāna, mūla or handle) which is bent like an elephant driver's hook.[1c] Figure 1 and 2.

Figure 1

Simhamukha svastikayantra

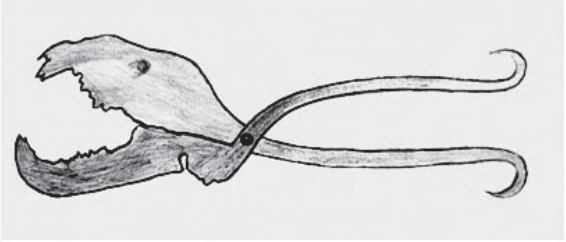
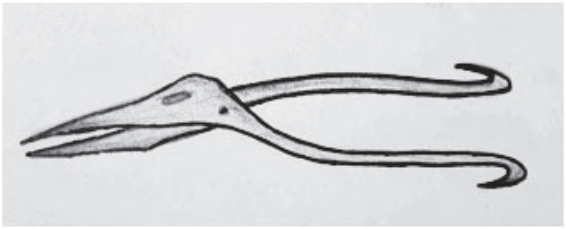


Figure 2

Kaṅkamukha svastikayantra



It is to be noted that all the dimensions of the instruments are given in the unit of aṅgula, which is a personalized measurement and differs from individual to individual. In āyurveda, the measurements of the body parts and its contents are given in two units- aṅguli and añjali pramāṇa. For linear measurements (length, width or breadth and height), the unit of measurement is aṅguli or aṅgula (finger) of the concerned person and for the volumetric measurements it is in the unit of añjali.[3] 'Svāṅgula' or the breadth of one's own finger is considered as the unit for measuring his body parts.[4] Aṅgula is calculated using various methods; it is considered equal to the breadth of the middle part of the thumb of the concerned person.[1h] Aṅgula is also defined as the distance between the adjacent knuckles of the fingers in the palmar aspect.[5] Ācārya has used this measurement of the person's own hand which is indigenous and remain the same whether the person is well grown or not and irrespective of his age. Hence, aṅgula is not a standard measure of universal value and the apt correlation of one aṅgula in terms of modern units of length cannot be provided.[5] However, a standardized measurement can be taken only from research studies. In this study, for convenience, one aṅgula is taken to be equal to 2/3 of one inch[6] (approximately 1.693 cm).

Samdaṁśayantra or pincher forceps: This instrument is of 16 aṅgula (about 27 cm) length and is of two varieties; one with a catch in the middle and other without the catch. They are used for extracting foreign bodies embedded in skin, muscle, blood vessels and tendons.[1d]

Tāḷayantra: The instrument has a length of 12 aṅgula (approximately 20.3 cm) and the shape of the operating end is like that of the 'tāḷa' of a fish. 'Tāḷa' here means 'śakala' or scales of the fish. The instrument is of two varieties - ekatāḷa (instrument with a single scale at one end) and dvitāḷa (with scales at two ends) and used for extracting foreign bodies from ear and nose like passages.[1e]

Nāḍīyantra (tubular instruments): These are of various types and of varied uses. They are open at one end or at two ends. The main use of the instrument is for extracting foreign bodies from the channels of the body. They are also used as diagnostic tools for visualizing the pathologies, for aspirating secretions and facilitating other surgical operations. They are to be manufactured as per the dimensions of the openings of the concerned srotas and according to the surgical procedures.

Number and types of nāḍīyantra:

1. Bhagandarayantra (instrument for fissure-in-ano), two types; with opening at one end and at both ends.

2. Arśoyantra (instrument for hemorrhoids)- two types; with opening at one end and at both ends.

3. Vraṇayantra (wound syringe) with diameter equal to the diameter of the margins of the wound.

4. Vastiyantra (instrument used for vastikarma)- four types according to the age of the patient.

5. Uttaravastiyantra (instrument used for uttaravasti)- two types; one each for males and females.

6. Yantra for draining mūtravṛddhi (hydrocele).

7. Dakodarayantra (yantra for aspirating ascites).

8. Dhūmayantra (nozzle used for herbal smoking)- three types, one each for three types of herbal smoking.

9. Niruddhaprakāśayantra (instrument for treating phimosis)

10. Sanniruddhagudayantra (instrument for dilating anal canal)

11. Alābuyantra (bottle guard, calabash or white-flowered gourd)

12. Śṛṅgayantra (horn of animals like cow)[1f]

Śalākayantra (rod-like instruments): They are of various types and have numerous usages. The difference between nāḍīyantra and śalākayantra is that, nāḍīyantra are tube like with cavity inside and śalākayantra are rod like with a solid body. They are to be made with different dimensions according to various surgical procedures. The types of śalākayantra are as follows: -

1. Gaṅḍūpadamukhi śalāka (earthworm faced probe)- two types

2. Sarpaphaṇamukhi śalāka (serpent hood faced probe)- two types

3. Śarapuṅkhamukhi śalāka (probe with face resembling the feathered end of an arrow)- two types.

4. Baḍiśamukhi śalāka (probe with face resembling fish hook)- two types.

5. Masūradaḷamukhi śalāka (lentil seed faced probe)- two types.

6. Kārpāsakṛtoṣṇīya śalāka (cotton mounted probe)- six types.

7. Darvyākṛti śalāka (probe with spoon shaped end)- three types.

8. Jāmbavavadana śalāka (probe with the shape of jambu fruit at the end)- three types.

9. Aṅkuśavadana śalāka (probe with the shape of elephant goad at the end)- three types

10. Nāsārbudaharaṇa śalāka (for excising nasal polyp)

11. Añjana śalāka (for applying collyrium)

12. Mūtramārgaviśodhana śalāka (for purifying urethral passage)[1g]

Upayantra: They are adjunct or minor instruments which support the actions of major instruments during surgical procedures. This includes ropes, braid of hair, bandage materials, leather, inner bark, creepers, cloth, stone, hammer, surgeon's own palm, sole, fingers, tongue, teeth, nail, mouth, bridle of a horse, branch of a tree, magnet, thermal cautery, caustic agents, drugs and actions like spitting, evacuation and cheerfulness.[1k]

Materials and methods

The literary and conceptual study of the topic was conducted by data compilations from Suśrutasamhita, Aṣṭāṅgahṛdayam, commentaries of Bṛhatrayī's (Suśrutasamhita, Carakasamhita and Aṣṭāṅga-hṛdayam), other ancient and modern text books and from the internet. Relevant informations were collected, reviewed and analyzed. The surgical instruments preserved in the museums of the Department of Salyatantra of the Govt. Ayurveda Colleges at Thiruvananthapuram, Tripunithura and Kannur, and VPSV Ayurveda College, Kottakkal, were inspected and photographs were taken. The instruments were inspected to get an idea about the representations of the ancient instruments in the current academic institutions and to examine these models which are designed by the academic teaching faculty for a better awareness of their students.

Observations

Svastikayantra: Svastikayantra or cruciform instruments are meant for extracting foreign bodies embedded in the bones. The shape of the operating part of the instrument resembles the mouth of carnivorous animals and birds of prey. Such a shape makes the instrument strong enough to extract the foreign bodies from the hard tissue like the bone. The animal faced instruments are suited for manipulating superficial structures whereas the bird faced ones are for extracting foreign bodies from deep structures in the body. The shape of the faces of the creatures mentioned do not vary much in one half of

the face corresponding to the lower jaw. Variations are seen in the other half corresponding to the upper jaw in its angle of slope or dip with the lower jaw. Thus, the lower jaw, corresponding part of the yantra is in level with the line of the lower handle. But the upper jaw counterpart forms a prominent curve with respect to the handle line. The handles cross at the junction also. This is the basics of the design and further variation of the total shape of the face of the yantra built on this basic design determines the changes in the functional capability of different svastikayantra.[5a]

As per the vision of the ancient scholars, the human is a miniature representation of the universe and hence all the materialistic natural phenomena are present in the human body in a tiny form and vice versa.[7] This leads to the concept that the universe and the puruṣa are equivalent and the structural and functional aspects of both are similar. This principle forms the basis of all the fundamental theories in āyurveda like the pañcamahābhūta siddhānta, tridoṣa siddhānta, etc. The same principle has been utilized by ācārya in the concept of yantra also. The peculiarities of the dentitions of the carnivorous animals and the bills of the birds in holding, tearing and consuming their prey are observed deeply and the same technique is utilized for the surgical application in the human body with the instrument. These constructions reflect the deep observation of the nature that has preceded their very assumption to begin with. They are not imaginary or unplanned, but purely principled and dictated by the surgical needs of the case.[5a]

Samdamśayantra or pincher forceps: These instruments are meant for extracting foreign bodies from soft tissues of the body like skin, muscles, blood vessels and tendons. Ācārya has designed the instrument resembling the shapes of certain common armaments used by the goldsmiths and blacksmiths. Here also, it is the keen observation of the surroundings that has motivated ācārya to propose the shape. The use of bulkier svastikayantra for extracting the foreign bodies from tender structures like the blood vessels, skin, etc. may cause harm to them. Samdamśa yantra is best suited for manipulating these structures and it is also evident that the modern tissue holding forceps holds much similarity in its shape and function to this instrument.

Tāḷayantra: The operating part of the instrument has resemblance to the scales of the fish, either on one end or both ends. The cymbal or the tāḷa is also given the meaning as the palate of the fish.[5b] The instrument is meant for extracting foreign bodies from external auditory meatus and nasal cavity. From the tāḷayantra onwards, the various levels of introduction of the instruments to the body cavities commences. The flexible, soft and thin scale like end of the instrument helps in easy introduction to the cavities mentioned. Though flexible, it is also firm enough to scoop the ear wax like foreign bodies with ease. The dvitāḷayantra can fasten the foreign body and by opposing the edges and can safely and precisely remove the same from the canal. The fish scale (or palate) has a slight concave surface and the yantra utilizes this shape for grasping the foreign bodies. The cavity like external auditory meatus forms a 'S' shaped curve and as such, the introduction of a metal part into the cavity may cause harm to its bony and cartilaginous walls. Thus, the anatomy of the external auditory canal and nasal cavity has been taken into consideration while designing the operating end of the device.

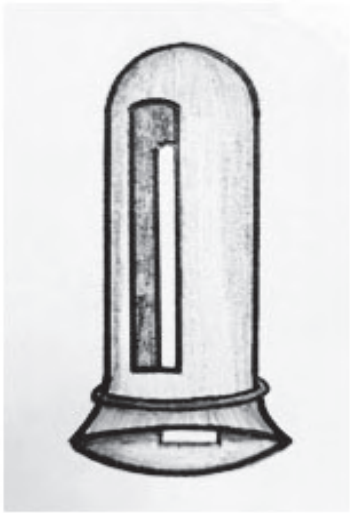
Nāḍīyantra or rod-like instruments: As the tāḷayantra are for extracting foreign bodies from the cavities which have normal external orifices, nāḍīyantra are meant for surgical and investigative procedures in cavities like anal canal, urethral passage, vagina and sinuses where the orifices of the cavities dilate only during the passage of materials through them. The anatomical expertise of ācārya Suśruta becomes evident in the description of nāḍīyantra.

Arśoyantra: The length of the device is 4 aṅgula (approximately 6.77 cm) and the circumference is 5 aṅgula (approximately 8.5 cm) for males and the shape is like the teat of a cow. For females, the circumference of the yantra is said to be 6 aṅgula (approximately 10.2 cm) and the length equal to the

width of palm of the patient concerned. In the yantra, at a distance of half aṅgula (0.85 cm) from the base, there is a circular ring. This ring which is having a width of half aṅgula (0.85 cm) prevents the entry of the instrument into the anal canal beyond it and thus the total length which can enter the canal is only less than 5 cm. Thus, the length of the device becomes identical to that of anal canal which is also 5 cm in length and the instrument helps in visualizing the entire anal canal and also aids in therapeutic measures like application of thermal cautery or caustic alkali in diseases like hemorrhoids. The introducing part is smooth and rounded (like the teat of a cow), which prevents any damage to the folds in the inner walls of the canal. The length of the anal canal is usually less for females and this also has been considered by ācārya while designing the device. For females, ācārya has proposed a more personalized dimension for the instrument by fixing its length equal to the width of the palm of the patient concerned. The bigger size of the female pelvic cavity enabling more distensibility of the anal canal has also been considered by providing one aṅgula additional circumference for the device to be used in females. Thus, we can infer that the anatomical features of the anal canal like the dimensions, the features in its interior and the pelvic measurements have been considered by ācārya in designing the arśoyantra. Figure 3.

Figure 3

Arśoyantra



There is no difference between the arśoyantra and bhagandarayantra except the fact that in bhagandarayantra, the ring at the base which may cause hindrance in visualizing the openings of the bhagandara (fistula-in-ano), is avoided.

Vastiyantra: Vasti is the most predominant treatment procedure among the pañcakarma therapies and is prescribed mainly for diseases dominating with vāta doṣa. The procedure is of three types- nirūha, anuvāsana and uttara vasti.[8] In fact, vasti is regarded as one half of the treatment or entire treatment as well.[8a] The device used for vasti consists of two parts; a nozzle (netra) which is to be introduced into the anal canal and a bladder (vasti) attached to the nozzle for holding the medicines. The patient is made to lie down on his left side, folding the right knee and extending the left. The medicine is filled in the bladder and the nozzle is fixed at the mouth of the bladder. The lubricated nozzle is gently pushed into the anal canal of the patient in the direction of the vertebral column. Then the bladder is pressed gently and continuously to empty the medicine into the anal canal.[8b]

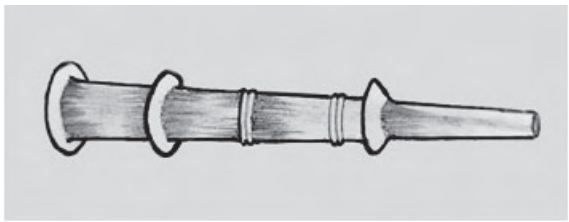
Being the introducing part into the body, it is the nozzle which is to be designed according to the anatomical consideration. The anatomical proficiency of ācārya Suśruta is again reflected in the description of the nozzle. Here, the age-wise dimensional variation of the anal canal has been considered. The shape of the vastinetra reveals that it has an introducing tip or agra, rings or karṇika and the tail end or puccha. The length of the nozzle and the circumference of the base and the tip varies as per the age of the patient. There is a ring at variable distance from the tip for different age groups. The ring is at a distance of about 2.5 cm for 1-year-old, about 3.4 cm for 8-year-old, about 4.2 cm for 16-year-old and about 5 cm for 25-year-old and above, from the tip. The base presents two rings at a distance of two aṅgula in between them. Regarding the structure of the nozzle, the main factor which restricts its entry into the anal canal is the presence of a ring at the tip or the introducing part. For different age

groups, ācārya has mentioned different distances for the ring from the tip. The distance between the tip and the ring gradually increases from one year of age to 25 years of age. The maximum distance to which the nozzle can enter the anal canal ranges from 2.5 cm to 5 cm. This coincides with the average length of the anal canal in different age groups. Another factor is the variation mentioned in the circumference of the nozzle which ranges from the thickness of little finger in 1-year-old patients, index finger in 8-years-old, middle finger in 16-years-old to the thumb in above 25-year-old patients.

At the base, the first ring is at the base itself and the second is at a distance of two aṅgula from it. This helps in binding the bladder accurately in the space in between the rings. The presence of the rings prevents the sliding of the bladder forwards or backwards and fixes it to the point of fastening during the procedure of squeezing. Figure 4.

Figure 4

Vastiyantra



Uttaravastinetra is the nozzle for injecting medicines to the urethral and vaginal passages. The length prescribed for the vastinetra and presence of a ring at its centre are exactly in accordance with the length of the urethra in males and females. The total length of the nozzle for males is approximately 23.7 cm. The ring at the centre i.e., at a distance of 11.85 cm from the tip of the nozzle prevents its entry beyond 7 aṅgula or 11.85 cm into the urethra. Hence the nozzle can enter into the penile part only. The length of male urethra is 18-20 cm and the urethral passage is a mere slit except during the passage of fluid. The penile part or the spongiose part of male urethra lies within the corpus spongiosum penis and is 15 cm long. It extends from below the perineal membrane to the external urethral orifice. Just below the perineal membrane, at the origin, in continuation with the membranous urethra, it runs as a ventral concave curve. This curve lasts till a point anterior to the lowest part of symphysis pubis. From here only the urethra curves downwards into the free part of the penis.[9] So, though the length of the penile part is 15 cm, the commencing part of the penile urethra for a distance of 3-4 cm is occupied by a ventral concave curve. Hence, only the distal 12 cm of the penile part is free inside the corpus spongiosum of the penis where the nozzle can reach safely. This anatomical consideration has been made by ācārya and the length of the nozzle which can enter is restricted to 11.85cm.

Uttaravastiyantra for female urethra: For females the length of the nozzle of the device is about 16.93 cm. The ring is present at a distance of 6.7 cm from the base. It is clearly mentioned by the ācārya that the length of the nozzle that can be introduced is only 2 aṅgula or 3.3 cm. Female urethra is 4 cm long and 6 mm in diameter. It begins at the internal urethral orifice of the bladder, at the level of middle of symphysis pubis and runs antero-inferiorly behind the symphysis pubis. Then traverses the perineal membrane and ends at the external urethral orifice.[9a] The mucosa of urethra is much folded and is easily dilatable. Though the total length of urethra is 4 cm, the length of the nozzle which can enter the cavity is 3.3 cm only. This is because the nozzle is introduced into the region below the perineal membrane only. Thus, the device is safe enough to be introduced into the canal without harming the perineal membrane. Here also, the apt measurement of the nozzle makes the instrument non-harming.

The other tubular instruments like wound syringe (vraṇayantra), hydrocele cannula (mūtravṛddhi yantra), paracentesis cannula (dakodarayantra), tubular instrument for herbal smoking (dhūmpāna yantra), for tapping phimosis (niruddhaprakāśa yantra), anal dilators (sanniruddhagudayantra), bottle gourd (alābu) and animal horn (śṛṅga) are the instruments which are constructed in accordance with the surgical procedures to be performed with them.

The niruddhaprakāśayantra may follow the general design as that of the uttaravastiyantra and the sanniruddhagudayantra can be designed following the guidelines for vastinetra for various age groups.

Śalākayantra: Śalākayantra are rod-like instruments with solid body and are used for various purposes like probing, bundling up, horizontally moving and extraction of foreign bodies, wiping, for applying caustic agents and thermal cautery, removing cancerous growths, for applying collyrium and cleaning of urethral tract. Here ācārya has not fixed the dimensions of the devices. This is because their length and circumference vary as per the procedures or based on the body part in which they are being used. Figures 5, 6 and 7.

Figure 5

Jāmbavavadana śalākayantra

Figure 6

Masūradaḷamukhi śalākayantra

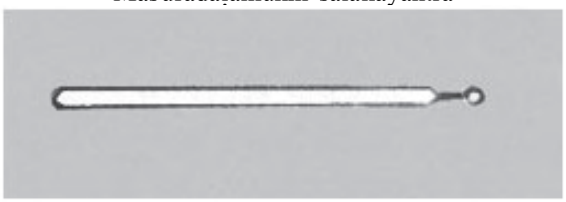


Figure 7

Sarpaphaṇamukhi śalākayantra

The surgical instruments designed and preserved in the museums of Salyatantra Department of the Ayurveda Colleges gives an impression regarding the shape of these instruments to the students. The shape of the instruments is constructed in accordance with the classical references. But minute details regarding the shape of the operating ends and the dimensions are not strictly followed for their construction. In case of svastikayantra, the three-dimensional outline of the dentition of the carnivorous animals and bills of birds is not applied for the instruments. Only a rough model with a two-dimensional projection depicting the shape is made. The models of such type are not sophisticated to perform a surgical procedure meant for them, but they provide an awareness regarding the general shape of the instruments to the students. Figures 8 and 9.

Figure 8

Mārjāramukha svastikayantra

(from Govt. Ayurveda College, Thiruvananthapuram)

Figure 9

Kākamukha svastikayantra

(from Govt. Ayurveda College, Thripunithura)

Discussion

In short, various criteria followed by ācārya for designing surgical instruments can be enlisted as:

- keen observation of the nature and incorporation of the natural principles to the surgical procedures. Eg: - Simhamukha svastikayantra, Samdamśayantra.

- as per the disease in which the surgical measure is required. Eg: - Vraṇayantra, Dakodarayantra

- as per the area to be operated. Eg: - Mūtravṛddhi yantra, Niruddhaprakāśayantra

- according to the size and nature of the foreign body to be removed. Eg: - Kaṅkamukha svastikayantra, Vyāghramukha svastikayantra.

- as per the anatomical consideration of the area. Eg: Tāḷayantra, Śalākayantra, Arśoyantra.

- as per the patient in whom the procedure is done Eg: - Vastiyantra, Uttaravastiyantra.

- depending upon the action to be performed, whether surgical, investigatory or therapeutic Eg: - Śalāka yantra, Nāḍīyantra.

- as per the knowledge from the available literature i.e., following the shape and dimensions given in the classical ayurvedic texts .

- opinion of the experts well mastered in the knowledge of instruments.

- one's own past experiences.

- one's own logic or judgement.

Of the above said criteria, utilization of the natural principles in the surgical procedures and the anatomical considerations of the body parts seems to be more important.

The ethical value of the surgical instruments has also been maintained by ācārya in their creation and uses. The designing of animal faced svastikayantra for removing visible foreign bodies and bird faced svastikayantra for deeper and hidden foreign bodies is really meant for reducing the discomfort caused to the patients. The lengthy bird faced yantra can enter deep into body without causing pain. This also reduces the risk of causing harm to the neighboring delicate structures like blood vessels or muscles while performing the surgical actions. The easiness of procedure was another concern for ācārya in the design and this is seen in the case of tāḷayantra, where the soft, flexible, slightly concave scale-like tip can enter the ear or nasal cavity to get hold of the foreign body and remove it with ease without harming the delicate walls of the cavities. Thus, the instruments are designed with a view of getting maximum precision in the surgical actions at the expense of minimum effort.

In view of the professional ethical principles, an expert surgeon should be well versed in the practical and descriptive anatomy of human body.[1i] Hence, a surgeon should perform the surgical actions only after acquiring thorough anatomical knowledge of the concerned parts and clarifying the doubts by actual seeing and reading of appropriate literatures.[10]

Minute considerations of the anatomical aspects of the body like the dhātu (body tissues), āśaya (viscera), marma, (vital spots), sirā (blood vessels), snāyu (tendons), sandhi (articulations), asthi (bones and cartilages) and garbha sambhava (embryology) along with the wide aspects of surgical procedures, differential diagnosis of diseases, fractures, dislocations, etc. are very difficult to learn even for very intelligent medical students. Hence, the teacher should try his level best to educate his disciples with the deep knowledge in the entire science.[1j] In these verses of ācārya, the importance of learning anatomy for a medical student is highlighted. Hence, it is clear that sufficient anatomical knowledge in āyurveda to perform surgeries, was prevalent among the surgeons of his period.

Conclusion

Ancient ācāryas had contributed to the development of the science by adding their knowledge which they acquired through previous experiences, keen observation of the surroundings and active experimentations. Design, development and appropriate use of a rich surgical armamentarium is an outstanding achievement of Suśrutasamhita.[11]

It is seen that the scholars during the period of ācārya Suśruta had possessed the anatomical knowledge sufficient to perform the surgical procedures. Ācārya has given much importance to anatomy and considered it as the basis for surgical expertise. Designing of surgical instruments is one among the sections of Suśrutasamhita, where the anatomical expertise of ācārya becomes obvious. Thus, it can be invariably approved that ācārya Suśruta had mastered human anatomy and was talented to be addressed as the master of anatomy of his period. This anatomical proficiency of ācārya is well reflected in the description of yantra which are designed with anatomical significance.

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PLANT STUDY

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Preliminary pharmacognostic and phytochemical analysis of Śaśaśrutiḥ [*Emilia sonchifolia* (Linn.) DC.]

Shree N., Remadevi R. and Raghunathan A.

ABSTRACT: Śaśaśrutiḥ is a common plant used in Kerala for various purposes. It is one of the important member of the group daśapuṣpa. It is easily available and traditionally used from time immemorial for treatment of various diseases. There are many formulations mentioned in Malayalam texts, where it is used as a major component. But there is no much information available on this drug in various āyurveda texts. The purpose of this work is to give scientific recognition to śaśaśrutiḥ. This study was an analytical one, in which the preliminary pharmacognostic and phytochemical analysis of śaśaśrutiḥ was performed. Pharmacognostic study was performed by T.S (Transverse section) of stem and leaf. Preliminary phytochemical analysis was performed by determination of physicochemical parameters (total ash, water insoluble ash, acid insoluble ash, moisture content, volatile oil content, sugar content total and reducing sugar, fibre content, etc.), qualitative analysis (detection of tannins, phenols, flavanoids, alkaloids and steroids) and TLC (Thin layer chromatography). This study will be helpful for standardization of śaśaśrutiḥ.

Key words: Śaśaśrutiḥ, Pharmacognostic, Phytochemical

Introduction

Śaśaśrutiḥ is quite common in all districts of South India in plains and upto an elevation of 1200 m in the hills. It is considered auspicious in addition to their medicinal properties by the people of Kerala. It is familiar even to the layman of Kerala. In nāṭṭuvaidyam (indigenous medicine), it is mentioned that the ādidevata of śaśaśrutiḥ is kāmadevata and its iṣṭasiddhi is saundarya and manaśśānti. Being a member of the group daśapuṣpa, Kerala Hindu women used to wear it on the head in the month of dhanu. It is traditionally used for the treatment of various diseases.

Botanical name: *Emilia sonchifolia* (Linn.)DC. [1]

Family: Asteraceae[1]

Vernacular names:

Sanskrit: Śaśaśrutiḥ[2]

Malayalam: Muyalccevi[2]

Hindi: Hiraṇkhurī[2]

Tamil: Muyalccevi[2]

Synonyms: Śaśaśrutiḥ, śrutaśreṇī, śambarī, śaśakarṇikā, pratyakśreṇī, vṛṣā and nyagrodhi.[1]

Plant Description

Distribution and habitat: Common throughout India from Punjab and Bengal in the north, southwards throughout Konkan, Decan, S.M. Country Kerala and Chennai to Cape Comorin. It is quite common in all districts of south India in the plains and upto an elevation of 1200 m in the hills.[2]

Habit and general features: *Emilia sonchifolia* is a glaucous nearly glabrous slender erect decumbent or straggling annual herb 30 to 60 cm high with a variously branched soft fistulose stem, bearing both radical and cauline very variable leaves. The lower or radical leaves which are crowded at the base of the stem are petiolate entire, obovate and pinnatifid, while the cauline are mostly amplexicaul and auricled at base fewer and alternate and the uppermost often reduced or linear. Flowers are all bisexual, discoid, purplish or red on terminal long peduncled, solitary or laxly corymbose homogamous heads about 12 mm long (devoid of bracteoles beneath) with the

involucres cylindric and composed of a single series of free or more or less coheringstriate calycine bracts. Fruits subterete or five ribbed achenes copiously tufted with very slender soft white pappus hairs.[2]

Macroscopic description: Figure 1.

Figure 1
Emilia sonchifolia

Stems and branches: Fistular[2]

Leaves: Variable, simple, alternate upto 12 cm long, both radical as well as cauline, the flower or basal leaves petioled, obovate or lyrate pinnatifid with a large terminal lobe, entire or toothed; the cauline mostly amplexicaul, acutely auricled, acute or less often obtuse at apex, and the uppermost ones still smaller or reduced, sometimes simply linear.[2]

Heads: Few, terminal homogamous, long peduncled, solitary or in loose lax corymbs without bracteoles beneath, about 12 mm long involucre cylindric somewhat swollen at base, composed of a single series of nearly glabrous to puberulous equal free or cohering greenish bracts that get refluxed in fruit. **Receptacle:** flat.[2]

Flowers: All discoid (not rayed). Bisexual, fertile and bracteates.[2]

Bracts: about the same length as the calyx, linear oblong, acute with scarious margins.[2]

Calyx: modified to form a persistent pappus of very slender soft white hairs.[2]

Corolla: purplish or red gamopetalous, tubular, slender, elongate; its limb dilated and shortly fivefid or lobed.[2]

Stamens: Five, filaments free epipetalous.[2]

Anthers: Syngenecious; anther bases obtuse or very minutely tailed.[2]

Ovary: Inferior, unilocular with a single basal anatropus ovule; Style arms subterete, the tips hairy short and obtuse or long and acute.[2]

Fruits: Narrowly oblong or subterete, five-ribbed brownish achenes about 3 mm long, glabrous or slightly scabrid along the ribs and copiously tufted with a soft white minutely hairy pappus that nearly equals the involucral bracts.[2]

Officinal part: Entire plant[2]

Micriscopic description

Stem:A T.S. of stem of *E. sonchifolia* revealed the following important structures; Figures 2, 3.

1. Epidermis: A single layered epidermis composed of compactly arranged parenchymatous cells.

2. Ground tissue: The ground tissue was differentiated into hypodermis, cortex and endodermis.

i. Hypodermis: The hypodermis was present immediately below the epidermis, which consisted of few layered collenchymatous cells. It provided a mechanical strength to the growing stem.

ii. Cortex: Next to hypodermis 6-7 layered cortex was present whichwas chlorenchymatous in nature. The cells were thin walled, oval or rounded. Since it was chlorenchymatous, it may function as assimilatory cells. Cortical cells were mainly served as food storage.

iii. Endodermis: Endodermis was present below the cortex. It was actually the innermost layer of cortex which separated cortex from the stele.

3. Stele: Pericycle, vascular bundle and pith together form the stellar region. In this section, pericycle was not visible. Vasular bundles were arranged in a ring. Each bundle had a patch of xylem towards centre and a patch of phloem towards the periphery. Pith was present in the central part which consisted of parenchymatous cells. The cells were rounded or rounded or polygonal, thin walled with several intercellular spaces. Cells of pith store food material.

Leaf: It showed following important structures; Figure 4.

Figure 2

T.S. of *E. sonchifolia* stem

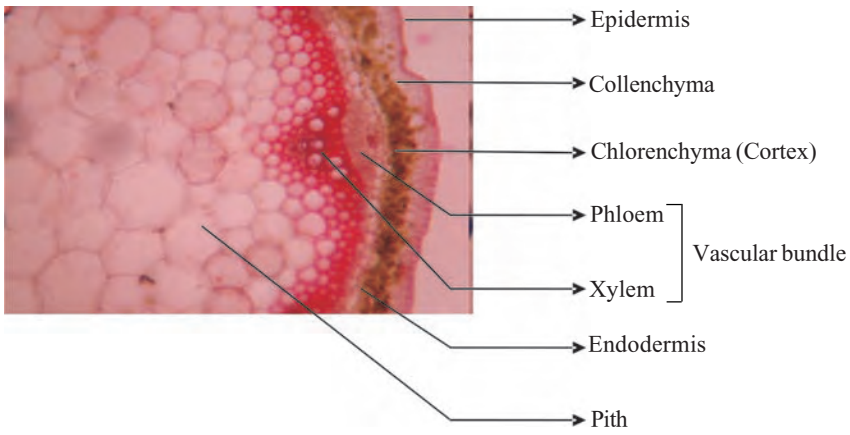


Figure 3

Trichome

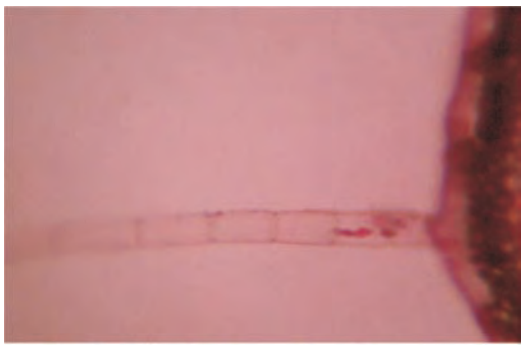
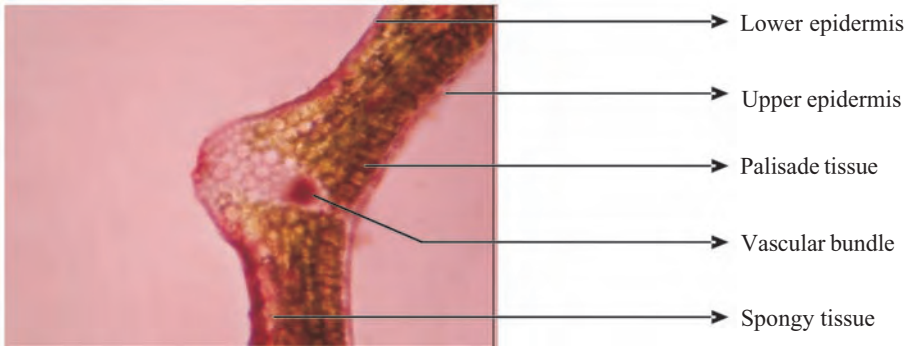


Figure 4

T.S. of *E. sonchifolia* leaf



1. Epidermis: There were two epidermal layers, one on adaxial (dorsal) and other on abaxial (ventral) surfaces and were accordingly called upper epidermis and lower epidermis, respectively. Epidermis was uniseriate, composed of a ring of compactly arranged, thin walled parenchymatous cells.

2. Mesophyll tissues: Here the ground tissue forming the mesophyll was differentiated into palisade and spongy layers. Palisade cells were found below the upper epidermis. They were columnar in shape with scanty intercellular spaces. The palisade cells were arranged in rows.

Spongy cells were present below the lower epidermis and were polygonal in shape. These were quite loosely arranged.

3. Vascular bundle: Vascular bundle was embedded in mesophyll tissues. Xylem lies towards upper epidermis and phloem towards lower epidermis.

Observations

The results obtained by the experiments are given in the following tables.

Table-1 Physicochemical analysis of *E.sonchifolia.* Physicochemical parameters are given in table-1, 2, 3 and 4.

Table 1
Physicochemical analysis of *E. sonchifolia*

Sl.No.	Experiments	Percentage
1.	Moisture content	24%
2.	Volatile oil content	1%
3.	Total ash	6.715%
4.	Water insoluble ash	4.86%
5.	Acid insoluble ash	0.505%
6.	Fibre content	27.4%
7.	Sugar content	
	A.Total sugar	6.75%
	B. Reducing sugar	5.45%

Table 2
Percentage of water soluble extractives in *E. sonchifolia*

Sl.No.	Name of extract	Colour of extract	% of extract
1.	Hot water extracts	Dark brown	19.38 %

Table 3
Percentage of alcohol soluble extractives in *E. sonchifolia*

Sl. No.	Name of extract	Colour of extract	% of extract
1.	Cold alcohol extracts	Brown	6.482 %
2.	Hot alcohol extracts	Brownish white	4.52%

Table 4
Successive solvent extreaction of *E. sonchifolia*

Sl.No.	Experiments	Colour of extract	Percentage
1.	Petroleum ether	Brownish white	1.866%
2.	Cyclohexane	Whitish brown	1.034%
3.	Acetone	Dark green	0.948 %
4.	Alcohol	Light green	1.882%

Total ash content was found to be 6.715%. Acid insoluble ash, which mainly gives the percentage of sand and impurities that remains insoluble in HCl and it was found to be 0.505%. Fibre content of drug was found to be 27.4%. Total sugar content of the drug was 6.75%, while reducing sugar was 5.45%.

Largest percentage of extract was obtained by alcohol and least with acetone. The percentage petroleum ether extract was 1.866 % and that of cyclohexane was 1.034%. This indicates the percentage of chemical constituent and its amount in *Emilia sonchifolia*.

Qualitative analysis of extracts: The qualitative analysis of extracts are given in the Table 5.

Tannins and steroids were present in all the seven extracts. Alkaloids were present in petroleum ether, cyclohexane, cold alcohol and hot alcohol extracts by Dragendorff's reagent test and in cyclohexane extract by Mayer's reagent test. Dragendorff's reagent test was positive for petroleum ether and cyclohexane soluble extracts. Phenols were present only in cold alcohol extracts. Flavonoids were present in petroleum ether, cyclohexane, cold alcohol and hot alcohol extracts.

T.L.C. Methodology

TLC analysis of whole plant extract

For TLC study all (successive) extracts were spotted

Table 5
Qualitative chemical examination of *E. sonchifolia*

Extract	Chemical constituents					
	Tannin	Phenol	Flavonoids	Alkaloids		Steroids
				Dragendorff's test	Mayer's test	
Petroleum ether	+	_	+	+	_	+
Cyclohexane	+	_	+	+	+	+
Acetone	+	_	_	_	_	+
Alcohol	+	_	_	_	_	+
Cold alcohol	+	+	+	+	_	+
Hot alcohol	+	_	+	+	_	+
Water	+	_	_	_	_	+

+ Present; - Absent

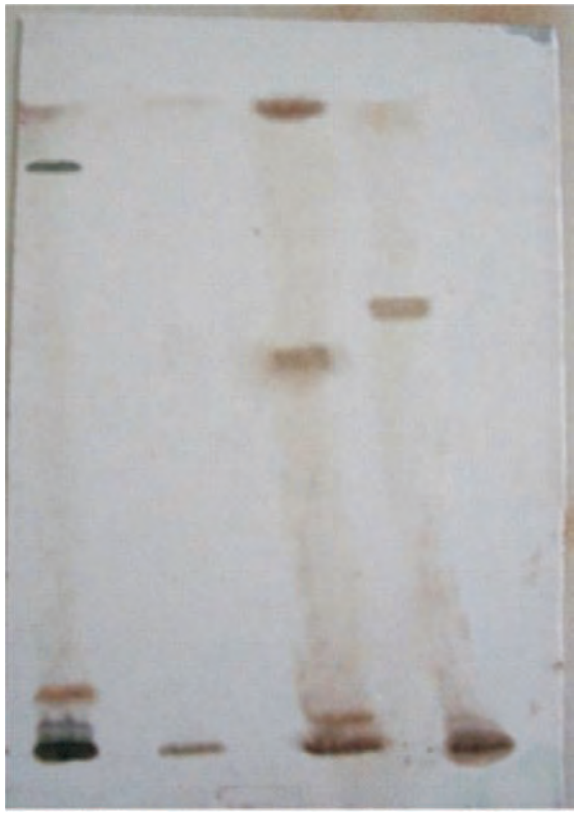
Table 6
TLC analysis of successive solvent extracts of *E. sonchifolia*

Solvent system	Extract	Spot detection	No. of spots	Rf values
toluene :ethyl	Petroleum ether	Visible	3	0.12, 0.57, 0.97
acetate :diethyl amine(7 : 2 : 1)	Cyclohexane	Visible	3	0.02, 0.61, 0.98
	Acetone	Visible	5	0.01, 0.03, 0.14, 0.93, 0.97
	Acetone	Visible	1	0.98

in one solvent system [toluene: ethyl acetate: diethyl amine (7 : 2 : 1)]. The plate was allowed to develop and the spots were visualized in ordinary light after spraying ethanolic sulphuric acid. Table 6

Different extracts were subjected to TLC study. Solvent system used for TLC was Toluene : ethyl acetate : diethyl amine in the ratio of 7 : 2 : 1. Petroleum ether extract gave three spots viewed in visible light. First and third spot from the bottom were of brown colour while second spot was yellow coloured. Cyclohexane extract also gave three spots, in which first and third spot were of brown and second spot was of yellow colour. In acetone extracts, five spots were formed. Among those spots first and fourth were green, second purple, third brown and fifth spot was of grey colour. In alcohol extract only one brown coloured spot was found. Figure 5

Figure 5
TLC (Thin layer Chromatography)



Properties and action according to āyurveda texts:

Attributes

Rasa: Kaṣāya[1], Vīrya: Uṣṇa[1], Vipāka: Madhura[1]

Indigenous therapeutic uses

Codified uses

1. Doṣaghnata: vātahara[1,2]

2. It is wound healer (vraṇaropaṇī). It pacifies vāta and is useful in fever (jvara) and asthma (śvāsa); eye and ear diseases especially in night blindness.[1]

3. It is jvarahara and pacifies vāta.[2]

Empirical uses

1. In Malabar, a decoction of the plant is said to be febrifuge. Mixed with sugar, it is given to bowel complaints (Rheede).[3]

2. In Travancore, pure juice of the leaves is poured drop by drop into the eyes in night blindness. The natives consider the juice as cooling as rose water and prescribes it in eye inflammations.[3]

3. In the Gold coast, the leaves are mixed with guinea grains and lime and is used to cure sore throat.[3]

4. In Indo-China, decoction of the leaves is prescribed as antipyretic.[3]

5. In La Reunion, the plant is used as an astringent, anti-asthmatic and vulnerary.[3]

6. Root or whole plant is used in bowel complaints, diarrhea and cataract.[4]

7. Whole plant paste is applied externally against stiff neck by Munda tribe of Mukkali forest, near Silent Valley National Park, Palakad district, Kerala.[4a]

Conclusion

In T.S of stem of *E. sonchifolia*, ground tissue is differentiated into hypodermis, cortex and endodermis. Multicellular epidermal trichomes are also present. In T.S of leaf, mesophyll cells are differentiated into palisade and spongy layers. Palisade cells are arranged in rows with scanty intercellular spaces. Spongy cells are loosely arranged.

Flavonoids were present in cold and hot alcohol soluble extracts of *E. Sonchifolia*. Alkaloids were present in P.E., C.H., cold alcohol and hot alcohol soluble extracts by DDR test and in C.H. soluble extracts by MR test. Steroids were present in all extracts of *E.sonchifolia*.

In TLC analysis of successive solvent extracts of *E.sonchifolia*, petroleum ether, cyclohexane, acetone and absolute alcohol extracts gave 3, 3, 5 and 1 spots respectively. Among the spots of petroleum ether extracts 1st and 3rd spots were brown coloured and 2nd spot was of yellow colour. In cyclohexane extracts also 1st and 3rd spots were of brown colour and 2nd was of yellow colour, but Rf value was different from that of petroleum extracts. In acetone extract spots, 1st and 4th spots were green in colour 2nd purple, 3rd brown and 5th was of grey colour. Spots obtained in the TLC of absolute alcohol extract were brown coloured.

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CASE STUDY
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Āyurveda management of Cobra bite ulcer - a case study

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ABSTRACT: Incidence of snake bite is very high in India. Around 1300-50000 deaths occurs in India due to snake bite. Common cobra, Russell's viper, Saw scaled viper and Common krait are considered as the most deadly venomous big four snakes in India. Among them common cobra causes neurologic dysfunction and tissue necrosis at the bite site amid survived victims. A case report of cobra bite complications and āyurveda aspects of management is discussed here.

Key words: Post cobra bite, Darvīkaradamśa, Koṭṭamtagarādi agada, Amukkuravayambādi agada, Taruṇabhāskara agada.

Introduction

Snake bite is considered as an important health problem in rural populations of tropical and subtropical countries.[1] According to the poisonous effects, the snake venoms are mainly classified as neurotoxic and hemotoxic.[1] Common cobra (Naja naja), a member of Elapidae family, is a potent neurotoxic poisonous snake.[2] The bite of common cobra with envenomation can be fatal rapidly as early as within 60 minutes.[2] Envenomation usually presents with local necrosis and systemic manifestations.[2] Drowsiness, neurological and neuromuscular symptoms may develop early.[2]

The Keraḷīyaviṣacikitsāsampradāya been nurtured by many eminent viṣavaidya, who have contributed significantly through various text books on viṣacikitsa. Prayogasamuccayam, Viṣavaidya-jyotsnikā and Kriyākaumudi are a few among them. However, nowadays, the knowledge about potent medicinal preparations in the above mentioned textbooks are diminished. This is due to the lack of practical knowledge about usage of medicinal preparations at proper time and on specific conditions. The absence of eminent followers in those viṣavaidya families too have contributed to this.

Case report

A 44-year old lean woman residing at Tenjippalam, Chelari, Kerala, with a history of cobra bite, which was managed at Govt. Medical College, Kozhikode, visited Agadatantra OPD of VPSV Ayurveda College on 11th August 2017, complaining of ulcerative lesion with blackish discolouration on the left middle finger and dorsal and palmar regions of hand. It was associated with severe aching pain, burning sensation and swelling on dorsal surface of left hand. 11 days back the patient experienced a bite on her left middle finger from a common cobra at courtyard of her house on a mid day (around 01.00 pm). Soon she started bleeding associated with severe pain over the bite site. Subsequently she poured a bucket of water, applied tourniquet on the wrist, and bandaged the bite site. The patient had no history of breathlessness, ptosis, diplopia, etc. Immediately she consulted Toxicology Department of Govt. Medical College, Kozhikode and got treatment for 7 days. On the sixth day of treatment, she developed blebs on the bite site and was advised for surgery.

Treatment history

She was administered 10 vials of ASV (Anti-snake venom) immediately from the Casualty Department of Govt. Medical College, Kozhikode, GM (Granulocyte Macrophage colony stimulating factor) dressing was done for 3 days, Tab. Moxclav 625 (Amoxicillin 500mg + Clavulanicacid -125mg) twice daily for 7 days and Tab. Ultracet for 3 days.

General examination

The patient was very weak. During the examination, she was having uneasiness in throat and heaviness of head. Severe aching pain had affected her sleep very much and she hardly slept for 2-3 hours.

Cardio vascular system: Pulse- 96/min, Heart rate- 96/min, Blood Pressure- 140/98 mm of Hg.

Respiratory system: There was no cough, breathing difficulty, wheezing or other abnormal sounds.

Digestive system: She was feeling discomfort around mid sternal region and was having a regular bowel habit.

Before bite, there was no history of diabetes mellitus or hypertension. After bite, a fluctuation in the blood glucose level was noticed.

Systemic examination

Swelling was oberved in the dorsal surface of left hand.

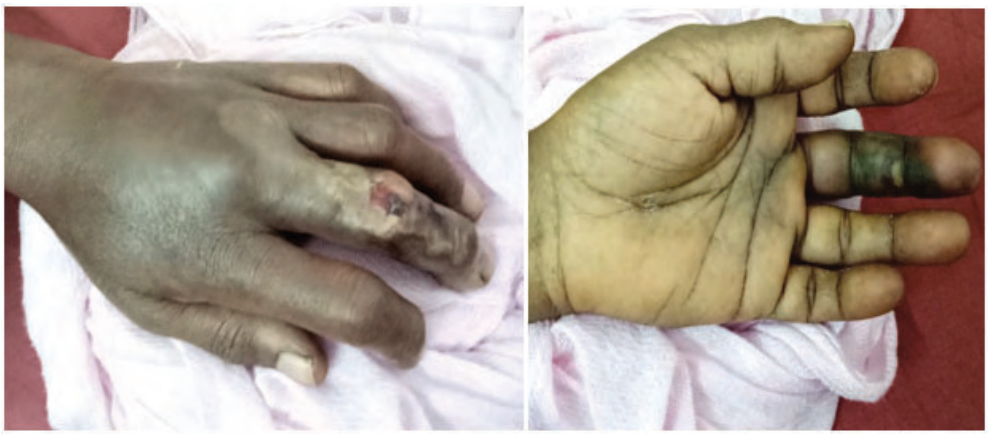
Hyperpigmentation was noticed in the dorsum of left hand, ventral aspect of the left middle finger and nearby areas.

Ulceration was present in the dorsal aspect of left middle finger (approx. 2cm length and 0.2cm depth).

Figure1 is showing the condition of the bite site on first visit.

Figure 1

Appearence of bite site of the patient at the time of first visit



Āyurveda view

In Agadatantra, cobra bites and the later on manifestations due to their bites are usually correlated with darvīkaradamśa and damṣṭra lakṣaṇa.[3] Damśa by darvīkara sarpa induces vātika lakṣaṇa and associated clinical manifestations.[3] Vṛddha Vāgbhaṭa describes the features of darvīkaradamśa as sūkṣmadamṣṭrāpada (subtle and black fang mark), kūrmapṛṣṭonnatā (shape of the swelling resembling tortoise), toda (needling pain), nidrānāśa (loss of sleep) and śirogurutva (heaviness of head).[3] Suśrutācārya and Vāgbhaṭācārya had explained the clinical manifestations of darvīkaradamśa through the seven vega.

From the clinical presentation of the patient, we assessed the leftovers of three vegalakṣaṇa. Table 1.

Table 1

Darvīkaradamśa vega lakṣaṇa

Stage	Features
1st Vega	Blood vitiation, the blood and bite site become blackish discoloured and will have a feeling of ants crawling on the body.
2nd Vega	Swelling
3rd Vega	Heaviness of head

Treatment

The treatments were administered at the OPD level. Treatment protocol adopted was that of sarpaviṣa cikitsa. At the time of first visit (11-08-2017), the patient was suffering from ulcerative lesion with blackish discolouration on the left middle finger and dorsal and palmar regions of hand. It was associated with severe aching pain, burning sensation and swelling on the dorsal surface of left hand. She also complained about discomfort in the midsternal region and heaviness of head. The initial prescription was as follows,

1. Amukkuravayambādi agada (15g fine powder boiled with 320ml water and reduced to 160ml, was filtered properly and advised to take 80ml at 8am and 8pm)[4]

2. Vilvādi agada (1tab. twice daily with the above decoction)[3a]

3. Taruṇabhāskara agada (1tab. at 9 am and 9 pm)[4a]

4. Koṭṭamtagarādi agada (2.5g fine powder boiled in 2l water, after cooling filtered well and was advised to use take for washing the bite site)[4b]

The ingredients of the above mentioned drugs are given in Table 2,3,4 and 5 respectively.

Table 2
Ingredients of Amukkuravayambādi agada

Sl.No.	Drug	Scientific name	Family	Vernacular name	Part used
1.	Aśvagandha	*Withania somnifera* (L.) Dunal[6]	Solanaceae	Winter cherry	Tuberous roots
2.	Vacā	*Acorus calamus* L.[6]	Acoraceae	Sweet flag	Rhizome
3.	Śvetacandanaḥ	*Santalum album* L.[6]	Fabaceae	Indian sandalwood	Heartwood
4.	Kaṭurohiṇī	*Picrorhiza scrophulariflora* Pennel	Plantaginaceae	Picrorrhiza	Dry root
5.	Īśvarī	*Aristolochia indica* Linn.[7]	Aristolochiaceae	Indian Birthwort	Indian Birthwort
6.	Nāgaram	*Zingiber officinale* Roscoe[6]	Zingiberaceae	Dry ginger	Rhizome
7.	Maricaḥ	*Piper nigrum* L.[6]	Piperaceae	Black pepper	Dried fruit
8.	Pippalī	*Piper longum* L.[6]	Piperaceae	Long pepper	Dried fruit

Table 3
Ingredients of Vilvādi agada

Sl.No.	Drug	Scientific name	Family	Vernacular name	Part used
1.	Vilva	*Aegle marmelos* Linn.Correa[6]	Rutaceae	Indian bael	Root bark
2.	Surasa	*Ocimum sanctum* Linn.[6]	Lamiaceae	Holy Basil	Flower
3.	Karañjaḥ	*Pongamia pinnata* (L.) Pierre[6]	Fabaceae	Indian beech	Seed
4.	Nataḥ	*Valeriana wallichii* DC.[6]	Valerianaceae	Indian valerian	Root
5.	Surāhva	*Cedrus deodara* Roxb.(exD.Don)[6]	Pinaceae	Himalayan ceder,Deodar	Heart wood
6.	Harītakī	*Terminalia chebula* Retz[6]	Combretaceae	Chebulic Myrobalan	Fruit
7.	Āmalakī	*Phyllanthus emblica* L.[6]	Phyllanthaceae	Belleric myrobalan	Fruit rind
8.	Vibhītakī	*Terminalia bellerica* (Gaertn.) Roxb[6]	Combretaceae	Indian goose berry	Fruit
9.	Pippalī	*Piper longum* L.[6]	Piperaceae	Long pepper	Dried spikes
10.	Nāgaram	*Zingiber officinale* Roscoe[6]	Zingiberaceae	Dry ginger	Rhizome
11.	Maricaḥ	*Piper nigrum* L.[6]	Piperaceae	Black pepper	Fruit
12.	Haridrā	*Curcuma longa* L.[6]	Zingiberaceae	Turmeric	Rhizome
13.	Dāruharidrā	*Berberis aristata* DC.[6]	Menisperamaceae	Indian berbery	Stem
14.	Basta mūtra	*Capra aegagrus hircus* Linnaeus	Bovidae	Goat's urine	Urine

Table 4
Ingredients of Taruṇabhāskara agada

Sl.No.	Drug	Scientific name	Family	Vernacular name	Part used
1.	Gorocana	*Bos taurus* L.	-	Bezore	Bile juice
2.	Intuppu	NaCl	-	Rock salt	-
3.	Maramanjal (Dāruharidrā)	*Berberis aristata* DC.	Menisperamaceae	Indian berbery	Stem
4.	Tippali (Pippalī)	*Piper longum* L.[6]	Piperaceae	Long pepper	Dried spikes
5.	Kurumuḷaku (Maricaḥ)	*Piper nigrum* L.[6]	Piperaceae	Black pepper	Fruit
6.	Cukku (Śuṇṭhī)	*Zingiber officinale* Roscoe[6]	Zingiberaceae	Dry ginger	Rhizome
7.	Ponkāram	$Na_2B_4O_7 10H_2O$	-	Borax	-
8.	Nirviṣā	*Deiphinium denudatum* wall.[6]	Ranunculaceae	-	Root
9.	Kāyam (Hiṅguḥ)	*Ferula asafoetida* L.[6]	Apiaceae	Asafoetida	Dried latex from rhizome
10.	Aśvagandha	*Withania somnifera* (L.) Dunal[6]	Solanaceae	Winter cherry	Tuberous roots
11.	Nataḥ	*Valeriana wallichii* DC.[6]	Valerianaceae	Indian valerian	Root
12.	Vacā	*Acorus calamus* L.[6]	Acoraceae	Sweet flag	Rhizome
13.	Pārada	Hg	-	Quicksilver	-
14.	Garuḍappacca	*Selaginella lycopoides* L.[7]	Selaginellaceae	Resurrection plant	Whole plant
15.	Pālgaruḍappacca*				
16.	Candanaḥ	*Santalum album* L.[6]	Santalaceae	Sandal wood	Heart wood
17.	Viṣavega (Īśvarī)	*Aristolochia indica* Linn.[6]	Aristolochiaceae	Indian Birthwort	Indian Birthwort
18.	Pathyā	*Terminalia chebula* Retz.[6]	Combretaceae	Chebulic Myrobalan	Fruit
19.	Pāśupatam (Arkaḥ)	*Calotropis gigantea* L. Dryand[6]	Asclepiadaceae	Blue Madar	Root
20.	Mūrvā	*Chonemorpha grandiflora* G.Don.[6]	Apocynaceae	-	Root

(* As pālgaruḍappacca was not readily available garuḍappacca was used in place of it)

Table 5
Ingredients of Koṭṭamtagarādi agada

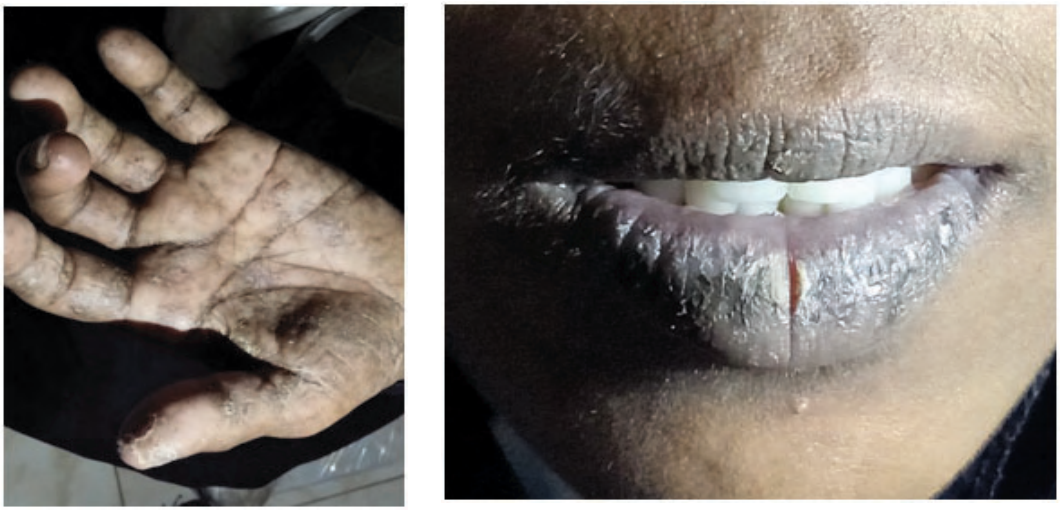
Sl.No.	Drug	Scientific name	Family	Vernacular name	Part used
1.	Koṭṭam (Kuṣṭhaḥ)	Saussurea lappa C. B. Clarke[6]	Compositae	Indian costus root	Root
2.	Tagara (Nataḥ)	Valeriana wallichii DC.[6]	Valerianaceae	Indian valerian	Root
3.	Rāmaccam (Uśīram)	Vetiveria zizanioides (L.) Nash [6]	Graminae	Khaskhas grass	Root
4.	Candanaḥ	Santalum album L.[6]	Santalaceae	Sandal wood	Heart wood
5.	Madhūkam (Yaṣṭhīmadhu)	Glycyrrhiza glabra L.[6]	Fabaceae	Liquorice	Root
6.	Śāribā	Hemidesmus indicus (L.) R. Br. ex Schult[6]	Asclepiadaceae	Indian sarsaparilla	Root

By one week the condition of the patient started improving. The pain and swelling on the left middle finger subsided. Aching pain on left upper limb and heaviness of head got relieved. After two weeks, the pain and swelling on left middle finger got almost cured. However, the patient started feeling burning pain at the bite site. She also felt tenderness over the area around the bite site. There was no tenderness or

pain at bite site, but the touch sensation preserved. Jaḷūkāvacaraṇa was done at the OPD and was advised to continue the above mentioned internal medications for three weeks. At the time of fifth visit, the condition of the patient improved. She described that she was having a feeling of burning pain as if a paste of chilly was applied. She was advised for lepana of Mahātiktaka ghṛta at the bite site. Movements of fingers of left hand were restricted, especially middle finger. On sixth visit (15-09-2017) her sleep pattern was improved, but she felt stretching type pain at the bite site. Jaḷūkāvacaraṇa was done again. Amukkura-vayambādi agada was changed to Punarnavādi kvātha. She was advised to continue other medications for one more week. Nevertheless, during the next visit patient developed severe itching all over the body with blackish discoularation especially on lips, both hands and feet (Figure 2). Adverse reaction of Mahātiktaka ghṛta was suspected.

Figure 2

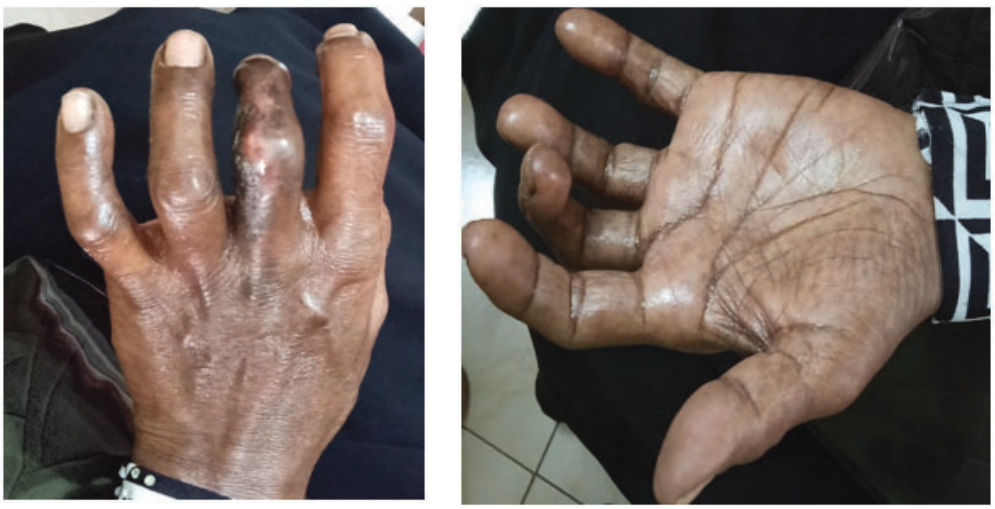
Drug interaction



It was stopped subsequently while the Punarnavādi kvātha was changed to Pañcatiktaka kvātha and kṣāḷana with Guḷūcyādi kvātha was advised. On her last visit she had started feeling pain at the bite site with the ulcer healed. She was having Dupuytren's contracture on the middle finger. Figure 3.

Figure 3

Condition of the patient on last visit (31.01.2018)



She was advised the following medicines;

1. Guḷūcyādi kvātha (15g fine powder boiled with 320ml water and reduced to 160 ml filtered properly and advised to take 80ml at 8am and 8pm)

2. Laghusūtaśekhara rasa (1 tab. twice daily)

3. Nīlīdaḷādi kerataila for external application (body)

4. Muriveṇṇa for local application (left middle finger).

For controlling blood glucose level, she was advised to consult a modern physician(now she is getting 12 unit of insulin human mixtard in the morning and 6 unit in the evening).

Discussion

Common cobra (Naja naja) venom contains proteases, hyaluronidase, phospholipase A, cholinesterase, phosphatases, nucleases (Deoxyribonuclease and ribonuclease), haemolysin, neurotoxins and cardio toxins.[5] The necrotic changes are due to proteases. Hyaluronidase helps in spreading toxins by increasing tissue permeability.[5] Cholinesterase causes block in the nerve impulse transmission.[5] Phosphatase in the venom causes destruction of cell membrane and hemolysis.[5] All the above said features were present in this patient. As she initially underwent modern treatment she had survived the bite, but had only slight relief on some features before visiting our OPD. Here the main aim of the treatment was to reduce damages that the poison had imposed on the patient followed by prompt initiation of healing process. The former aim was attained through administering Amukkura-vayambādi agada, Vilvādi agada, and Taruṇa-bhāskara agada. The initiation of healing process was intended by kṣāḷana with Koṭṭamtagarādi agada. Jaḷūkāvacaraṇa done during the course of treatment improved the circulation and accelerated the healing. In addition, it helped to remove burning sensation and improved the touch sensation.

Conclusion

Generally, viṣaharacikitsa is to be dealt in the form of emergency. Ācārya Vāgbhaṭa had mentioned that the approach of a physician has to be just that of one who deals with pradīptāgāra(a house on fire).[8] Once the life-threatening phase has passed off the rest of the symptoms are to be managed accordingly. The initial complaints of the patient were swelling, aching pain, blackish discolouration and ulceration at the bite site. The first three features were suggestive of vāta-kapha predominant doṣa vitiation and the latter features were suggestive of pitta vitiation. Even though, Darvīkaradamśa is a vāta predominant condition, the involvement of tridoṣa in sarpaviṣa is to be expected. The drugs chosen during her first visit were sufficient to manage the deranged vāta and kapha as the condition had already changed to nija avastha from āgantuja. So pitta which is always dominating here was only limited to the localized lesion, that is, in the form of ulcer. As per rasapañcaka analysis, the drugs of Amukkuravayambādi agada and Vilvādi agada have vāta kapha śamana property where as the drugs of Taruṇabhāskara agada are tridoṣa śāmaka in nature. Analysis of drugs of Koṭṭamtagarādi agada reveals that it is having pitta śamana property. This was used for kṣāḷana in this patient. Considering jaḷūkāvacaraṇa, jaḷūka, the name itself is suggestive of its pitta śamana character. According to ācārya Suśruta, among bloodletting procedures jaḷūkāvacaraṇa is indicated in avagāḍha (deep rooted) condition.[9] Here the patient came with ulceration, which had started to affect the deeper tissues.

Informed consent: An informed consent was obtained from the patient for reporting the case.

Financial support and sponsorship : Nil

Conflicts of interest:There are no conflicts of interest.

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CLINICAL STUDY

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A comparative clinical study to evaluate the efficacy of Lodhrādi lepa and Mukhadūṣikāhara vaṭi with Virecana in the management of Mukhadūṣikā w.s.r. to Acne vulgaris

Rashmi Kathait, Sanjay Kumar Tripathi, Sunil Kumar Sharma, Jaya Saklani Kala and Shweta Shukla

ABSTRACT: One of the leading cosmetic problems which affect the facial skin is acne vulgaris and it is affecting 85% of teenagers among the world population. So there is a need for potential well tolerated treatment which can limit the disease and thereby reduce the psychological impact of the condition. In ayurvedic classics in the context of Kṣudraroga, there it is mentioned about mukhadūṣikā occurring in yauvanāvastha and its signs and symptoms are similar to that of acne vulgaris. The present study was carried out with an objective to compare the efficacy of Lodhrādi lepa and Mukhadūṣikāhara vaṭi with virecana in the management of mukhadūṣikā ie. acne vulgaris. The study was single blind comparitive study, conducted on 40 patients of either sex having mukhadūṣikā. Patients were randomly recruited in two groups (20 each). In Group-A patients were subjected to virecana followed by local application of Lodhrādi lepa and mukhadūṣikāhara vaṭi as oral drug two times a day and in Group-B patients were subjected to virecana only. Overall response in Group-A was excellent improvement in 60% patients, marked improvement in 25% patients and mild improvement in 15% of patients while in Group-B excellent improvement was in 35% patients, marked improvement in 35% patients and mild improvement in 30% patients. It was found that the overall effect of Group-A was better than that of Group-B. Both trial drugs exhibited kapha, vāta, and rakta (and pitta) śamaka properties. Hence, it was concluded that śodhana (virecana) followed by śamana (Lodhrādi lepa and mukhadūṣikāhara vaṭi) is effective in combating mukhadūṣikā in comparison with śodhana alone.

Key words: Mukhadūṣikā, Yuvanapiḍakā, Tāruṇyapiḍakā, Acne vulgaris, Śodhana, Śamana, Virecana, Lodhrādi lepa, Mukhadūṣikāhara vaṭi

Introduction

Acne vulgaris is one among the most common skin disorders. It can be very well co-related with mukhadūṣikā or tāruṇyapiḍakā mentioned in āyurveda. It is caused by the vitiation of kapha, vāta and rakta. It is prevalent among the adolescents and the appearance of the piḍakā (eruption) is like that of thorn of śālmali [*Salmalia malabarica* (DC.) Schott & Endl].

Acne vulgaris is a nearly universal skin disease afflicting 85% of the adolescent population. In men and women older than 25 years, 40% to 54% have some degree of facial acne and clinical facial acne persists into middle age in 12% of women and 3% of men.[1] The psychological harm acne causes to its many sufferers should not be underestimated; but things are gradually improving for them. Modern medications for acne include topical therapies; antimicrobials, hormones, surgery, UV irradiation; intra lesional injections, etc.. But these have their own limitations. All these modern treatment modalities burn a hole in the pocket without permanently curing the disease and are only effective until used, with some side effects. After looking into the above mentioned facts there is a need for a treatment which can prevent complications of the disease as well as reduce the recurrence effectively. A study in modern science has shown that gut dysbiosis and increased intestinal permeability (AKA leaky gut) are the root causes of acne vulgaris.[2] This has also encouraged to

give virecana to the patients in this study. Various researches have been done earlier to study the effect of different lepa preparation in the management of mukhadūṣikā along with or without śodhana karma. This study is a comparison of the effect of simple virecana with the combined effect of the two drugs Lodhrādi lepa and Mukhadūṣikāhara vaṭi.

Aims and objectives

1. To evaluate the effect of Lodhrādi lepa and Mukhadūṣikāhara vaṭi along with virecana.

2. To evaluate the efficacy of virecana.

3. To compare the effect of virecana with Lodhrādi lepa and Mukhadūṣikāhara vaṭi.

Hypothesis

H_0 - Lodhrādi lepa and Mukhadūṣikāhara vaṭi have no effect on mukhadūṣikā.

H_1 - Lodhrādi lepa and Mukhadūṣikāhara vaṭi have some effect on mukhadūṣikā.

Materials and methodes

Inclusion criteria

1. Age: 16-35years.

2. Patients of either sex were taken.

3. Diagnosed case of mukhadūṣikā (acne vulgaris).

4. Patients fit for virecana.

5. Patients willing to participate in the above mentioned trial with informed consent.

Exclusion criteria

1. Age < 16 years and > 35 years.

2. Patients having any other skin diseases.

3. Patients not fit for virecana.

4. Patients with complicated acne.

Criteria for withdrawl

1. Personal reasons

2. Intercurrent illness

3. Aggravation of complaints

4. Any other difficulties

Investigations

Investigations like Hb%, T.L.C., E.S.R., Fasting blood sugar and Post prandial blood sugar and LFT (Serum bilirubin total, indirect, SGPT and SGOT) were carried out before the initiation of trial and after completion of the trial, to rule out any systemic pathology and to address side effect of the trial drug.

Assessment of result [1, 2]

Effects of the therapies were compared before and after the treatment on the basis of self-formulated scoring scales based on subjective and objective parameters associated with the disease. Table 1.

Table 1
Parameters of assessment

Subjective parameters	Objective parameters
Piḍakā (type of lesion)	Number of Comedones
Vedana (pain)	Number of papules
Vaivarṇyata (discoloration)	Number of Pustules
Srāva (discharge)	Number of Nodules
Kaṇḍū (itching)	Number of Cysts
Snigdhata (oiliness)	Number of Scars
Dāha (burning sensation)	
Pāka (inflammation)	
Scars	

Statistical analysis

Wilcoxon signed rank test was applied on the subjective parameters in both the groups. Paired t- test was applied on biochemical parameters. For inter group comparison of subjective parameters Mann-Whitney U test was used. For inter group comparison of objective and biochemical parameters, unpaired t- test was used.

Thus, the obtained results were interpreted as;

P> 0.05 - Not Significant
P< 0.01 and <0.05 - Significant
P< 0.001 - Highly Significant

40 Patients with mukhadūṣikā were selected from the O.P.D. and I.P.D., Department of Kayacikitsa, Rishikul Campus, Haridwar, and from a camp on

mukhadūṣikā which was organized on 18th November, 2017 by the Post Graduate Department of Kayacikitsa, Rishikul campus, Haridwar.

Ethical clearance: The research has been approved by the Institutional Ethical Committee. Written consent was taken from all the subjects before the trial and study was in accordance with ICH GCP Guidelines. Ethical committee approval no.- UAU/R/C/IEC/2016-17/2

Selection of sample: Stratified randomized sampling.

Type of study: Single blind

Duration of study: 45 days

Selection of drug:

1. Lodhrādi lepa
2. Mukhadūṣikāhara vaṭi
3. Virecana

Preparation and dose of drug

1. Preparation of Lodhrādi lepa (modified as gel)

Lodhrādi lepa is described by different ācārya in their text; but here it was modified into gel form due to its inert nature, easy to apply and remove, non sticky and non-oily base. Topical gel formulation provides a suitable delivery system for drugs as they are less greasy and can be easily removed from the skin. It also allows the percutaneous absorption of drugs from topical application and permeation through skin to reach the target tissue. Gel base formulation makes the drug molecules more easily removable from system than cream, ointment, or lepa. Gels for dermatological use have favorable properties such as being greaseless, easily spreadable, easily removable, emollient, non-staining and compatible with several excipient and water soluble or miscible.

Lodhrādi lepa in gel form contained three ingredients; lodhraḥ [*Symplocos cochinchinensis var. laurina* (Retz.) Noot.] , dhānyakam (*Coriandrum sativum* L.) and vacā (*Acorus calamus* L.) in equal proportion. All the raw drugs were collected from a renowned crude drug supplier from Haridwar, were identified and authenticated by the Department of Dravyaguna, Rishikul campus, Uttarakhand Ayurved University, Haridwar. All the raw drugs were cleaned thoroughly with water and dried under sun to remove the moisture and later grinded to fine powder. This powder was soaked in water (triple times of the raw materials) for 24 hours and later this soaked drug was boiled till water gets evaporated and mixture changed to dried form. Then distilled water was added to dilute the mixture. On the other side a gel base powder (Carbapol) was taken and mixed with distilled water to transform (from powder to gel base form) and then preservatives MPS and PPS were added into it. Later this gel base preservatives MPS and PPS were mixed with diluted mixture of drugs to form Lodhrādi gel; then this self formulated gel was packed in plastic sealed containers weighing 30 gm each.

Mode of use: Local application twice a day.

2. Preparation of Mukhadūṣikāhara vaṭi

All the raw drugs were obtained, from a renowned crude drug supplier from (Prem nagar ashram) Haridwar, were identified and authenticated by the Department of Dravyaguna, Rishikul campus, Uttarakhand Ayurved University, Haridwar. All the raw drugs were cleaned thoroughly with water and dried under sun to remove the moisture and later grinded to fine powder. The raw drugs mañjiṣṭhā (*Rubia cordifolia* L.), śāribā [*Hemidesmus indicus* (L.) R. Br. ex Schult.] , madhusnuhī (*Smilax china* L.), haridrā (*Curcuma longa* L.), nimba (*Azadirachta indica* A. Juss.) and guḍūci [*Tinospora cordifolia* (Willd.) Miers] were taken in equal proportion (1kg each) grinded to coarse powder and mixed with 8 parts of water. This mixture was boiled till the proportion reduced to one fourth of the principle

quantity. Bhāvana was given to the above prepared fine powder with the decoction and svarasa of nimba, haridrā and guḍūci for three times (in each svarasa). The whole mixture was compressed into tablet weighing 500mg each. These tablets were packed in a sterile polythene covers containing approximately 150 tablets in each.

Dose: 3tab. thrice daily (1.5gram) with koṣṇajala anupāna after meals, for one month.

3. Virecana: Trivṛt avaleha with Triphalā Kvātha (dose was given on varying amount, according to the koṣṭha of the patient i. e. mṛdu, madhya and krūra)

Trial drug schedule

The patients selected for trial were randomly divided in two groups:

Group-A: Patients were subjected to virecana followed by local application of Lodhrādi lepa and mukhadūṣikāhara vaṭi for oral intake.

Group-B: Patients were subjected to virecana followed by placebo.

Assessment of the patients was done at an interval of 15 days. Two assessments were done and follow up was done 30 days after the completion of treatment to look for any recurrence.

Observations

Table 2 and 3 is showing the efficacy study of Group-A on subjective and objective parameters respectively.

Efficacy study of Group-A on biochemical parameters: There was statistically Non-significant (p>0.05) result seen in all biochemical values i.e. Hb%, TLC, ESR, FBS, PPBS, Serum billirubin, SGPT and SGOT.

Table 4 and 5 is showing the efficacy study of Grioup-B on subjective and objective parameters respectively.

Efficacy study of Group-B on biochemical parameters: There was statistically Non-significant (p>0.05) result seen in all biochemical values i.e. Hb%, TLC, ESR, FBS, PPBS, Serum billirubin, SGPT and SGOT.

Table 6 and 7 is showing the intergroup comparison of subjective and objective parameters respectively.

Table 8 and 9 is showing the comparative assessment of percentage of relief in subjective and objective parameters respectively.

Table 10 is showing the estimation of overall response of each group.

Table 2

Efficacy study of Group-A on subjective parameters

Symptoms	Median		Wilcoxon Signed Rank test	P-Value	% Effect	Result
	BT	AT				
Piḍakā	2	0.5	-4.177[a]	<0.001	79.2	Highly Significant
Vaivarṇya	2	1	-3.987[a]	<0.001	69.4	Highly Significant
Kaṇḍū	2	0	-3.508[a]	<0.001	88.5	Highly Significant
Vedana	1	0	-3.071[a]	<0.05	93.3	Significant
Snigdhata	2	0	-4.028[a]	<0.001	94.3	Highly Significant
Dāha	0	0	-2.460[a]	<0.05	90.0	Significant
Srāva	0	0	-2.714[a]	<0.05	88.2	Significant
Pāka	2	0	-3.852[a]	<0.001	90.6	Highly Significant
Scar	0.5	0	-2.828[a]	<0.05	66.7	Significant

Table 3
Efficacy study of Group-A on objective parameters

Symptoms		Mean	N	SD	SE	t-Value	P-Value	Result
No. of comedones	BT	2.1	20	0.9	0.2	10.925	<0.001	Highly Significant
	AT	0.4	20	0.5	0.1			
No. of papules	BT	2.6	20	0.6	0.1	16.376	<0.001	Highly Significant
	AT	0.5	20	0.5	0.1			
No. of pustules	BT	1.4	20	1.0	0.2	5.877	<0.001	Highly Significant
	AT	0.2	20	0.4	0.1			
No. of cysts	BT	0.2	20	0.4	0.1	2.179	<0.05	Significant
	AT	0.0	20	0.0	0.0			
No. of nodules	BT	0.1	20	0.2	0.1	1.000	>0.05	Non-Significant
	AT	0.0	20	0.0	0.0			
No. of scars	BT	0.3	20	0.6	0.1	2.517	<0.05	Significant

Table 4
Efficacy study of Group-B on subjective parameters

Symptoms	Median		Wilcoxon Signed Rank Test	P-Value	% Effect	Result
	BT	AT				
Piḍakā	2	1	-4.134[a]	<0.001	55.6	Highly Significant
Vaivarṇya	2	1	-3.944[a]	<0.001	54.1	Highly Significant
Kaṇḍū	1	0	-3.500[a]	<0.001	70.0	Highly Significant
Vedana	0.5	0	-3.000[a]	<0.05	75.0	Significant
Snigdhata	1	0	-3.557[a]	<0.001	69.6	Highly Significant
Dāha	1	0	-2.887[a]	<0.05	76.9	Significant
Srāva	1	0	-3.314[a]	<0.05	81.0	Significant
Pāka	1	0	-2.810[a]	<0.05	68.8	Significant
Scar	0	0	-2.449[a]	<0.05	60.0	Significant

Table 5
Efficacy study of Group-B on objective parameters

Symptoms		Mean	N	SD	SE	t-Value	P-Value	Result
No. of comedones	BT	1.9	20	0.8	0.2	10.162	<0.001	Highly Significant
	AT	0.6	20	0.6	0.1			
No. of papules	BT	2.0	20	0.8	0.2	12.337	<0.001	Highly Significant
	AT	0.6	20	0.7	0.2			
No. of pustules	BT	1.3	20	1.0	0.2	5.667	<0.001	Highly Significant
	AT	0.4	20	0.7	0.2			
No. of cysts	BT	0.7	20	0.9	0.2	2.854	<0.05	Significant
	AT	0.4	20	0.6	0.1			
No. of nodules	BT	1.45	20	1.0	0.2	1.304	>0.05	Non-Significant
	AT	1.05	20	0.94	0.2			
No. of scars	BT	0.5	20	0.6	0.1	2.179	<0.05	Significant
	AT	0.3	20	0.6	0.1			

Table 6
Intergroup comparison of subjective parameters

Parameters	Group	N	Mean Rank	Sum of Ranks	Mann-Whitney U test	P-Value	Result
Piḍakā	Group-A	20	26.63	532.50			
	Group-B	20	14.38	287.50	77.500	<0.001	Highly Significant
	Total	40					
Vaivarṇya	Group-A	20	22.95	459.00			
	Group-B	20	18.05	361.00	151.000	>0.05	Non-Significant
	Total	40					
Kaṇḍū	Group-A	20	23.73	474.50			
	Group-B	20	17.28	345.50	135.500	>0.05	Non-Significant
	Total	40					
Vedana	Group-A	20	22.18	443.50			
	Group-B	20	18.83	376.50	166.500	>0.05	Non-Significant
	Total	40					
Snigdhata	Group-A	20	26.75	535.00			
	Group-B	20	14.25	285.00	75.000	<0.001	Highly Significant
	Total	40					
Dāha	Group-A	20	19.78	395.50			
	Group-B	20	21.23	424.50	185.500	>0.05	Non-Significant
	Total	40					
Srāva	Group-A	20	19.33	386.50			
	Group-B	20	21.68	433.50	176.500	<0.05	Significant
	Total	40					
Pāka	Group-A	20	26.58	531.50			
	Group-B	20	14.43	288.50	78.500	<0.001	Highly Significant
	Total	40					
Scar	Group-A	20	21.50	430.00			
	Group-B	20	19.50	390.00	180.000	>0.05	Non-Significant
	Total	40					

Table 7
Intergroup comparison of objective parameters

Parameters	Group	N	Mean	SD	SE	t-Value	P-Value	Result
No. of comedones	A	20	1.8	0.7	0.2	2.476	<0.05	Significant
	B	20	1.3	0.6	0.1			
No. of papules	A	20	2.2	0.6	0.1	4.681	<0.001	Highly Significant
	B	20	1.4	0.5	0.1			
No. of pustules	A	20	1.2	0.9	0.2	1.217	>0.05	Non-Significant
	B	20	0.9	0.7	0.2			
No. of cysts	A	20	0.2	0.4	0.1	-0.717	>0.05	Non-Significant
	B	20	0.3	0.5	0.1			
No. of nodules	A	20	0.1	0.2	0.1	1.000	>0.05	Non-Significant
	B	20	0.0	0.0	0.0			
No. of scars	A	20	0.3	0.4	0.1	0.370	>0.05	Non-Significant
	B	20	0.2	0.4	0.1			

Table 8 Comparative assessment of % relief in subjective parameters		
Symptoms	% Relief	
	Group-A	Group-B
Piḍakā	79.2%	55.6%
Vaivarṇya	69.4%	54.1%
Kaṇḍū	88.5%	70.0%
Vedana	93.3%	75.0%
Snigdhata	94.3%	69.6%
Dāha	90.0%	76.9%
Srāva	88.2%	81.0%
Pāka	90.6%	68.8%
Scar	66.7%	60.0%

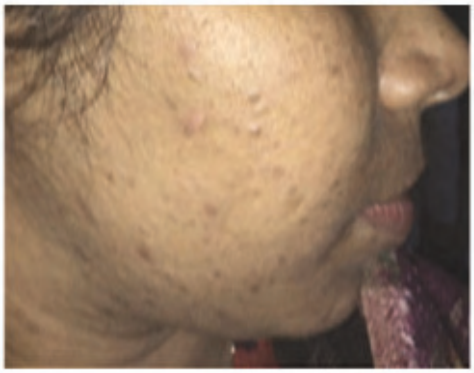
Figure 1 and 2 is showing the result of some of the patients in Group-A and Group-B.

Table 9 Comparative assessment of % relief in objective parameters		
Objective parameter	Group-A	Group-B
No. of comedones	83.333	67.568
No. of papules	82.692	69.231
No. of pustules	85.185	68.000
No. of cysts	100.000	46.154
No. of nodules	100.00	78%
No. of scars	83.333	44.444

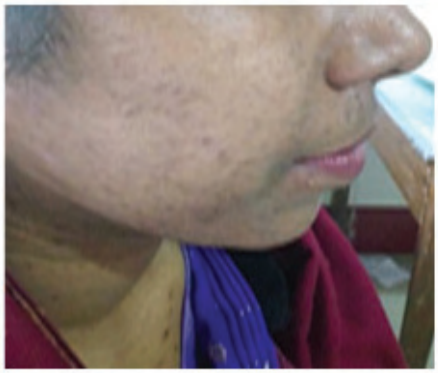
Table 10 Estimation of overall response in each Group				
Improvement (%)	Group-A		Group-B	
	No	%	No	%
Excellent (75-100%)	12	60%	7	35%
Marked Improvement (50-74%)	5	25%	7	35%
Mild Improvement (25-49%)	3	15%	6	30%
No Improvement (<24%)	0	0	0	0%

Figure 1
Result obtained in Group-A

Before treatment



After treatment



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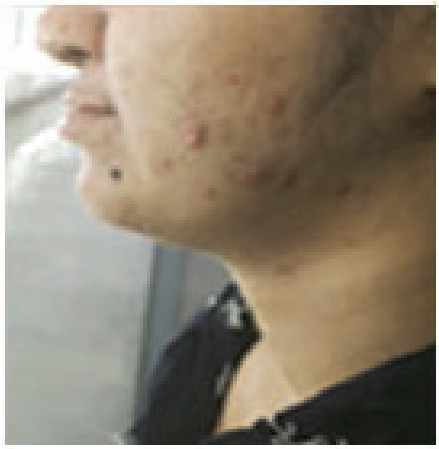

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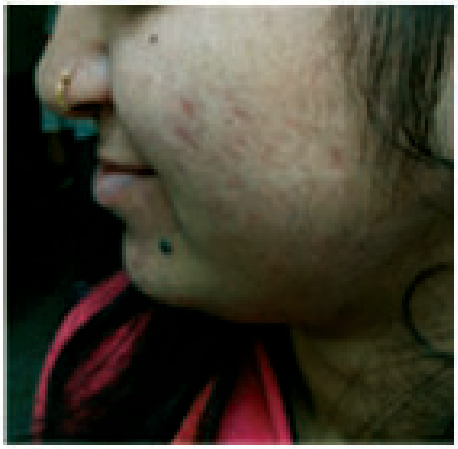
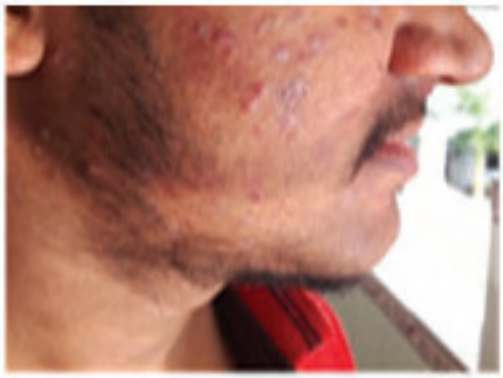
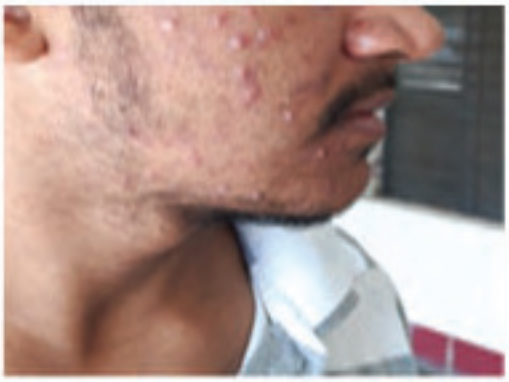


Figure 2
Result obtained in Group-B

Before treatment

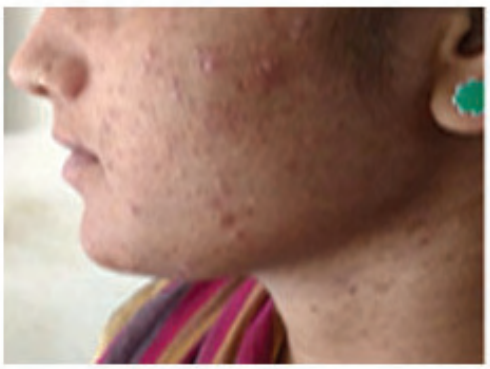


After treatment



Before treatment

After treatment



Result

While observing the subjective and objective assessments the following result was obtained.

Group-A: Statistically highly significant result was obtained in subjective parameters like piḍakā, vaivarṇya, kaṇḍū, snigdhata and pāka ($p<0.001$). Statistically significant result was obtained in subjective parameters like vedana, dāha and srāva ($p<0.01$). In objective parameters statistically highly significant result was obtained in number of comedones, papules and pustules ($p<0.001$). Statistically significant result was obtained in number of cysts and scars ($p <0.01$) and statistically non-significant result was obtained in number of nodules and biochemical values ($P >0.05$).

In Group-B: Statistically highly significant result was obtained in subjective parameters like piḍakā, vaivarṇya, snigdhata, and kaṇḍū ($p<0.001$) and statistically significant result was obtained in parameters like vedana, dāha, pāka and srāva ($p<0.05$). In objective parameters statistically highly significant result was obtained in number of comedones, papules and pustules ($p<0.001$). Statistically significant result was obtained in number of cysts and scars ($P<0.05$) and statistically non-significant result was obtained in number of nodules and biochemical values ($P >0.05$).

Inter group comparison: On inter group comparison of (subjective parameters i.e. piḍakā, snigdhata and pāka) by using Mann-Whitney U test; patients got better percentage of relief in Group-A than Group-B. On Comparative percentage of relief in objective parameters it was found that patients got

better relief in Group-A than Group-B especially in number of comedones and papules. On inter group comparison of objective parameters (i.e. number of comedones and number of papules.), by using unpaired t-test, patients got better percentage of relief in Group-A than Group-B. Statistically non-significant result was found in all the biochemical values in both groups ($p>0.05$). On Comparative assessment, percentage of relief in subjective parameters was in vaivarṇya (55.6%,), kaṇḍū (54.1%), vedana (75%), snigdhata (69.6%), srāva (81%), pāka (68.8%) and scar (60%).

Overall effect of therapy: Overall response in Group-A was excellent improvement in 60% of patients, marked improvement in 25% of patients and mild improvement in 15% of patients while in Group-B excellent improvement was in 35% of patients, marked improvement in 35% of patients and mild improvement in 30% of patients. Thus, we can conclude that the overall effect of Group-A was better than that of Group-B.

Discussion

Probable mode of action of Lodhrādi lepa: Lodhrādi lepa as described in Aṣṭāṅgahṛdayam, Cakradattam[1] and Śāraṅgadharasamhita[2]; had been selected for this study. It contains three drugs namely lodhra, dhānyaka and vacā. Ingredients of Lodrādi lepa have the predominance of tikta, kaṭu and kaṣāya rasa, laghuguṇa, kaṭuvipāka and uṣṇavīrya. These properties alleviates kapha doṣa. Lodrādi lepa is capable of pacifying vitiated vāta doṣa by its madhura rasa, snigdhaguṇa, uṣṇavīrya and madhuravipāka. Due to the presence of madhura, tikta and kaṣāya rasa, snigdhaguṇa and śītavīrya it alleviates pitta doṣa. Rūkṣaguṇa helps in drying up the piḍakā. Tīkṣṇa guṇa assists the drug to act fast, spreading into the deep and squeeze out the pus inside. As tiktarasa is having raktaśodhana property it acts on the vitiated raktadhātu and purifies it. By cleansing the blood, it cures the skin diseases and enhances the skin complexion. The drugs also pocess śothahara, vraṇaropaṇa, pācana and kṛmighna properties. Hence, it helps to enhance the healing process of mukhadūṣikā (acne vulgaris). Medoghna property of vacā will be useful in subsiding the medogarbha piḍakā.

Probable mode of action of mukhadūṣikāhara vaṭi :[3,4]

All the six ingredients (mañjiṣṭhā, śāribā, madhusnuhi, nimba, haridrā and guḍūci) of mukhadūṣikāhara vaṭi have shown their anti-inflammatory, anti-microbial, anti-acne effect in various studies and ācārya Caraka[5] has described mañjiṣṭhā and śāribā, in varṇya mahākaṣāya, haridrā in kuṣṭhaghna, and viṣaghna mahākaṣāya, guḍūci and śāribā in dāhapraśamana mahākaṣāya. This vaṭi basically contains raktaprasādana dravya like śāribā, mañjiṣṭhā and madhusnuhi which detoxifies the blood. Śothahara and kṛmihara dravya like nimba, guḍūci and haridrā subsides śotha, excessive sebum production and reduces the bacterial load. Almost all the drugs have tridoṣaśāmaka properties. Mukhadūṣikāhara vaṭi is mainly tikta rasa pradhāna having laghu rūkṣaguṇa, uṣṇavīrya and kaṭuvipāka with which it helps in the management of mukhadūṣikā by breaking the samprāpti.

Conclusion

Mukhadūṣikā is a kapha-vāta-rakta pradhāna vyādhi which has the clinical features similar to acne vulgaris. Lodhrādi lepa and mukhadūṣikāharavaṭi as śamana cikitsa along with virecana as śodhana cikitsa when given together has proved to be quite effective than only virecana in managing the patients of mukhadūṣikā. Moreover no side-effects were observed in patients during and after the treatment. So, it can be concluded that the patients of mukhadūṣikā can be managed effectively by āyurveda.

Conflict of interest: None.

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Muyalccevi (Śaśaśruti)

Ollur Vaidyan Thomas

Dhanvantari is the first medical journal in Malayalam published every month by Vaidyaratnam P. S. Varier from Arya Vaidya Sala uninterruptedly for 23 years from 1903 to 1926 . This clinical note was published in its column on Book No. 1, 1079 Kumbham Malayalam Era (1904 CE), Article No. 6, Page 133.

There is a general misconception that psychological disorders like epilepsy could only be cured through the means of 'Voodoo' and medicines affiliated with it. Seldom would have people heard about 'Muyalccevi ie śaśaśruti [*Emilia sonchifolia* (Linn.) DC.]' that acts as a wholesome cure for various possessive states, colloquially termed as demons, cāttan, gandharvan, witch, kāḷi, kariṅkuṭṭy and other paediatric ailments.

Thus runs the prescription. The whole plant is plucked on the auspicious day of 'jyeṣṭha' during sunrise. Cleaned thoroughly, it is then ground in the juice of vaṭṭakkilukiluppa [śaṇapuṣpī ie *Crotalaria retusa* (L.) Sweet] for three hours and rolled into three tablets. It is then dried in shade. Again, care should be taken to see that the tablets are not put on the ground to dry.

On drying these are kept in a silk cloth with all respect. Take a tablet and grind it in the juice of betel leaf. This is used as 'kājal' and is applied in the eyes. Visible changes can be noticed. Next, he is to take the second tablet ground in vaṭṭakkilukiluppa juice. The third tablets is to be ground in the same juice and applied on the body. It can be stated without dought that on doing this, he will be completely cured of the malady.

In almost all the texts, the 'Voodoo' practices are the only means to treat suchdisorders. But the usage of 'Muyalccevi' is proven to be very effective to my knowledge.

Translated by: Rati Vijayan, Publication Department, Arya Vaidya Sala, Kottakkal, Kerala, India.

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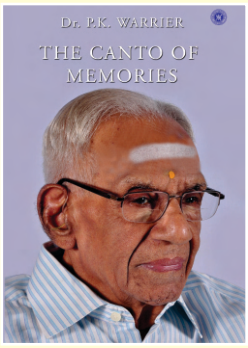

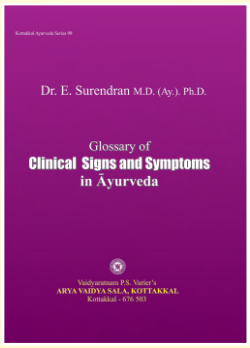

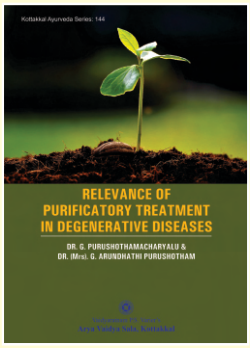

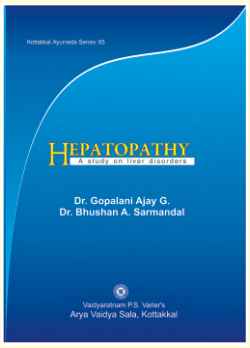

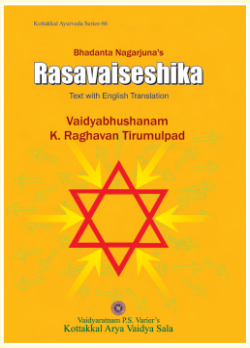

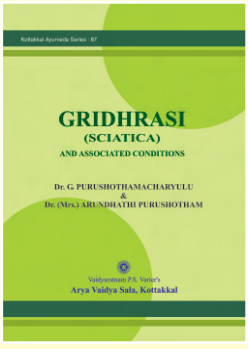

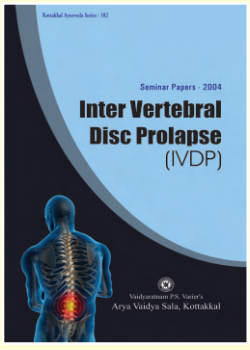

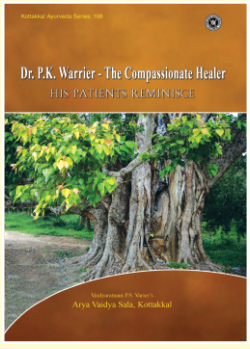

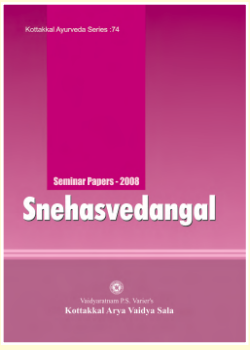

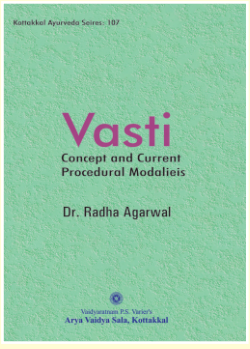

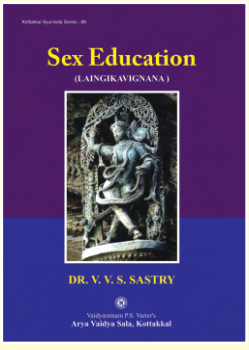

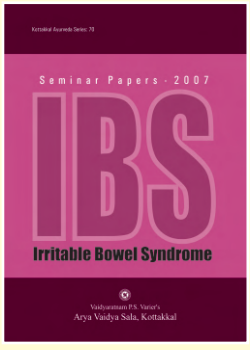

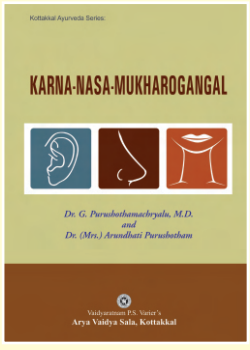

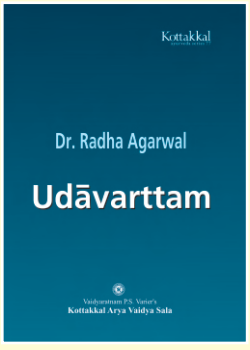

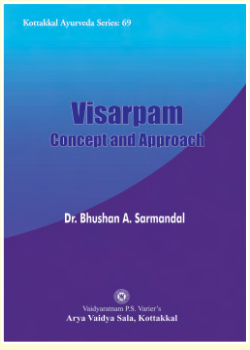

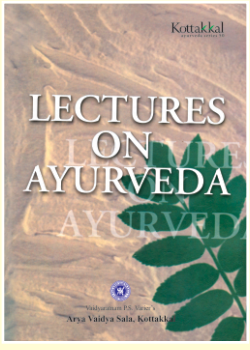

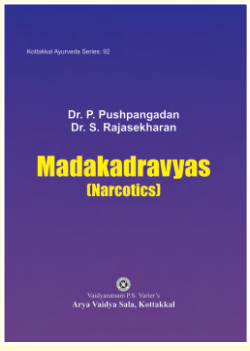

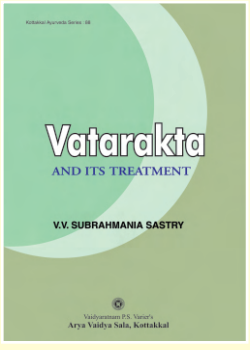

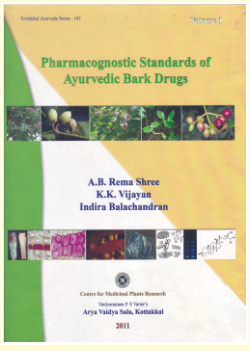

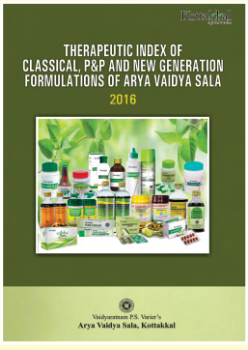

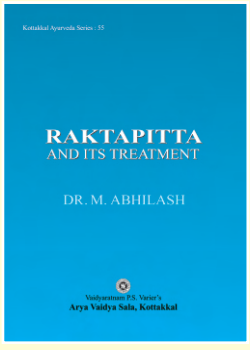

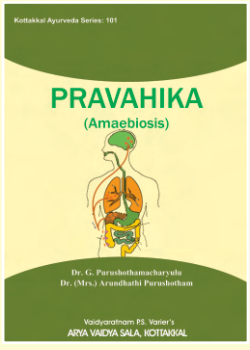

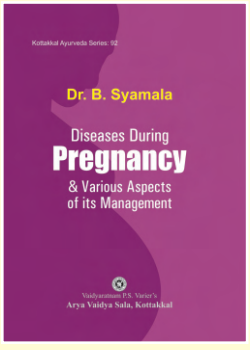

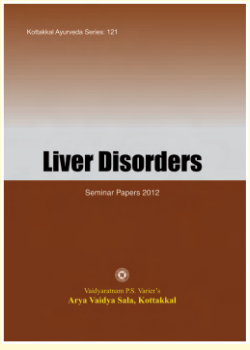

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