# ĀRYAVAIDYAN

A QUARTERLY JOURNAL ON AYURVEDA AND ALLIED SCIENCES

ISSN 0970 - 4086 Vol. XXXI, No. 2 November 2017 - January 2018

लाभानां श्रेय आरोग्यम्

*Of all the gifts,*
*the most precious is health*

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

Aryavaidyan, the quarterly journal of Arya Vaidya Sala, Kottakkal, is intended to encourage scientific writing and intellectual interactions among scholars, academicians, practitioners and students of ayurveda and allied subjects.

# ĀRYAVAIDYAN

A QUARTERLY JOURNAL ON AYURVEDA AND ALLIED SCIENCES

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

# ĀRYAVAIDYAN

A QUARTERLY JOURNAL ON AYURVEDA AND ALLIED SCIENCES

ISSN 0970 - 4086; Vol. XXXI, No. 2; November 2017 - January 2018


**सततायध्ययनं, वादः परतन्त्रावलोकनम् ।**
**तद्विद्याचार्यसेवा च बुद्धिमेधाकरो गणः ।।**

Constant study, mutual discussion,
learning other disciplines and
serving the preceptor - these factors
endow one with intelligence and memory

Details:

In India (inclusive of mailing): single copy, one hundred and twenty rupees; annual subscription (four issues) four hundred rupees. Out of India (postal charges extra) single copy, US dollars fifteen; annual subscription (four issues) US dollars fifty. Concessional rate for bonafide students of all systems of medicine in India, single copy, rupees ninety; annual subscription (four issues) rupees three hundred and twenty.


Please address all enquiries and subscriptions to: The Chief Editor (Publications), Arya Vaidya Sala, Kottakkal, Malappuram District, Kerala State, Pin - 676 503, India. Phone : 0483 -2742225, 2746665, Fax : 2742210, 2742572, E-mail: publications@aryavaidyasala.com.





Published by Department of Publications, Kottakkal Arya Vaidya Sala, Malappuram Dist. Kerala - 676 503, Phone: 0483 - 2742225, 2746665, Fax: 0483 - 2742210, 2742572, E-mail: publications@aryavaidyasala.com, Web: www.aryavaidyasala.com

# CONTENTS

ANALYTICAL STUDY

Āryavaidyan, Vol XXXI, No. 2, November 2017 - January 2018, Pages 05 - 10

# Contemporary and extended use of Kṣāra in medical and surgical practices - a prospective analysis

Sreekumar T.

**ABSTRACT:** Kṣāra is one of the medicinal preparations from the treasure of āyurveda having versatile benefits.[1] However, it is scarcely used for management of medical and surgical conditions now, except by certain individual practitioners, whose use is also restricted to its external application in surgical domains. This article scrutinizes the merits of various types of kṣāra and tries to contemporarize its use in diseases where it is classically indicated besides exploring the possibility of its use in conditions which are not amenable to conventional therapies.

*Key word*: Kṣāra

## Introduction

The use of herbs and plants in the preparation of water soluble alkaline preparations is described in all the Bṛhattrayī treatises of āyurveda and Cakradatta.[2,1a,3,4] Suśruta and Vāgbhaṭa even describe its method of preparation in finer detail.[2,1a] The types of kṣāra, indications of each variety, contraindications and potentially harmful effects - all are portrayed.[2,1a] Despite the theoretical explanations of its use, the clinical use of kṣāra is on the decline for many decades now except for the preparation of kṣārasūtra which is only one of the means of its use.[1b,4] It is one of the preparations that can be made and used economically, as the quantity used is minimal. This article tries to probe and table the scientific rationale in its make and use and potentiality for diversification of its use.

Definition and word derivation: Kṣāra is defined as the one which melts, destroys, disintegrates, injures or kills.[1c] The first syllable, 'kṣa' itself is indicative of destruction or disappearance.[1c,2] There are people of the east who pronounce kṣāra as kāra, which also means alkali. The word 'cāram' used in Malayalam to denote ash is also related to kṣāra both in pronunciation and word meaning. Its functions are kṣaraṇa[1c,2] (to melt away, perish or to waste off) and kṣaṇana (to break, cut or to injure). The word is related with kṣaṇa (an instant, a moment) and with kṣāḷana (to wash, clean and to make purified). As of its rasa (taste), it is related to lavaṇa (salt) and kaṭu (acrid),[3a] so much so that there is resemblance between even the functions of kṣāra and these rasas.[3a] Chemically, kṣāra is alkaline.[5] However, methods to assess the potency of various kṣāra preparations based on measurement of pH have not been successful.[5] Hence, kṣaraṇa (causticity) is a property independent of its alkalinity.[5] Thus, even potent inorganic alkalies cannot perform the fine-tuned functions of kṣāra in the specific removal of unwanted tissue.

Classification: Kṣāra is classified[2] into mṛdu, madhyama and tīkṣṇa. The three varieties have differences in preparatory modes, indications and methods of pharmacological action.[2,1a] Kṣāra is again classified into pānīya and pratisāraṇīya.[2,1a] Mṛdukṣāra is just the user synonym of pānīyakṣāra (the kṣāra variety for internal use after dissolving in water).[1a] Pratisāraṇīyakṣāra is an umbrella terminology for madhyama and tīkṣṇakṣāras with slightly different actions;[2,1a] both being indicated for external use only.[2,1a] Pānīyakṣāra and pratisāranīyakṣāra are different in their basic

chemistry, storage and activity.

**Preparation**

**1. Classical method**

a) Mṛdukṣāra: Kṣāra is to be prepared from herbs, it (mṛdukṣāra for use as pānīyakṣāra) being the soluble residue of the ash of burnt herbs.[2,1a] Although any single herb or its individual parts or a group of herbs can be taken for this purpose,[2,1a] the classical texts identify certain specific plants for making kṣāra.[2,1a] This is independent of its alkalinity or acidity, as some of the herbs or other ingredients so suggested (e.g. snuhi, cow's urine, etc.) are even acidic in nature.[2,1a] From the available descriptions in classical literature, it can be assumed that only fresh and un-dried[2,1a] herbs should be used for preparing kṣāra. The raw drug is burnt (if more than one drug, each is to be burnt separately), ash collected and mixed in 4 times of liquid (either water or a mixture of water and cow's urine in equal proportions).[2,1a] This mixture is filtered many times till it becomes clear[2,1a] and is set to boil in a large iron caldron till it attains reddish tan and semisolid consistency.[2,1a]

b) Madhyamakṣāra: Addition of fried sudhābhasma śarkarā (fried limestone) and some other similar contents makes the mṛdukṣāra more potentiated to madhyamakṣāra.[2,1a]

c) Tīkṣṇakṣāra: Addition of paste of lāṅgali (*Gloriosa superba*), citraka (*Plumbago zeylanica*), ativiṣa (*Aconitum heterophyllum*) etc. makes the madhyamakṣāra even more potent, to be tīkṣṇa kṣāra.[2,1a] This variety is fit for use only after 7 days of its make.

**2. Practical method**

a) Mṛdukṣāra for internal use (pānīya): Any single herb or its part may be taken. In instances, a drug group of similar properties can also be taken.[2,1a] The selection of the drug is according to its desired action, each drug exhibiting different pharmacodynamics when administered internally in kṣāra form. The drug for making kṣāra is to be taken un-dried itself. This ensures enhanced action on internal use, besides minimizing wastages in ash. The yield of ash will be only 5 to 8 % of the drug taken; this grossly depends on the water content in the herb before burning. Ash yield will also depend upon the bhautik constitution of the herb - the more pārthiva the herb is; the better would be the ash yield. The ash procured should be mixed well with six times by volume of water and allowed to sediment. (Cow's urine is usually not added, unless warranted). The liquid should be strained after minimum 4 hours undisturbed standing, with a clean cloth devoid of starch and only clear alkaline liquid is harvested. The process is repeated on mixing the sedimented ash of the previous straining with fresh water till all the dissolved alkali is got. The solution strained should be clear without any supernatant or sedimented materials - usually straining should be repeated for 3-4 times to obtain all the solutes. All the filtrates are mixed and boiled in a stainless steel vessel (not in aluminum or copper vessels) till dry. The residue is procured and stored for use in powder form. In short, mṛdu(pānīya)kṣāra is just the organic salt extracted out of a plant product.

b) Madhyamakṣāra for external use (pratisāraṇīya): When the filtrate as per 'a' cited just above has been reduced over fire to 10% of its original volume, fine powder of fried conch shell is added in proportion of 10% the weight of ash initially taken and stirred well with a ladle over mild fire. The fire should be put off when the preparation just attains the consistency of condensed milk - solidification makes it useless. If it is going to solidify, distilled water may be immediately supplemented and stirred well to prevent the whole preparation going futile and taken off the fire. A short period afterwards, a layer of water will be formed at the top, this being called kṣārajala. (The preparation should be incremented with distilled water in hot seasons to prevent drying up by evaporation). The shelf life of this product is infinite, so long as it never dries up - this is to be stored in

semisolid form only. This is not to be used internally because of its corrosive nature.

c) Tīkṣaṇakṣāra for external use (pratisāraṇīya): If the juice extracted out of a paste of citraka is added to the madhyamakṣāra in a proportion of 10% of volume of kṣāra, it becomes tīkṣṇakṣāra. This also should never be used internally.

Note: Mṛdu(pānīya)kṣāra can be stored infinitely as powder itself. However, this has hydroscopic property and thus melts if exposed to air for some time. Even if liquefied, it does not lose its potency. Any time later, it can be transformed into pratisāraṇīyakṣāra by the requisite processes stated above, if needed.

**Uses of pratisāraṇīyakṣāra**

As mentioned earlier, this variety of kṣāra should not be allowed to dry before its use. Both varieties of pratisāraṇīyakṣāra(madhyama and tīkṣṇa) are potentially corrosive and lytic, when applied as a paste over the tissues to be destructed. Madhyama variety can be used over chronic ulcers with poor healing or which refuse to heal due to unhealthy granulation tissue, known as 'proud flesh'. This can also be used over malignant ulcers. The specific property of madhyamakṣāra is that, if used properly only the precise depth of tissue required to be removed will be destructed. The kṣāra is allowed to remain *in situ* for 100 mātra (approximated at 150 seconds) beyond which it should be washed off with any natural acidic solution for neutralizing the alkali - usually lemon juice is used. After 150 seconds of application of the acidic solution, the superficial fluids are mopped off and a mixture of honey and ghee in equal proportion is smeared over the site. No amount of healthy tissue will be destroyed and no complications such as bleeding will occur, which is quite unique. Some patients will experience moderate burning sensation for 2 to 3 minutes during and after the procedure, which limits the complications of kṣārapātana. After the procedure, the colour of the treated tissue will be dark violet, denoting charring. Tissue destruction can be fully appreciated only two or three days after kṣārakarma. After the removal of the unhealthy tissue, wounds show accelerated healthy healing with healthy granulation and epithelial tissues and with less scar formation.

Madhyamakṣāra can also be applied to melt away fibrotic tissue and debris in ulcers of tubular nature like those of low level fistulae, pilonidal sinus, etc., which are laid open by incising their roof. This helps save time, prevents excessive scar and is widely appreciated for relative painlessness, non-recurrence, etc.

Tīkṣṇakṣāra is used over mucosal surfaces of the body to be removed along with intended fibrosis of their submucosa. The common clinical indication is piles, where it is used with success by many practitioners. It is also used for the removal of horny growths like varicosities and corns.

**Uses of pratisāraṇīyakṣāra in preparation of kṣārasūtra**

As per classical literature, kṣārasūtra is to be prepared either by impregnating a thread by pratisāraṇīya kṣāra[2a,6] or by the sap of snuhi (*Euphorbia neriifolia* L.) added with haridrā (*Curcuma longa*) cūrṇa;[4] the former thread being alkaline in nature and the latter, acidic. However, this is seldom followed now in its true spirit, the thread usually being prepared by kṣāra, snuhīkṣīra and haridrācūrṇa - all three.[7] This method has not got direct classical support. The so called kṣārasūtra prepared out of guggulu, etc.[8] also lacks classical support, such trials being best addressed as academic exercises.

Usually the kṣāra selected for preparation of kṣārasūtra is tīkṣṇakṣāra, prepared of any herb like apāmārga (*Achyranthes aspera*),[7] pūtīka (*Holoptelea integrifolia*)[5] etc. A group of herbs would also serve the purpose, without much difference.[2,1a] Although a thread coated with pratisāraṇīyakṣāra alone would serve the purpose if used afresh,[2a,6] the usual custom

is to prepare kṣārasūtra by coating pratisāraṇīya kṣāra over a thread on which is coated snuhīkṣīra for 7 times. Coatings with haridrācūrṇa (or better still, the fresh juice of haridrā) are done in between coatings of snuhīkṣīra or after seven coatings of snuhīkṣīra, to minimize the cytotoxic effects of the latter[8,9] (*Euphorbia tirukkali*, a variety of snuhi is already known to cause chromosomal translocation, reactivation of Epstein-Barr virus and genetic alterations leading to MYC overexpression).[8,9] It is customary to limit the kṣāra coating to one (though coatings of kṣāra are done upto seven times in some institutes), since otherwise the thread may become too thick.[10] Though the thread is used after drying and sterilization in a chamber, the corrosive effect of pratisāraṇīyakṣāra is seen preserved to greater or lesser degree in most instances. However, this mode of preparation involving both kṣāra and snuhīkṣīra has no classical support. It should be understood that out of the three ingredients that goes into the preparation of kṣārasūtra, the kṣāra alone is alkaline - both snuhīkṣīra and haridra are acidic in pH,[5] which means neutralization of alkali and acid is possible with subsequently diminished effect of the thread. Here also, the kṣaraṇa is brought out by the tīkṣṇa attribute of two of the ingredients, not their alkalinity. Juice or sap of plants like kumāri (*Aloe vera*), udumbara (*Ficus racemosa*), guggulu (*Commiphora mukul*), eraṇḍakarkaṭī (*Carica papaya*), arka (*Calotropis gigantea*), etc. are used to replace snuhīkṣīra, the main objective being to eliminate the toxic nature of the latter yet to retain its 'adhesiveness - stickiness' (binding property).[10] But various studies done across the nation proved that cutting time is compromised by replacing snuhīkṣīra with such ingredients.[10] This means that the kṣaraṇatva of snuhīkṣīra was not able to be restored by drugs having 'stickiness' alone.

**Standardization of kṣārasūtra**

Over the years, the various contents that go into the making of kṣārasūtra have been standardized to obtain an ideal kṣārasūtra fulfilling objectives to the optimum.[5,11] This include standardization of the material of thread, of the species of snuhi from which kṣīra is harvested, of the many species of drugs used for binding of kṣāra to the thread, snuhīkṣīra harvesting time and season, number of coatings, species of plants which are used for kṣāra preparation, addition or not of haridrācūrṇa, etc. The main objective was to attain maximum unit cutting time (UCT) with minimal complications.[5]

**Other utility modes of pratisāraṇīyakṣāra**

Over the time, practitioners have found that kṣāra can be used in manifold methods. These include its use as kṣārapicu in open ulcers, kṣāravarti in blind sinuses and kṣārajala for washing ulcers with debris. Kṣāravarti can be employed in high level fistulae like supra-levator fistulae where kṣārasūtra cannot be used when the age of the patient is an obstacle or his medical status is critical. The use of kṣārajala (made by diluting pratisāraṇīyakṣāra in distilled water or the supernatant solution over pratisāraṇīyakṣāra) is commendable in destruction of debris much like the use of maggots in such ulcers. Kṣārajala can also be used to impregnate varti which is used in tubular ulcers, or which can be spread over chronic ulcers for debris removal.

**Uses of pānīyakṣāra**

Pānīyakṣāra is seldom used by practitioners now. It is used rarely to disintegrate stones,[12] usually of the urinary tract. The effect is thought to be by the systemic alkalizing property of pānīyakṣāra. This use dissolves away stones which lie inside the system but not as part of it. But it is not found to give predictably promising results in gallstones, pancreatic or prostatic stones; as alkalinity does not disintegrate the stones here. However, kṣāra made out of drugs like śrāvaṇī (*Sphaeranthus indicus* L.) are used in gallstones which provide relief to inflammatory signs. Kṣāra made from mineral ingredients along with bhasma of annabhedi (for site specific targeted

action) is known to 'dissolve' gall stones, though this cannot be considered as a 'herbal pānīyakṣāra'.

**Discussion**

The herb or plant chosen for making pānīyakṣāra should be handpicked to perfection, to suit the pharmacological needs in the clinical condition - it is not just the alkalinity which does the work. On the other hand, both types of pratisāraṇīyakṣāra can be made of the ash of any herb (or a group of herbs), though some varieties of plants would yield more potent kṣāra based on their inherent tīkṣṇa property. For making pratisāraṇīyakṣāra for majority of the clinical conditions where it is used, even kitchen ash (gṛhadhūma) serves the purpose, if it is otherwise non-toxic and pollution free.

The chemistry of pānīyakṣāra and pratisāraṇīya kṣāra is totally different. The former is a pharmacologically active organic salt which acts slowly by weeks or months only when used internally on a daily basis. The dosage should be tailored to suit individual clinical needs - usually 0.5 gm to 1gm at 8 hour intervals daily. It is preferable to avoid use of all acidic food during the course of the treatment and for a week thereafter. Though it is indicated for arśas (haemorrhoids), agnisāda (weak digestive fire), aśmari (calculi), gulma (phantom tumors), udara (ascites), gara (cumulative toxins), etc. it is not used internally for conditions other than urinary calculi now. The detailed usage of pānīyakṣāra is not charted in classical literature, whereas that of the pratisāraṇīyakṣāra is well documented. It can be used mixed with decoctions indicated for the clinical condition, provided these are not acidic in pH. There was a practice of making gruel prepared with bhasma (pānīyakṣāra) e.g. Panaviralādi bhasma kañji in Kerala till quarter of a century ago,[13] used mainly for oedema due to systemic conditions; the practice being extinct now for reasons obscure. The mixture of pānīyakṣāra with rice gruel rich in carbohydrate is supposed to enhance its bio-availability, targeted and sustained release and prevention of complications if consumed alone. It is at this juncture that an out-of-the-box indication for pānīyakṣāra has surfaced from learning the texts, which is provided below.

**Projected uses of pānīyakṣāra and suggestions for future prospective studies**

Kṣāra kills or disintegrates. Drugs vested with kṣaraṇa property are not recommended for continuous use - eg. salt, pippalī (*Piper longum*), etc. The affinity of kṣāra for tissue destruction is more for new tissues. This fact is raised by Suśruta, who finds destruction of reproductive tissue as a complication of use of kṣāra.[2] It is this virtue of kṣāra that selectively destructs unwanted new tissue when used externally. The effect of kṣāra by virtue of its systemic alkalization and property to curb 'new' tissues by herbal products can be put to enormous outcome if it is effective for use in cancers, by making the lesions difficult to thrive in alkaline medium - all cancer cells are 'new' to the body (hence the term, neoplasia). The effect is likely to be slow in slowly growing squamous cell carcinomas and negative in lesions due to pitta, like rapidly growing lymphosarcomas, yet this author is optimistic about the futuristic indications of pānīyakṣāra in selective malignant lesions where it is not absolutely doṣa vise contraindicated. If fruitful results are got out of animal studies conducted for induced neoplasia on experimental animal models, it may pave way for development of an āyurvedic chemotherapeutic tool for the management of some types of cancers, provided that the herb selected for making kṣāra is specific to that variety of tumor.

**References**

1. Susruta, *Susrutasamhita,* Nibandhasangraha commentary of Dalhana, Edited by Vaidya Jadavaji Trikamji Acharya, Sutrasthanam 11/3,5, Chaukhambha Surabharati Prakashan, Varanasi, 2012.

1a. Ibid. Sutrasthanam 11/8-9

1b. Ibid. Cikitsasthanam 17/29

1c. Ibid. Sutrasthanam 11/4

2. Vagbhata, *Ashtangahrdayam*, with the commetaries Sarvangasundara of Arunadatta and Ayurvedarasayana of Hemadri, Edited by Hari Sadasiva Sastri Paradakara, Sutrasthanam 30/1-2, Chaukhambha Surabharati Prakashan, Varanasi, 2011.

2a. Ibid. Uttarasthanam 28/9

3. Agnivesa, *Carakasamhita*, with Ayurvedadipika commentary of Cakrapanidatta, Cikitsasthanam 13/97, Chaukhambha Surbharati Prakashan, Varanasi, 2009.

3a. Ibid. Sutrasthanam 26/9

4. Cakrapanidatta, *Cakradatta*, Arshodhikara, 146-147, II[nd] Edtn., Chaukhambha Sanskrit Sansthan, Varanasi, 2010.

5. Sreekala C., *Clinical Evaluation Between Classical Ksharasutra Techniques in Bhagandara,* MD Thesis, Kerala University, 2002.

6. Alex Sebastian Chirayath, *Jomar*-New concepts in Ksharasutra, Anveshana Ayurveda Medical Journal, Vol. 2, Issue 2, P 638-640, 2016.

7. Deshpande et.al., *Series of studies on Ksharasutra*, Banaras Hindu University, Varanasi.

8. Marco Limone and Matteo Simoncini, *Euphorbia Tirucalli and Burkitt's Lymphoma*, Discussions during Continuum Interactive Training, Turin University, Italy, 28.06.2014.

9. Jackson Orem et.al, *Burkitt's lymphoma in Africa - a review of the epidemiology and etiology*, African Health Sciences, Makerere University Medical School, 2007 September 7(3): 166-175

10. Manju Rani et.al., International Journal of Research in Ayurveda Pharmacy, 7 (Suppl. 2), Rampur, Mar-Apr-2016.

11. Sarma S. K., Sharma K. R. and Singh Kulwant, *Ksharasutra therapy in fistula in ano and other anorectal disorders*, P185, Rashtreeya Ayurveda Vidyapeedh, New Delhi, 1994-95.

12. Beena K. G., *Effect of Kalyanaka kshara in muthrasmari (urolithiasis)*, PG Thesis, Kerala University, 2002.

13. Vaidyaratnam P. S. Varier, *Cikitsasamgraham*, Department of Publications, Arya Vaidya Sala, Kottakkal.

Author
Sreekumar T., Vice Principal, Vaidyaratnam Ayurveda College, Ollur, Thrissur, Kerala.

Āryavaidyan, Vol XXXI, No. 2, November 2017 - January 2018, Pages 11 - 18

# Pages from Vāgbhaṭa

Ramankutty C.

**ABSTRACT:** The fifteenth chapter of Nidānastānam *viz*. Vātavyādhinidānam is explained here. The aetiology, symptamatology, prognosis, etc. of vātavyādhi (vāta disorders) are detailed in this chapter.

*Key words:* Vāta, Ākṣepaka, Ardita, Pakṣāghāta

Kuṣṭha and vātavyādhi are very much related with nerves. Vātavyādhi affects the nerves with pain, numbess, etc. Hence, after enumerating the aetiology, symptamatology etc. of kuṣṭha we are proceeding to the details of vātavyādhi.

अथातो वातव्याधिनिदानं व्याख्यास्यामः।
इति ह स्माहुरात्रेयादयो महर्षयः।
(Athāto vātavyādhinidānam vyākhyāsyāmaḥ।
iti ha smāhurātreyādayo maharṣayaḥ।)
Let us discuss the chapter regarding the diagnosis of vātavyādhi (vāta disorders). Thus spoke the sages Ātreya, etc.

सर्वार्थानर्थकरणे विश्वस्यास्यैककारणम्।
अदुष्टदुष्टः पवनः शरीरस्य विशेषतः।।१।।
(Sarvārthānarthakaraṇe
viśvasyāsyaikakāraṇam।
aduṣṭaduṣṭaḥ pavanaḥ
śarīrasya viśeṣataḥ।।1।।)
The sole cause of all the good and evil happenings in the world, especially in the human body is attributed to vāta.

स विश्वकर्मा विश्वात्मा विश्वरूपः प्रजापतिः।
स्रष्टा धाता विभुर्विष्णुः संहर्ता मृत्युरन्तकः।।२।।
तददुष्टौ प्रयत्नेन यतितव्यमतः सदा।
(Sa viśvakarmā viśvātmā
viśvarūpaḥ prajāpatiḥ।
sraṣṭā dhātā vibhurviṣṇuḥ
samhartā mṛtyurantakaḥ।।2।।)
Tadaduṣṭau prayatnena
yatitavyamataḥ sadā।)
It is the power behind all the activities, the soul of all beings. It is the Lord of all things and gives a form to everything. It is the creater, preserver and destroyer. It is the omniscient chieftain of death and death itself/the end of all things.

तस्योक्तं दोषविज्ञाने कर्म प्राकृतवैकृतम्।।३।।
समासाद्व्यासतो दोषभेदीये नाम धाम च।
प्रत्येकं पञ्चधा चारो व्यापारश्च.....
(tasyoktam doṣavijñāne
karma prākṛtavaikṛtam।।3।।
Samāsādvyāsato doṣa-
bhedīye nāma dhāma ca।
pratyekam pañcadhā cāro
vyāpāraśca.....)
One can find a brief description of the nature of vāta and its vitiated nature in the chapter 'Doṣādi-vijñānīyam' in Sūtrasthānam. Whereas a detailed description of its five divisions and functions can be had from 'Doṣabhedīyam'.

..... इह वैकृतम्।।४।।
तस्योच्यते विभागेन सनिदानं सलक्षणम्।
(असङ्ख्यमपि सङ्ख्याय यदशीत्या पुरेरितम्।)
(..... iha vaikṛtam।।4।।)
tasyocyate vibhāgena
sanidānam salakṣaṇam।)
(Asaṅkhyamapi saṅkhyāya
yadaśītyā pureritam।)
A discussion of its deviations from normal functions with their causes and clinical features can be had here.

धातुक्षयकरैर्वायुः कुप्यत्यतिनिषेवितैः।।५।।
चरन् स्रोतःसु रिक्तेषु भृशं तान्येव पूरयन्।
तेभ्योऽन्यदोषपूर्णेभ्यः प्राप्य वाऽऽवरणं बली।।६।।
(dhātukṣayakarairvāyuḥ
kupyatyatiniṣevitaiḥ।।5।।
Caran srotaḥsu riktesu
bhṛśam tānyeva pūrayan।
tebhyoऽnyadoṣapūrṇebhyaḥ
prāpya vāऽऽvaraṇam balī।।6।।)

Vāta is perturbed by unwhoelsome food and activities, which lead to the wasting of tissues. Vāta would move into channels vacated by lost tissues and gain speed, or may get covered by other doṣa which may also have moved into the vacant space in the channels.

तत्र पक्वाशये क्रुद्धः शूलानाहान्त्रकूजनम्।
मलरोधाश्मवर्ध्मार्शस्त्रिकपृष्ठकटीग्रहम्।।७।।
करोत्यधरकाये च तांस्तान् कृच्छ्रानुपद्रवान्।
(Tatra pakvāśaye kruddhaḥ
śūlānāhāntrakūjanam।
malarodhāśmavardhmārśa-
strikapṛṣṭhakaṭīgraham।।7।।
Karotyadharakāye ca
tāṃstān kṛcchrānupadravān।)

If vitiated vāta lodged in the large intestine colic, flatulence, gurgling in the abdomen, constipation, urinary calculii, hernia, hemorrhoids, catching pain in the sacrum, coccygeal region and hip and ailments below the waist which are difficult to cure are the clinical features.

आमाशये तृड्वमथुश्वासकासविषूचिकाः।।८।।
कण्ठोपरोधमुद्गारान् व्याधीनूर्ध्वं च नाभितः।
(āmāśaye tṛḍvamathu-
śvāsakāsaviṣūcikāḥ।।8।।
Kaṇṭhoparodhamudgārān
vyādhīnūrdhvam ca nābhitaḥ।)

If it is in stomach morbid thirst, vomiting, shortness of breath, cough, cholera, obstruction in the throat, repeated belching and disorders above the level of umbilicus are the clinical features.

श्रोत्रादिष्विन्द्रियवधं.....
(śrotrādiṣvidriyavadham.....)

If it affects the sense organs and the extremities, loss of functions of respective one, is the result.

..... त्वचि स्फुटनरूक्षते।।९।।
(..... tvaci sphuṭanarūkṣate।।9।।)

Splitting and dryness are caused when it affects the skin.

रक्ते तीव्रा रुजः स्वापं तापं रागं विवर्णताम्।
अरूष्यन्नस्य विष्टम्भमरुचिं कृशतां भ्रमम्।।१०।।
(Rakte tīvrā rujaḥ svāpam
tāpam rāgam vivarṇatām।
arūmṣyannasya viṣṭambha-
marucim kṛśatām bhramam।।10।।)

Intense pain, numbness, burning sensation, redness, discolouration, ulcers, indigestion with food retention, loss of appetite, debility and dizziness are the symptoms when vāta affects raktadhātu.

मांसमेदोगते ग्रन्थींस्तोदाढ्यान् कर्कशान् श्रमम्।
गुर्वङ्गं चातिरुक्स्तब्धं मुष्टिदण्डहतोपमम्।।११।।
(Māmsamedogate granthīm-
stodāḍhyān karkaśān śramam।
gurvaṅgam cātirukstabdham
muṣṭidaṇḍahatopamam।।11।।)

When vāta affects flesh and adipose tissue appearance of glands with pricking pain and hard to touch will occur. Fatigue on effort, heaviness to the body parts, severe pain and stiffness are the other features. Moreover, feeling of being punched or thrashed with sticks or fist are also featured.

अस्थिस्थः सक्थिसन्ध्यस्थिशूलं तीव्रं बलक्षयम्।
(Asthisthaḥ sakthisandhyasthi-
sūlam tīvram balakṣayam।)

Pain in the thighs, joints and bones; depletion of strength are the clinical features when the bones are affected with vāta.

मज्जस्थोऽस्थिषु सौषिर्यमस्वप्नं सन्ततां रुजम्।।१२।।
(majjasthoऽsthiṣu sauṣirya-
masvapnam santatām rujam।।12।।)

Increased porosity in the bones (osteoporosis), poor sleep and continuous pain are the clinical features when vāta is affected in the marrow.

शुक्रस्य शीघ्रमुत्सर्गं सङ्गं विकृतिमेव वा।
तद्वद्गर्भस्य शुक्रस्थः.....
(Śukrasya śīghramutsargam
saṅgam vikṛtimeva vā।
tadvadgarbhasya śukrasthaḥ.....)
Premature or obstructed ejaculation and premature birth are resulted because of the perturbed vāta located in semen.

.....सिरास्वाध्मानरिक्तते।।१३।।
तत्स्थः.....
(..... sirāsvādhmānariktate।। 13।।)
Tatsthaḥ.....)
Fullness or emptiness is the clinical feature when the sira (blood vessels) is affected.

..... स्नावस्थितः कुर्याद्गृध्रस्यायामकुब्जताः।
(..... snāvasthitaḥ kuryād-
gṛdhrasyāmakubjatāḥ।)
On perturbed vāta affecting the tendons, one can find the following diseases such as sciatica, spasm of muscles causing backward or forward arching (antarāyāmam, bāhyāyāmam) and hunchback.

वातपूर्णदृतिस्पर्शं शोफं सन्धिगतोऽनिलः।।१४।।
प्रसारणाकुञ्चनयोः प्रवृत्तिं च सवेदनाम्।
(vātapūrṇadṛtisparśam
śopham sandhigato'nilaḥ।। 14।।
Prasāraṇākuñcanayoḥ
pravṛttim ca savedanām।)
Swelling resembling on touching an air filled leather bag is the clinical feature when perturbed vāta affects the joints. Pain on initiating bending and straightening is also experienced.

सर्वाङ्गसंश्रयस्तोदभेदस्फुरणभञ्जनम्।।१५।।
स्तम्भनाक्षेपणस्वापसन्ध्याकुञ्चनकम्पनम्।
(sarvāṅgasaṁśrayastoda-
bhedasphuraṇabhañjanam।। 15।।
Stambhanākṣepaṇasvāpa-
sandhyākuñcanakampanam।)
When the perturbed vāta affects the whole body, various type of pains like piercing pain, splitting pain, throbbing pain, breaking pain, etc. stiffness, convulsions, numbness, contractures and tremors are the clinical features.

यदा तु धमनीः सर्वाः क्रुद्धोऽभ्येति मुहुर्मुहुः।।१६।।
तदाऽङ्गमाक्षिपत्येष व्याधिराक्षेपकः स्मृतः।
(yadā tu dhamanīḥ sarvāḥ
kruddho'bhyeti muhurmuhuḥ।। 16।।
Tadā'ṅgamākṣipatyeṣa
vyādhirākṣepakaḥ smṛtaḥ।)
Akṣepaka (involuntary muscle spasm) is a condition characterised by recurrent contractions, especially in the limbs. It is caused by the inappropriate entry of vāta into the dhamanis (nerves) all over the body.

अधः प्रतिहतो वायुर्व्रजन्नूर्ध्वं हृदाश्रिताः।।१७।।
नाडीः प्रविश्य हृदयं शिरः शङ्खौ च पीडयन्।
आक्षिपेत्परितो गात्रं धनुर्वच्चास्य नामयेत्।।१८।।
कृच्छ्रादुच्छ्वसिति स्तब्धस्रस्तमीळितदृक्कतः।
कपोत इव कूजेच्च निःसंज्ञः सोऽपतन्त्रकः।।१९।।
स एव चापतानाख्यो मुक्ते तु मरुता हृदि।
अश्नुवीत मुहुः स्वास्थ्यं मुहुरस्वास्थ्यमावृते।।२०।।
(adhaḥ pratihato vāyur-
vrajannūrdhvam hṛdāśritāḥ।। 17।।
Nāḍīḥ praviśya hṛdayam
śiraḥ śaṅkhau ca pīḍayan।
ākṣipetparito gātram
dhanurvaccāsya nāmayet।। 18।।
Kṛcchrāducchvasiti stabdha-
srastamīḷitadṛktataḥ।
kapota iva kūjecca
niḥsamjñaḥ so'patantrakaḥ।। 19।।
Sa eva cāpatānākhyo
mukte tu mārutā hṛdi।
aśnuvīta muhuḥ svāsthyam
muhurasvāsthyamāvṛte।। 20।।)
Apatantraka or apatānaka is a condition where the normal downward course of vāta is reversed and thereby enters the channels connected to the heart and occures squeezing pain to the heart, temples and

head. Here, the whole body is affected and there will be involuntary muscle spasm throughout the body. The body bends like a bow. He experiences with half closed eyes and his breathing is laboured. The patient makes cooing sounds like a pigeon because the channels are blocked by mucus. When the heart is freed from vāta, he would regain normalcy temporarily but would again experience convulsions when vāta re-enters the heart channels.

गर्भपातसमुत्पन्नः शोणितातिस्रवोत्थितः।
अभिघातसमुत्थश्च दुश्चिकित्स्यतमो हि सः।।२१।।
(Garbhapātasamutpannaḥ
śoṇitātisravotthitaḥ।
abhighātasamutthaśca
duścikitsyatamo hi saḥ।।21।।)

Apatantraka is incurable after a miscarriage, serious bleeding and trauma.

मन्ये संस्तभ्य वातोऽन्तरायच्छन् धमनीर्यदा।
व्याप्नोति सकलं देहं जत्रुरायम्यते तदा।।२२।।
अन्तर्धनुरिवाङ्गं च वेगैः स्तम्भं च नेत्रयोः।
करोति जृम्भां दशनं दशनानां कफोद्भवम्।।२३।।
पार्श्वयोर्वेदनां वाक्यहनुपृष्ठशिरोग्रहम्।
अन्तरायाम इत्येष.....
(Manye samstabhya vātoऽnta-
rāyacchan dhamanīryadā।
vyāpnoti sakalam deham
jatrurāyamyate tadā।।22।।
Antardhanurivāṅgam ca
vegaiḥ stambham ca netrayoḥ।
karoti jṛmbhām daśanam
daśanānām kaphodvamam।।23।।
Pārśyayorvedanām vākya-
hanupṛṣṭhaśirograham।
antarāyāma ityeṣa.....)

Antarāyāma (emprosthotonos) occurs due to perturbed vāta affects the 'manyānāḍi' (tendon of the nape of the neck) and stiffens it and enters the rest of the body and bends inwards and resemble a bow. The symptoms are eyes become motionless, pandiculation, gnashing, continuous flow of kapha through mouth, pain on the sides, stuttering and stiffness to the jaw, back and head.

..... बाह्यायामश्च तद्विधः।।२४।।
देहस्य बहिरायामात् पृष्ठतो नीयते शिरः।
उरश्चोत्क्षिप्यते तत्र कन्धरा चावमृद्यते।।२५।।
दन्तेष्वास्ये च वैवर्ण्यं प्रस्वेदः स्रस्तगात्रता।
बाह्यायामं धनुष्कम्भं ब्रुवते वेगिनं च तम्।।२६।।
(.....bāhyāyāmaśca tadvidhaḥ।।24।।
Dehasya bahirāyāmāt
pṛṣṭhato nīyate śiraḥ।
uraścotkṣipyate tatra
kandharā cāvamṛdyate।।25।।
Danteṣvāsye ca vaivarṇyam
prasvedaḥ srastagātratā।
bāhyāyāmam dhanuṣkampam
bruvate veginam ca tam।।26।।)

Bāhyāyāma (opisthotonus) is also similar to this. Here the body bent backwards with the head moving towards the back. The chest is thrust forward and pain as if the neck is being squeezed is felt, and discolouration to the teeth and mouth. There is profuse sweating and the body is severely weakend. This condition is also known as 'dhanuṣkampa' or 'vegī'.

व्रणं मर्माश्रितं प्राप्य समीरणसमीरणात्।
व्यायच्छन्ति तनुं दोषाः सर्वामापादमस्तकम्।।२७।।
तृष्यतः पाण्डुगात्रस्य व्रणायामः स वर्जितः।
(Vraṇam marmāśritam prāpya
samīraṇasamīraṇāt।
vyāyacchanti tanum doṣāḥ
sarvāmāpādamastakam।।27।।
Tṛṣyataḥ pāṇḍugātrasya
vraṇāyāmaḥ sa varjitaḥ।)

Vraṇāyāma is a condition where the wounds on the vital parts come under the influence of the other doṣa because of the perturbed vāta. It spreads all over the body and causes convulsions which are associated with morbid thirst and pallor. This condition is incurable.

गते वेगे भवेत्स्वास्थ्यं सर्वेष्वाक्षेपकेषु च।।२८।।
(gate vege bhavetsvāsthyam
sarveṣvākṣepakeṣu ca।। 28।।)
The patient would regain apparent health in between bouts when vāta is pacified in all these convulsions.

जिह्वातिलेखनाच्छुष्कभक्षणादभिघाततः।
कुपितो हनुमूलस्थः स्रंसयित्वाऽनिलो हनू।।२९।।
करोति विवृतास्यत्वमथवा संवृतास्यताम्।
हनुस्रंसः स तेन स्यात्कृच्छ्राच्चर्वणभाषणम्।।३०।।
(Jihvātilekhanācchuṣka-
bhakṣaṇādabhighātataḥ।
kupito hanumūlasthaḥ
sramsayitvāऽnilo hanū।। 29।।
Karoti vivṛtāsyatva-
mathavā samvṛtāsyatām।
hanusramsaḥ sa tena syāt-
kṛcchrāccarvaṇabhāṣaṇam।। 30।।)
Excessive and vigorous (too much protruded) cleaning of tongue, chewing of very dry food and trauma vitiate vāta located in the lower jaw and displaces it. It is fixed in either the open or closed position. This is known as 'hanusramsa'. The patient would then find it difficult to chew or speak.

वाग्वाहिनीसिरासंस्थो जिह्वां स्तम्भयतेऽनिलः।
जिह्वास्तम्भः स तेनान्नपानवाक्येष्वनीशता।।३१।।
(Vāgvāhinīsirāsamstho
jihvām stambhayateऽnilaḥ।
jihvāstambhaḥ sa tenānna-
pānavākyeṣvanīśatā।। 31।।)
'Jihvāstambha' is a condition where the perturbed vāta located in the channels of speech where in the tongue becomes immobile with inability to take food and drink water and speech is also affected.

शिरसा भारहरणादतिहास्यप्रभाषणात्।
उत्त्रासवक्त्रक्षवथोः खरकार्मुककर्षणात्।।३२।।
विषमादुपधानाच्च कठिनानां च चर्वणात्।
वायुर्विवृद्धस्तैस्तैश्च वातळैरूर्ध्वमास्थितः।।३३।।
वक्रीकरोति वक्त्रार्धमुक्तं हसितमीक्षितम्।
ततोऽस्य कम्पते मूर्द्धा वाक्स्ङ्गः स्तब्धनेत्रता।।३४।।
दन्तचालः स्वरभ्रंशः श्रुतिहानिः क्षवग्रहः।
गन्धाज्ञानं स्मृतेर्मोहस्त्रासः सुप्तस्य जायते।।३५।।
निष्ठीवः पार्श्वतो यायादेकस्याक्ष्णो निमीलनम्।
जत्रोरोर्ध्वं रुजा तीव्रा शरीरार्धेऽधरेऽपि वा।।३६।।
तमाहुरर्दितं केचिदेकायाममथापरे।
(Śirasā bhāraharaṇād-
atihāsyaprabhāṣaṇāt।
uttrāsavaktrakṣavathoḥ
kharakārmukakarṣaṇāt।। 32।।
Viṣamādupadhānācca
kaṭhinānām ca carvaṇāt।
vāyurvivṛddhastaistaiśca
vātaḷairūrdhvamāsthitaḥ।। 33।।
Vakrīkaroti vaktrārdha-
muktam hasitamīkṣitam।
tatoऽsya kampate mūrddhā
vāksaṅgaḥ stabdhanetratā।। 34।।
Dantacālaḥ svarabhramśaḥ
śrutihāniḥ kṣavagrahaḥ।
gandhājñānam smṛtermoha-
strāsaḥ suptasya jāyate।। 35।।)
Niṣṭhīvaḥ pārśvato yāyād-
ekasyākṣṇo nimīlanam।
jatrorūrdhvam rujā tīvrā
śarīrārdheऽdhareऽpi vā।। 36।।
Tamāhurarditam kecid-
ekāyāmamathāpare।)
Ardita (facial paralysis) is the condition where vāta is vitiated because of many reasons and focuses on the upper part of the body and make the face irregular. Some of the causes are carrying heavy headloads, excessive speech or laughter, contortions of the face, voluntary sneezing through mouth, exertion to string a bow, use uneven pillows and chewing on hard food articles. The irregularity of the face becomes noticeable when the patient speaks, laughs or opens his eyes, when his head may shake and his speech may become halting. Similarly, the movements of the eye may be absent, tremors, loosening teeth, hoarseness, deafness, difficulty in sneezing, loss of smell, loss of memory and jolt while

sleeping are also experienced. The saliva tends to deviate from the normal path while spitting. One eye always remain closed while the other is open. Excruciating pain is experienced above the neck and the lower half of the body or one side of the body. This condition is also termed 'ekāyāma'.

रक्तमाश्रित्य पवनः कुर्यान्मूर्द्धधराः सिराः।।३७।।
रूक्षाः सवेदनाः कृष्णाः सोऽसाध्यः स्यात्सिराग्रहः।
(raktamāśritya pavanaḥ
kuryānmūrddhadharāḥ sirāḥ।। 37।।
Rūkṣāḥ savedanāḥ kṛṣṇāḥ
so'sādhyaḥ syātsirāgrahaḥ।)

'Siragraha' is the condition where the perturbed vāta involves blood vessels to the head wherein they become rough, painful and black. This is incurable.

गृहीत्वाऽर्धं तनोर्वायुः सिराः स्नायूर्विशोष्य च।।३८।।
पक्षमन्यतरं हन्ति सन्धिबन्धान् विमोक्षयन्।
कृत्स्नोऽर्धकायस्तस्य स्यादकर्मण्यो विचेतनः।।३९।।
एकाङ्गरोगं तं केचिदन्ये पक्षवधं विदुः।
(gṛhītvā'rdham tanorvāyuḥ
sirāḥ snāyūrviśoṣya ca।। 38।।
Pakṣamanyataram hanti
sandhibandhān vimokṣayan।
kṛtsno'rdhakāyastasya syād-
akarmaṇyo vicetanaḥ।। 39।।
Ekāṅgarogam tam kecid-
anye pakṣavadham viduḥ।)

The vitiated vāta affects one half of the body thereby shrinking the veins and tendons. The affected part is inactivated by loosening the joints. As a result the affected half of the body becomes incapable of movement and insensitive to touch. Some call it 'ekāṅgarogam' whereas some others call it 'pakṣavadham or pakṣāghātam'.

सर्वाङ्गरोगं तद्वच्च सर्वकायाश्रितेऽनिले।।४०।।
(sarvāṅgarogam tadvacca sarvakāyāśrite'nile।। 40।।)

If the entire body is similarly affected, then it is termed 'sarvāṅgarogam'.

शुद्धवातहतः पक्षः कृच्छ्रसाध्यतमो मतः।
कृच्छ्रास्त्वन्येन संसृष्टो विवर्ज्यः क्षयहेतुकः।।४१।।
(Śuddhavātahataḥ pakṣaḥ
kṛcchrasādhyatamo mataḥ।
kṛcchrāstvanyena samsṛṣṭo
vivarjyaḥ kṣayahetukaḥ।। 41।।)

The paralysis of half of the body caused by perturbed vāta alone is difficult to cure. The same is applicable when caused by other doṣa. But when it is associated with wasting of tissues, it is incurable.

आमबद्धायनः कुर्यात्संस्तभ्याङ्गं कफान्वितः।
असाध्यं हतसर्वेहं दण्डवद्दण्डकं मरुत्।।४२।।
(Āmabaddhāyanaḥ kuryāt-
samstabhyāṅgam kaphānvitaḥ।
asādhyam hatasarveham
daṇḍavaddaṇḍakam marut।। 42।।)

'Daṇḍaka' is the condition where the ingested food material influences vāta to enter the channels of the whole body along with kapha and the path way gets clogged. Body becomes stiff like rod with no possible movement. This is incurable.

अंसमूलस्थितो वायुः सिराः सङ्कोच्य तत्रगाः।
बाहुप्रस्पन्दितहरं जनयत्यवबाहुकम्।।४३।।
(Amsamūlasthito vāyuḥ
sirā saṅkocya tatragāḥ।
bāhupraspanditaharam
janayatyavabāhukam।। 43।।)

'Apabāhuka' (atrophy of the arm) is the condition where vāta present in the root of the arm (shoulder joint?) compress the nerve and cause loss of movement of the arm.

तलं प्रत्यङ्गुलीनां या कण्डरा बाहुपृष्ठतः।
बाहुचेष्टापहरणी विश्वाची नाम सा स्मृता।।४४।।
(Talam pratyaṅgulīnām yā
kaṇḍarā bāhupṛṣṭhataḥ।
bāhuceṣṭāpaharaṇī
viśvācī nāma sā smṛtā।। 44।।)

'Viśvācī' is the condition where the vitiated vāta affects the kaṇḍarā (tendon) on the palms, fingers and back of the arm and causes loss of movement of the arm.

वायुः कट्यां स्थितः सक्थ्नः कण्डरामाक्षिपेद्यदा।
तदा खञ्जो भवेज्जन्तुः पङ्गुः सक्थ्नोर्द्वयोरपि।।४५।।
(Vāyuḥ kaṭyām sthitaḥ sakthnaḥ
kaṇḍarāmākṣipedyadā।
tadā khañjo bhavejjantuḥ
paṅguḥ sakthnordvayorapi।।45।।)
When the perturbed vāta localises in the tendons of the thigh, it produces contracture of the tendons leading to partial lameness, 'khañja', if one leg is affected. If it affects both the legs, it is known as 'paṅgu', full lameness.

कम्पते गमनारम्भे खञ्जन्निव च याति यः।
कळायखञ्जं तं विद्यान्मुक्तसन्धिप्रबन्धनम्।।४६।।
(Kampate gamanārambhe
khañjanniva ca yāti yaḥ।
kaḷāyakhañjam tam vidyān-
muktasandhiprabandhanam।।48।।)
'Kaḷāyakhañja' is the condition where the patient experiences shaking of legs when he starts walking. It is because of the looseness of his joints and he is found to be lame during walking.

शीतोष्णद्रवसंशुष्कगुरुस्निग्धैर्निषेवितैः।
जीर्णाजीर्णे तथाऽऽयाससङ्क्षोभस्वप्नप्रजागरैः।।४७।।
सश्लेष्ममेदःपवनमाममत्यर्थसञ्चितम्।
अभिभुयेतरं दोषमूरु चेत्प्रतिपद्यते।।४८।।
सक्थ्यस्थीनि प्रपूर्यान्तः श्लेष्मणा स्तिमितेन तत्।
तदा स्तभ्नाति तेनोरू स्तब्धौ शीतावचेतनौ।।४९।।
परकीयाविव गुरू स्यातामतिभृशव्यथौ।
ध्यानाङ्गमर्दस्तैमित्यतन्द्राच्छर्द्यरुचिज्वरैः।।५०।।
संयुतौ पादसदनकृच्छ्रोद्धरणसुप्तिभिः।
तमूरुस्तम्भमित्याहुराढ्यवातमथापरे।।५१।।
(Śītoṣṇadravasamśuṣka-
gurusnigdhairniṣevitaiḥ।
jīrṇājīrṇe tathāऽऽyāsa
saṅkṣobhasvapnaprajāgaraiḥ।।47।।
Saśleṣmamedaḥpavana-
māmamatyarthasañcitam।
abhibhūyetaram doṣa-
mūru cetpratipadyate।।48।।
Sakthyasthīni prapūryāntaḥ
ślesmaṇā stimitena tat।
tadā stabhnāti tenorū
stabdhau śītāvacetanau।।49।।
Parakīyāviva gurū
syātāmatibhṛśavyathau।
dhyānāṅgamardastaimitya-
tandrācchardhyarucijvarai।।50।।
Samyutau pādasadana-
kṛcchroddharaṇasuptibhiḥ।
tamūrustambhamityāhu-
rāḍhyavātamathāpare।।51।।)
'Ūrustambha' is the condition where the vāta gets vitiated because of an unhealthy regimen. The vitiated vāta gets associated with kapha, adipose tissue and undigested food material find lodgement in the thighs including the thigh bone. The unhealthy regimen include, excessive consumption of cold, hot, liquid, dry, heavy, greasy and overcooked or undercooked food; over-exertion, excessive sleep or sleeplessness and other bad actions. The thighs become numb, stiff, immobile, cold and devoid of sensation to such an extent that he feels the legs do not belong to him. The legs also become heavy and severly painful. The patient develops body ache, drowsiness, vomiting, poor appetite, fever, weakness of feet and difficulty in lifting the leg. Some term this as 'āḍhyavāta'.

वातशोणितजः शोफो जानुमध्ये महारुजः।
ज्ञेयः क्रोष्टुकशीर्षश्च स्थूलः क्रोष्टुकशीर्षवत्।।५२।।
(Vātaśoṇitajaḥ śopho
jānumadhye mahārujaḥ।
jñeyaḥ kroṣṭukaśīrṣaśca
sthūlaḥ kroṣṭukaśīrṣavat।।52।।)
'Kroṣṭukaśīrṣa' is a painful swelling in the knee because of the vitiation of vāta with rakta. This swelling resembles the head of a kroṣṭuka (jackal).

रुक् पादे विषमन्यस्ते श्रमाद्वा जायते यदा।
वातेन गुल्फमाश्रित्य तमाहुर्वातकण्टकम्।।५३।।
(Ruk pāde viṣamanyaste
śramādvā jāyate yadā।
vātena gulphamāśritya
tamāhurvātakaṇṭakam।।53।।)

By walking on uneven ground and irregular movement the vāta gets lodged in the ankle and pain is developed. It is termed as 'vātakaṇṭaka'. The pain resembles that of thron (kaṇṭaka) pricks. Hence, the name.

पार्ष्णिं प्रत्यङ्गुलीनां या कण्डरा मारुतार्दिता।
सक्थ्युत्क्षेपं निगृह्णाति गृध्रसीं तां प्रचक्षते।।५४।।
(Pārṣṇim pratyaṅgulīnām yā
kaṇḍarā mārutārditā।
sakthyutkṣepam nigṛhṇāti
gṛdhrasīm tām pracakṣate।। 54।।)

When the vitiated vāta targets the tendon of the ankle and toes, the raising of the thighs/legs becomes difficult and painful. This is known as 'gṛdhrasī' (sciatica).

विश्वाची गृध्रसी चोक्ता खल्ली तीव्ररुजान्विते।
(Viśvācī gṛdhrasī coktā khallī tīvrarujānvite।)

When 'gṛdhrasī' and viśvācī' are associated with severe pain, it gets the name 'khallī'.

हृष्येते चरणौ यस्य भवेतां च प्रसुप्तवत्।।५५।।
पादहर्षः स विज्ञेयः कफमारुतकोपजः।
(hṛṣyete caraṇau yasya
bhavetām ca prasuptavat।। 55।।
Pādaharṣaḥ sa vijñeyaḥ
kaphamārutakopajaḥ।)

Some may complaint of a tingling sensation alternating with numbness in the feet. This arises from the perturbation of kapha and vāta. This condition is termed as 'pādaharṣa'.

पादयोः कुरुते दाहं पित्तासृक्सहितोऽनिलः।।५६।।
विशेषतश्चङ्क्रमिते पाददाहं तमादिशेत्।।५६½।।
(pādayoḥ kurute dāham
pittāsṛksahito'nilaḥ।। 56।।
Viśeṣataścaṅkramite
pādadāham tamādiśet।। 56½।।)

Some may experience a burning sensation in the feet especially while walking. Here the vitaited vāta combines with pitta and rakta and this is termed as 'pādadāha'.

इति श्रीवैद्यपतिसिंहगुप्तसूनुश्रीमद्वाग्भटविरचितायामष्टाङ्गहृदयसंहितायां तृतीये निदानस्थाने वातव्याधिनिदानं नाम पञ्चदशोऽध्यायः।।१५।।
(Iti śrīvaidyapatisimhaguptasūnuśrīmadvāgbhaṭaviracitāyāmaṣṭāṅgahṛdayasamhitāyām tritīye nidānasthāne vātavyādhinidānam nāma pañcadaśo'dhyāyaḥ।। 15 ।।)

Thus ends the 15th chapter named Vātavyādhinidānam of Aṣṭāṅgahṛdayam composed by Śrīmad Vāgbhaṭa, the son of Śrī Vaidyapati Simhagupta.

Author
Ramanakutty C., Chief Medical Officer (Publications), Arya Vaidya Sala, Kottakkal, Kerala. E-mail: drcramankutty@gmail.com

*IN - VIVO* STUDY

Āryavaidyan, Vol XXXI, No. 2, November 2017 - January 2018, Pages 19 - 25

# Acute oral toxicity study of Smashit tablet

Hemant Toshikhane, Satej Banne T., Sailee Kadam, Snigdha Das Mandal, Kruti Upadhyaya

**ABSTRACT:** The present study was carried out in the animal house of Parul University's, Parul Institute of Pharmacy and Research, Limda, Vadodara. Experimental animals were procured from licensed animal breeder. Source of test item Smashit tablets were provided by Gufic Biosciences Ltd. Study code number was IAEC Number- 984/01/2017-18. This study was approved as per protocol no. 984/01/2017-18 and has been verified from the records by IAEC. The objective of the study was to evaluate adverse effects and lethal dose 50 ($LD_{50}$) of test formulation after single oral administration of test substance in mice (*Mus musculus*). Adverse effect after single oral administration of test drug was evaluated using parameter like change in fur (rough or discoloration), tremor (present or absent), diarrhea (present or absent), lethargy or sleep (present or absent), respiratory pattern, and behavior. A total of 06 mice were selected and divided into 2 groups. In GroupI, Test material was given in the dose of 2000 mg/kg; oral once and in Group II, Test material was given in the dose of 2000 mg/kg; oral once. In the present study, a single oral dose of 2000mg/kg of test material was administered followed by continuous observation up to four hour and then daily once upto 14 days. Cage side observation during initial four hours and daily once after administration of test material did not produce any abnormal clinical sign like change in fur color, tremor, diarrhea, lethargy, sleep, change in normal respiratory pattern and behavior. The body weight and feed consumption of those animals were found normal. There was no significant difference in gross necropsy as well as histology of major organ like brain, lungs, heart, liver and kidney. As per OECD guideline 423 and test condition; it can be concluded that the $LD_{50}$ of test material was found to be higher than 5,000 mg/kg, p/o. Hence it was categorized under Category 5 or Unclassified Category.

*Key words:* Tablet Smashit, Oral toxicity, Mice

## Introduction

Smashit tablet, a Patent and Proprietary Ayurvedic medicine, is composed of 60 mg of pāṣāṇabheda (*Bergenia lingulata* Engl.), 50 mg each of gokṣura (*Tribulus terrestris* Linn.), punarnava (*Boerhavia diffusa* L.nom.cons.), śuddha śilājatu (Purified asphaltum), yavakṣāra (*Hordeum vulgare* L.), śilāpuṣpa (*Didymocarpus pedicellata* R.Br.), tṛṇapañcamūla, lajjālumūla (*Mimosa pudica* Linn.), amṛta [*Tinospora cordifolia* (Willd.) Miers ex Hook. F. & Thoms.], kulattha (*Dolichos biflorus* Linn.), śigru (*Moringa oleifera* Lam.), 25 mg each of varuṇa (*Crataeva nurvala* Linn.), uśīra (*Vetiveria zizanioides* Linn.) and 100 mg of Hazaral yahad bhasma (Calcined lime silicate).

**Study design:** 2 groups of 3 (M) mice (*Mus musculus*) species were taken. (Table 1)

Table 1
Grouping of Animals

| Group | Animals | Treatment | Dose | Route |
|---|---|---|---|---|
| Group I | 3 (M) | Test material | 2000 mg/kg; | Oral once |
| Group II | 3 (M) | Test material | 2000 mg/kg; | Oral once |
| M indicates Male | | | | |

**Experimental design**

Source of test item: Gufic Biosciences Ltd.

Experimental procedure: Six healthy male mice were randomly selected.

**First step**: In Group I three mice were administered test substance at a dose of 2000 mg/kg body weight once. The animals were observed for morbidity and mortality at 0, 1, 2, 3, 4, and 12 hr on the day of dosing and once a day thereafter up to 14 days. The body weights and feed left over were recorded individually on day 0 (before administration of test substance), on 7$^{th}$ and 14$^{th}$ day.

**Second step**; In Group II three mice were treated with test substance in the same dose for confirmation (2000 mg/kg body weight; once). The animals were observed for mortality on the day of dosing and once a day thereafter up to 14 days.

At the end of 14$^{th}$ day, one animal was sacrificed from each group and histopathology of vital organs was performed. (Table 2)

Table 2
Type, Date and Phases of study inspected

| Sl. No. | Type of inspection | Date of inspection | Phases of study inspected |
|---|---|---|---|
| 1 | Study based | 02/05/2017 | Acclimatization of animal |
| 2 | Study based | 07/05/2017 | Grouping of animal, body weight, dose preparation and dosing. |
| 3 | Study based | 08/05/2017 | Body weight, and feed left over |
| 4 | Study based | 20/05/2017 | Necropsy |

**Objective of the study**

The study was conducted to establish the Acute oral toxicity and lethal dose 50 ($LD_{50}$) of test formulation Smashit tablet in mice.

**Materials and methodes**

Product name: Smashit tablet

Supplied by: Gufic Biosciences Ltd.

Dosage formulation: Tablet

Batch No.: AB16025

Mfg. date: August 16

Expiry Date: July 19

Stability: Sponsor is responsible for stability of the test article formulations, under the storage conditions used in this study.

Safety precautions: Standard laboratory safety procedure was employed for handling the dose formulations. Specifically, laboratory apron, gloves and face mask was worn while administering doses.

**Test System and Animal husbandry**

**Test System**

Species: Mice (*Mus musculus*)

Strain: Swiss albino

Sex: male

No. of animals: 3 rats at each dosage form

Identification: The animal were mark on its body and the cages were identified by attaching a cage card containing minimum information such as cage/study/group/animal number(s) and species/strain, sex, dose level, test item name and study personnel signature.

**Source**: Animal House Facility

**Rationale/Justification for the Choice of the Test System**: OECD Guideline recommends Rodent for Acute oral toxicity testing.

**Acclimatization**: All animals were acclimatized for a minimum period of five days. Animals were maintained in the test setup for minimum 30 minutes

once during the acclimatization period to reduce the stress. Animals were weighed on the day of receipt and observed daily for abnormalities if any. Detailed records of acclimatization were maintained in the raw data.

**Animal husbandry: Test room**

**Animal house conditions**

Lighting : 12/12 hour light- dark cycle

Temperature: 22 ± 3$^0$C

Relative humidity: 30 to 70%

Temperature and relative humidity was recorded thrice daily.

Animal housing: Mice were housed 3 per cage in clean, sterilized Polypropylene cages.

Feed and water: Standard certified rat pellet feed (Manufactured by VRK Nutritional Solution, Pune) and drinking water treated by reverse osmosis) was provided *ad libitum* to all animals.

Analysis reports for microbial load and contaminants in feed and water and nutrient content of feed are retained with the raw data.

Sanitation: The floor of the experimental room was swept and mopped thrice daily. Cages and bedding material were changed once in three days and water bottles were changed daily. All the experimental procedures were done in a clean environment.

Guidelines followed [1] : The Organization for Economic Co-operation and Development (OECD) Guideline for Testing of Chemicals; 423 (2001) - Acute Oral Toxicity - Acute Toxic Class Method.

Quality assurance statement: This study report has been reviewed by the Quality Assurance Unit of Parul Institute of Pharmacy and Research, for compliance with the OECD Principles of Good Laboratory Practices, Study data and applicable Operating Procedures. This statement confirms that the study report accurately reflects study data. The summary of inspections performed during the course of the study.

**Results**

Group I: Dose preparation and Individual animal dosing record. Protocol No: 984/01/2017-18. (Table 3 and 4)

Table 3
Dose preparation (2000 mg/kg)

| Test substance (mg) | Solvent used | Dissolved in solvent (ml) | Concentration (mg/ml) |
|---|---|---|---|
| 500 | 0.5% CMC | 2 | 250.00 |

Table 4
Individual animal dosing record

| Animal ID | Body weight (g) | Volume administered (ml) |
|---|---|---|
| T 1 | 15 | 0.12 |
| T 2 | 15 | 0.12 |
| T 3 | 20 | 0.16 |

Group II: Dose preparation and Individual animal dosing record , Protocol No: 984/01/2017-18, (Table 5 and 6)

Table 5
Dose preparation 2000 mg/kg

| Test substance (mg) | Solvent used | Dissolved in solvent (ml) | Concentration (mg/ml) |
|---|---|---|---|
| 500 | 0.5% CMC | 2 | 250.00 |

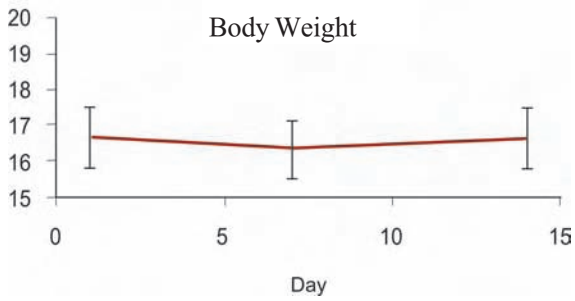
Table 6
Individual animal dosing record

| Animal ID | Body weight (g) | Volume administered (ml) |
|---|---|---|
| T 1 | 17 | 0.13 |
| T 2 | 16 | 0.12 |
| T 3 | 20 | 0.16 |

**Body weight:** There was no abnormal change in the body weight in any animal. (Table 7 and 8, Figures 1 and 2)

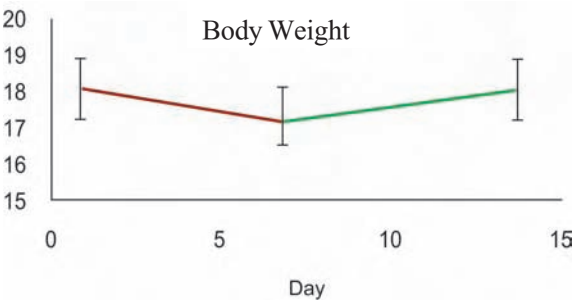
| Table 7<br>Group I- (Protocol No: 984/01/2017-18)<br>Dose: 2000 mg/kg<br>Individual animal body weight | | | |
|---|---|---|---|
| Animal ID | Change in body weight (gm) at specific day | | |
| | 01 | 07 | 14 |
| T 1 | 15 | 14 | 15 |
| T 2 | 15 | 15 | 15 |
| T 3 | 20 | 20 | 20 |
| Mean | 16.66666667 | 16.33333333 | 16.66666667 |
| SD | 2.886751346 | 3.214550254 | 2.886751346 |
| SEM | 1.666666667 | 1.855921454 | 1.666666667 |

Figure 1
Group I- (Protocol No: 984/01/2017-18)
Dose: 2000 mg/kg, body weight of animals




| Table 8<br>Group II- (Protocol No: 984/01/2017-18)<br>Dose: 2000 mg/kg<br>Individual animal body weight | | | |
|---|---|---|---|
| Animal ID | Change in body weight (gm) at specific day | | |
| | 01 | 07 | 14 |
| T 1 | 17 | 17 | 17 |
| T 2 | 16 | 15 | 16 |
| T 3 | 20 | 19 | 20 |
| Mean | 17.66666667 | 17 | 17.66666667 |
| SD | 2.081665999 | 02 | 2.081665999 |
| SEM | 1.201850425 | 1.154700538 | 1.201850425 |

Figure 2
Group II- (Protocol No: 984/01/2017-18)
Dose: 2000 mg/kg, body weight of animals




**Feed intake:** There was no abnormal change in the feed intake in any animal. (Table 9 and 10)

**Mortality:** Mortality was not observed in any animal. (Table 11)

| Table 9<br>Feed input and feed left over Group I | | | |
|---|---|---|---|
| Day | Feed input | Feed left | Feed intake |
| 01 | 200 | N/A | N/A |
| 07 | 200 | 117 | 83 |
| 14 | N/A | 103 | 97 |

| Table 10<br>Feed input and feed left over Group II | | | |
|---|---|---|---|
| Day | Feed input | Feed left | Feed intake |
| 01 | 200 | N/A | N/A |
| 07 | 200 | 117 | 83 |
| 14 | N/A | 103 | 97 |

| Table 11<br>Individual animal mortality | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Animal ID | Day | | | | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| T 1 | A | A | A | A | A | A | A | A | A | A | A | A | A | A |
| T 2 | A | A | A | A | A | A | A | A | A | A | A | A | A | A |
| T 3 | A | A | A | A | A | A | A | A | A | A | A | A | A | A |
| P = Present and A = Absent | | | | | | | | | | | | | | |

**Cage side observations:** There was no abnormal change at any time point when compare to 0 hr. (Table 12)

**Histopathology:** Histopathology of organ did not reveal any toxicity. (Figure 3, 4, 5, 6 and 7).

Table 12
Individual animal cage side observation

| Animal ID | Observation parameter | Change at specific time interval (hr) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 0 | 1 | 2 | 3 | 4 | 4-12 | 12-24 | After 24 |
| T1 | Fur | Normal | Normal | Normal | Normal | Normal | Normal | Normal | Normal |
| | Tremor | Absent | Absent | Absent | Absent | Absent | Absent | Absent | Absent |
| | Diarrhoea | Absent | Absent | Absent | Absent | Absent | Absent | Absent | Absent |
| | Lethargy | Absent | Absent | Absent | Absent | Absent | Absent | Absent | Absent |
| | Sleep | Absent | Absent | Absent | Absent | Absent | Absent | Absent | Absent |
| | Respiratory Pattern | Normal | Normal | Normal | Normal | Normal | Normal | Normal | Normal |
| | Behaviour | Normal | Normal | Normal | Normal | Normal | Normal | Normal | Normal |
| | Mortality | No | No | No | No | No | No | No | No |
| Animal ID | Observation parameter | Change at specific time interval (hr) | | | | | | | |
| | | 0 | 1 | 2 | 3 | 4 | 4-12 | 12-24 | After 24 |
| T2 | Fur | Normal | Normal | Normal | Normal | Normal | Normal | Normal | Normal |
| | Tremor | Absent | Absent | Absent | Absent | Absent | Absent | Absent | Absent |
| | Diarrhoea | Absent | Absent | Absent | Absent | Absent | Absent | Absent | Absent |
| | Lethargy | Absent | Absent | Absent | Absent | Absent | Absent | Absent | Absent |
| | Sleep | Absent | Absent | Absent | Absent | Absent | Absent | Absent | Absent |
| | Respiratory Pattern | Normal | Normal | Normal | Normal | Normal | Normal | Normal | Normal |
| | Behaviour | Normal | Normal | Normal | Normal | Normal | Normal | Normal | Normal |
| | Mortality | No | No | No | No | No | No | No | No |
| Animal ID | Observation parameter | Change at specific time interval (hr) | | | | | | | |
| | | 0 | 1 | 2 | 3 | 4 | 4-12 | 12-24 | After 24 |
| T3 | Fur | Normal | Normal | Normal | Normal | Normal | Normal | Normal | Normal |
| | Tremor | Absent | Absent | Absent | Absent | Absent | Absent | Absent | Absent |
| | Diarrhoea | Absent | Absent | Absent | Absent | Absent | Absent | Absent | Absent |
| | Lethargy | Absent | Absent | Absent | Absent | Absent | Absent | Absent | Absent |
| | Sleep | Absent | Absent | Absent | Absent | Absent | Absent | Absent | Absent |
| | Respiratory pattern | Normal | Normal | Normal | Normal | Normal | Normal | Normal | Normal |
| | Behaviour | Normal | Normal | Normal | Normal | Normal | Normal | Normal | Normal |
| | Mortality | No | No | No | No | No | No | No | No |

Figure 3
Histopathology of Heart

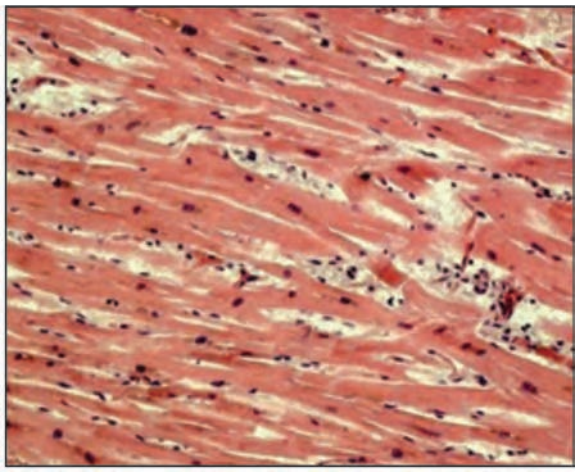


Figure 4
Histopathology of Lungs

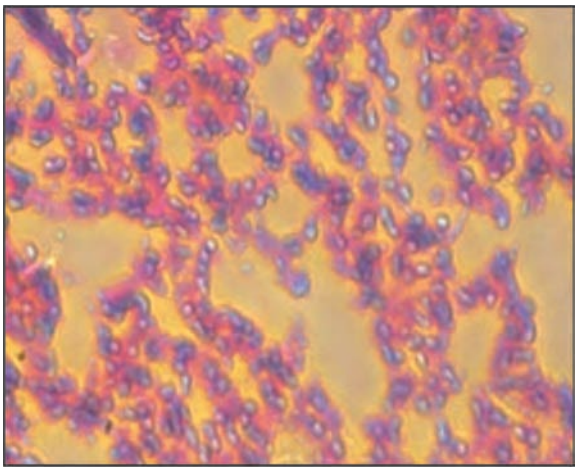


Figure 5
Histopathology of Liver

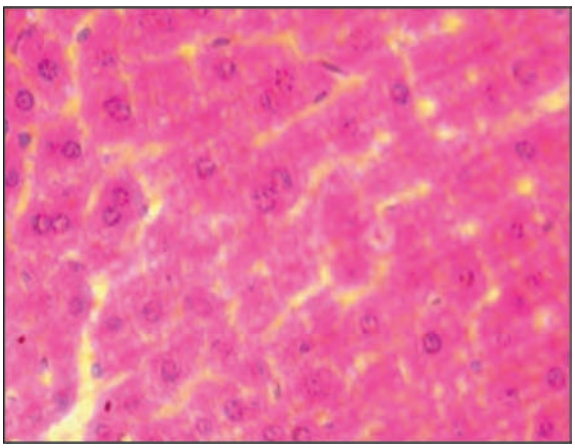


Figure 6
Histopathology of Kidney

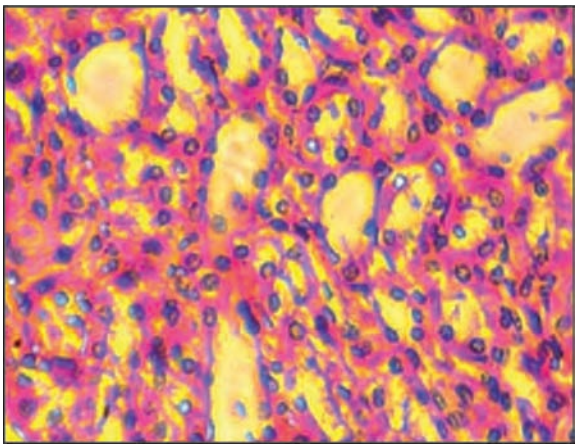
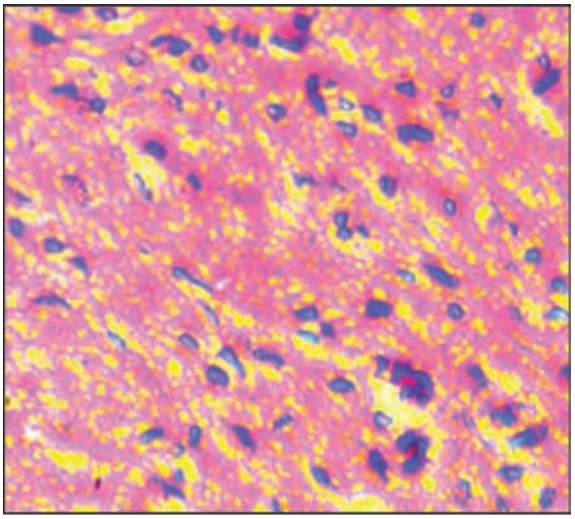


Figure 7
Histopathology of Brain



**Discussion**

In the present study, a single oral dose of 2000 mg/kg of test material was administered followed by continuous observation up to 4 hour and then daily once upto 14 days. Cage side observation during initial four hours and daily once after administration of test material did not produce any abnormal clinical sign like change in fur color, tremor, diarrhea, lethargy, sleep, change in normal respiratory pattern and behavior. The body weight and feed consumption of those animals were found normal. There was no significant difference in gross necropsy as well as histology of major organ like brain, lungs, heart, liver and kidney.

## Conclusion

As per OECD guideline 423 and test condition; it can be concluded that the $LD_{50}$ of test material was found to be higher than 5,000 mg/kg, per Oral. Hence it was categorised under Category 5 or Unclassified Category.

## Statement of Compliance

We, hereby declare that this Study Code No. 'IAEC-984/01/2017-18' entitled 'Acute oral toxicity study of Smashit tablet according to OECD Guideline No. 423' was performed by under our supervision in compliance with the Drugs And Cosmetics (II$^{nd}$Amendment) Rules, 2005 and OECD principle of good laboratory practice. Characterisation of the test material was performed by the sponsor. The objective laid down in the study protocol was achieved. No unforeseen circumstances were observed which might affect the quality or integrity of the study. The report represent a true and accurate report of the results obtained. We accept the responsibility for validity of the data, as well as the interpretation, analysis, documentation and reporting of the results.

## Acknowledgement

We are using this opportunity to express our gratitude to Dr.Pasha T.Y., Principal, Parul Institute of Pharmacy and Research for providing animal house, reviewing and approving of study. We are thankful for their aspiring guidance, invaluably constructive criticism and advice during the study. It would not have been possible without the kind support and help of many individuals and organizations. We would like to extend our sincere thanks to all of them. This research was supported by Gufic Biosciences Ltd. We have to express out appreciation to Mr. Neelang Trivedi, Research Assistant and Dr. Sajan Malik S., Veterinarian, Parul Institute of Pharmacy and Research, for sharing their pearls of wisdom with us during the course of this research. Our sincere thanks and appreciations also go to our colleague Dr. Chandrashekhar Jagtap in developing the project and people who have willingly helped us out with their abilities.

## References

1. The Organization for Economic Co-operation and Development (OECD) Guideline for Testing of Chemicals; 423 (2001) - Acute Oral Toxicity - Acute Toxic Class Method.

Authors

Hemant Toshikhane, Principal and Dean, Department of Shalyatantra, Parul Institute of Ayurveda, Parul University, Faculty of Ayurveda, Tal. Waghodia, Dist. Vadodara, Limda, Vadodara, Gujarat.

Satej Banne T., Ph.D. Scholar, Assistant Professor, Department of Dravyaguna, Parul Institute of Ayurveda, Parul University, Faculty of Ayurveda, Tal. Waghodia, Dist. Vadodara, Limda, Vadodara, Gujarat.

Sailee Kadam, Medical Adviser, Gufic Biosciences Ltd., Andheri (East), Mumbai, Maharashtra.

Snigdha Das Mandal, Assistant Professor, Parul Institute of Pharmacy and Research, Parul University, Tal. Waghodia, Dist. Vadodara, Limda, Vadodara, Gujarat.

Kruti Upadhyaya, Executive Research Assistant, Accuprec Research Labs. Pvt. Ltd., Vadodara, Gujarat.

PLANT STUDY

Āryavaidyan, Vol XXXI, No. 2, November 2017 - January 2018, Pages 26 - 30

# Phytochemical study of damanakaḥ (*Artemisia vulgaris* L.)

Shikerkar Pratima

**ABSTRACT:** A systematic study of crude drug embraces, thorough consideration of primary and secondary metabolites derived as a result of plant metabolism. The compounds that are responsible for medicinal property of the drug are usually secondary metabolites. The plant damanakaḥ is subjected to preliminary phytochemical screening for detection of its various chemical constituents which are responsible for pharmacological or therapeutic activity and play important role in identification and authentication of drug, the first and foremost step in any of the drug research.

*Key words:* Damanakaḥ, Preliminary, Phytochemical

## Introduction

Plants contain different chemical constituents. These chemical constituents may be therapeutically active or inactive. The one which are active are called as active constituents or active principles (alkaloids, glycosides, etc.) which are responsible for pharmacological or therapeutic activity.

The preliminary phytochemical studies are essential to know the basic constituents present in drug. It helps to get an idea about the enormous variety of organic substances. The action of a drug depends upon the basic components present in the drug. This analysis will help to know the chemical constituents present in damanakaḥ plant which are responsible for the pharmacological or therapeutic action.

Scientific classification:[1] Refer table 1.

Table 1
Scientific classification

| Scientific kingdom | Classification plantae |
|---|---|
| | *Angiosperms* |
| | *Eudicots* |
| | *Asteroids* |
| | *Asterales* |
| Family | *Asteraceae* |
| Genus | *Artemisia* |
| Species | *A.vulgaris* |

Botanical name: *Artemisia vulgaris* L.

Family: *Asteraceae*

English name: Indian worm wood, Fleabane[2]

Synonymes- Damanaḥ[2]

Distribution: Throughout India, in hilly districts in areas upto 2,400 m elevation.[2]

Habit: A tall aromatic perennial shrub, often gregarious, pubescent or villous throughout, pubescent above, white-tomentose beneath, uppermost smaller, 3-fid or entire, lanceolate, flowers in subglobose heads, in spicate or suberect or horizontal panicled racemes, outer flowers female, very slender, inner disk flowers fertile, bisexual, bracts ovate or oblong, margins scarious, fruits oblong, ellipsoid minute achenes. [2] (Figure 1)

## Rasapañcaka [3]

Rasa (taste): Tikta (bitter) and kaṣāya (astringent)

Guṇa (property): Laghu (light), rūkṣa (dry), tīkṣṇa

Vīrya(potency): Uṣṇa (hot), Vipāka: Kaṭu (pungent)

Chemical constituents: Artemisia alcohol, psilostachyn A and C, capillin, azulen, caryophyllene, geraniol, Artemisia ketone, etc. [3]

Doṣakarma: Tridoṣaśāmaka mainly kaphavāta śāmaka.[4]

Mukhyakarma: Vatānulomana[4]

Sāmānyakarma:Hṛdya,vṛṣya,viṣaghna,bhūtadoṣanut.[4]

Indications: Grahaṇi (gastritis), viṣa (poisoning),

Figure 1
Damanakaḥ (*Artemisia vulgaris* L.)

kuṣṭha (skin disease), kaṇḍu (itching), kṛmi (worm infestation), viṣṭambha, ādhmāna (blotting of abdomen), kaṣṭārtava (dysmenorrhoea).[4]

Parts used: Leaves, flowering top, pañcāṅga (whole plant).[4]

Dosage: Svarasa (juice): 5-10 ml., cūrṇa (powder)-0.5 -1gm.[4]

Properties and actions:[5] The plant has a hot, sharp, pungent taste, alexiteric, appetiser, cures kapha-vāta doṣa, asthma and itching. The plant is considered to be a valuable stomachic, deobstruent and anti-spasmodic, it is prescribed as infusion and electuary in cases of obstructed menses and hysteria. Externally it is used as fomentations given in skin diseases and foul ulcers as an alterative.

The expressed juice is used in diseases of children. It is applied to the head of young children for the prevention of convulsions. The leaves and tops are administered in nervous and spasmodic affections connected with debility, in asthma and diseases of brain. In Afghanistan and throughout India, a strong decoction is given as a vermifuge and a weak one to children in measles. The infusion is given as tonic.

The plant is much used medicinally in Indo-China, where the leaves and flowers are considered as aromatic, emmenagogue, stomachic, antispasmodic and anthelmintic. The boiled leaves are used as poultice in headache, is dried and cut into small fragments; they are used to cauterize wounds.

In China and Japan, inflammable cones or 'moxa' are obtained by grinding the leaves in a stone mortar with water separating the coarser particles, and drying what remains moxibustion, or the method of cauterizing the skin by burning, is resorted to for a very large number of diseases, from itch to sterility.

In Malaya, the leaves are employed as a carminative and haemostatic. The tonic and stomachic properties of the plant are well known in the Philippine Islands. An infusion of the leaves is commonly used as an emmenagogue.

The plant is prescribed by Ācārya Suśruta in the treatment of snake bite and scorpion sting, but the plant is not an antidote to either snake venom or scorpion venom.

**Materials and methods**

Preliminary phytochemical study: Phytochemistry (python - plant) is the science of matter that deal with plants or plant products. Natural products comprise of different chemical constituents that may be therapeutically active or inactive. The one which are active are called as active constituents or active principles (alkaloids, glycosides, etc.). The inactive ones are called inert chemical constituents (starch, cellulose, etc.). Such inert constituents though they possess no pharmacological or therapeutical activity, are essential for the normal physiological processes. In the recent times phytochemistry has undergone significant development as a distinct discipline.

Preliminary phytochemical studies are essential to know the basic constituents present in the drug. It gives an idea about the enormous variety of organic substances. The action of a drug depends on the basic components present in the drug and the analysis will help to know the components responsible for the drug action.

The preliminary tests were made by using the four different extracts of *Artemisia vulgaris.*

1. Proteins: Biuret test:- 2 ml of 10% copper sulphate solution, is added to 2 ml of test solution, mixed well

and 2 drops of 1% copper sulphate solution is added. Violet or pink colour indicates the presence of two or more peptide bond of proteins.

Ninhydrin test:- 1ml of 0.1% freshly prepared ninhydrin solution is added to 4 ml of the test solution, which should be neutral pH. The contents are mixed and boiled for a minute and allowed to cool. Violet or purple coloured solution indicates the presence of amino acids and proteins.

Xanthoproteic test:- 1ml of Conc. $HNO_3$ is added to 5 ml of the solution. The contents are boiled and cooled. Appearance of yellow colour indicates the presence of nitro derivatives of aromatic amino acids. To this solution 40% of NaOH is added. A deep orange colour solution indicates the presence of sodium salts of nitro derivatives of aromatic amino acids.

Hopkins-Cole test:- 2 ml of glacial acetic acid is added to 2 ml of the test solution and mixed well. To this, 2ml conc. $H_2SO_4$ is added carefully along the sides of the test tube. The formation of violet ring in the junction of two liquids indicates the presence of indole group of tryptophan.

Sulphur test:- 2 ml of 40% NaOH solution and 10 drops of 2% lead acetate solution are added to the 2ml of solution and the contents are boiled for a minute and cooled back. Precipitate indicates the presence of sulphur containing amino acids of proteins.

2. Carbohydrates test for starch: Molisch's test:- 2 drops of Molisch's reagent is added along the sides of the test tube. At the junction of two liquids a red cum violet coloured ring indicates the presence of carbohydrates.

Iodine test:- A few drops of iodine solution is added to 1 ml of the test solution. Appearance of deep colour indicates the presence of starch.

Fehling's test:- 1ml of Fehling's solution-A and 1ml of Fehling's solution-B are added to 1ml of test solution. The contents are mixed well and boiled for a minute. Yellow or brownish-red precipitate indicates the presence of the reducing sugars.

Benedict's test:- 2 ml of Benedict's reagent is added to five drops of the solution. Boiled for a minute in a water bath and cooled the solution. Yellow, red or green colour precipitate indicates the presence of reducing sugars.

Non-reduction sugar such as sucrose: Benedict's test:- Benedict's test showing no characteristic colour forming, indicates the presence of non-reducing sugars in the test solution.

3. Tannins: Gelatin test:- the solution is evaporated to dryness and the residue was dissolved in gelatin 1%. To this salt solution (10% Nacl) is added. A white precipitate was obtained which indicates the presence of tannins.

4. Anthocyanins: Aqueous NaOH test:- 1ml aqueous NaOH solution is added to 1ml test solution, formation of blue to violet colour indicates the presence of anthocyanins.

Conc. $H_2SO_4$ test:- 1ml of conc. $H_2SO_4$ is added to the 1 ml of test solution. Formation of yellow to orange colour indicates the presence of anthocyanins.

5. Glycosides: Molisch's test:- 1ml of Molisch's reagent and 1ml of conc. $H_2SO_4$ is added to the test solution. Formation of reddish violet colour ring at the junction of two liquids indicates the presence of glycosides.

Conc. $H_2SO_4$ test:- 1ml of conc. $H_2SO_4$ is added to the 1 ml of solution and is allowed to stand for 2 minutes. Formation of reddish colour indicates the presence of glycosides.

Keller kiliani test:- The test solution is dissolved in glacial acetic acid. Boiled for a minute and cooled. To this solution, 2 drops of ferric chloride solution is added. The contents were transferred to a test tube containing 2 ml of concentrated sulphuric acid. A reddish brown colour ring observed at the junction of two layers indicates the presence of glycosides.

6. Saponin: Foam test:- Extract is shaken vigorously with distilled water in a test tube. Honeycomb like foam produced, persists for few minutes confirms the presence of saponin.

7. Flavanoids : The presence of flavanoids is detected by the development of scarlet and cherry red colour

in alcoholic extract when a few drops of sulphuric acid with few magnesium turnings are added to the test solution. These colours usually indicate flavanoids. Scarlet colour indicates flavones; deep cherry red colour indicates the presence of flavanoids.

Pew's test (Zn/Hcl) for dihydro flavonols:- A pinch of Zn powder and 5 drops of 5N Hcl are added to the test solution. It gives a deep purple red (dihydroquercetin) or cherry red (dihydrokaempfeol) colour. Flavones, dihydrochalocones and other flavanoids gives at most pinkish or brownish colour.

Shinoda test:- This test is applied in the same way as Zn/Hcl, but magnesium powder is used instead of zinc. The development of a deep-red or magenta colour of the solution is an indication for the presence of flavane/dihydroflavanol. Dihydrochalcones and other flavanoids do not react with the reagent.

Aqueous NaOH solution:- 1ml of aqueous NaOH solution is added to 1ml of test solution. Formation of yellow colour indicates the presence of flavanoids.

Conc. H2SO4 test:- 1ml of conc. $H_2SO_4$ is added to test solution, formation of red colour indicates the presence of flavanoids.

8. Phenols: Phenol test:- When 0.5 ml of $Fecl_3$ solution is added to 2 ml of test solution, formation of an intense colour indicates the presence of phenols.

9. Steroids: Salkowski's test:- A wine red colour is developed when chloroform and $H_2SO_4$ are added to the test solution. It indicates the presence of steroidal nuclei.

10. Alkaloids: Mayer's test:- The filtrate when mixed with few drops of Mayer's reagent gives creamy white precipitate.

Dragendroff's test:- The filtrate when added with few drops of Dragendroff's reagent gives orange red colour.

**Observation and results**

The components present in four extracts of damanakaḥ after conducting preliminary phytochemical studies is given below. (Table 2)

All the five extracts show presence of proteins and starch (carbohydrates) and absence of alkaloids and tannins.

Anthrocyanins are present in juice, petroleum ether and chloroform extract and absent in hot infusion and ethanol extract of damanakaḥ.

Glycosides, saponins and flavanoids are present in juice and hot infusion of damanakaḥ and absent in petroleum ether, ethanol and chloroform extracts.

Phenols are present in juice, hot infusion; ethanol and chloroform extracts absent in petroleum ether extract.

Steroids are present in juice, hot infusion and chloroform extracts and absent in petroleum ether and ethanol extracts.

Table 2
Components present in four extracts of damanakaḥ

| Sl. No | Tests | Juice | Hot infusion | Petroleum ether | Ethanol | Chloroform |
|---|---|---|---|---|---|---|
| I | Proteins | | | | | |
| a. | Biuret test | +ve | +ve | -ve | -ve | +ve |
| b. | Ninhydrin test | -ve | -ve | -ve | -ve | +ve |
| c. | Xanthoproteic test | +ve | -ve | +ve | Traces | +ve |
| d. | Hopkins-cole test | -ve | -ve | -ve | +ve | +ve |
| e. | Sulphur test | -ve | -ve | -ve | -ve | +ve |
| II | Carbohydrate test for starch | | | | | |
| a. | Molisch's test | -ve | +ve | +ve | -ve | -ve |
| b. | Iodine test | -ve | -ve | +ve | -ve | +ve |
| c. | Fehling's test | +ve | -ve | -ve | -ve | +ve |

| Sl. No | Tests | Juice | Hot | Petroleum infusion | Ethanol ether | Chloroform |
|---|---|---|---|---|---|---|
| d. | Benedict's test | +ve | +ve | +ve | +ve | +ve |
| e. | Test for non reducing sugar such as sucrose | -ve | -ve | -ve | -ve | +ve |
| III. | Tannins | | | | | |
| a. | Gelatin test | -ve | -ve | -ve | -ve | -ve |
| IV. | Anthrocyanins | | | | | |
| a. | Aqueous NaOH test | +ve | -ve | -ve | -ve | +ve |
| b. | Conc. $H_2SO_4$ test | +ve | -ve | +ve | -ve | -ve |
| V. | Glycosides | | | | | |
| a. | Molisch's test | +ve | +ve | -ve | -ve | -ve |
| b. | Conc. $H_2SO_4$ test | +ve | +ve | -ve | -ve | -ve |
| c. | Keller Kiliani test | +ve | -ve | -ve | -ve | -ve |
| VI. | Saponin | | | | | |
| a. | Foam test | +ve | Traces | -ve | -ve | -ve |
| VII. | Flavanoids | | | | | |
| a. | Flavanoid test | -ve | -ve | -ve | -ve | -ve |
| b. | Pew's test for dihydroflavanols | -ve | -ve | -ve | -ve | -ve |
| c. | Shinoda test | -ve | -ve | -ve | -ve | -ve |
| d. | Aqueous NaOH test | +ve | +ve | -ve | -ve | -ve |
| e. | Conc. $H_2SO_4$ test | +ve | +ve | -ve | -ve | -ve |
| VIII. | Phenols | | | | | |
| a. | Phenol test | +ve | +ve | -ve | +ve | +ve |
| IX. | Steroids | | | | | |
| a. | Salkowski's test | Traces | +ve | -ve | -ve | +ve |
| X. | Alkaloids | | | | | |
| a. | Mayer's test | -ve | -ve | -ve | -ve | -ve |
| b. | Dragendroff's test | -ve | -ve | -ve | -ve | -ve |

## Conclusion

Juice can be considered as a best form to administer as it contains majority of chemical constituents in it, followed by hot infusion of damanakaḥ. All this studies play important role in identification and authentication of drug, the first and foremost step in any of the drug research.

### References

1. www.wikipedia.org

2. Vaidyaratnam P. S. Varier's *Indian Medicinal Plants*, Vol. I, Arya Vaidya Sala, Kottakkal, P 202, Orient Longman Limited, 1994.

3. Dr. Shastry J. L., *Illustrated Dravyagunavijnana*, Vol. II, 2nd Edtn., P 803, Chaukhambha Orientalia, Varanasi, 2005.

4. Acharya Priyavrat Sharma, *Dravyagunavijnana*, Vol. II, P 399-401, Chaukhambha Bharati Academy, Varanasi.

5. Kirtikar K. R. and Basu B. D., *Indian Medicinal Plants*, Vol. II, 2nd Edtn., P 1395 & 1396, Lalit Mohan Basu, Allahabad, 1996.

Author

Shikerkar Pratima, Lecturer, Department of Dravyaguna, Gomantak Ayurveda Mahavidyalaya & Research Centre, Vaje, Shiroda, Goa. E-mail: pratimagoa@gmail.com

CASE STUDY

Āryavaidyan, Vol XXXI, No. 2, November 2017 - January 2018, Pages 31 - 34

# Nayanābhighāta due to Arkakṣīra - a case report

Aiswarya Nair V. and Abdul Salam A.

**ABSTRACT:** Arka (*Calotropis gigantea*), a plant found commonly along wastelands produces copious amounts of thick milky latex which exudes out on breaking the leaves or stem of the plant. Accidental ocular injury due to sap from the plant is frequently encountered especially around the time of Śivarātri festival. The case of a 51 year old male patient with ocular injury to arkakṣīra is being reported here. He had presented with blurred vision, pain and burning sensation around right eye and photophobia following drops of sap falling into his right eye while plucking flowers from arka plant. After thorough clinical examination, he was diagnosed as a case of nayanābhighāta due to upaviṣa and treated along the lines of nayanābhighāta, śophahara and viṣahara with internal medicines and kriyākramas like viḍālaka, seka and jaḷūkāvacaraṇa and made a successful recovery.

*Key words:* Nayanābhighāta, Arkakṣīra, Ocular toxicity

## Introduction

Arka is a plant found commonly along the roadsides, wastelands and dry exposed areas. Copious amounts of thick milky latex exude out on breaking the leaves or stem of the plant. Ocular injury due to latex from the plant is frequently encountered especially around the time of Śivarātri festival. The encounters are mostly accidental. The available medical literature has only few reports of such cases. Similar cases which received āyurvedic management have not been reported. The case of a 51year old male patient with ocular injury due to the exposure to sap from the plant is being described in this report. He had presented with blurred vision, pain and burning sensation around right eye and photophobia following drops of sap falling into his right eye while plucking flowers from arka plant. After thorough clinical examination, he was diagnosed as a case of nayanābhighāta due to upaviṣa and treated along the lines of nayanābhighāta, śophahara and viṣahara with internal medicines and kriyākramas and made a successful recovery. We report this case in hope to demonstrate the ability of āyurveda to deal with such acute cases effectively and to caution professionals the need to familiarize themselves with spectrum of ocular toxicity manifestations of arkakṣīra.

## Case report

51 year old patient, a manual labourer with poor socio- economic background, was plucking *Calotropis* flowers in evening, when a few drops of latex from the plant accidentally fell into his right eye. Instantly he felt severe burning pain in his right eye. He immediately washed his eyes with cold water. An hour later there was watering, foreign body sensation and swelling over both lids of right eye. He had repeatedly washed eyes with cold water throughout the night. On waking up next day morning, in addition to previous symptoms, his vision was blurred and he experienced high discomfort while looking into sunlight. He approached the Out Patient Department of Salakyatantra, Govt. Ayurveda College Hospital, Thiruvananthapuram, right away for management.

Patient had a history of trauma to face by road traffic accident 2 years back resulting in fracture of nasal bones and loss of upper two and lower left incisors. No history of any other systemic disease, allergies or ocular pathology. Patient has been using reading glasses for the past 2 years for presbyopia.

## Clinical findings

General examination showed PICCLE (Pallor, Icterus, Cyanosis, Clubbing, Lymphadenopathy,

Edema) to be nil. His vital signs were within normal limits. Examination of right eye and adnexa showed increased blinking, oedema over lids, narrow palpebral fissure, and moderate congestion in bulbar and palpebral conjunctiva. Hazy and oedematous cornea and quiet anterior chamber (AC). He had uncorrected visual acquity (UCVA) of 6/18 in the right eye and 6/6 in the left eye. The eye was also examined under the dim illumination of slit lamp biomicroscope which showed normal corneal epithelium with no epithelial defect and presence of Descemet's folds in cornea.

Diagnostic evaluation: From the history and examination, patient was diagnosed to have nayanābhighāta due to upaviṣa exposure in right eye.

Therapeutic intervention: The interventions and treatment outcomes are tabulated below. (Table 1)

Figure 1 and 2 showing the affected eye on day 1 and day 3 (Informed consent was obtained from the patient for the publication of photos and the case report)

Table 1
Therapeutic interventions and outcomes

| Day | Medicines | Procedures | Observations |
|---|---|---|---|
| 1st day | Guḍūcyādi kaṣāyam - 90 ml thrice daily, Avipatticūrṇam - 10 gm. at night with honey internally | Viḍālakam with Mukkādi guḷika, lodhra and yaṣṭī-kṣīra sekam thrice daily. | Haziness of cornea, swelling of conjunctival congestion honey eyelids, reduced. Photophobia reduced. Pain and burning sensation persisted. |
| 2- 3 days | Guḍūcyādi kaṣāyam - 90 ml thrice, daily, Avipatticūrṇam - 10 gm. at night with honey internally. | Jaḷūkāvacaraṇa over right forehead and temple, with above procedures | All subjective symptoms reduced. Cornea clearer and conjunctival congestion markedly low. UCVA right eye 6/9 on 3rd day |
| 4th day | Guḍūcyādi kaṣāyam - 90 ml thrice, daily, Avipatticūrṇam - 10 gm. at night with honey internally. | Jaḷūkāvacaraṇa over right forehead and temple, with above procedures | Cornea clear, conjunctival congestion markedly reduced |
| 5th day | Guḍūcyādi kaṣāyam - 90 ml thrice, daily, Avipatticūrṇam - 10 gm. at night with honey internally. | To continue seka for 2 more days | Complaints resolved completely |

Figure 1
Day 1 (Eye with hazy cornea, Descement's folds, lid swelling and congestion)

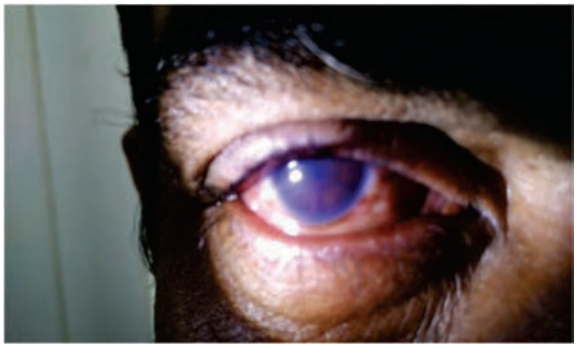
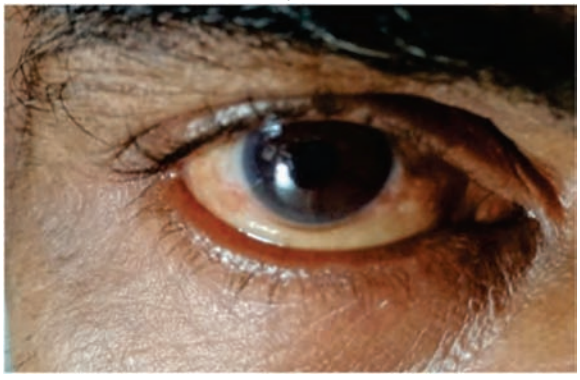


Figure 2
Day 3



## Discussion

Arka is distributed throughout India in dry waste lands. It is a large hard much branched milky shrub, the branches, leaves and inflorescence covered with loose soft white wool. The latex of arka contains akundarin, 0.45% uscharin, 0.15% calotoxin, 0.15% calactin, α- calatropeol, β- calotropeol, β- amyrin and calcium oxalate, and also yields a nitrogen and sulphur containing fish and cardiac poison, gigantin. It also contains traces of glutathione.[1] The latex of *C. gigantea* is acidic in reaction and turns blue litmus red.

Arkakṣīra is one among the upaviṣas. It is snigdha, tikta and uṣṇa and acts like a kṣāra when coming into contact with skin.[2] It has an action causing tissue necrosis, 'kṣaraṇāt kṣaṇanāt vā kṣāra'.

The spectrum of ocular toxicity after accidental inoculation of the latex of arka probably occurs due to two reasons. The first being the acidic nature of the milky sap and second due to the toxins present in the sap.

A review of available medical literature shows that *Calotropis* latex is capable of penetrating the corneal stroma and inducing permanent loss of endothelial cells. Confocal and specular microscopy confirmed permanent endothelial cell loss with morphologic alteration after intracorneal penetration of the latex.[3]

Cases of keratitis with showed corneal edema and striate keratopathy without any evidence of intraocular inflammation, relieved by local corticosteroid use has also been reported.[4] Toxic iridocyclitis due to *Calotropis* has been reported by Tomar et. al[5] and also by Basak et.al.[6]

*Calotropis* latex is ironically relatively non-toxic to the corneal epithelium, but highly toxic to the corneal endothelium. Corneal oedema with Descemet's membrane folds appears to be the predominant feature due to the toxicity of *Calotropis* sap. This corneal oedema is probably due to toxicity of latex towards endothelium.[7] Basak et.al. reported low endothelial cell count in 17 out of 23 eyes (74%) on specular microscopy at three months in comparison to the normal fellow eye.

These findings also suggest that the cause of corneal oedema is endothelial toxicity. The epithelial lesions were seen in some patients who had rubbed their eyes after exposure.

The ocular toxicity of arkakṣīra is an amūrta nayanābhighāta due to upaviṣa. Śopha, rāga, toda, dāha, pāka, gharṣa, etc. are the symptoms of nayanābhighāta. It is understood from previous literature that the corneal oedema thus produced in eye is a viṣajaśopha caused by coming in contact with a viṣavṛkṣa. The line of management adopted here need to be rakta and pitta abhiṣyandahita[8] and the drugs should have antidote or antitoxic properties. The first dhātu affected in the body by viṣa is rakta, same is applicable to the eye as well. Kriyākramas like mukhalepa, seka, etc. which are indicated in nayanābhighāta, are also included in ekādaśa upakrama for śopha.

In the case described here, viḍālaka is local topical application of medicines over eyelids excluding the lashes. The drugs of the compound Mukkādi guḷika are viṣahara in nature. Lodhra and yaṣṭīkṣīrakaṣāya are very helpful in reducing pain as yaṣṭīmadhu is cakṣuṣya, sadyakṣatahita and rakta and sannipāta doṣahara.[9] Lodhra is rakta-kaphapittahara and śophahara i.e. it can reduce inflammatory odema.[9a] Seka was found to make instant remarkable changes in haziness of cornea due to oedema. The haziness had markedly reduced right after the first seka. This may be due to the pressure effect of the stream of seka on the eye, which falls over a large surface area of eyelid as well as transcorneal absorption of drugs used. Raktamokṣa is beneficial for analgesia as well as to inhibit inflammation.[8a] Jaḷūkāvacaraṇa is the method of choice especially in case of toxicities, saviṣa cases.[8b] Jaḷūkāvacaraṇa is practised widely in cases of venous congestion and analgesia. The painkiller

effects of leech application were ascertained in many trials on patients with osteoarthritis who claimed that leeching was more relieving than topical diclofenac with no adverse effects.[10] There are over 100 bioactive substances found in leech salivary glands. Some can function as analgesics, vasodilators, bacteriostatics, anti-inflammatories, antiedematous, and anti-coagulants. These bioactive enzymes may improve blood circulation, increase thrombolysis, and enhance anti-inflammatory responses.[11] Hence it is extremely useful in this case as well.

## Conclusion

The injury from *Calotropis* appears to be common especially around festivals celebrated in regard of Lord Śiva like Śivarātri. All ophthalmologists especially āyurveda Śālākyatantra specialists practising in rural areas need to be well acquainted with the clinical picture so that ocular toxicity due to arkakṣīra can be managed effectively. This case report is relevant as cases of *Calotropis* toxicity reported in medical scientific community is very few even in the field of modern medicine let alone āyurveda. This demonstrates the ability of āyurveda to deal with such acute cases effectively.

### References

1. Namrata S., Piush G., Atul V. P. and Pathak A.K., *Calotropis gigantea: a review on its phytochemical & pharmacological profile,* International Journal of Pharmacognosy; 1(1): 1-8. doi: 10.13040/IJPSR. 0975-8232.1(1).1-8, 2014.

2. Sadananda Sarma, *Rasatarangni*, Reprint Edtn., Taranga 24, Sloka 511-512, Motilal Banarasidas, 2012.

3. Al-Mezaine H. S., Al-Rajhi A. A., Al-Assiri A. and Wagoner M. D., *Calotropis procera (Ushaar) keratitis*, American Journal of Ophthalmology, 139:199-202, 2005.

4. Pandey N., Chandrakar A. K., Garg M. L. and Patel S. S., *Calotropis procera induced keratitis*, Indian Journal of Ophthalmology,;57:58-60, 2009.

5. Tomar V. P., Agarwal P. K. and Agarwal B.L., *Toxic iridocyclitis caused by Calotropis*, Journal of All India Ophthalmological Society,18:15-6, 1970.

6. Basak S. K., Bhaumik A., Mohanta A. and Singhal P., *Ocular toxicity by latex of Calotropis procera (Sodom apple)*, Indian Journal of Ophthalmology, 57(3):232-234. doi:10.4103/0301-4738.49402, 2009.

7. Waikar S. and Srivastava V. K, *Calotropis induced ocular toxicity*, Medical Journal, Armed Forces India, 71(1):92-94. doi:10.1016/j.mjafi.2012.08.017, 2015.

8. Susruta, *Susrutasamhita*, Nibandhasangraha vyakhya of Dalhana, Uttarasthanam 19/3, Chaukhambha Surbharati Prakashan, Varanasi, 2012.

8a. Cikitsasthanam 1/27 8b. Cikitsasthanam 1/29.

9. Arya Vaidya Sala, *Indian medicinal plants*, Vol. 3, P 87, Orient Blackswan Ltd., Chennai.

9a. Ibid. Vol. 5, P 218.

10. Michalsen A., Klotz S., Ludtke R., Moebus S., Spahn G. and Dobos G. J., *Effectiveness of leech therapy in osteoarthritis of the knee: a randomized, controlled trial*, 139:724-3, Annals of Internal Medicine, 2003.

11. Godekmerdan A., Arusan S., Bayar B. and Saglam N., *Medicinal leeches and hirudotherapy*, 35(4):234-239, Turkiye Parazitolojii Dergisi, 2011.

Authors

Aiswarya Nair V., II MS Scholar (Shalakya-Netraroga), Department of Shalakyatantra, Govt. Ayurveda College, Thiruvananthapuram, Kerala.

Abdul Salam A., Professor and Head, Department of Shalakyatantra, Govt. Ayurveda College, Thiruvananthapuram, Kerala.

CLINICAL STUDY

Āryavaidyan, Vol XXXI, No. 2, November 2017 - January 2018, Pages 35 - 42

# Randomized controlled trial to assess the effect of potentiated Triphalācūrṇa with honey in overweight adults

Saniya C. K., Jyothi R. and Sunitha V. K.

**ABSTRACT:** Overweight is being evolved as a major health hazard in urbanized societies and the overweight population has more than doubled in a few decades as a result of changes occurring in food habits and occupational patterns. It has significant health implications in the form of hypertension, diabetes mellitus, coronary heart diseases, etc. Triphalācūrṇa potentiated in khadira [*Acacia catechu* (L.f) Willot] and asana (*Pterocarpus marsupium* Roxb.) decoction along with honey as anupāna is highly effective in reducing sthaulya and atisthaulyavikāras. The study was aimed at establishing the effectiveness of this formulation in patients of age 20-40 years, by randomized controlled trial on 30 patients each in study and control group having BMI (body mass index) from 25-29.99 Kg/M$^2$ and WHR (waist hip ratio) >1 in men, and >0.85 in women. Patients in both groups were instructed to modify their dietary pattern. The experimental group was given the formulation for 30 days in the dose of 6 gm each with 12 gm of poly floral honey as anupāna on empty stomach in the morning and evening. Patients in the control group were given only the dietary modification. After one month of study period, BMI, WHR and other parameters were assessed before treatment and after treatment for both groups and follow ups were taken on 60$^{th}$ day. After testing the hypothesis, it was found that, significant reduction has happened in the study group for all the outcome variables at 5% level.

*Key words:* Potentiated Triphalācūrṇa, Honey, Overweight

## Introduction

With the advent of modern sophisticated techniques in medicine, the last century has witnessed a complete reversal in the morbidity pattern. Non-communicable diseases came into the center stage by eclipsing the communicable diseases. Major among them are life style disorders. Over the recent decades, overweight and obesity have evolved as one among the prominent health hazards and at present it is the fifth leading risks of global deaths.[1]

As per WHO figures, in 2014 more than 1.9 billion adults were overweight.[2] India is the third most obese country, just behind USA and China, according to a study conducted by the Journal Lancet.[3] As per the latest 2015-16 National Family Health Survey, 20.7% of women and 18.6% of men in India are overweight.[4]

Overweight is a risk factor in the development of hypertension, diabetes mellitus, coronary heart diseases, gall bladder diseases, certain types of cancers especially hormone related and large bowel cancers. Several associated diseases, which although not usually fatal, cause a great deal of morbidity in the community, e.g. varicose vein, hernia, osteoarthritis and psychological stress particularly during adolescence. Women affected by obesity are also more likely to face reproductive problems like polycystic ovarian syndrome (PCOS), which eventually leads to infertility.[1]

In Carakasamhita, sthaulya is mentioned as one among the most undesirable traits or 'Aṣṭanindita puruṣa'. This study ventures at administering Triphalā cūrṇa potentiated in khadira and asana decoction along with honey as anupāna. Roots of this formulation can be traced in texts 'Yogāmṛtam'[5] and 'Cikitsāmañjari'[6] which records them as highly effective in sthaulya and its vikāras.`

People are wary of adopting most of the modern weight reduction techniques fearing both grim side

effects and the huge cost involved. Traditional āyurvedic methods, therefore assume greater significance. Intake of khadira and asana kaṣāya bhāvita Triphalācūrṇa along with honey can better serve the purpose of a weight reducer without causing any side effects, and at the same time, promotes overall rejuvenation of body. Triphalā enhances wound healing, cures eye diseases, skin diseases, kḷeda-medovikāras and kaphaja-raktajavikāras. Khadira and asana have hypoglycemic activity too. Honey is good for eyes and has a property of cleansing the body channels along with kaphamedohara property. This study aims to find out the effect of Triphalācūrṇa potentiated in khadira and asana decoction along with honey in reducing body mass index and waist hip ratio along with other anthropometric parameters of overweight.

**Hypothesis**

Null Hypothesis: Triphalācūrṇa potentiated in khadira and asana decoction along with honey is not effective in reducing BMI of overweight adults.

Alternative Hypothesis: Triphalācūrṇa potentiated in khadira and asana decoction along with honey is effective in reducing BMI of overweight adults.

**Materials and methodes**

An effort is made to materialize the formulation mentioned in Sthūlacikitsā chapter of both Yogaratnākaram and Cikitsāmañjari to benefit patients with overweight. Triphalācūrṇa potentiated in khadira and asana decoction along with honey as anupāna is an adoptable and natural way to overcome the ill effects of overweight.

**Preparation of the medicine**

The drugs harītakī (*Terminalia chebula* Retz.), vibhītakī [*Terminalia bellirica* (Gaertn.) Roxb.], āmalakī (*Phyllanthus emblica* L.), khadira, asana and honey were used for the preparation of the medicine.

All the drugs of superior quality were identified and purchased from authorized sources. First five drugs were washed thoroughly in running water to remove dirt and other extraneous materials. Then they were dried in shade and crushed separately from grinding mills to reduce their size. In the initial phase 6 kg each of harītakī, vibhītakī and āmalakī (triphalā) were taken for cūrṇa preparation. Both khadira and asana were taken equal to the total quantity of first three drugs, i.e. a total of 18 kg (9 kg each khadira and asana) were used for the preparation of the decoction.

(i) Preparation of the decoction: 9 kg each of khadira and asana were taken in a large vessel , 8 times i.e.144 litre of water was added to this container and boiled till it was reduced to 1/8$^{th}$ i.e.18 liter. This decoction was used for potentiating Triphalācūrṇa.

(ii) Potentiation (bhāvana): The crushed triphalā was soaked in to the above mentioned decoction and kept overnight till it gets completely absorbed. Then it was kept in shade and completely dried. The process of bhāvana was done again two more times with freshly prepared decoction. Then it is kept under shade and dried.

(iii) Powdering of the potentiated drugs: The dried bhāvita triphalā was powdered fine and kept in airtight non reactive containers.

(iv) Packing and dispensing of the drugs: Each patient required 360 g of potentiated Triphalācūrṇa for a month. They were advised to take the powder in 6 gm in the morning and evening in empty stomach with double quantity i.e. 12 gm of Agmark honey for a period of one month.

**Methodology**

Study Design: Randomized controlled trial.

Study Setting: OPD (Out-patient department) of Swasthavritta Department, Govt. Ayurveda College, Thiruvananthapuram.

Study Population: Patients registering in the OPD of Swasthavritta having BMI from 25 to 29.99 Kg/m$^2$ and WHR > 1 in men, and > 0 .85 in women.

Sample Size: Total 60 patients satisfying the conditions were selected i.e. 30 patients each were assigned to both study (experimental) group and control group.

**Inclusion criteria**

Patients in the age group of 20 - 40 years including both sexes, having BMI from 25 to 29.99 Kg/$m^2$ and WHR > 1 in men, and > 0 .85 in women.

**Exclusion criteria**

Patients undergoing prolonged medications like anti depressants, antipsychotics, anticonvulsants, oral contraceptives, oral hypoglycemic agents, insulin, beta adrenergic blockers, antihistamines, etc. for chronic illnesses.

- Pregnancy and lactation
- Patients on steroid therapy
- Known cases of hypothyroidism, PCOS
- Bronchial asthma

Duration of the study: 30 days and follow up was done for the following one month.

Sampling procedure: Simple random sampling technique was adopted and patients were randomly allocated to the study group and control group using lottery method.

Data collection: It was done using a pre-designed questionnaire and laboratory investigation

Procedure: 60 patients satisfying the inclusion and exclusion criteria were selected. 30 patients each were randomly allocated into the study and control groups by lottery method. Detailed demographic information related to general health condition of the patients was gathered by using the pre-designed questionnaire. Laboratory investigation of blood, body mass index, waist circumference, hip circumference, waist hip ratio, mid arm circumference, mid thigh circumference and chest circumference were checked before the study period. Patients in both groups were instructed to modify their dietary pattern based on the nutrition requirement and intensity of their daily activity for 30 days. Triphalācūrṇa potentiated in khadira and asana decoction was given in the form of fine powder with honey as anupāna for 30 days to the experiment group along with dietary modification. Dietary modification without medicine was prescribed to the patients in the control group. Parameters mentioned above were assessed for both groups after one month of study period.

The medicine was provided for the entire course. 12 gm of potentiated Triphalācūrṇa was given in two divided doses of 6 gm each with 12 gm of poly floral honey as anupāna in empty stomach in morning and evening. On the 31$^{st}$ day and 60$^{th}$ day the above mentioned parameters were measured. The results obtained were statistically analyzed. .

**Outcome variable/Assessment criteria**

- Body weight
- Body mass index (BMI)
- Waist circumference (WC)
- Hip circumference (HC)
- Waist hip ratio (WHR)
- Mid arm circumference (MAC)
- Mid thigh circumference (MTC)
- Chest circumference (CC)

Ethical consideration: Written informed consent of patients and approval from the Institutional Ethical Committee (IEC No.: 104/28.4.2015 dated 28. 04.2015) were also obtained prior to the study.

**Results**

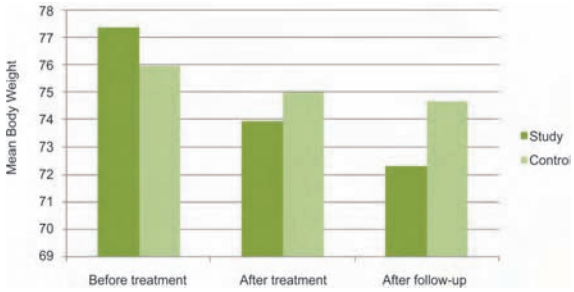
Measures of outcome variables were made at three points-before treatment (BT), after treatment (AT) and after follow up (AF). Apart from assessing and comparing the effect of the medicine on each groups of patients based on descriptive measures like arithmetic mean, standard deviation and coefficient of variation, appropriate statistical tests, both parametric and non parametric tests like one way

repeated measures ANOVA, Kruskal-Wallis and Friedman's test were used.

### 1. Effect of treatment on body weight

Considerable reduction has occurred in the body weight of patients who received the medicine. The mean difference in body weight among the study and control groups before and after the intervention respectively are 3.42 kg and 0.95 kg. (Figure 1)

Figure 1
Effect of treatment on body weight

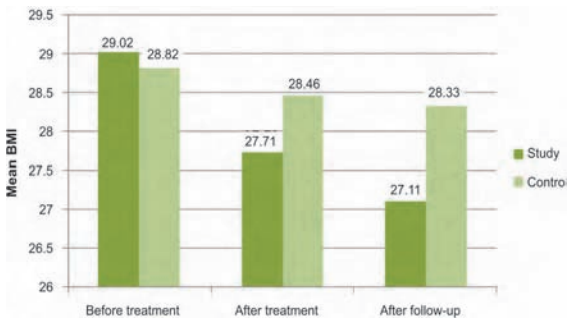



One way repeated measures ANOVA was separately conducted in the study and control groups to test whether the weight reduction is statistically significant or not before treatment, after treatment and after follow up. It was found that statistically significant weight reduction has happened in both groups of patients. It can be concluded that dietary modification along with medicine was highly beneficial for overweight patients in reducing their weight. (Table 1)

### 2. Effect of treatment on BMI

The medicine has considerably reduced the BMI in patients in the study group. Also, the mean reduction in BMI among the patients of the study group before and after the treatment is 1.29 units. The same in the control group is only 0.36 units. (Figure 2)

Figure 2
Effect of treatment on BMI




Since at least one of the variables did not clear the test of normality at 5% level, non-parametric test 'Kruskal-Wallis' was used. It was found that there is significant change in BMI at 5% level (value of Kruskal Wallis statistics is 35.66, P value 0.0001). It is worth mentioning that drastic change in BMI was seen in female patients.

Table 1
ANOVA (Study & Control group) - Effect of treatment on body weight

| Study group | | | | | |
|---|---|---|---|---|---|
| | SS | DF | MS | F (DFn, DFd) | P value |
| Treatment (between columns) | 398.4 | 2 | 199.2 | F (1.162, 33.71) = 145.5 | P<0.0001 |
| Individual (between rows) | 6955 | 29 | 239.8 | F (29, 58) = 175.2 | P<0.0001 |
| Residual (random) | 79.39 | 58 | 1.369 | | |
| Total | 7433 | 89 | | | |
| Control group | | | | | |
| | SS | DF | MS | F (DFn, DFd) | P value |
| Treatment (between columns) | 27.15 | 2 | 13.58 | F (1.221, 35.41) = 14.53 | P=0.0002 |
| Individual (between rows) | 7402 | 29 | 255.2 | F (29, 58) = 273.2 | P<0.0001 |
| Residual (random) | 54.18 | 58 | 0.9342 | | |
| Total | 7484 | 89 | | | |

In the control group, it was observed that the BMI is not significantly changed after testing the hypothesis using Kruskal-Wallis test (value of Kruskal Wallis statistics is 5.762, P value .0561).

### 3. Effect of treatment on waist circumference

Mean reduction in the WC in the study group of patients is 3.3 cm. At the same time the same measure on an average reduced only 0.4 cm among patients in the control group. (Figure 3 and Table 2)

Figure 3

Effect of treatment on Waist circumference

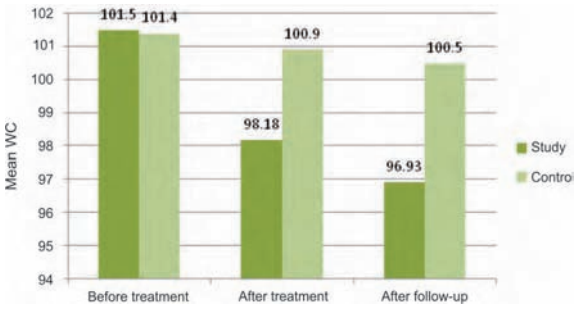



Table 2

ANOVA (Study group) - Effect of treatment on Waist circumference

| | SS | DF | MS | F (DFn, DFd) | P value |
|---|---|---|---|---|---|
| Treatment (between columns) | 328.9 | 2 | 164.5 | F (1.062, 30.81) = 43.05 | P<0.0001 |
| Individual (between rows) | 6848 | 29 | 236.1 | F (29, 58) = 61.81 | P<0.0001 |
| Residual (random) | 221.6 | 58 | 3.82 | | |
| Total | 7398 | 89 | | | |

The effect of medicine was quick when it comes to a variable like WC, which is perceived to be highly difficult to cut short. It is also to be mentioned that other weight reduction techniques are mostly concentrating on reducing the total body weight not on the WC. In the study group, it is found that many female patients have improved their quality of menstrual cycle within the limited period of the study due to the reduction in WC.

### 4. Effect of treatment on hip circumference

Hip circumference has also undergone significant reduction on an average after receiving the medicine. Patients in the study group have reduced 2.1cm of their hip circumference and are far better when compared to the 1.00 cm reduction in the control group. (Figure 4 and Table 3)

Figure 4

Effect of treatment on Hip circumference

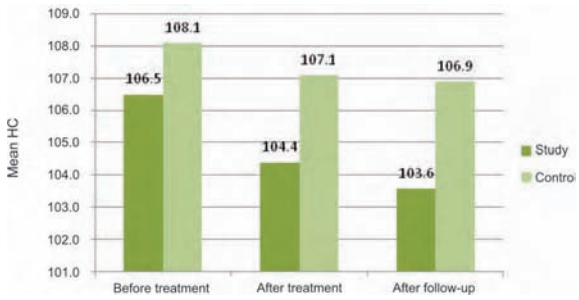



Table 3

ANOVA (Study group) - Effect of treatment on Hip circumference

| | SS | DF | MS | F (DFn, DFd) | P value |
|---|---|---|---|---|---|
| Treatment (between columns) | 139.6 | 2 | 69.81 | F (1.091, 31.62) = 36.03 | P<0.0001 |
| Individual (between rows) | 3474 | 29 | 119.8 | F (29, 58) = 61.83 | P<0.0001 |
| Residual (random) | 112.4 | 58 | 1.938 | | |
| Total | 3726 | 89 | | | |

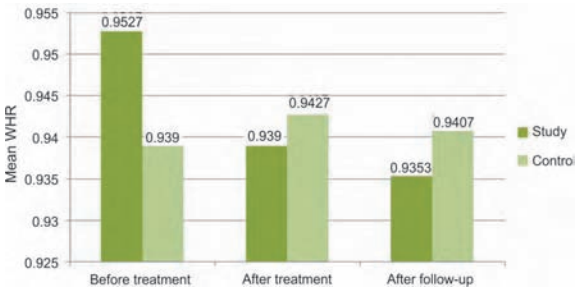
One way Repeated ANOVA was also conducted to test the significance of the measure. At 5% level, the change is highly significant with a P value 0.0001.

### 5. Effect of treatment on waist hip ratio

The WHR has reduced by 0.01 units on an average in study group whereas no positive change happened in

the control group. It is also interesting to note that the mean of the ratio has increased among the patients in the control group. (Figure 5)

Figure 5
Effect of treatment on Waist hip ratio




It is observed that the WHR of women is very high when compared with those of men, even women with normal BMI showed high WHR while overweight men had WHR within the normal range.

The statistical significance of WHR is established through testing using the non-parametric method of Friedman test (value of the test statistic is 28.74, P value 0.0001). It is found that the change in WHR in study group is statistically highly significant.

**6. Effect of treatment on mid thigh circumference**

The mean reduction in the study group with regard to the concerned measure is 1.77 cm. At the same time reduction among the control group patients are not at par, having only 0.3 cm decrease. (Figure 6 and Table 4)

Figure 6
Effect of treatment on Mid thigh circumference

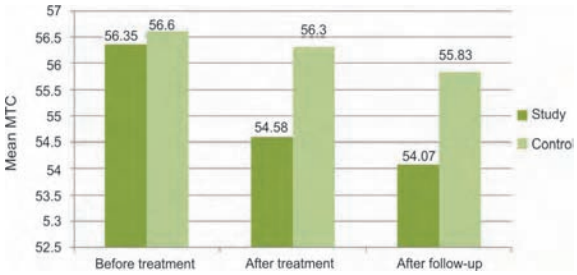



Table 4
ANOVA (Study group) - Effect of treatment on Mid thigh circumference

| | SS | DF | MS | F (DFn, DFd) | P value |
|---|---|---|---|---|---|
| Treatment (between columns) | 86.02 | 2 | 43.01 | F (1.053, 30.54) = 23.1 | P<0.0001 |
| Individual (between rows) | 981 | 29 | 33.83 | F (29, 58) = 18.17 | P<0.0001 |
| Residual (random) | 108 | 58 | 1.862 | | |
| Total | 1175 | 89 | | | |

It is evident that the statistically significant change in MTC of the study group is due to the use of medicine.

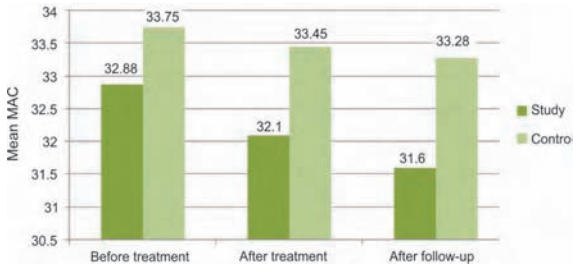
A repeated measure ANOVA also showed that the difference are not arised out of chance, but is produced by the intake of medicine alone.

**7. Effect of treatment on mid arm circumference**

The average reduction in the mid arm circumference among study group patients is 0.78 cm and among the control group is 0.3 cm. The descriptive statistics table below gives more information. (Figure 7 and Table 5)

The significance of change in the measurement is established through One Way ANOVA. The hypothesis of no difference is rejected at 5% level with P value 0.0001.

Figure 7
Effect of treatment on Mid arm circumference




**8. Effect of treatment on chest circumference**

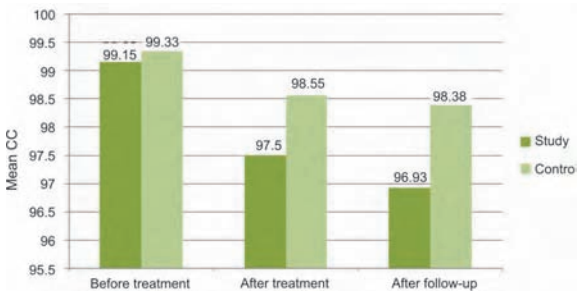
The differences in study group are very high when compared with that of control group with respect to

Table 5
ANOVA (Study group) - Effect of treatment on Mid arm circumference

| | SS | DF | MS | F (DFn, DFd) | P value |
|---|---|---|---|---|---|
| Treatment (between columns) | 25.11 | 2 | 12.55 | F (1.271, 36.87) = 33 | P<0.0001 |
| Individual (between rows) | 602.7 | 29 | 20.78 | F (29, 58) = 54.64 | P<0.0001 |
| Residual (random) | 22.06 | 58 | 0.3804 | | |
| Total | 649.8 | 89 | | | |

CC of the patients. The average reduction of CC is 1.65 cm in study group and 0.78 in control group. (Figure 8)

Figure 8
Effect of treatment on Chest circumference




Since the variable has failed the normality assumption, the significance is tested using Friedman statistics and it is found that the reduction in CC is statistically significant (Friedman test statistic is 50.54, P value .0001).

It was observed during the study that the reduction in the CC was more in women compared to men. This may be due to the excess fat in the chest areas of the women than men.

**Probable mode of action of the medicine**

The tikta-kaṣāyarasa and laghu-rūkṣaguṇa of the drug help in kaphamedoharaṇa. Dīpana-anulomana guṇa of the drug removes the obstruction of the vāta and maintains the uniform formation of dhātus which prevents the occurrence of sthaulya.

Diet regulation was prescribed for both groups help to reduce the calorie intake so no excess calorie is stored in the body. Evaluating the action of the medicine, Triphalācūrṇa itself has kaphamedohara property. But when it is potentiated in khadira and asana kaṣāya, they impart their inherent kapha-pitta-hara property to Triphalācūrṇa. These bhāvana dravyas are best hypoglycemic agents too. Overweight and insulin resistance are interlinked. Hence use of hypoglycemic agents helps to prevent overweight and its further progression towards higher grades of obesity. As the number of bhāvana increases, the qualities offered are more. Here a total of three bhavanas were done. Honey acts as anupāna and helps to transport the medicine to deeper tissues of the body. The main involved dhātu in sthaulya is medas, which is a deep seated dhātu, so to carry the medicine into such areas, a good vehicle like honey is necessary. It is not only acting as a vehicle, but also imparts its qualities to the formulation with its yogavāhi property.

The main ingredient in the formulation is triphalā, which possess some peculiar properties. It can stimulate metabolism, suppress appetite, affect serotonin and can prevent digestion of fat. Oxidative stress plays critical role in the pathogenesis of overweight. Triphalā is very rich in antioxidant, which may explain the useful effects of this compound in the treatment of overweight. Triphalā contains gallic acid as the major component. Gallic acid (3, 4, 5-trihydroxybenzoic acid; GA) is a naturally abundant phenolic compound. It is reported to have antioxidant activity and is expected to reduce the risk of disease and brings health benefits through daily intake. Taking together, the above mentioned properties may be the reason behind the effect of triphalā on weight reduction as seen in this study.[7]

Similarly, khadira possess the peroxyl radical scavenging capacity and antioxidant activity. Catechin present in this drug is responsible for decrease in serum concentrations of triglycerides and non-esterified fatty acids. The chemical constituents in this plant are responsible for the inhibitory action of plasma lipase and glucosidase which in turn results in reduction in intestinal absorption of lipids and carbohydrates.[8] The anti-obesity actions of this plant may be attributed to increased expression of energy expenditure-related genes in skeletal muscle and liver, and decreased fatty acid synthesis and fat intake in the liver. It reduces hyperglycemia and hyper-insulinemia by increasing adiponectin secretion and suppressing TNF-α(tumour necrosis factor) secretion by white adipocytes, and elevating the expression of GLUT4 (glucose transporter type 4) in skeletal muscle in addition to reducing obesity.[8]

Presence of tannins, terpenoids and flavonoids in asana is responsible for hypoglycemic activity.[9] The same ingredients may be the reason for its antiobesity action, since diabetes and obesity are over linked.

Honey modulates appetite-regulating hormones such as leptin, ghrelin and peptide YY and increases plasma antioxidants and ameliorates oxidative stress in tissues, thereby contributing to weight reduction.[10]

## Conclusion

On analyzing all the parameters of overweight, this combination is found to be effective. The study clearly rejects the null hypothesis that the medicine makes no effect in parameters of overweight, i.e. it accepts the alternative hypothesis that the medicine has significant effect in reducing the parameters under the study. Let this formulation alleviate the sufferings of overweight generation by making them healthy individuals.

## Acknowledgment

I sincerely express my intense gratitude and indebtedness to my guide Dr. Sunitha V.K , MD (Ay.) and my co-guide Dr. Jyothi R., MD (Ay.) for their timely advice and valuable suggestions given throughout the research. I extend my wholehearted thanks to all my teachers, friends and patients. I express my sincere gratitude to Kerala State Council for Science, Technology and Environment for including this dissertation in the Student Projects category for the year 2016-17.

### References

1. Park K., *Park's Text book of Preventive and Social Medicine*, 23rd Edtn., Banarsidas Bhanot Publishers, Jabalpur, 2011.

2. http://www.who.int/topics/obesity/en/ (accessed on 27/03/2015).

3. Stephen Lim S., *Global Burden of Disease Study*, Lancet Journal, Vol. 380(9859), P 1477-1590(accessed on 12.04.2015), 2013.

4. http://www.rchiips.org/nfhs (accessed on 20.2.2017)

5. Sreeman Namboothiri D., *Yogamritam*, 6th Edtn., P 309, Vidyarambham Publishers, Alappuzha, 2014.

6. Sreeman Namboothiri D., *Chikitsamanjari*, 11th Edtn., P 417, Vidyarambham Publishers, Alappuzha, 2013.

7. https://www.ncbi.nlm.nih.gov NCBI Literature PubMed Central (PMC). (accessed on 19.4.17).

8. https://www.hindawi.com/journals/ecam/2011/952031/. (accessed on 19.4.17).

9. https://www.ncbi.nlm.nih.gov NCBI Literature PubMed Central (PMC). (accessed on 19.4.17).

10.https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3399220/. (accessed on 20.4.17).

Authors

Saniya C. K., III MD Scholar, Department of Svasthavrutta, Govt. Ayurveda College, Thiruvananthapuram, Kerala.
Jyothi R., Associate Professor, Department of Svasthavrutta, Govt. Ayurveda College, Thiruvananthapuram, Kerala.
Sunitha V. K., Professor, Department of Svasthavrutta, Govt. Ayurveda College, Thiruvananthapuram, Kerala.

PLANT STUDY

Āryavaidyan, Vol XXXI, No. 2, November 2017 - January 2018, Pages 43 - 51

# Study on macro and micro nutrients content in the leaves of *Murraya koenigii* (L.) Spreng.

Mohanraj Pattar, Santoshkumar Teerthe, Ashwini A. and Kerur B. R.

**ABSTRACT**: A macro and micro nutrients content analysis was carried out in leaves of *Murraya koenigii* (L.) Spreng., an indigenous medicinal plant, collected from different places of North Karnataka. The leaves were digested with Conc. HCl, deionized water and ash (25:25:1:950) and the contents of macro and micro nutrients and harmful heavy metals such as Potassium (K), Calcium (Ca), Magnesium (Mg), Iron (Fe), Molybdenum (Mo), Copper (Cu), Manganese (Mn), Zinc (Zn), Aluminium (Al), Vanadium (V), Cadmium (Cd) and Titanium (Ti) were determined by analytical Atomic absorption spectrometry (AAS) technique. The experimental results confirmed the presence of mineral nutrients which are beneficial to the human body, within limits. The heavy metals like Cd and Al, which are harmful to human body were within the limits but concentration of Al was absent in the leaves collected from Shahapur and Kappathgudda. The data obtained in this study may help in the synthesis of new drugs with various combinations of plants that can cure many diseases.

*Key words:* *Murraya koenigii* (L.) Spreng., Macro and Micro nutrients, Atomic absorption spectroscopy.

## Introduction

Medicinal plants are the richest bioresource of drugs of traditional systems of medicine. They play an important role in meeting the global health care needs. Medicinal plants supply minerals, vitamins and certain hormone precursors in addition to protein and energy to the body.[1, 2] According to the survey reported by World Health Organization (WHO), about 80% of the world's population depends the traditional medicinal plants in direct or indirect ways to overcome their illnes. The traditional medicine system uses indigenous medicinal plants widely as home remedies to improve the health and to prevent or cure various life style disorders. It depends on the mineral nutrient contents of the plants. The concentration level of the mineral nutrients in the plant plays an important role in chemical, biological, biochemical, metabolic, catabolic and enzymatic reactions in the living organism which will lead to the formation of active organic constituents[3] and these minerals varies by the geochemical characteristics of the soil and environmental conditions.[4] During the past few decades, a significant increase in the use of traditional medicine is seen due to their minimal side effect, easy availability and acceptability.[5]

Essential macro and micro nutrients in indigenous medicinal plants have been investigated by many researchers to strengthen the importance of mineral nutrients content analysis with respect to human health.[6] Macro nutrients include carbohydrates, fats and proteins which are the structural and energy giving caloric components. Whereas the micro nutrients are the vitamins, minerals, trace elements, phytochemicals and antioxidants.

Human body requires a number of mineral nutrients to maintain a good health.[7] In this context several attempts have been made to determine the mineral nutrient contents of indigenous medicinal plants using different elemental analysis techniques from various countries all over the world.[8]

In the present study, leaves of *Murraya koenigii* (L.) Spreng., a commonly available garden plant was

collected from different place of North Karnataka *viz*. Bidar, Kalaburagi, Shahapur, Sandur and Kappathgudda. They are used in traditional medicinal system for the treatment of many diseases due to its anti-diabetic, cholesterol lowering property, anti-diarrheal, antioxidant, antiulcer, antimicrobial, antibacterial and many more. The collected leaves of *Murraya koenigii* (L.) Spreng. were investigated for their mineral nutrients content using analytical AAS technique. This technique measures the concentration of elements. Atomic absorption is so sensitive that it can measure down to ppb (parts per billion) or ppm (parts per million) of a gram ($\mu g\ dm^{-3}$or $10^{-6}$) in a sample. The technique makes use of the wavelengths of light specifically absorbed by an element present in the sample. They correspond to the energies needed to promote electrons from one energy level to the other, i.e., higher energy level. AAS has many uses in different areas like clinical analysis, environmental analysis, pharmaceuticals, industry, mining and agriculture.[9,10]

## Materials and methods

Plant material: Figure 1 is showing the Karnataka region map and figure 2 is showing the leaves of the *Murraya koenigii* (L.) Spreng., an indigenous medicinal plant.

Sample collection: North Karnataka locally known as Uttara Karnataka is a geographical region consisting of mostly semi-arid plateau from 300 to 730 metres (980 to 2,400 ft.) elevation that constitutes the northern part of the South Indian state of Karnataka. Districts of North Karnataka are Bidar, Belgaum, Gulbarga, Yadagiri, Raichur, Koppal, Bellary, Bijapur, Bagalkot, Gadag, Dharwad, Haveri, and Uttara Kannada Districts. Leaves of *Murraya koenigii* (L.) Spreng., an indigenous medicinal plant were plucked from different places of North Karnataka region viz. Bidar, Kalaburagi, Shahapur, Sandur and Kappathgudda. About a few kg of leaves were collected and washed in deionized water to eliminate the contamination due to dust and

Figure 1
Map of Karnataka


Figure 2

Leaves of *Murraya koenigii* (L.) Spreng.

environmental pollution. The washed leaves were air-dried under shade for more than 30-45 days and then grinded to get fine powder which was further used for the mineral nutrients content analysis.

Sample preparation for mineral nutrients content analysis: 10 gm of powdered *Murraya koenigii* (L.) Spreng. plant leaves were taken in a silica crucible and kept in an oven for 2-3 hours at 250-350$^0$C to get ash. The obtained ash was used for the preparation of solution. The solution was prepared by mixing

concentrated HCL, double distilled water and 1gm of ash in the ratio 25: 25:1. The mixed solution was then stirred for few minutes and was then filtered using Whatman filter paper 41. A 950 ml of double distilled water was added to the filtered solution to make it 1000 ml solution. The same procedure was repeated for all other plant material samples.[11] (The prepared solutions are as shown in Figure 3) The same solution was used for the measurement of mineral nutrients content analysis using AAS technique.

Determination of elements: The mineral nutrients such as K, Ca, Mg, Fe, Mo, Cu, Mn, Zn, Al, V, Cd and Ti in the leaves of *Murraya koenigii* (L.) Spreng. plant samples were analyzed using analytical atomic absorption spectrophotometer. It is manufactured by Thermo Scientific™ with a model No. i CETM-3000 series and it is equipped with dedicated flame, furnace or combined flame and furnace option. Air-$C_2H_2$ and $N_2O$- $C_2H_2$ flame was used for determination mineral nutrients content. The instrument was operated with

Figure 3
Samples for mineral nutrients content analysis

the conditions shown in Table1. The calibration has been carried out using different hollow-cathode lamps for Al, Cu, Mg, Zn, and Cd were employed as radiation source and calibrated using 100 ml standard solutions in equal ratio. A detector measures the wavelengths of light transmitted by the sample, and compares them to the wavelengths which originally passed through the sample. Atoms of each element will emit a characteristic spectral line. Every atom has its own distinct pattern of wavelengths at which it will absorb energy, due to the unique configuration of electrons in its outer shell. This enables the qualitative analysis of a sample. The absorption wavelength for the determination of each element with its linear working range and correlation coefficient was calibrated for the analysis. A monochromator was used to select the specific wavelength of light that is absorbed by the sample and to exclude other wavelengths. The selection of the specific wavelength of light allows for the determination of the specific element of interest when it is in the presence of other elements. Figure 4 shows the instrument processes of an atomic absorption spectrometer.

**Results and discussion**

Table 2, 3 and 4 shows the concentrations of essential macro nutrients, essential micro nutrients and harmful heavy metals measured in the leaves of *Murraya koenigii* (L.) Spreng..

Table 1
Operating parameter for working elements

| Elements Flow | Wavelength (nm) | Slit width (nm) | Lamp Current | Flame Type | Fuel Flow (L/min) | Characteristic Conc. (mg/L) | Burner Height (mm) |
|---|---|---|---|---|---|---|---|
| Mg | 285.2 | 0.5 | 75% | Air-C2H2 | 1.2 | 0.0170 | 7 |
| Al | 309.3 | 0.5 | 100% | N2O- C2H2 | 4.3 | 12.0442 | 11 |
| K | 766.5 | 0.5 | 100% | Air-C2H2 | 1.2 | 0.0567 | 7 |
| Mn | 279.5 | 0.2 | 75% | Air-C2H2 | 1.0 | 0.0860 | 7 |
| Fe | 248.3 | 0.5 | 75% | Air-C2H2 | 0.9 | 0.2344 | 7 |
| Cr | 357.9 | 0.5 | 100% | N2O- C2H2 | 4.2 | 0.6196 | 8 |
| Ca | 422.7 | 0.5 | 100% | N2O- C2H2 | 4.2 | 0.2340 | 11 |
| Cu | 324.8 | 0.5 | 75% | Air-C2H2 | 1.1 | 0.1119 | 7 |
| Zn | 213.9 | 0.2 | 75% | Air-C2H2 | 1.2 | 0.0333 | 7 |
| Cd | 228.8 | 0.5 | 50% | Air-C2H2 | 1.2 | 0.0344 | 7 |
| Si | 251.6 | 0.5 | 75% | N2O- C2H2 | 4.9 | 2.698 | 11 |
| Mo | 313.3 | 0.5 | 75% | N2O- C2H2 | 4.7 | 3.6551 | 11 |
| V | 318.5 | 0.5 | 75% | N2O- C2H2 | 4.7 | 4.2067 | 11 |
| Ti | 365.4 | 0.5 | 75% | N2O- C2H2 | 4.7 | 45.6638 | 11 |

Figure 4
Instrument processes of an Atomic absorption spectrometer

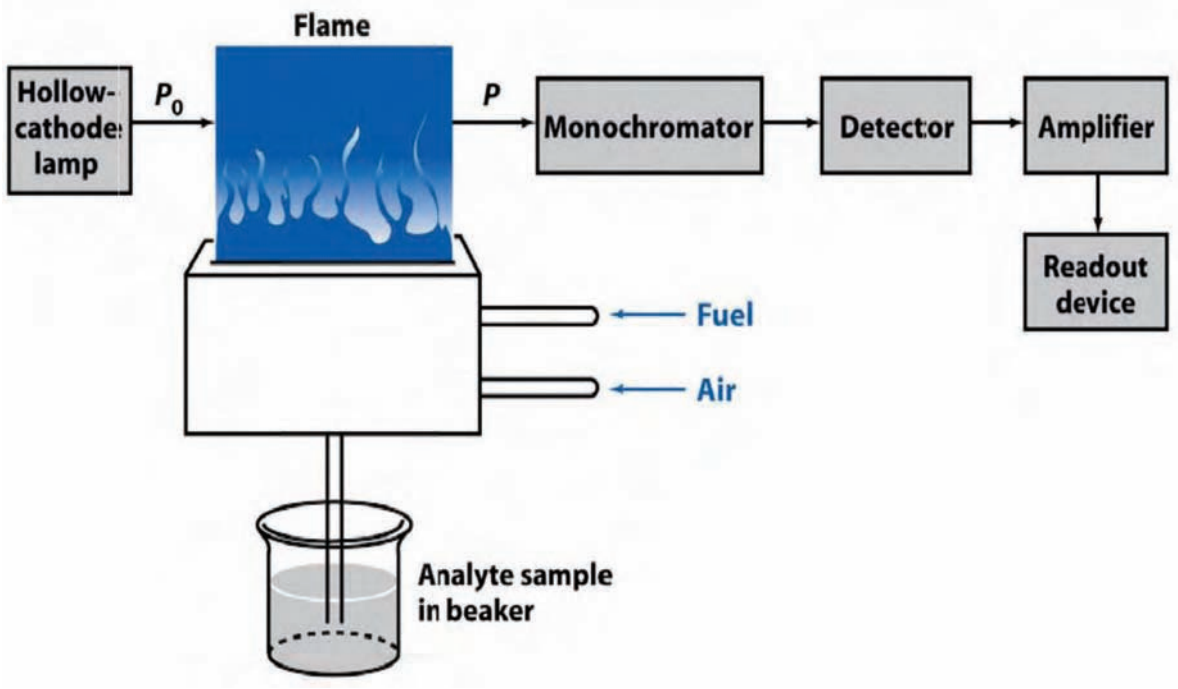


Table 2

Essential macro nutrients concentration (mg/L) of *Murraya koenigii* (L.) Spreng. leaves

| Sl. No. | Mineral | Bidar | Kalaburagi | Shahapur | Sandur | Kappathgudda |
|---|---|---|---|---|---|---|
| 1. | K | 16.2793 | 17.1518 | 17.5753 | 17.3008 | 17.0827 |
| 2. | Ca | 68.1831 | 73.779 | 75.9759 | 71.6995 | 74.3512 |
| 3. | Mg | 6.8058 | 7.0280 | 7.3278 | 7.0660 | 7.2192 |

Table 3

Essential micro nutrients concentration (mg/L) of *Murraya koenigii* (L.) Spreng. leaves

| Sl. No. | Mineral | Bidar | Kalaburagi | Shahapur | Sandur | Kappathgudda |
|---|---|---|---|---|---|---|
| 1. | Zn | 0.1071 | 0.0744 | 0.2086 | 0.1192 | 0.1198 |
| 2. | Fe | 8.8503 | 3.1464 | 1.1948 | 3.7004 | 6.1110 |
| 3. | Cu | 0.0364 | 0.0460 | 0.0919 | 0.0298 | 0.0527 |
| 4. | Mn | 0.3240 | 0.2419 | 0.2840 | 0.1145 | 0.3217 |
| 5. | Mo | 2.3720 | 2.808 | 2.5465 | 2.4943 | 2.2794 |
| 6. | V | 1.9062 | 2.0665 | 2.0436 | 1.7820 | 1.9617 |
| 7. | Ti | 4.6044 | 4.7605 | 4.9615 | 2.2708 | 2.8988 |

Table 4

Harmful heavy metals concentration (mg/L) of *Murraya koenigii* (L.) Spreng. leaves

| Sl. No. | Mineral | Bidar | Kalaburagi | Shahapur | Sandur | Kappathgudda |
|---|---|---|---|---|---|---|
| 1. | Cd | 0.0095 | 0.0188 | 0.0097 | 0.0044 | 0.0040 |
| 2. | Al | 0.5249 | 0 | 0 | 0.3495 | 1.7302 |

**Essential macro nutrients**

**Calcium (Ca)**

The concentration of calcium was found in all the collected leaves of *Murraya koenigii* (L.) Spreng. and it was the highest compared to all other macro-nutrients. It could be due to the fact that the soil of North Karnataka region contains maximum amount of calcium and the same is reflected in the medicinal plants. The level of calcium varied from 68.1831-75.9759 mg/l in all samples. Figure 5 shows the calcium concentration in the leaves of *Murraya koenigii* (L.) Spreng., the least for Bidar and the highest is of Shahapur. Calcium is essential for all organisms, used in cell walls, bones etc. It helps in the transport of long chain fatty acids which helps in preventing high blood pressure, heart diseases, cardiovascular diseases, repair worn out cells, strong teeth in humans, building of RBCs and body mechanism. That is why calcium has been extensively used for the treatment of various diseases.

**Potassium (K)**

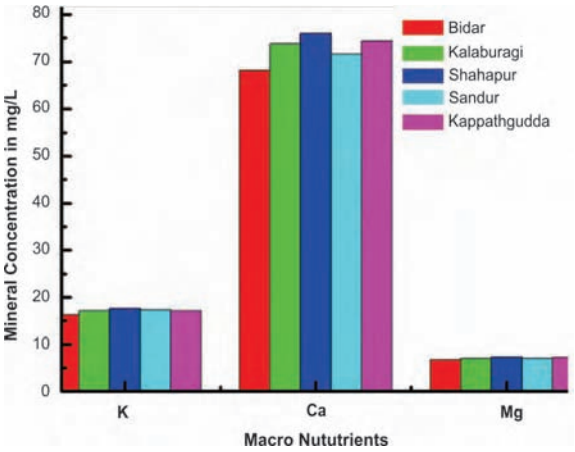
The concentration of potassium was found in all the collected leaves of *Murraya koenigii* (L.) Spreng. and was the second dominant essential macro nutrient. The presence of high amount of the K concentration in the leaves could be due to the botanical structure as well as the mineral composition of the soil and also other factors like the use of fertilizers, water irrigation and geological conditions of the region. The level of K varied from 16.2793-17.5753 mg/L in all the

samples collected from different places of North Karnataka region. The mineral concentration level is same as the Ca i.e. mineral concentration is least for Bidar and highest for Shahapur (Figure 5). Potassium is essential for all organisms with the possible exception of blue green algae. It is a major cation and is important in nerve action. Potassium reduces the blood pressure but moderately toxic to mammals when injected intravenously.

**Magnesium (Mg)**

The concentration of magnesium was also found in all collected leaves and was the third dominant mineral. The level of Mg was varied from 6.8058-7.3278 mg/L in all samples collected from different places of North Karnataka region. Like Ca and K the mineral concentration level of Mg was almost same for the leaves collected from different places which can be seen in Figure 5. Magnesium works with calcium to help transmitting nerve impulse in the brain. Magnesium has calming effect and works on the nervous system of those peoples, suffering from depression. In blood, its quantity is 2-4 mg/100 ml. Magnesium plays an important role in the phosphorylation reactions of glucose and its metabolism. Its deficiency has been implicated in insulin resistance, carbohydrate intolerance, dyslipidemia and complications of diabetes.

Figure 5
Comparative study of essential macro nutrients in the leaves of *Murraya koenigii* (L.) Spreng.




**Essential micro nutrients**

**Zinc (Zn)**

The concentration of zinc was found in all the collected leaves of *Murraya koenigii* (L.) Spreng. and their level was in the range of 0.0744-0.2086mg/L. The mineral nutrient concentration of Zn was in very small amount. Several biological roles of Zn have been reported and over 200 proteins and enzymes contain Zn and produce important role in DNA synthesis, brain development, steroidogenesis, bone formation, wound healing. (Figure 6)

**Iron (Fe)**

Iron is an essential mineral to prevent anemia and cough associated with angiotensin converting enzyme (ACE) inhibitors. The mineral concentration of Fe was in the range of 1.1948-8.8503 mg/L. For the formation of hemoglobin Fe is necessary. For the transfer of oxygen, Fe is required in human body.[12] Iron deficiency is the most prevalent nutritional deficiency in humans.[13] (Figure 6)

**Copper (Cu)**

The mineral concentration of copper was 0.0298 mg/L in leaves of *Murraya koenigii* (L.) Spreng. of Sandur and 0.0527 mg/L in leaf sample of Kappathgudda. Copper plays an important role in the treatment of chest wounds, to prevent inflammation in arthritis and similar diseases. It is required for some essential enzymes such as super oxide dismutase, cytochrome oxidase, lysyl oxidase, etc. Excess consumption of Cu results in dermatitis, metallic taste in the mouth, hair and skin discoloration etc. Copper play role in some neurological conditions like Alzheimer's disease, Wilson's disease, etc.[14] (Figure 6)

**Manganese (Mn)**

The mineral concentration of manganese was 0.1145mg/L in leaves of *Murraya koenigii* (L.) Spreng. of Sandur and 0.3240mg/L in leaf sample of

Bidar. Mn can help to assist the body in metabolizing protein and carbohydrates. (Figure 6)

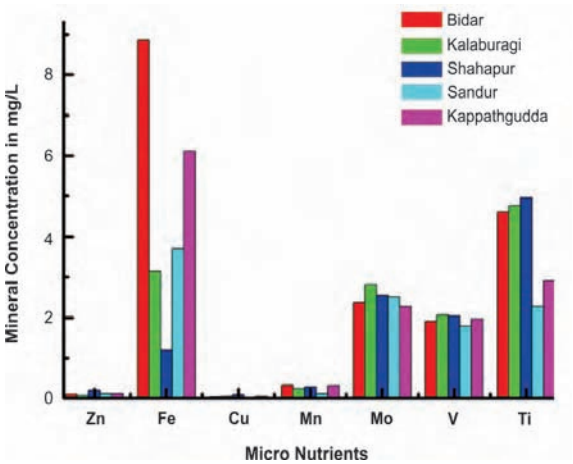
**Molybdenum (Mo)**

The concentration of molybdenum was found in all the collected leaves of *Murraya koenigii* (L.) Spreng. and it varied from 2.2794 -2.808 mg/L. Molybdenum is a rare mineral, but it is essential for human body for various metabolic processes. The amount of Mo in the plant depends on the soil content in the growing area. Molybdenum is stored in the body, particularly in the liver, kidneys, glands and bones. It is also found in the lungs, spleen, skin and muscles. About 90% of the molybdenum eaten in foods is eliminated by the body through the urine.(Figure 6)

**Vanadium (V)**

The concentration of vanadium was found in all the collected leaves of *Murraya koenigii* (L.) Spreng. that varied from 1.7820-2.0665 mg/L. Vanadium affects carbohydrate metabolism including glucose transport, glycolysis, glucose oxidation and glycogen synthesis.[14] At a dose of 100 mg/day vanadyl sulfate improves insulin sensitivity.[15] Its possible mechanism of action in glycemic control is thought to be primarily insulin mimetic with up regulation of insulin receptors. (Figure 6)

Figure 6
Comparative study of essential micro nutrients in the leaves of *Murraya koenigii* (L.) Spreng.




**Titanium (Ti)**

The concentration of titanium was found in all the collected leaves of *Murraya koenigii* (L.) Spreng. and it varied from 2.2708-4.7605 mg/L. Titanium is a physically promotive trace mineral. The function of Ti in not known yet. It is harmless to our body. (Figure 6)

**Harmful heavy metals**

**Cadmium (Cd)**

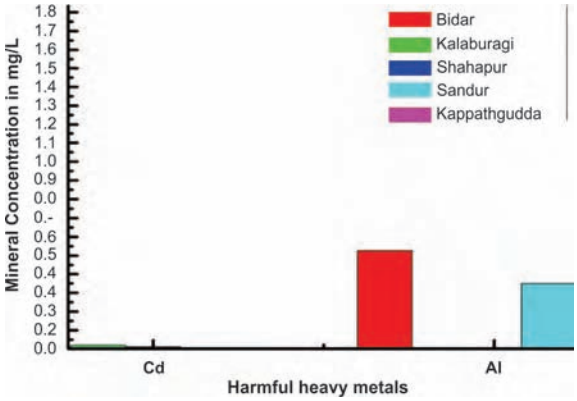
The concentration of cadmium was found in all the collected leaves of *Murraya Koenigii* (L.) Spreng. and their level was in the range of 0.0040-0.0188 mg/L. The mineral concentrations of leaves collected from different place of North Karnataka were very low and within the permissible limit set by WHO. Cadmium is a non-essential harmful heavy metal which biochemically replaces zinc and causes high blood pressure. It also damages the kidney and liver[16]and causes a disease known as Itai-itai. (Figure 7)

**Aluminium (Al)**

The concentration of aluminum was not found in all the leaves of *Murraya Koenigii* (L.)Spreng.. It was present in the leaves collected from Bidar, Sandur and Kappathgudda in the range of 0.3495-1.7303 mg/L. The concentration of Al was high in the leaves collected from Kappathgudda and was totally absent in Kalaburagi and Shahapur. Aluminum is usually not harmful. Some studies show that aluminum may develop Alzheimer's disease, but other studies have not found this to be true. (Figure 7)

In the present study 12 mineral nutrients *viz*. Macro nutrients, micro nutrients and harmful heavy metals concentration were determined and found varying from place to place. These mineral nutrients help us to prevent and cure various diseases and are very essential for human health.

Figure 7
Comparative study of harmful heavy metals in the leaves of *Murraya koenigii* (L.) Spreng.




## Conclusion

The present study on macro and micro nutrients content in the leaves of *Murraya koenigii* (L.) Spreng. reveals the presence of various mineral nutrients attributed to the presence of the minerals of the soil, the different botanical structure of the medicinal plant or soil, environmental factors including atmosphere and pollution, season of collection sample, age of indigenous medicinal plant and soil conditions in which plant grows. From this study it is also verified that the leaves of *Murraya koenigii* (L.) Spreng. contains concentration of micro nutrients *viz*. copper and zinc along with macro and other micro nutrients, which are required for the metabolism as per the recommendations of WHO.[16-18] The data obtained in the present study will be helpful in the synthesis of new modern drugs with various combinations of plants which can be used to cure many diseases. However, more detailed study of chemical composition of the indigenous medicinal plants is required which is progressive in this direction.

### References

1. Faizul Haq and Rahat Ullah, *Comparative determination of trace elements from Allium sativum, Rheum australe and Terminalia chebula by atomic absorption spectroscopy*, International Journal of Biosciences (IJB), Vol. 1, No. 5, P 77-82, 2011.

2. Antia B.S., Akpan E. J., Okon P. A. and Umoren I. U., *Nutritive and anti-nutritive evaluation of sweet potatoes (Ipomoea batatas) leaves*, Pakistan Journal of Nutrition, 5: 166-168, Asian Network for Scientific Information, 2006.

3. Serfor-Armah Y., Nyarko B. J. B., Akaho E. H. K., Kyere A. W. K., Osae S., Oppong-Boachie K. and Osae E. K. J., *Activation analysis of some essential elements in five medicinal plants used in Ghana*, Journal of Radioanalytical and Nuclear Chemistry, 250 (1), 173-176, Springer Science+Business Media, Netherlands, 2001.

4. Tolonen M., *Vitamins and minerals in health and nutrition*, P 240, Ellis Hardwood Ltd., Chichester, England, 1990.

5. Raut O. P., Acharya R., Gupta R., Mishra S. K. and Sahoo R. et. A, *Internatioinal Journal of Applied biliogy and pharmaceutical technology*, Vol. 4, Issue - 1, 2013.

6. Subramanian R., Subbramaniyan P. and Raj V., *Asian Pacific Journal of Tropical Biomedicine*, S 555-558, Elsevier, Amsterdam, Netherlands, 2012.

7. Lozak A., Soltyk K., Ostapczuk P. and Fij alek Z., *The Science of the Total Environment*, 289, 33, Elsevier, Amsterdam, Netherlands, 2002.

8. Rivier L. and Bruhn J. G., Editorial. *J. Ethnopharmacol.* (1979) 1 110.1016/0378-8741(79)90013-8.

9. Subramanian R., Gayathri S., Rathnavel C. and Raj V., *Analysis of mineral and heavy metals in some medicinal plants collected from local market*, Asian Pacific Journal of Tropical Biomedicine, 2 (1), S74-S78, Elsevier, Amsterdam, Netherlands, 2012.

10. Dushenkov V., Kumar P. B. A. N., Motto H. and Raskin I., *Rhizofiltration: The Use of Plants to Remove Heavy Metals from Aqueous Streams*, Environmental Science Technology, Vol. No. 29, Pages 1239-1245, American Chemical Society, United States, 1995.

11. Santosh T., Mohanraj P., Sharanabasappa and Kerur B. R., *Accumulation of Elements in Homemade Herbal Medicinal plants*, International Journal of Pure & Applied Physics, Vol. 13, No. 1, P 50-53, Research India Publications, Delhi, 2017.

12. Kaya I. and Incekara N., Turkish Journal of Weed Science, 3: 56, Huseyin ONEN, Turkey, 2000.

13. Reddy M. B., Chidambaram M. V. and Bates G. W., *Iron Transport in Microbes, Plants and Animals,* VCH, NewYork, 1987.

14. Onyamborko N. V., Benemariya H., Robberecht H. and Deelstra H., *Atomic absorption spectrometric determination of selenium, zinc and copper in different vegetables from Zaire*, Belgian Journal Food Chemistry Biotechnology, 45: 21, 1990.

15. Hunt J. R., *Bioavailability of Fe, Zn and other Trace Minerals for Vegetarian Diets*, The American Journal of Clinical Nutrition,78: 633-39, American Society for Nutrition, United States, 1994.

16. Neil P.O., *Minor Element and Environmental Problems*, 2nd Edtn., Environmental Chemistry, 1993.

17. Thunus L. and Lejeune R., *Handbook on Metals in Clinical and Analytical Chemistry*, Marcel Dekker, New York, 1994.

18. World Health Organization, *Quality Control Methods for Medicinal Plant Materials*, WHO Press, Geneva, Switzerland, 1998.

Authors

Mohanraj Pattar, H.K.E Society's, M S I Degree College of Arts, Science and Commerce, Kalaburagi- 585102, Karnataka. E-mail: mohanrajpattar@gmail.com

Santoshkumar Teerthe, Department of Physics, Gulbarga University, Kalaburagi- 585 106, Karnataka.

Ashwini A., Department of Physics, Gulbarga University, Kalaburagi- 585 106, Karnataka.

Kerur B. R., Department of Physics, Gulbarga University, Kalaburagi- 585 106, Karnataka. E-mail: kerurbrk@hotmail.com

OBSERVATIONAL STUDY

Āryavaidyan, Vol XXXI, No. 2, November 2017 - January 2018, Pages 52 - 55

# A critical analysis of subjective and objective outcomes of Nirūhavasti in relation to the procedure

Ramya A.

**ABSTRACT:** Nirūhavasti, the most important among pañcakarma has many dimensions in its practice.The clinical practice need to be analysed with respect to its outcome keenly in relation to each indicated clinical condition. Here lies the importance of objective parameters like retention time, number of vegas, blood pressure, temperature (before and after treatment), etc. all in the scene. The outcome of any kriyākrama in āyurveda is dependent on the medicines used and the way the procedure is done considering the doṣa, dūṣya, kāla and prakṛti. Vasti and its outcome need to be understood in this perspective. Objective parameters will help to understand vasti in a better way. However, to assess any karma without understanding in terms of samprāpti of the roga may not be sensible.This paper puts forward few observations and adresses the issue.

*Key words*: Pañcakarma, Nirūhavasti, Samyaknirūḍhalakṣaṇa

## Introduction

Vasti is considered as ardhacikitsā in pañcakarma.[1] It is one of the most commonly practised kriyākrama across the country. In āyurveda, the best outcome of any kriyākrama depends on factors like the medicines used, the physiological, pathological state of the patient (doṣam, dūṣyam, deśam, balam, analam, vayaḥ etc.),[2] environmental factors (kālam), when and how the procedure is done. Each of these factors have its own influence in the clinical outcome.

Nirūhavasti, has many dimensions in its practice. The clinical practice need to be updated and analysed with respect to its outcome keenly in relation to each indicated clinical condition.

Here lies the importance of objective parameters like retention time, number of vegas, blood pressure, temperature (before and after treatment), etc. all in the scene. Is retention time important with respect to vasti? Is it sensible to force the patient to retain vasti dravya for a longer period for better outcome? Was the samyakniruḍhalakṣaṇa affected if the medicine is retained for a longer period? Is there a role of prakṛti, koṣṭha and kāla with respect to retention and outcome of vasti? Is the objective standardisation of vasti possible? Can subjectivity be the lone criteria for assessing the clinical efficacy of vasti? These issues are addressed in the paper. An observational study of 75 vastis done in various clinical conditions and analysed with regards to above parameters is being put forth for discussion in the paper.

## Methodology

Study design: Observational study

Study setting: Ashtamgam Ayurveda Chikitsalayam and Vidyapeedam,Vavannoor, Pallakkad., Kerala.

Study population: IP patients admitted at Ashtamgam Ayurveda Chikitsalayam during time period of July 2016 - August 2016.

## Aims and objectives

- To objectively asses the procedure without any bias,
- To assess the subjective/functional outcomein terms of samyaknirūḍhalakṣaṇa.
- To evaluate the clinical outcome in relation to outcome of vasti.

75 vasti in our hospital irrespective of cases done during the period June-25 to August-20, 2016 were assessed. However, due to lack of full information, only 60 cases were considered for the data collection.

## Parameters of the study

1. Time of administration: In the classics the time of

administration of vastidravya is mentioned as follows;

- Madhyāhne kiñcāvṛtte nātibubhukṣitam[1a]
- Kiñcitāvṛtte madyāhne nātikṣudhitam[3]
- Jīrṇānnamupakramet[2a]
- Abhukte madhyāhne[4]

By taking all these references into consideration, dravya can be administered either in empty stomach without food or with little hunger. Only Vāgbhaṭa and Suśruta specifies the time in relation to 'ahas' that is 'madhyāhne kiñcitāvṛtte'.

In practice there are usually two schools that are followed; one as in most academies where vasti is usually done between 9 am to 11 am after having little food early in the morning. The second being in the places especially with traditional background where vasti is done in the morning by 8 am without any food. However, as very well emphasised by Ācārya Caraka 'prāśamīkṣya'[2b] which indicates the physiological status of the patient with respect to his agni under the influence of environmental factors is the most important factor that need to be considered while giving vasti.

2. Retention time: Eventhough there is no specification regarding how long to retain the vastidravya with respect to nirūhavasti, the maximum retention time specified is one muhūrta.

'āgatau paramaḥ kālo muhūrto mṛtyave param'[1b]

In practice, there are practitioners who make their patients to retain vastidravya for a longer time as against their vega tendency for better results. In this work it was specifically observed about any relation between samyaknirūḍhalakṣaṇa, kaphāntam and change in clinical outcome with respect to the retention time.

3. Samyaknirūḍhalakṣaṇa: The samyaklakṣaṇa as mentioned in śāstra can be considered to be the bench markers for the physician to analyse the outcome of the procedure done which is directly proportional to the intended clinical benefits. Samyaknirūḍha-lakṣaṇas specified in various treatise are as follows;

'Tasyahīnasamyagatiyogastu viriktavat' [3a]
(Aṣṭāṅgasaṅgrahaḥ)

'Prasṛṣṭaviṇmūtrasamīraṇatvam
rucyāgnivṛdhyāśaya lāghavāni
Rogopaśāntiḥ prakṛstathā ca
balam ca tat syāt sunirūḍhaliṅgam' [2c]
(Carakasamhitā)

Yasya krameṇa gacchanti viṭpittakaphavāyavaḥ
Lāghavam copajāyeta sunirūḍham tamādiśet' [4a]
(Suśrutasamhitā)

'Śuddhasphaṭikasamkāśam yadā śleshmā viricyate, vinā mūtra purīṣeṇa,
Nirupadravatākṣusca nirūḍhaḥ samyak ucyate' [5]
(Kāśyapasamhitā)

In practice, to asess objectively, kaphāntam as said in samyakvirecana and specified by Ḍalhaṇa to be 'sphaṭikābham', whitish frothy material coming out can be enquired with the patient. There is an arguement that immediate visibility of kaphāntam may not be the sole rule to decide its optimum action, but kaphāntam can be seen even in the evening or next day morning. The subjective lakṣaṇas of agnivṛddhi, āśayalāghavam, srotośuddhi can be decided only upon the praśnaparīkṣa.

The atiyoga lakṣaṇas includes expulsion of niśleṣma-pitta, salohita-udaka, śveta-udaka and kṛṣṇa-udaka, guda-nissaraṇa, netra-praveśana, tṛṣṇā, bhrama and expelled content alike māmsa-dhāvana and medodakābha.

The ayoga lakṣaṇas includes pain over śiras, hṛdaya, basti, guda and liṅga, śopha, pratiśyāya, vikartikā, hṛllāsikā, mūtra and māruta saṅga and śvāsa.

Other complications includes kḷama, ādhmāna, hikkā, hṛtpravṛtti, ūrdhvatā, pravāhika, śirortti, aṅgārtti, parikartikā and parisrāva.

Variables considered were;

- Prakṛti
- Retention time
- Koṣṭha
- Number of vegas
- Blood pressure before and after vasti
- Samyaknirūḍhalakṣaṇa

**Observations and results**

The following observations were included;

1. Average retention time (Table 1)
2. Retention time /number of vegas (Table 2)

| Table 1<br>Average retention time | |
|---|---|
| Retention time (in mins.) | No. of patients |
| 0 to 5 | 44 out of 60 |
| 6 to 10 | 13 out of 60 |
| 10 to 20 | 2 out of 60 |
| 20 and higher | 1 out of 60 |

| Table 2<br>Retention time / No. of vegas | |
|---|---|
| Retention time (in mins.) | Average no. of vegas |
| 0 to 5 | 3.5 |
| 6 to 10 | 3.3 |
| 10 to 20 | 3 |
| 20 and higher | 3 |

3. Retention time and kaphāntam (Table 3)

4. Blood pressure before and after

- Increased in 9 patients (within normal limits)
- Decreased in 51 patients (within normal limits)

| Table 3<br>Retention time and Kaphāntam | |
|---|---|
| Retention time (in mins.) | Kaphāntam in cases |
| 0 to 5 | 32/44 |
| 6 to 10 | 8/13 |
| 10 to 20 | 2/2 |
| 20 and higher | 1/1 |

**Type of vasti and variables**

See Table 4.

1. Retention time and prakṛti

- Not considered since descripancy in evaluation of prakṛti.

2. Retention time and koṣṭha

- Madhyamakoṣṭha: 4.3 minutes
- Krūrakoṣṭha: 9.7 minutes
- Mṛdukoṣṭha: 3 minute

3. Koṣṭham and kaphāntam

- Madhyamakoṣṭha: 26/44
- Krūrakoṣṭha: 5/12
- Mṛdukoṣṭha: 1/4

4. Status of food intake

- Abhukte: 7 vasti
- Nātibubhukṣita: 53 vasti

5. Samyaklakṣaṇa/kaphāntam

- On same day/soon after: 35
- Evening: 8

6. Samyaklakṣaṇa- on same day

- Laghutva: 42 patients
- Srotośuddhi: 42 patients
- Agnivṛddhi: 14 patients

**Dviputaka vasti**

The reference from Aṣṭāṅgahṛdayam says;

Svayameva nivṛtte tu dvitīyo vastiriṣyate
tritīyoऽpi caturthoऽpi yāvadvā sunirūḍhatā [1c]

Ācārya Suśruta is also having a similar opinion.[4b]

Forgetting this part of śāstra, most commonly vasti is generally practiced with one puṭaka eventhough samyaknirūḍhalakṣaṇa are not attained. Some observation from 15 dviputakavasti done in various clinical conditions considering doṣabala and rogībala are documented.

Dviputakavasti: 15 vasti were given during July-August 2016.

Content of evacuated material after each puṭaka is as follows;

- Medicine with yellowish fluid and feces. 12 vasti after 1st puṭaka.

| Table 4<br>Type of vasti and variables | | | | |
|---|---|---|---|---|
| Type | No. of vasti | Retention time (mnts.) | No. of vegas | Kaphāntam seen in |
| Vaitaraṇa | 15 | 5.2 | 2 | 12 |
| Mādhutailika | 22 | 4.6 | 1.9 | 15 |
| Kṣīra | 7 | 6 | 2.67 | 5 |
| Rājayāpana | 4 | 11.7 | 1.9 | 2 |
| Ardhamātrika | 6 | 2.6 | 3.1 | 3 |
| Lekhana | 6 | 3.1 | 3.14 | 5 |

• Whitish frothy material after 2nd puṭaka - 13 vasti Samyaklakṣaṇa attained on the same day;
• Agnivṛddhi: 15/15 • Laghutvam: 15/15
• Āśayalāghavam: 15/15

## Conclusion

It was observed that retention time has no direct relation with attaining of samyaknirūḍhalakṣaṇa. But it has a relation between the nature of koṣṭha of patients. (Other factors like the temperature of vastidravya, amount of saindhava in vastidravya, the concentration of kalka, etc. can play a role in retention time which are not documented here.)

Observation of samyaknirūḍhalakṣaṇa was in direct relation to the clinical efficacy. Hence, passing of motion loosely 2-3 times (the seen common mode of enquiry) may not be enough for understanding vasti.

No direct relation could be assessed between the nature of koṣṭha and samyaknirūḍhalakṣaṇa. If samyaknirūḍhalakṣaṇa is not attained the reasons has to be analysed by the physician with respect to;

• the way the procdure was done
• the quality and quantity of medicine
• the time of administration
• the physiological and pathological status (samprāpti) of the patient

Our centre practiced more of 'nātibubhukṣita' as the time of administration of vasti ie. after giving little food in the early morning. No incidents of complications were reported, however for patients given vasti as abhukta, two incidents of giddiness and vomiting was noted which was managed with śamanauṣadhi.

Among the samyaknirūḍhalakṣaṇa, a set of them (kaphāntam, āsaya lāghavam, etc.) are observed on the same day and a set (agnivṛddhi, rogopaśānti, etc.) in the coming days which has to be closely followed up by the physician.

## Limitations of the study

• The observations included all kind of vasti
• The variables were too many
• Study can be done for greater population

## Summary

Vasti, the ardhacikitsā, we need to have a holistic understanding. Our responsibility is to understand śāstrārtha, practice accordingly and evaluate holistically. The rogi, basic physiology, pathology, samprāpti and administration of the procedure is the real 'agniparīkṣa' for the physician. Hence, it is most important to follow each case totally with subjective and objective functional analysis, after thorough analysis, understanding of underlying samprāpti. Vastikarma assessed individually forgetting the samprāpti has very little usefulness.

Let the nirūhatva of nirūha continue to dazzle our mind and soul with more and more realizations and questions.

## References

1. Vagbhata, *Ashtangahrdayam* with commentaries of Arunadatta and Hemadri, edited by Vaidya Hari Sadasiva Sastri Paradakara, 9th Edtn., Sutrasthanam 19/86, Chaukhambha Orientalia, Varanasi, 2005.

1a. Ibid. Sutrasthanam 19/36-37

1b. Ibid. Sutrasthanam 19/ 47-48 1c. Ibid. Sutrasthanam 19/ 49

2. Agnivesa, *Carakasamhita,* edited by Jadavji Trikamji Acharya, Kalpasthanam 1/6, Choukhambha Orientalia, Varanasi, 2009.

2a. Ibid. Siddhisthanam 3/12 2b. Ibid. Siddhisthanam 3/6

2c. Ibid. Siddhisthanam 1/41

3. Vagbhata, *Ashtangasamgraha*, edited by Shivaprasad Sharma, Sutrasthanam 28, Chaukhambha Orientalia, Varanasi.

3a. Ibid. Sutrasthanam 28/ 45

4. Susruta, *Susrutasamhita*, Nibandhasangraha vyakhya of Dalhana, Cikitsasthanam 38/6, Chaukhambha Surbharati Prakashan, Varanasi, 2012.

4a. Ibid. Cikitsasthanam 38/10 4b. Ibid. Cikitsasthanam 38/6

5. Vruddha Jivaka, *Kasyapasamhita*, Sidhisthanam 2, Chaukhambha Sanskrit Sansthan, Varanasi.

Author
Ramya A., Assistant Professor and Specialist Medical Consultant, Ashtamgam Ayurveda Vidyapeedam, Vavannoor, Pattambi, Kerala. Email: drramyaradhakrishnan@gmail.com

Āryavaidyan, Vol XXXI, No. 2, November 2017 - January 2018, Pages 56 - 61

# Ethanomedicine - rose tree of Yumthang valley

Kamini Kaushal

**ABSTRACT:** There are abundant plants all over the world, which are yet to be explored and investigated for their biological activity and pharmacological potency. *Rhododendron* is one among them. This study is intended to explore the medicinal importance of *Rhododendron* species of Yumthang valley.

*Key words*: *Rhododendron*, Yumthang, Ethanomedicine

## Introduction

The name '*Rhododendron*' is derived from the Greek word 'Rhodo' meaning rose and 'Dendron' meaning tree.The plant is found in the Himalayas from Kashmir eastwards to Nagaland. *Rhododendron* (Ericaceae) is the state tree of Uttarakhand and the state flower of Nagaland. It grows at the elevations of 4500 to 10,500 ft and grows up to 40 to 50 ft hight, sometimes attaining over 100 ft (Rai and Rai,1994). The āyurvedic preparation 'Aśokāriṣṭa, containing *R. arboreum* possesses oxytocic, estrogenic and prostaglandin synthetase inhibiting activity (Midlekoop and Labadie, 1983). But it could not be found in Ayurvedic Pharmacopoeia of India(API).[1]

*Rhododendrons* are a genus of 1,024 species. In India, about 80 species are found. Flowering plants are found primarily in the northern hemisphere and were introduced to Britain in the late 18th century. The other locations includes; Asia, China, Europe, Himalayas and the United Kingdom. In India, the Yumthang valley, the Sikkim Valley of flowers sanctuary located in north Sikkim (although that name is associated with the valley of Flowers in Uttarakhand) we can see many varieties of *Rhododendron* and also the breathtaking view of mountain Kanchenjunga which has over twenty four species of *Rhododendron*, the state flower.[2] A direct journey to Yumthang is not feasible as roads are commonly foggy which becomes dark very early around 5:30 pm. A trip to the valley takes around two hours from Lachung, which is about 125 Km. from Gangtok. *Rhododendrons* are shrubs or trees. Different species of *Rhododendrons* cover large stretches of the valley. Rural people especially the tribals inhabiting in different regions of Sikkim utilize the varieties of *Rhododendron* for the treatment of various diseases.[2]

## Materials and methodes

Description of the study area: For the survey and documentation of *Rhododendron* species, intensive exploration trip was conducted in the month of May in Yumthang valley (Figure1). Geographically, the entire area of Yumthang valley is at an elevation of 3,564 m. (11,800 ft) at a distance of 150 kms. (93m.) from the state capital Gangtok (Figure 2). Temperature scarcely fluctuates in the year, with the mean monthly minimum and maximum temperatures

Figure 1
Map of Yumthang valley (Sikkim), where the study was carried out

Figure 2
Map of Yamthang Valley (Sikkim)


of $10^0$C and $15^0$C respectively. In this paper, an attempt has been made to collect information on the pharmacology and uses of *Rhododendron* species from the inhabitants of the local villages and to collect data from the literature and herbarium specimens.

The *Rhododendron* plants were collected both in flowering and fruiting condition. In case of no flowering and fruiting conditions during collection, the plant twig with few leaves were collected for proper identification. The collected plant twigs were tagged properly with proper accession number and herbarium was prepared. *Rhododendrons* are terricolous, sometimes epiphytic and often aromatic. Young shoots glabrous, tomentose, loriform-ciliate or lepidote covered with leafy bracts. Stem is smooth or rough, sometimes warted; bark peeling or not. Leaves are evergreen, deciduous or semideciduous, monomorphic, rarely dimorphic, alternate, very rarely subopposite, crowded at the end of the branches, coriaceous to leathery, rounded to cuneate at base, acute, acuminate to obtuse at apex, entire to rarely undulate at margin, glabrous, lepidote or tomentose either or both above and beneath; pedicel glabrous to tomentose or lepidote. Inflorescence terminal, rarely lateral, raceme or corymb, lax or dense, few to many-flowered, rarely reduced to Calyx 5-8 lobed or rimmed, large, leafy to sometimes obscure, persistent. Corolla funnel shaped, campanulate, tubular, rotate or hypocrateriform, acinomorphic or symmetrically zygomorphic, 5- 8 (-10) lobed; lobes imbricate in bud, sometimes quincuncial. Stamens (5-) 10 (-22), inserted at base of corolla, declinate or not, unequal to nearly equal, actinomorphically or zygomorphically arranged; filaments glabrous or pilose towards base; anthers without any appendages, opening by terminal pores. Ovary superior, 5-16 locular, tomentose and/or lepidote, sometimes glabrous; style straight to deflexed, sometimes persistent with fruit; stigma capitates to discoid, crenate to lobed. Capsules cylindric, oblong to ovoid, 5-18 valved, septicidal, dehiscent; valves thick or thin, woody or linear, straight or twisted. Seeds numerous, minute, fusiform, winged, sometimes with appendages at both ends.[3]

Field observation and records: For the *Rhododendron*, which were used by the healers and households, their local and botanical names were recorded. All the plants collected were tagged and the data regarding details of the plants were recorded properly and all the specimens collected from the field work were identified with flora of Sikkim and the flower of India were used to ascertain the nomenclature.[4,5]

## Results

1. Medicinal importance of *Rhododendron*: In the present study 24 *Rhododendron* plant species belonging to Yumthang valley were collected from the field, in the month of May and their botanical name, family name, common or vernacular name, morphology of the parts used and their medicinal properties were documented. (Table 1)

Diseases cured by *Rhododendron*: One of *Rhododendron* species *R. arborium* stem is used in the preparation of jams, jellies and local brew. The local brew is reported very efficacious in the the prevention of high altitude sickness. Fresh flower in the ailment of hill diarrhoea, dysentery, dyspepsia,

Table 1
*Rhododendron* Species in Yumthang valley with their common/Botanical/Family names, Habitat and their specific information. [6, 7, 8]

| Sl. No. | *Rhododendron* species | Habitat | Special Characteristics | Local name |
|---|---|---|---|---|
| 1. | *Rhododendron vaccinoides* | Northeast Sikkim, rare near Lachung and Changu lake in Nathula. | In the shades of trees in association with *Vaccinium obovatum* and *Agaptes seroens*. | -------- |
| 2. | *Rhododendron anthopogon* (*Revans-masoori*-Tālisapatra) | North Sikkim 3,000-5,500 m locations are Bakkim, Dzongri Gnathang in west Sikkim and Muguthang above Lachen and Yumthang in north. (Found Abundent) | Rockey areas or edges of forests. | Shukpa Dhup |
| 3. | *Rhododendron edgeworthii* | Inner renges of Sikkim Himalaya particularly in Lachen at 2,000-4,000m. | In cliff habitat overhanging rivers usually pendulous from oak, pine and pine and Michelia trees. | -------- |
| 4. | *Rhododendron pendulum* | In Yakchey and Phuni between Lachung and Yumthang in North Sikkim at 3,3000-4,000m. | Found in sheltered silver fir or Abies forests and pendulous from *Abies spectabilis* and *Abies brunniona* and rocks. | -------- |
| 5. | *Rhododendron maddenii* | Ratechu Catchment at 2,00m, Gangtok, Chungthang, at the confluence Lachen and Lachung betwen 2,500-4,000m. | Epiphytic on trees in steep rocky precarious slopes and thickest. | -------- |
| 6. | *Rhododendron dalhousiae* | Occurs in Pangthang, Chungthang and Lachungin North Sikkim between 1,500-2,500 m. | Foundin steep banks, rocks and treesof *Michelia* species and *Quercus* species in association with ferns, orchids and *Agaptes* species. | Lahare-Chimal |
| 7. | *Rhododendron lindleyi* | ---------- | Epiphytic on trees and rocks on 2,000-3,000 m. | -------- |
| 8. | *Rhododendron ciliatum* | Lachung and Lachen, northeast Sikkim at 3,000-3,800 m. | Marshy situations, well exposed to sunlight in association with other *Rhododendron* species. | -------- |
| 9. | *Rhododendron triflorum* | Lachung, north Sikkim at 2,300- 4,000 m. | Found in association with other Rhododendron | Yellow Chimal |
| 10. | *Rhododendron nivale* | Dry, high slopes in open rocky places at 4,500-6,000 m. | Forest margins, *Rhododendron* thickets, alpine meadows, moorlands, swampy grassland, open bogs, damp places, open mountainsides, dry rocky slopes, screes, cliffs, ice gorges; 3100-5800 m | ---------- |

| Sl. No. | *Rhododendron species* | Habitat | Special characteristics | Local name |
|---|---|---|---|---|
| 11. | *Rhododendron serosum* | ---------- | High passes growing on rockey situation gregariously with other species at 3,000 - 5,000 m. | -------- |
| 12. | *Rhododendron plumulum* | Rare in Sikkim and found in Zemu Lonak and Bhurium lake at 4600m,Chachuzul near Yumthang at 3,500-4,500m. | Inhabits the alpine reglion on open sandy or gravelly soil or on avalache slopes. | -------- |
| 13. | *Rhododendron cinnabarinum* | Mixed rhodendron forests at 1,900-4,000 m.(Found common) | Forests, open woodlands, forest margins, *Rhododendron* thickets, among shrubs, hillsides; 1900-4000 m. | Sanu-Chimal |
| 14. | *Rhododendron virgatum* | Chungthung, Lachung and Lachen at 2,500-3,300 m. | Found in freshy exposed steep slopes. | -------- |
| 15. | *Rhododendron glaucophyllum* | Above 27,00 min Lachung, Lachen and Chola at 4,000 m. | Occurs in open rocky moss covered ridges and undergrowth in the Abies densa forest. | -------- |
| 16. | *Rhododendron lapidotum* | Chungthang at 25,00-5,000 m. (Found Abundent) | Inhabits open rocky areas. | Bhale Sunpati |
| 17. | *Rhododendron bouleyi* | Yumthang at 3,000-3,800 m. | Inhibits edges of pine and hemlock forests. | -------- |
| 18. | *Rhododendron laptocarpum* | Choka in Dzongri at 3,000-3,500m | Mixed forests, cliff ledges, rocks, sometimes epiphytic; 2400-3400m | -------- |
| 19. | **Rhododendron arboreum* (Kurbak)/Jasund-adultrant of hibiscus rosa sinensis (*National flower of Nepal) | Found throughout Sikkim. | It can grow in semi-shade (light woodland) or no shade. | Lali-Gurans |
| 20. | *Rhododendron camelliflorum* | Nathula at 2,000-2,500m. | Broad leaved forests and rocks. | -------- |
| 21. | *Rhododendron niveum*(State tree of Sikkim) | Yackheyin lachung at 3,100m, Lachen and Chola. (Rare found) | This species is endemic to Sikkim. | Hunpate-gramh |
| 22. | *Rhododendron barbatum*(Kurbak) | Yakchey in northeast Sikkim at 3,000 -3,700m. (Found common) | Found in mixed Abies species forest. | Lal Chimal |
| 23. | *Rhododendron campanulatum* (State flower of Himachal pradesh) | Found in Yumthang near the hot water spring.(Found common) | Inhabits *Abies* species forest in association with other *Rhododendron* species at 4,500m. | Nilo Chimal |

enlargement of liver, spleen, etc.. It reduces the pittadoṣa. Its root is mild poisonous but useful in leucorrhea. This is known as Kurbak/Jasund-adultrant of *Hibiscus rosa sinensis*. *Rhododendron anthopogon* known as *Revans-masoori-Tālīsapatra*.[9,10] The flower is considered edible and enjoyed for its sour taste. The pickled flower can last for months and the flower juice is also marketed. The flower, fresh or dried, is added to fish curry in the belief that it will soften the bones. The juice of *Rhododendron* flower is used to make a squash called burans (named after the flower-in the hilly regions of Uttarakhand). It is admired for its distinctive flavor and colour. Although the flowers are eaten, when consumed in excess they are known to cause intoxication (Anonymous, 1972). Tender leaves are reported to be used as vegetables (Anonymous, 1972; Nayar et al., 1994) but in view of the presence of toxic compounds (Andromedotoxin) in them.[11]

Parts of *Rhododendron* used: The villagers used diverse parts of the *Rhododendron* based on their ability to cure disease such parts includes leaf, roots, bark, seed, fruit, flower, stem, etc. Flowers are highly used by the village peoples (Table 2).

Table 2
Various species of *Rheodendron* and their medicinal uses

| Sl.No. | Species | Medicinal uses |
|---|---|---|
| 1 | *Rhododendron anthopogon* | Leaves ans stem- promote heat, anti-tussive, diaphoretic, digestive, various skin disorders.<br>Highly demanded plant for manufacturing of herbal drugs. |
| 2 | **Rhododendron arboreum* | Tender leaves's paste- headaches.<br>Juice of the bark- coughs, diarrhea, dysentery.<br>Decoction of the flowers- vomiting, loss of appetite.<br>Juice of the flowers- menstrual disorders. |
| 3. | *Rhododendron campanulatum* | The leaves + tobacco- colds, headaches (especially of one side of the head)<br>Juice of the leaves- chronic rheumatism, sciatica and syphilis.<br>Dried twigs and wood- phthisis and chronic fevers. |
| 4 | *Rhododendron lapidotum* | Purgative |
| 5 | *Rhododendron barbatum* | Used in fish poison.<br>Toxic due bitter substance glucoside ericolin. |
| 6 | *Rhododendron cinnabarinum* | Poisonous to cattle's; Smoke of leaves and wood may cause inflammation in eyes and face.<br>Corolla flower is useful in jems |

*In Homeopathic Materia Medica, the tincture of dried leaves of *Rhododendron arboretum* has been used in gout and rheumatism (Skidel, 1980). Ayurvedic preparation 'Aśokāriṣṭha,' containing *R. arboretum* possesses oxytocic, estrogenic, and prostaglandin synthetase-inhibiting activity (Midlekoop and Labadie, 1983).

## Discussion

The survey of *Rhododendron* was done at Yumthang valley, North Sikkim, India, and 24 species were observed and listed in this study. In this survey on *Rhododendron* species used in āyurveda, the plants are reported with its common/vernacular name, morphology of parts used, family and its medicinal / commercial properties. The people of North Sikkim are using different morphological useful parts such as leaves, flowers bark, fruit, stem for their health

care. These collected plants are used for the treatment of several diseases of liver, spleen and heart, fever, skin diseases, and also as a health tonic. In āyurvedic texts, it has mentioned *Abies pindrow* Royle is quite similar to *A. webbiana* in benefits. Yadavji Trikamji Acarya quotes that three herbs are taken in the name of tālīsapatra.

1.*Taxus baccata*-also identified as sthauṇeyaka/ tuṇekara.

2. *Abies webbiana* and 3. *Rhododendron lapidotum*.

## Conclusion

The survey and documentation of medicinal and aromatic plants in each and every place is mandatory for easy identification of local traditional healers, conservation and sustainable utilization. The most important utilization of these plants is through medicines. However, plants, their parts and the pattern of administration vary from person to person. Thus, there is enormous scope for the recorded 24 species, out of 80, found in India, which have been found useful to the local inhabitants. All the species with their vernacular names among the different communities, distribution in Yumthang valley are mentioned here. Facts are represented in maps and tables.

## Acknowledgements

I am cordially grateful to the people inhabiting in North Sikkim for their kind support and co-operation during the field trips. I am also thankful to my tour guide.

### References

1. Maximowicz C. J., *Rhododendreae Asiae Orientalis,* St Pētersbourg, 1870.

2. Davidian H. H., *The Rhododendron Species*, In four volumes from 1982-1995,(1. Lepidotes 2. Elepidotes *Arboreum-Lacteum* 3. Elepidotes Continued *Neriiflorum-Thomsonii, Azaleastrum and Camtschaticum*, 4. Azaleas, ISBN 0-917304-71-3 ISBN 0-88192-109-2 ISBN 0-88192-168-8 ISBN 0-88192-311-7, Timber Press.

3. Xiao-Feng Jin, Bing-Yang Ding, Yue-Jiao Zhang and De-Yuan Hong (2010), *A Taxonomic Revision Of Rhododendron subg. Tsutsusi sect. Brachycalyx (Ericaceae),* Annals of the Missouri Botanical Garden. 97 (2): 163 190. doi:10.3417/2007139.

4. Bentham G. and Hooker J. D. (1876), *Genera plantarum ad exemplaria imprimis in herbariis kewensibus servata definita,* Vol. 2, Part II, L Reeve & Co., London. (Retrieved 10th July 2014)

5. Stevenson J. B.(ed), *The Species of Rhododendron*, The Rhododendron Society, Edinburgh, 1930.

6. Sleumer H. (1966), Ericaceae 1. *Rhododendron- In 'Flora Malesiana'*, (Ed. CGGJ van Steenis) P 469-656, Wolters-Noordhoff Publishing, Groningen, The Netherlands.

7. Sleumer H.(1949), *Ein System der Gattung Rhododendron L.,* Botanische Jahrbucher fur Systematik, 74: 511-553.

8. Hooker, Joseph Dalton, Fitch W. H. and Hooker, William Jackson. *The rhododendrons of Sikkim-Himalaya*, being an account, botanical and geographical, of the rhododendrons recently discovered in the mountains of eastern Himalaya, from drawings and descriptions made on the spot, during a government botanical mission to that country. Reeve, Benham, and Reeve, London, 1849-51.

9. Brown Gillian K., Craven Lyn A., Udovicic Frank and Ladiges Pauline Y., *Phylogenetic relationships of Rhododendron section Vireya (Ericaceae) inferred from the ITS nr-DNA region (PDF)*, Australian Systematic Botany, 19: 329-342, doi:10.1071/SB05019.

10. *Sorting out the Genus Rhododendron:A Taxonomic Overview of this Large Complex of Species*, University of California Botanical Garden at Berkeley, March 27, 2014.

11. Agarwal S. S., Sharma Kalpana (1988), *Anti-inflammatory activity of flowers of Rhododendron arboreum (SMITH) in rat's hind paw oedema induced by various phlogistic agents*, Indian Journal of Pharmacology, 20 (2): 86-90.

Author

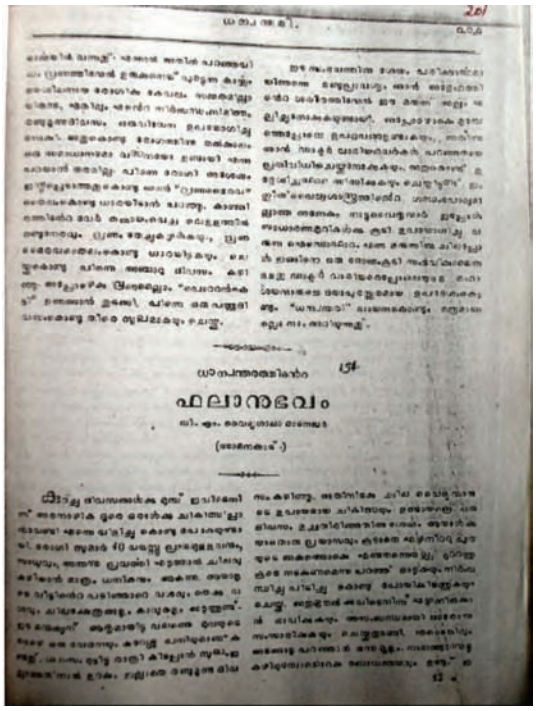
Kamini Kaushal, Professor and Head, Post Graduate Department of Dravyaguna, M M M Govt. Ayurved College, Udaipur, Rajasthan. Email: drkaushal2002@yahoo.com

Āryavaidyan, Vol XXXI, No. 2, November 2017 - January 2018, Page 62

# A study in Dhānvantaram*

V. M. Vaidyasala Manager, Njamanakkad

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. 5, 1083 Metam Malayalam Era (1908 CE), Article No. 8, Page 154.



ഫലാനുഭവം

I happened to treat a man of 40 yrs. who was a Christian by birth. He suffered from running temperature and pain on the thoracic region, below the right nipple. The family members thought that he was under the spell of the spirits as 120 deities were installed in the compound. Moreover he was rambling like a lunatic.

The family members summoned the priest thinking that his end was near. They thought that proper rituals had to be followed. The next day they came to me around 8 in the morning. On the way I was briefed of the situation which made me realized that the ailment was due to the vitiation of vāta. I prescribed oil for external application and roasted powdered horse gram bolus (kizi). This went on till mid noon. By then he started responding by way of crooning. He was unable to open his mouth. He had edema around the neck and breathing difficulty. He was showing varied facial expressions, as though his end was near; like rolling the eyeballs, laughing and so on.

I felt that it was a vāta disorder with the influence of pitta. Then I made a decoction with the roots of kaṇṭakāri (*Solanum surattense*) and cumin seeds. To this additives such as Vāyuguḷika and a small dose of Dhānvantaram tailam (14) were mixed. I forcefully opened his mouth and gave three mouths full. Though he was showing difficulty in breathing; I was under the impression that he was swallowing it. But to my dismay it was not so. Then I applied Dhānvantaram (14) on the chest and neck. After sometime he was able to gulp it in. We made him sit so that he might get a relief from his breathing problem. Then he passed urine and spat sputum. He was given kaṣāyam with Dhānvantaram tailam. Slowly he swallowed it. In the meantime, he began to utter a few words. Again, he drank a cup full of porridge. Later he was given the kaṣāyam made of Balāmūla (*Sida cordifolia*)- 2½ karṣa, Cumin seeds - 2 karṣa, śuṇṭhi (*Zingiber officinale*) -1 karṣa and the ripe leaf stalk of jackfruit tree - ½ karṣa. (1 karṣa - 5 gm.)

Two glasses of water was taken, boiled the ingredients and reduced to ½ glass. Then it was given at regular intervals with Dhānvantaram tailam as additive. Vāyu guḷika was also added to the kaṣāyam to reduce his breathing difficulty. This continued for nearly one and a half hour before he was able to talk freely. He was cured of the illness within a period of four days.

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

## We invite papers on clinical research, clinical experiences, medicinal plants, drug development, drug processing and drug standardisation and also book reviews...

The language of the journal is English. All the manuscripts published are reviewed by eminent scholars around the globe.

The contents of the papers shall be the sole responsibility of the authors and publication shall not imply the concurrence of the Editors or Publishers. Manuscripts that are not accepted for publication will not be returned. Authors will be informed within three months of submission of manuscripts if they are recommended for publication in the journal. One copy of the journal will be sent to the author.

**Manuscript presentation**

Manuscript must be typed double spaced with margins of one inch (2.5cm) at the top, bottom and the sides and all pages numbered starting from the title page. 12 point Times New Roman font must be used and remain uniform throughout the text.

The manuscript should be divided into:

i. Title page
ii. Second page with article title and Abstract (maximum 300 words for full papers and reviews or 200 words for short communications; without the use of references) followed by 3-5 key words
iii. Introduction (state the objectives of the investigation with an adequate background)
iv. Materials and methods (provide adequate details to enable others to reproduce; previously reported methods should be cited by a reference with a brief description of modifications)
v. Results (clear and concise) and discussion separately or in combination is acceptable
vi. Conclusion - clearly and logically stated conclusion
vii. Acknowledgements (should include credit to technical assistance, financial support and other appropriate recognition)
viii. References
ix. Tables
x. Captions of figures
xi. Figures

Research papers, review articles and short communications must be limited to 5000, 4000 and 2000 words in length respectively. The articles/papers may be sent to publications@aryavaidyasala.com For more details visit www.aryavaidyasala.com

**Book Review**

Authors/Publishers who wish their books to be reviewed in this journal are requested to send two copies of the same to the editor.

# ARYAVAIDYAN

## SUBSCRIPTION/RENEWAL SLIP

I wish to subscribe to the journal Aryavaidyan for ☐ 1 year ☐ 2 years ☐ 4 years

I am sending DD/MO/ for Rs.....(Rupees.....only).

Name: _____

Address: _____

_____

_____ Pin: _____

Phone: _____ E-mail: _____

Date: Signature:

---

**HOW TO SUBSCRIBE**

i Please fill in your name and address (in block letters)

ii Tick the box to indicate the period of your subscription.

iii Detach the slip and mail it at your earliest.

iv Medical students should attach a bonafide certificate from the college for availing of the discount allowed.

v Subscription fee is to be made either by money order or by a demand draft (State Bank of Travancore (Code 7269) / Canara Bank (Code 338) / Vijaya Bank (Code 2017) / Punjab National Bank (4297)) in favour of Arya Vaidya Sala, Kottakkal.

*For Online Payment*

SB A/c Name : Arya Vaidya Sala, Kottakkal
Account No. 57021886014
IFSC Code : SBIN 0070269

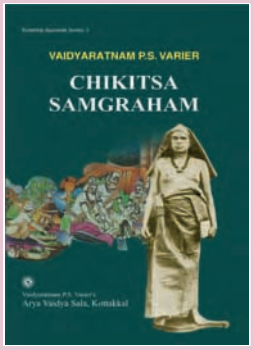
Information to *publications@aryavaidyasala.com* will be appreciated after making the payment.

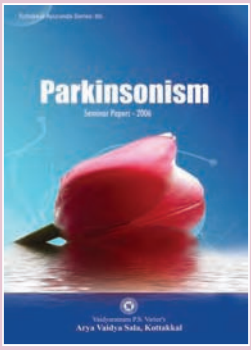
**SUBSCRIPTION RATES**

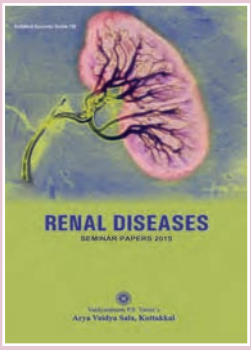
| *In India* | | *Out of India (postal charges extra)* | |
|---|---|---|---|
| Annual subscription | : ₹ 400/- | Annual subscription | : $ 50 |
| Single copy | : ₹ 120/- | Single copy | : $ 15 |

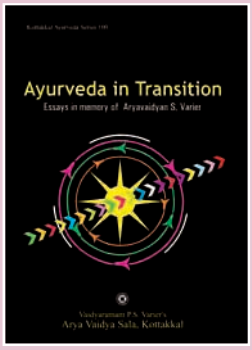
*Concessional rate for bonafide students of all systems of medicines in India*

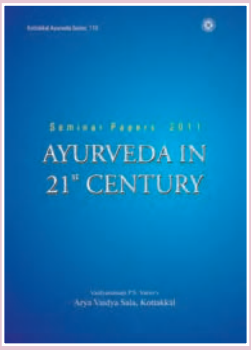
| | | | |
|---|---|---|---|
| Annual subscription | : ₹ 320/- | Single copy | : ₹ 90/- |

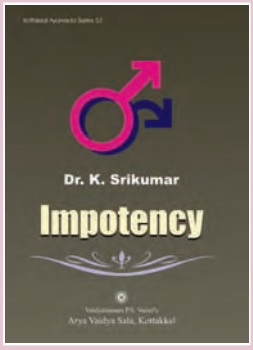


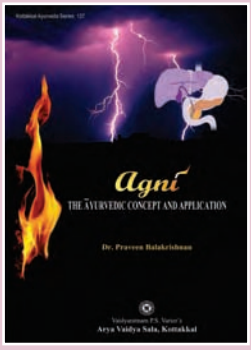


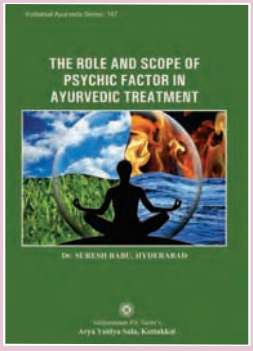


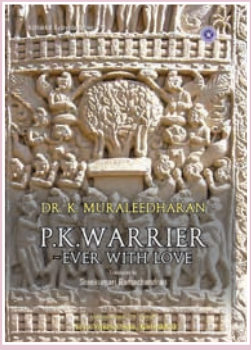


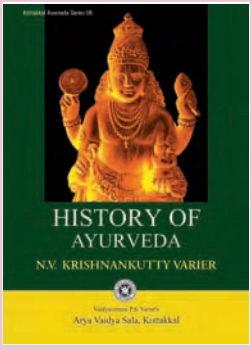


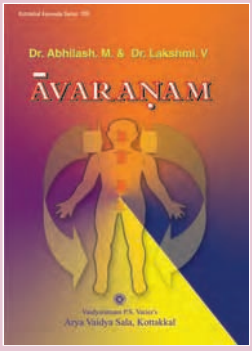


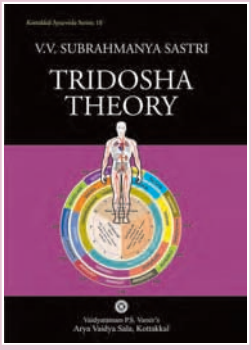


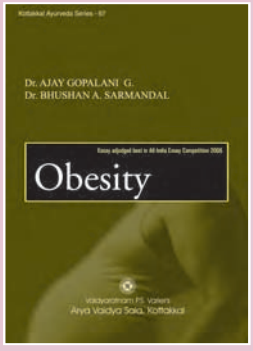


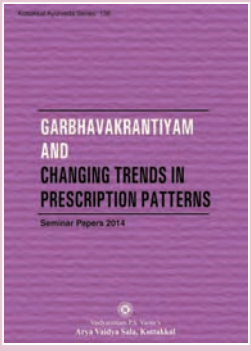


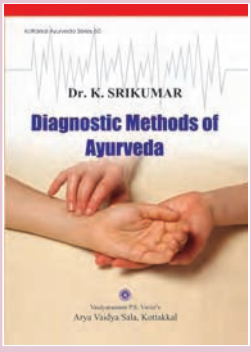


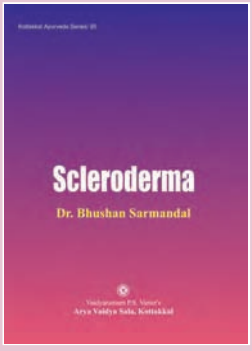


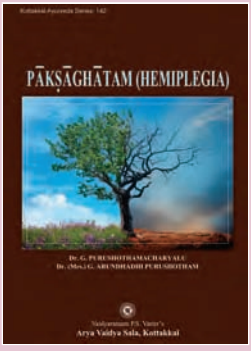


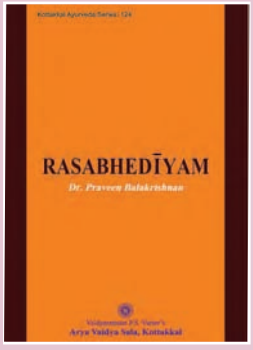


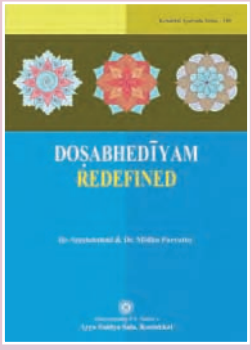


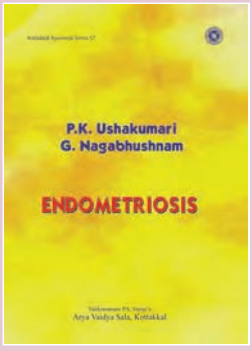


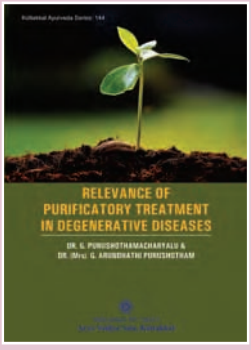













**Kottakkal Ayurveda Series, Popular Ayurveda Series, Fine Arts - Kathakali Literature, Journal, Souvenirs etc.**

Phone: 0483 - 2742225/2746665 E-mail: publications@aryavaidyasala.com Web site: www.aryavaidyasala.com


▸ NABH accredited Hospital at Kottakkal ▸ Hospitals at Delhi, Kochi and Himachal Pradesh ▸ Charitable Hospital at Kottakkal ▸ Panchakarma and Kerala Special Therapies ▸ Three GMP accredited factories manufacturing over 500 formulations ▸ 29 Branch Clinics, 1650 exclusive authorised dealers ▸ Herb gardens ▸ Centre for Medicinal Plants Research-A centre of Excellence in Research ▸ Germ Plasm Bank ▸ AYUSH and DSIR approved QC Laboratory ▸ Major Research Programmes in collaboration with AYUSH, ICMR, DST, MAHE, BHU, IIT and DAE ▸ Publication Department ▸ Vaidyaratnam P.S. Varier Museum ▸ Support to VPSV Ayurveda College at Kottakkal ▸ PSV Natyasangham for nurturing Kathakali

AYURVEDA - THE AUTHENTIC WAY

Vaidyaratnam P.S. Varier's
**ARYA VAIDYA SALA**
(A CHARITABLE TRUST)
**KOTTAKKAL-676 503, KERALA**
ESTD 1902

Tel: 0483-2808000, 2742216, Fax:2742572, 2742210
E-mail: mail@aryavaidyasala.com / info@aryavaidyasala.com
www.aryavaidyasala.com

**BRANCHES: Adoor**- 04734 220440, **Ahmedabad**- 079 27489450, **Aluva** - 0484 2623549, **Bangalore** - 080 26572956, **Chennai** - 044 28251246, 47, **Coimbatore** - 0422 2491594, **Ernakulam** - 0484, 2375674, **Indore** - 0731 2513335, **Jamshedpur** - 0657 6544432, **Kannur** - 0497 2761164, **Kolkata** - 033 24630661, **Kottakkal** - 0483 2743380, **Kottayam** - 0481-2304817/2562396, **Kozhikode(Kallai Road)** - 0495 2302666, **Kozhikode(Mananchira)** - 0495 2720664, 2723450, **Madurai** - 0452 2623123, **Mangalore** - 0824 2443140, **Mumbai, Sion (E)** - 022 24016879, **Mumbai, Vashi** - 022-27814542, **Mysore** - 0821-2331062, **New Delhi** - 011 24621790, **Palakkad(Vadakanthara)** - 0491 2502404, **Palakkad(Town)** - 0491 2527084, **Secunderabad** - 040 27722226, **Thiruvananthapuram** - 0471 2463439, **Thiruvananthapuram (Kazhakkoottam)** - **0471 2413439**, **Thrissur** - 0487-2380950, **Tirur** - 0494 2422231, **Vijayawada** - 0866 - 2578864/65 **AYURVEDIC HOSPITAL & RESEARCH CENTRES: Kottakkal** - 0483 2808000, **Delhi** - 011 22106500, **Kochi** - 0484 2554000, **Ayurveda Hospital, Baddi, Himachal Pradesh** - 1795667166