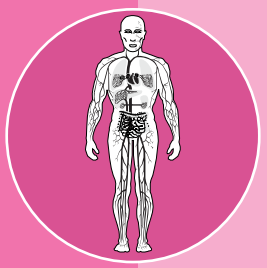
ISSN 0970 - 4086

Āryavaidyan

लाभानां श्रेय आरोग्यम्

Of all the gifts,
the most precious is health



Vol. XXVIII., No.1
August - October, 2014

A QUARTERLY JOURNAL OF
THE ARYA VAIDYA SALA - KOTTAKKAL

āryavaidyan

A Quarterly Journal of
the Arya Vaidya Sala, Kottak

Vol. XXVIII., No.1 Regn. No. 55127/87 August - October, 2014

Aryavaidyan is intended to encourage scientific writing and intellectual interactions among scholars, academicians, practitioners and students of ayurveda and allied subjects like Siddha, Unani, modern medicine, etc.

Vol. XXVIII., No. 1, August - October, 2014

CONTENTS

Efficacy of Thyromax powder against thyroxine sodium in the management of hypothyroidism - A comparative clinical and pharmacognostical evaluation	Nitin Ujjaliya S.V. Krishnankutty R. Remadevi	3
Hygrophila schulli M.R. Almeida & S.M. Almeida (kokilākṣa) - A phytopharmacological review	Amol S. Kadu Anita Sharma Vinod Kumar Gothecha	14
Effect of Katakakhadirādi kaṣāya in type 2 diabetes mellitus associated with hypercholesterolemia	Roopa Mathew V.N. Radhakrishnan N.Subhash Babu	27
Plants used in the treatment of bronchial asthma in and around Belgaum region, Karnataka - An ethnomedicinal survey	Arun Chougale, Harsha Hegde Satej T. Banne Ritesh Kumar	31
Analgesic activity of Vedanāsthāpanadaśemāni - A case study	Dileep Kumar K.J. Shreevathsa	43
Comparative study of Gaṇeśayāgokta havana-sāmagrībhasma and Śilābhrarasa with Madhumehāricūrṇa with special reference to its anti-hyperglycemic effect	Date K.A. Dwivedi L. K. Sharma R.P. Rao K.S.	47
Management of sandhigatavāta w.s.r to jānusandhi by agnikarma and svedana - A comparative clinical study	Mohasin Kadegaon Udayashankar Harshavardhan Mahamad Yunus	52
Pakṣāghāta - A clinical study	Prashant M. Bhandi	57
Preparation of Mauktika bhasma by two different methods and its comparative analytical study	Ketki Prakash Adhav Kunal H. Lahare	59

āryavaidyan
Quarterly journal of Arya Vaidya Sala

सततांध्ययनं, 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

Subscription rates

Annual subscription	₹ 200/-
Outside India	U. S. dollar 20 (Air surcharge extra)
Single copy	₹ 50
Concessional rate for bonafide students of all systems of medicine	₹ 160/-

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

Āryavaidyan Vol. XXVIII., No. 1, Aug. - Oct., 2014, Pages 3 - 13

EFFICACY OF *THYROMAX POWDER* AGAINST THYROXINE SODIUM IN THE MANAGEMENT OF HYPOTHYROIDISM - A COMPARATIVE CLINICAL AND PHARMACOGNOSTICAL EVALUATION

Nitin Ujjaliya,[1] S.V. Krishnankutty[2] and R. Remadevi[3]

Abstract: Insufficient levels of thyroid hormone causes signs and symptoms such as slower metabolic rate, weight gain, sleepiness, puffy face, dry and cool skin. This condition collectively can be called as hypothyroidism. Hypothyroidism is most common in women than men. The available treatment for this in conventional science is Hormone Replacement Therapy which is not always free from side effects and also has to be taken life-long. A controlled clinical trial was conducted in 20 subjects to evaluate the efficacy of an āyurvedic formulation Thyromax powder, a combination of Guḍūcīsatvam and Āmalakīcūrṇam. Statistically, the study-drug showed positive correlation on subjective parameters while the control group showed significant result on T3 and T4 levels. Both the groups were statistically insignificant on TSH level.

Introduction

Endocrinology concerns the synthesis, secretion and action of hormones. Hormones are chemical messengers which have diverse molecular structures and are related to endocrine glands thereby coordinate the activities of different cells. Some endocrine disorders are common, particularly those of the thyroid gland. At present, thyroid diseases form the second most common endocrine disorder in India are next to Diabetes mellitus (Sir Stanley Davidson, Davidson Principles & Practice of Medicine). According to a report, thyroid disorders (5.4%) are most common among all the endocrine diseases in India (N. Kochupillai *et al*, 1986). Unfortunately, many people may have this disease but not knowing it. In Kerala, 9.4% people who suffer from hypothyroidism are asymptomatic (Unnikrishnan, A.G. *et al*, 2011). The Wickham Survey suggested that there is a high possibility of developing hypothyroidism in the population with raised TSH and thyroid antibodies; and in the after-follow-up study it was demonstrated to be much accurate. It was inferred that increasing values of serum TSH above 2mU/l increases the probability of developing hypothyroidism which was further increased in the presence of anti-thyroid antibodies (Vanderpump MP, 1995). According to a study, anti-thyroid antibodies were found in 89.6% of the women between 15 to 35 years of age and the overall prevalence of

1. *Deptt. of Dravyaguna, Govt. Ayurvedic College, Lower mall, Patiala (Punjab)*
2. *Deptt.of Internal medicine, Maulana Hospital, Perinthalmanna, Kerala*
3. *Deptt. of Dravyaguna Vijnana, V.P.S.V. Ayurveda College, Kottakkal, Kerala*

classical hypothyroidism was found to be 10 times more than men (K.P. Paulose, 2011). The possibility of incidence of the disease also increases with a higher rate in old age.

In hypothyroidism, body functions decreases and this lead to slow heart rate, increase in cholesterol level, mild anemia, pervasive fatigue, depression, low body temperature, cold intolerance, coarsening of skin, muscles and joint aches, constipation, weight gain, slow hair growth, loss of libido, infertility, increased risk of miscarriage and irregular menstrual cycle. In the most common case of hypothyroidism viz. Primary Hypothyroidism resulting from an intrinsic disorder of thyroid gland, low level of serum T3 and T4 and elevated TSH, also called as classical hypothyroidism, resulting the above signs and symptoms (Davidson Principles & Practice of Medicine).

Based on the signs and symptoms, it can be concluded that hypothyroidism is a resultant of vāta-kapha-medovikṛti and dhātvāgni-māndya (Alsa Mariyam Kalathancheri, 2008 and Chanchal Gupta, 2003). Guḍūci and āmalaki are known for their rasāyana property and have action on dhātvāgni especially rasa and rakta. Both the drugs have proven to be immuno-modulators and anti-oxidants. (Dikshit, V. *et al*, 2003 and Shukla, V. *et al*, 2009). According to a report, prevalence of autoimmune hypo-thyroidism is much higher (K.P. Paulose, 2001). Considering the rejuvenative effect of guḍūcī and āmalakī, it can be presumed that they revitalize the destroyed follicles of thyroid gland that are responsible for production of thyroid hormones; of course, it may be questionable and needs further research. These are proved drugs for many diseases and found non-toxic. These two drugs are not found to have any drug-interactions (Database on Medicinal Plants used in Ayurveda, 2005). It has reported that the traditional vaidyas of Madhya Pradesh used guḍūcīsatvam along with āmalakīcūrṇam in hypothyroidism and found effective.

In modern medicine hormone supplement is the only management of this disease. Though it is thought to be a successful therapy, a long term hormone therapy is not always free from complications as well as side effects. Most often it is needed to continue throughout the life in adjusted doses.

This study was an effort to evaluate the effect of a combination of guḍūcīsatvam and āmalakīcūrṇam, named as Thyromax powder, on the clinical symptoms and T3, T4 and TSH levels of hypothyroidism.

Aim:- To evaluate the clinical efficacy of Thyromax powder against Thyroxine sodium in the management of hypothyroidism.

Objectives:- a) Preliminary pharmacognostical study of Thyromax powder; b) clinical evaluation of Thyromax powder in the management of hypothyroidism.

Material and method

A. Preliminary pharmacognostical study

Guḍūcīsatvam

General process and parameters employed in the standardization of guḍūcīsatvam are described below (Quality Standards of Indian medicinal Plants, 2003):

Sample collection:- Fresh stems of guḍūcī (*Tinospora cordifolia*) were collected from nearby areas of Kottakkal with the help of gardener of the College herbal garden. The stem cuttings were properly identified in the department using external morphological and

histological characters. The extract (satvam) was prepared as per the procedure given in the text (Yogaratnākara, Rājayakṣmā cikitsa, 328/1-1½)

Organoleptic characters:- The organoleptic characters are shown in Table 1

Powder microscopy:- Starch grains of guḍūcī showed deep blue color when mounted with iodine solution. Every particle of the extract was separated from each other. The shapes of satvam particle found dissimilar and varied in size from other particles. The particle size assessed and recorded.

Particle size:- Starch grains of guḍucī were approximately 5.5 to 11.20 micron in diameter and 6 to 11.28 micron in length (Fig. Ia & b)

Āmalakīcūrṇam

General process and parameters employed in the standardization of āmalakīcūrṇam are described below (Quality Standards of Indian medicinal Plants, 2003)

Sample collection:- Fresh fruit of āmalakī (*Phyllanthus emblica*) of similar size were bought from market. The fruits were identified in the department and well dried in shade. Powder was prepared in the size of 40 to 80 microns (The Ayurvedic Pharmacopoeia of India, 2001)

Organoleptic characters:- The organoleptic characters are shown in Table 1

Powder microscopy:- Powder showed hexagonal, thick, straight-walled epidermal cells

TABLE 1
Organoleptic characters of combination drugs

Characters	Characteristic
I. Guḍūcīsatvam	
- Touch	Fine and smooth
- Colour	White
- Taste	Sweet
- Odour	Odourless
- Consistency	Fine powder
II. Āmalakīcūrṇam	
- Touch	Rough
- Colour	Light grey
- Taste	Bitter, sour, sweet, astringent
- Odour	Odourless
- Consistency	Fine powder

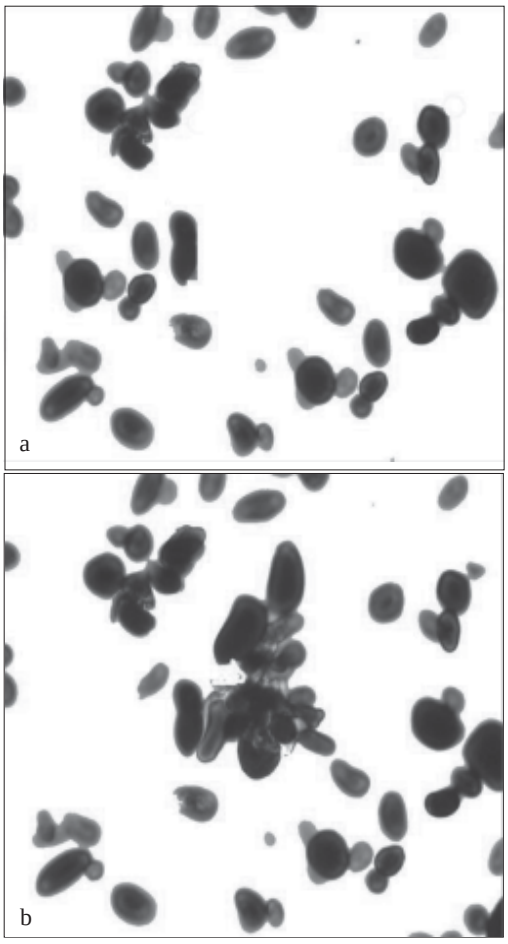


Fig I a&b
Guḍūcīsatvam - Starch grains

in surface view embedded with small prismatic crystals of silica; isolated or groups of thin-walled pitted stone cells; fragments of thick walled fibers and sclereids; fragments of pitted vessels, tracheids and parenchyma, crystals of silica and simple oval to spherical starch grains scattered as such or embedded in the parenchymatous cells of the mesocarp (Fig. IIa-d).[2]

Thyromax powder

Physicochemical standardization:- The combination of extract of guḍūcī and fine powder of dried fruits of āmalakī in the ratio of 1:3, named Thyromax powder, were subjected to preliminary physicochemical screening for the standardization of drug and extraction of plant constituents. (Quality Standards of Indian

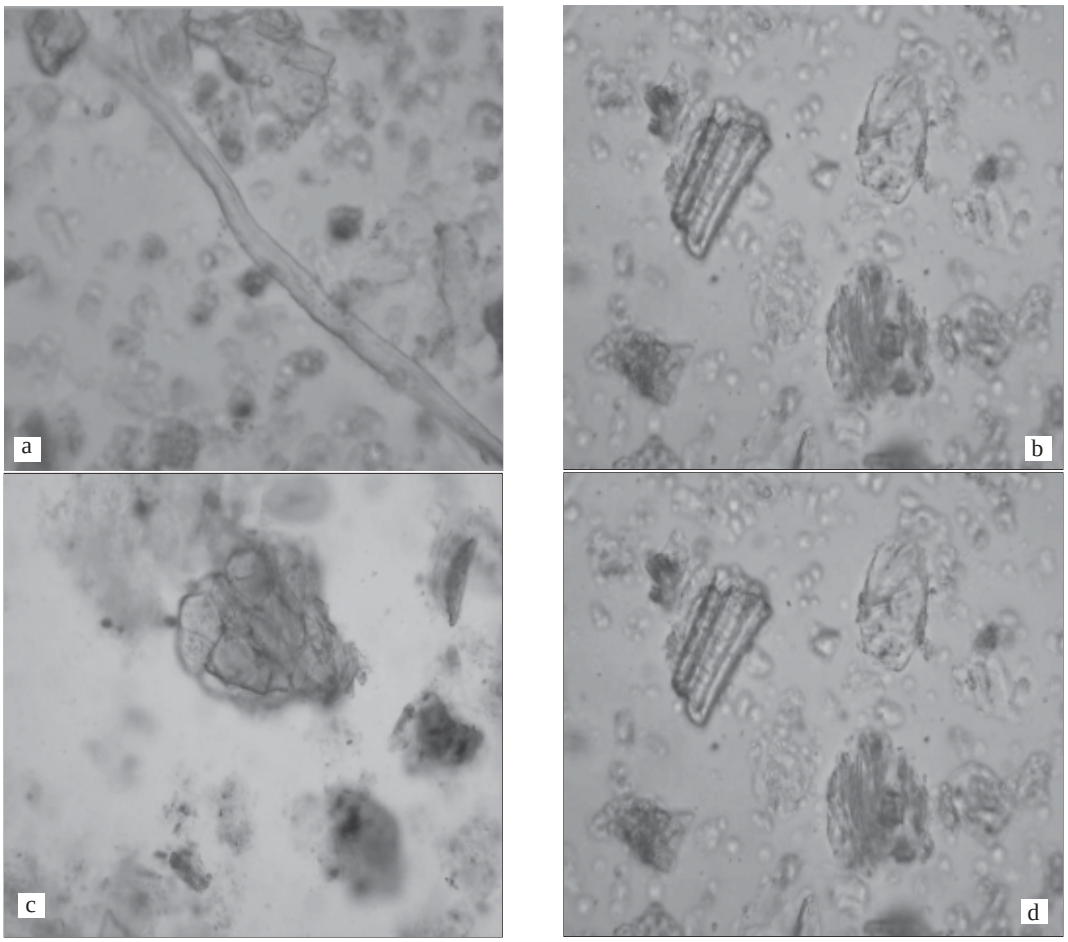


Fig II a-d
Āmalakīcūrṇam - Powder microscopy

medicinal Plants, and The Ayurvedic Pharmacopoeia of India, 2001). The physicochemical standards, percentage of soluble extractives are shown in Tables 2 & 3.

TLC & HPTLC

Selection of chromatographic layer:- Pre-coated TLC silica gel 60 F_{254} (E. Merck) plates on aluminum sheet were used for chromatographic profile for individual drugs and for Thyromax powder. TLC of all successive solvent extractives of Thyromax powder was prepared. While HPTLC fingerprinting of methanolic extract of guḍūcīsatvam, āmalakīcūrṇam and Thyromax powder was prepared.

TABLE 2
Physicochemical standards of Thyromax powder

Experiments	Percentage
1. Total ash	3.05
2. Water insoluble ash	2.23
3. Acid insoluble ash	1.47
4. Moisture content	11
5. Volatile oil content	01
6. Sugar content	
a. Total Sugar	13.1
b. Reducing sugar	7.23
7. Fibre content	3.0

TABLE 3
Percentage of water soluble, alcohol soluble and successive solvent extractives

Name of extract	% of extract	Color / Consistency
I. Water soluble and alcohol soluble		
- Hot water soluble	80.75	Blackish brown/ Dry
- Cold alcohol soluble	27.40	Dark brown / Oily
- Hot alcohol soluble	50.00	Dark brown / Oily
II. Successive solvent		
- Petroleum ether	1.63	Light yellow / Oily
- Cyclohexane	0.80	Lemon yellow / Oily
- Acetone	12.0	Dark brown / Oily
- Ethanol	11.0	Dark brown / Oily

Selection of mobile phase for TLC:- For Thyromax powder, an appropriate solvent system was selected before the application of the samples to the plates. The solvent system chosen by the trial and error method for TLC analysis were different for different successive solvent extractives viz. a) For Petroleum ether extract - n-hexane:ethyl acetate:formic acid (10:2:0.2), b) For Cyclohexane extractive - toluene:ethyl acetate:formic acid (8:2:0.2) and c) For Acetone and Ethanol extract - Toluene:ethyl acetate:formic acid (5:5:1).

Selection of mobile phase for HPTLC:- For guḍūcīsatvam, āmalakīcūrṇam and Thyromax powder, the solvent system chosen was - methanolic extract - toluene:ethyl acetate:formic acid (7:5:1).

Application of sample:- CAMAG Automatic TLC sampler IV was used for application of sample and the concentration of sample extractives were between 0.2 to 0.6 micro liters.

Pre-conditioning:- Saturated chamber by lining with filter paper for 30 minutes was prepared prior to development for getting better Rf values. For this CAMAG ADC-2 Automatic development chamber was used.

Chromatographic development and drying:- After development, the plates were taken out and mobile phase was completely removed from the plate by drying in vacuum desiccators.

Detection and visualization:- Detection under UV light is the first choice. So plates were visualized in CAMAG TLC Visualizer and photographs were taken in UV 254 and 365 nm wavelength. Since very dim spots were obtained in visible light, the TLC plates were sprayed with Anisaldehyde sulphuric acid and dried in hot air oven at 110°C. The colours of the spots were recorded and their positions were marked. The distance travelled by each band was measured and respective Rf values were calculated.

Phytochemical analysis

Quantification of characteristic compounds:- The extracts obtained were subjected to qualitative tests for identification of various plant constituents. (Quality Standards of Indian medicinal Plants, 2003 and The Ayurvedic Pharmacopoeia of India, 2001). The qualitative Phytochemical analysis of the extractives is shown in Table 4.

TLC analysis:- For TLC study of Thyromax powder, Petroleum ether, Cyclohexane, Acetone and Ethanol extractives were spotted in the solvent system given in the literature of TLC under heading selection of solvent system.

TABLE 4
Qualitative phytochemical analysis of extractives

Solvent	S	Alk. by		P	F	T
		M	D			
Petroleum ether	+	–	+	–	–	+
Cyclohexane	–	+	+	–	–	+
Acetone	+	–	+	+	+	+
Ethanol	+	–	+	+	+	+
Water	+	–	–	+	+	+
Cold alcohol	+	–	+	+	+	+
Hot alcohol	+	–	+	+	+	+

* S - Steroid, Alk - Alkaloids, M - Mayer's, D - DDR, P - Phenol, F - Flavanoids, T - Tannins

Eluents were different for all extractives (common for Acetone and Ethanol). The Rf values of different spots of Thyromax powder are shown in Table 5.

HPTLC analysis

HPTLC profile was prepared for guḍūcīsatvam, āmalakīcūrṇam and for the combination Thyromax powder separately. The mobile phase and extracts were different for samples. The Rf values of methanolic extract of guḍūcīsatvam, āmalakīcūrṇam and Thyromax powder are shown

TABLE 5
Rf values of different spots of Thyromax powder

Name of extract and colour of spot	Rf value
1. Petroleum ether (7 spots)	
- Violet	0.24
- Violet	0.31
- Violet	0.36
- Violet	0.40
- Pale pink	0.61
- Violet	0.68
- Pale violet	0.80
2. Cyclohexane (5 spots)	
- Purple	0.40
- Purple	0.48
- Purple	0.66
- Violet	0.78
- Violet	0.88
3. Acetone (3 spots)	
- Brown	0.12
- Brown	0.34
- Light violet	0.46
4. Ethanol (7 spots)	
- Pale brown	0.07
- Pale brown	0.13
- Pale brown	0.17
- Brown	0.24
- Pale brown	0.35
- Light green	0.41
- Light violet	0.49

in Table 6. The area graphs of guḍūcīsatvam, āmalakīcurṇam and Thyromax powder are shown in Fig. IIIa-d.

B. Clinical study

Study design

The study was a controlled clinical trial. Randomization was not done due to two different settings. Newly diagnosed participants were selected as per the inclusion and exclusion criteria. The control selected was not a concurrent control. The control group was selected from an accessible population at

TABLE 6

Rf value of Methanolic extract of Guḍūcīsatvam, Āmalakīcūrṇam and Thyromax powder

Guḍūcīsatvam		Āmalakīcūrṇam		Thyromax	
Spots		Spots		Spots	
Colour	Rf	Colour	Rf	Colour	Rf
LO	0.80	B	0.18	DB	0.18
		LO	0.40	B	0.60
		LV	0.70	P	0.70
		P	0.80		

*LO - Light orange; B - Blue; LV - Light violet; P - Pink; DB - Dark blue

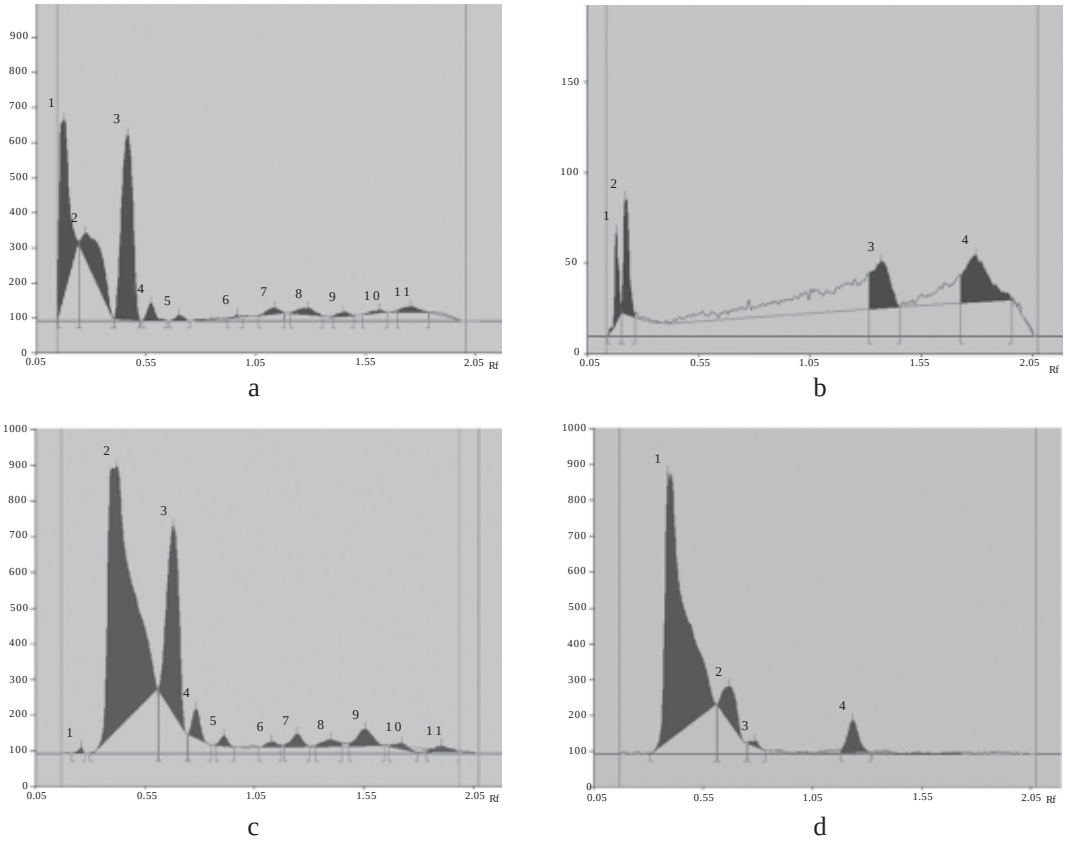


Fig IIIa-d : Area graphs of Methanolic extract

a Āmalakīcūrṇam at 254 nm; b Guḍūcīsatvam at 254 nm;
c Thytomax powder at 254 nm; d Thyromax powder at 366 nm

Maulana Hospital, Perinthalmanna, Kerala. A detailed clinical examination was done before and after the study using a specially prepared case record form. Analysis of both the treatments was done by evaluating subjective and objective parameters.

As randomization was not done, comparison of demographic details and the base line values of both the groups and comparison of response to the treatment within both the groups were done. Total 20 participants were registered; and equally divided into two groups i.e. 10 subjects each in Study and Control. All participants received full course of treatment and completed the course successfully without any interruption.

Results and discussion

A. Pharmacognostical study

Moisture content of the shade dried drug determined by Dean & Starks apparatus found to be 11%. Total ash of any drug is the residue obtained on its complete incineration in an electric Bunsen burner. This mainly represents the inorganic salts present in the drug; if the drug is pure and any impurities like sand, soil etc. adhering to the drug will also remain as ash and thereby increases the ash value several fold. Ash value is the general criterion to ascertain the purity of the drug. Total ash value of the drug was found to be 3.05%. Water insoluble ash mainly gives the percentage of organic matter present in the ash and this found to be 2.23%. Acid insoluble ash, which mainly gives the percentage of the sand and impurities that remain insoluble in HCl; it was found to be 1.47%. Water soluble extracts of the drug mainly represents the percentage of organic constituents such as tannins, sugars, plant acids, mucilage and glycosides. Alcohol soluble extracts mainly represents the percentage of organic constituents such as alkaloids, phenols, flavanoids, steroids, sugars, etc. present in the drug. (Table 2 & 3)

Successive solvent extraction, which is the extraction of the drug with organic solvents of increasing polarity, was applied for the isolation of active constituents from the crude drug. The highest percentage of extract was obtained by the extraction with acetone (12.0%) and least with the solvent cyclo-hexane 0.80 percent. (Table 3)

The extracts obtained by exhausting crude drugs are indicative of approximate measure of their chemical constituents. Successive extraction showed scattered results because of the combination of two drugs. Due to the ingredient drug *Phyllanthus emblica,* tannin and steroids were present in all except cyclo-hexane extractive. While alkaloid by Mayer's reagent was present only in cyclohexane extract, alkaloid by Dragendroff's reagent was present in all except water soluble extract. Phenol and flavonoids were present in all the extract except petroleum ether and cyclohexane extractives.

B. Clinical study

Student 't' test was applied to find out the level of significance for all the parameters within the study and control groups. The data were statistically analyzed before and after intervention. Both the groups were not compared since only study group showed significant improvement on subjective parameters and only control group showed significant improvement on T3 and T4 level. None of them showed significant effect on TSH parameter (Tables 7 & 8).

Probable mode of action

It has been established for a very long time that there is a complex relationship between thyroid disease, body weight and metabolism; and that difference in BMRs are associated with changes in energy balance (K.P. Paulose, 2011). These studies have concluded that under secretion of thyroid hormones leads to low BMR and thereby weight gain, decrease in energy balance causes sleepiness and muscle cramps. Once the drug holds the body metabolism, all these symptoms get relieved. Functions of thyroid hormone have a close resemblance to the dhātvāgni (Alsa Mariyam Kalathancheri, 2008). Constipation is the foremost symptom of this disease which is due to agnimāndya and āma. Both the drugs are considered excellent pittaśāmaka and hence balance the pitta and

TABLE 7
Effect of the treatment on various parameters in Study group

Parameters	Mean			SD	't'	p
	BT	AT	Difference			
1. Weight gain	1.2	0.3	0.90	0.31 ± 0.1	9	0.00
2. Excessive sleep	2.2	0.2	2.0	0.47 ± 0.14	13.4	0.000
3. Muscle cramp	2.2	0.2	2.0	0.47 ± 0.13	13.14	0.000
4. Oedema	1.8	0.40	1.4	0.51 ± 0.16	8.5	0.000
5. Dry skin	2.0	0.6	1.4	0.69 ± 0.22	6.33	0.000
6. Constipation	2.8	0.0	2.8	0.42 ± 0.42	21	0.000
7. T3 parameter	0.696	0.719	0.023	0.168 ± 0.53	0.431	0.677
8. T4 parameter	54.01	54.91	1.93	17.31 ± 5.47	0.353	0.733
9. TSH	55.99	23.46	3.25	97.81 ± 30.93	1.052	0.320

TABLE 8
Effect of the treatment on various parameters in Control group

Parameters	Mean			SD	't'	p
	BT	AT	Difference			
1. Weight gain	1.3	1.2	0.10	0.31 ± 0.1	1	0.34
2. Excessive sleep	1.9	1.6	0.3	0.48 ± 0.15	1.96	0.081
3. Muscle cramp	2.0	1.7	0.3	0.48 ± 0.15	1.96	0.081
4. Oedema	1.3	1.10	0.20	0.42 ± 0.13	1.5	0.168
5. Dry skin	1.5	1.4	0.10	0.31 ± 0.10	1.0	0.343
6. Constipation	2.4	2.1	0.30	0.483 ± 0.15	1.96	0.081
7. T3 parameter	0.658	0.822	0.164	0.091 ± 0.028	5.66	0.000
8. T4 parameter	43.76	65.92	2.21	14.71 ± 4.65	4.76	0.001
9. TSH	62.79	8.17	5.46	90.36 ± 28.57	1.910	0.088

regularise the dhātvāgni. The properties like madhura and amḷa rasa, snigdha guṇa, madhura vipāka and uṣṇa vīrya of drugs pacify the aggravated vāta; and kaṣāya rasa, rūkṣa guṇa and uṣṇa vīrya eliminate the kapha in channels and also help in improving agni. Once agni gets normalized, the signs and symptoms of hypothyroidism like constipation, weight gain, excessive sleep and muscle cramp get relieved. Guḍūcīsatvam having snigdhaguṇa and madhurarasa reduces the dryness of skin. Āmalakīcūrṇam by virtue of its rūkṣaguṇa reduces the excessively accumulated water in the case of hypothyroidism that is the main cause of weight gain.

As both guḍūcīsatvam and āmalakīcūrṇam have rasāyana properties, they are best in longstanding disease like hypothyroidism. In the case of primary hypothyroidism, the anomaly happens is in the thyroid gland itself. The under-production of thyroid hormones leads to increased TSH from pituitary and various signs and symptoms. Being pittaśāmaka, the trial drugs reduce inflammatory changes; being vātaśāmaka reverse the condition of destroyed thyroid follicles or hold up the follicles to amplify the liberation of hormones. Anti-oxidant and immunomodulatory effect of these drugs helps in this action.

Conclusion

- Yield of guḍūcīsatvam was only 3% and the HPTLC finger print showed more than four chemical constituents present in guḍūcīsatvam.
- HPTLC finger print showed 11 peaks representing chemical constituents present in āmalakīcūrṇam.
- There was no negative impression in HPTLC profile of Thyromax powder due to combination of two herbs. Thyromax powder found to be more effective in reducing the subjective parameters.
- Thyroxine sodium is found to be more effective on T3 and T4 parameters.
- Thyromax powder and Thyroxine sodium both are found to be insignificant on TSH level parameter.

References:

1. Alsa Mariyam Kalathancheri, *Ayurvedic perspective on endocrinology with special reference to Hyperthyroidism and Hypothyroidism* (Thesis submitted to Kerala University, Thiruvananthapuram, 2008
2. *Pharmacopoeia of India*, Vol. 2, A-53-55, Govt. of India, Ministry of Health, The Controller of Publication, 2001.
3. Billore, K.V., Yelne, M.B., Dennis, T.J. and Chaudhari, B.G., *Database on Medicinal Plants used in Ayurveda*, Vol. 3, 1st Edn., CCRAS, New Delhi, 2005.
4. Chanchal Gupta, "*A comparative study of Pippaliprayoga and Sodhana purvaka samana cikitsa in the management of dhatvagnivikrti* (*hypothyroidism*)" (Thesis Submitted to Gujarat Ayurveda University, Jamnagar), 2003.
5. Dikshit, V., Damre, A.S. and Kulkarni, K.R., "Preliminary screening of Immunocin for immune-modulatory activity", *Indian J. Pharm Sci*., 71: pp 254-7, 2003.
6. Gay J. Canaris *et al*, "The Colorado Thyroid disease prevalence study", *Arch. Intern Med*., 160: pp 526-34, 2000.
7. *Quality Standards of Indian medicinal Plants*, Appendix I and II, pp 235-37, Vol. 1, 1st Edn., Indian Council for Medical Research, New Delhi, 2003

8. Paulose, K.P., *Kerala Medical Journal* (Editorial), issue 4, July 2011.
9. Kochupillai, N. *et al*, "Iodine deficiency and neonatal hypothyroidism", *Bill World Health organ*., 64(4): pp 547-51, 1986.
10. Sir Stanley Davidson, *Davidson Principles & Practice of Medicine*, P 691, 20th Edn., Churchill Livingstone Elsevier Health Science, Philadelphia, 2006.
11. Shukla, V., Vasishtha, M. and Singh, S.N., "Evaluation of Antioxidant profile and activity of Amalaki, Spirulina and wheat grass", *Indian Journal of Biochem*., 24(1): pp 70-75, 2009.
12. *The Ayurvedic Pharmacopoeia of India*, Part 1, Vol. II, Appendix 1, 2.1, 2.2, 3 and 4, pp 205-08, 1st Edn., The Controller of Publication, New Delhi, 2001.
13. Unnikrishnan, A.G. *et al*, "Thyroid disease in India - An epidemiological perspective", *Indian J. Endocr Metab.*, 15:S pp 78-81, 2011.
14. Vanderpump, M.P. "The incidence of thyroid disorders in the community: A twenty year follow up of the Whickham Survey", *Clin Endocrinol (Oxf).*, 43(1): pp 55-68, 1995.

Āryavaidyan Vol. XXVIII., No.1, Aug. - Oct., 2014, Pages 14 - 26

HYGROPHILA SCHULLI M.R. ALMEIDA & S.M. ALMEIDA (KOKILĀKṢA) - A PHYTOPHARMACOLOGICAL REVIEW

Amol S. Kadu[1], Anita Sharma[2] and Vinod Kumar Gothecha[2]

Abstract: *Hygrophila schulli* M.R. Almeida & S.M. Almeida is a promising medicinal plant with great economic potential, described in āyurvedic literature as ikṣura, ikṣugandha and kokilākṣa (having eyes like kokila or Indian cuckoo). It is well known as tālimkhana in Unani medicine. It has been traditionally used for the treatment of inflammation, pain, urinary infection, edema, gout and as a diuretic. The seeds are acrid, bitter, aphrodisiac, tonic, sedative, used for diseases of the blood. A scrutiny of literature revealed some notable pharmacological effects like antitumor, hypoglycemic, aphrodisiac, antibacterial, free radical scavenging and lipid peroxidation, hepatoprotective, haematopoietic, anthelmintic, anti-inflammatory, antipyretic, anabolic and androgenic activities. The plant contains saponins, alkaloids, steroids, tannins, flavonoids and triterpenoids are the main phytoconstituents. This review is an attempt to summarise the various pharmacological action of *H. schulli* along with its phytochemical constituents as well as ethanobotanical and traditional uses.

Introduction

The role of traditional medicines in resolving health problems on a global level is invaluable. Medicinal plants continue to provide valuable therapeutic agents, in both modern and traditional medicine. With the associated side effects of modern medicine, traditional medicines are gaining importance and are now being studied to find the scientific basis of their therapeutic actions.[1] *Hygrophila schulli* M.R. Almeida & S.M. Almeida, finds mention in all āyurvedic treatises as rasāyana or rejuvenator. *H. schulli* belonging to the family Acanthaceae called tālimkhana is described in āyurvedic literature as ikṣura, ikṣugandha and kokilākṣa (having eyes like the kokila or Indian cuckoo) and is common in moist places like the banks of tanks, ditches and paddy fields. It is believed to be indigenous to India from the Himalayas to Srilanka, Myanmar, Malaysia, and Nepal.[2-5] The synonyms of *H. schulli* are *Asteracantha longifolia* (Linn.) Nees; *Hygrophilia spinosa* T. Anders and *Hygro-philia auriculata* (Schum.) Hiene.[6]

Morphology

It is spinscent herb; fascicle with many roots at the base of stem;[6] it is with numerous fasciculate usually unbranched subquadrangular, rusty-green erect stems 0.6-1.5 m. high, thickened at the nodes, more or less hispid with

1. Pitruchhaya, Tidke Nagar, Near Indane Gas Agency, Murtizapur (Tq), Akola Dist.
2. P.G. Deptt. of Agadtantra, National Institute of Ayurveda, Madhav Vilas Palace, Amer Road, Jaipur - 302 002

long hairs, especially below each node. Leaves simple, opposite, subsessile, lanceolate, 7.5-17.0 cm, entire, sparsely hispid with long white hairs, whorls of straight stout spines present at nodes.[6] Flowers in a whorl of 8 (in 4 pairs) at each node; bracts about 2.5 cm. long, like the leaves, lanceolate, hairy and ciliate; bracteoles 2 cm. long, linear-lanceolate, with hyaline margins in the lower part, hairy and ciliate with long white hairs. Calyx 4- patite; upper sepal 1.6-2 cm. long, broader than the other 3, which are 1.3 cm long, all linear lanceolate, coarsely hairy on the back, and with hyaline ciliate margins. Corolla purple-blue, reaching 3.2 cm long, widely 2 lipped; tube 1.6 cm. long, the upper lip 2-fid with oblong truncate lobes, the lower lip with 2 entire crest like longitudinal folds or callosities on the palate, deeply 3 lobbed, the lobes oblong or slightly obovate, rounded or truncate. Filaments quite glabrous, one short and one long filament of each pair united at the base. Style slightly pubescent, filiform.[5] Capsules 8 mm. long, linear-oblong, pointed. 4-8 seeded; seeds like the eye of cuckoo.[5,6] (Fig. Ia-c)

Phenology:- Flowering: October- November[6]

Parts used:- Root, seed, whole plant

Adulterant:- Young plant looks like *Enhydra flactuens*.[6]

Āyurvedic preparations:- Pauṣṭikacūrṇam; Kokilākṣa kvātham, Āvilttolādi bhasmam, Panaviralādi bhasmam, Vastyāmayantaka ghṛtam, Rasnairaṇḍādi kvātham, Vasiṣṭha rasāyanam, etc.

Phytochemistry

Whole plant:- Phytochemically, the whole plant contains phytosterols, tannins, carbohydrates, flavonoids, terpenoids, and sterols.[7,8] and lupeol, betulin, and stigmasterol were isolated

Fig. Ia-c - *Hygrophila schulli*
a Whole plant; b Flower; c Seeds

from the plant.[10] Parashar and Harikishan Singh (1964) isolated an alkaloidal fraction from the alcoholic extract of the aerial parts.[15] Betulin was isolated from the methanolic extract of the aerial parts.[17] Misra *et al*, (2001) isolated two aliphatic esters, 25-oxo hentriacontyl acetate and methyl 8-n-hexyltetracosanoate, from the methanolic extract of the aerial parts.[17] Essential oils were isolated from the aerial parts and tested for antibacterial activity.[1]

Seed:- Phalnikar *et al* analyzed the oil from the seeds and reported the presence of uronic, palmitic, stearic, oleic, and linoleic acids.[7,8] Thanki and Thaker (1980) studied the amino acid composition of the seeds and reported that the seed proteins contained all the essential amino acids and were comparable with those of groundnut protein.[19] Two alkaloids, asteracanthine and asteracanthicine, were reported from the seeds.[15]

Flower:- Balraj and Nagarajan (1982) isolated apigenin 7-O-glucuronide from the flowers along with traces of apigenin 7-O-glucoside.[9]

Root, leaves and stem:- Alkaloids, steroids, tannins, proteins, flavonoids, carbohydrates, fats, and oils were isolated from the roots.[11] Quasim and Dutta (1967) reported the presence of stigmasterol in the roots.[18] Essential oils were isolated from the root and tested for antibacterial activity.[15] Moreover, the leaves show the presence of alkaloids, carbohydrates, proteins, steroids, glycosides, flavonoids, tannins, phenolic compounds, fats, and oils.[11] Nair *et al*, (1965) reported the presence of luteolin and luteolin-7-Orutinoside in the leaves.[17] The high-performance thin layer chromatography analysis revealed the presence of phytosterols, namely, â-sitosterol and lupeol. Maximum content of lupeol was found in the roots (0.25%), whereas the maximum content of â-sitosterol was found in the leaves (0.069%).[12] Govindachari *et al*, (1957) reported the presence of lupeol in the roots, leaves and stem, and a hydrocarbon, hentricontane, in the leaves and stems.[16]

Other isolated chemical constituents: - Include betulin, 25-oxo-hentriacontanyl acetate,[13] and methyl8-n-hexyltetracosanoate.[13] Choudhary and Bandyopadhyay (1998) reported a high concentration of Fe, Cu, and Co in all organs.[19]

Pharmacological activity

A. Hyploglycemic activity

1. In 1989, the hypoglycemic activity of H. auriculata in human subjects was reported. Treatment of streptozotocine-induced diabetic rats with ethanolic extracts from the aerial parts at doses 100 and 250 mg/kg for 3 weeks showed a significant reduction in the blood glucose levels. There is also decrease in thiobarbituric acid reactive substances (TBARS) and hydroperoxide in both liver and kidney. The treatment with Al Eth significantly increased the glutathione (GSH), glutathione peroxidase (GPx), glutathione S-transferase (GST) and catalase (CAT) in the drug-treated group, which is comparable to the control group. Al Eth treated rats also showed decreased lipid peroxidation that is associated with increased activity of superoxide dismutase (SOD) and catalase. This study shows the antidiabetic activity along with potent antioxidant potential in diabetic conditions. It is useful in treating diabetes as per the traditional system.[19]
2. Fernando *et al*, (1991) carried out preliminary investigations of the hypoglycaemic activity of aqueous extracts of the whole plant and found that the extract significantly lowers

the fasting blood glucose level and markedly improves the glucose tolerance of rats at a therapeutic dose equivalent to 5 g/kg of the starting material.[20]

3. Administration of the aqueous extract to rats prior to glucose loading showed hypoglycemic action as it was significant increase in the glycogen content of liver and muscle and a significant increase in triacylglycerol content of adipose tissue in comparison with control rats. However, the plant extract had no effect on the gluconeogenic capacity of the kidney or intestinal glucose absorption.[21,22]

4. Alloxan induced diabetic male albino wistar rats were treated with the aqueous extract at the doses of 100, 200 and 400 mg/kg, p.o showed significantly decrease in plasma glucose, glycosylated hemoglobin, alanine transaminase, aspartate transaminase, serum total cholesterol, whereas plasma insulin, haemoglobin, levels of pancreas enzymatic and non-enzymatic antioxidant enzymes (superoxide dismutase, catalase and reduced glutathione) were significantly increased. Histopathological observation of pancreas reverses the trends towards normalcy. Hence, it can be concluded that the leaf extract is effective in the treatment of diabetes mellitus owing to its ability to increase insulin secretion and enhance the antioxidant activity.[23]

B. Hepatoprotective activity

There are so many animal expireriments performed to evaluate the significant hepatoprotective activity against CCl_4 (Carbon tetrachloride) and paracetamol induced liver damage:-

1. The aqueous extract exhibited significant hepatoprotective activity in mice by reducing Carbon tetrachloride- and paracetamol induced changes in liver enzymes. The plant extract may interfere with free radical formation, which may account for the hepatoprotective action. *Asteracantha longifolia* showed significant hepatoprotective activity against carbon tetrachloride and paracetamol, comparable with standard drugs used for this purpose.[24]
2. Aqueous extract of the roots at a dose of 150 mg/kg/p.o exhibited potent hepatoprotective activity against carbon tetrachloride-induced liver damage in rats.[25]
3. Aqueous extract of the roots exhibited hepatoprotective in CCl4-induced liver toxicity in rats and in vitro antioxidant activity using ferric thiocyanate (FTC) and thiobarbituric acid (TBA) methods.[26]
4. Aqueous extract of the root in carbon tetrachloride-induced liver damage was studied in albino rats to support the traditional claim. The roots were found to be rich in antioxidants. Liver damage in rats was induced by carbon tetrachloride. To find out the hepatoprotective activity, the aqueous extract of the plant root samples were administered to rats for 15 days. The serum marker enzymes aspartate transaminase, alanine transaminase, and ãglutamyl were measured in experimental animals. The increased enzyme levels after liver damage with carbon tetrachloride were nearing normal value when treated with aqueous extract of the root samples. Histopathologic observation also proved the hepatoprotective activity of the root samples.[1, 27]

5. Potent hepatoprotective action was studied against perchloroethylene induced hepatic damage in rats. Perchloroethylene (1000mg/kg bwt) was administered orally as a single dose. The lipid peroxidation levels (LPO) and liver marker enzymes such as alanine aminotransferase (ALT), aspartate aminotransferase (AST), and alkaline phosphatase(ALP) were significantly increased whereas the antioxidant enzymes such as superoxide dismutase (SOD), catalase (CAT), and glutathione peroxidase (GPx) were significantly decreased. *H. schulli* (300mg/kgbw for 15 days) treated group significantly decrease the LPO level and liver marker enzymes and increased the antioxidant status. The biochemical observations were supplemented with histopathological examination of rat liver sections.[29]
6. Antihepatotoxic effect with treatment of methanolic extracts of the seeds of this plant was studied on rat liver damage induced by a single dose of paracetamol (3 g/kg, p.o.) or thioacetamide (100 mg/kg, s.c.) by monitoring several liver function tests, namely, serum transaminases (SGOT and SGPT), alkaline phosphatase, sorbitol dehydrogenase, glutamate dehydrogenase, and bilirubin in the serum. Furthermore, hepatic tissues were processed for assay of triglycerides and histopathologic alterations simultaneously. A significant hepatoprotective activity of the methanolic extract of the seeds was observed.[30]
7. A methanolic extract of the seeds at a dose of 200 mg/kg/p.o exhibited potent hepatoprotective activity against paracetamol and thioacetamide-induced liver damage in rats.[31]
8) The whole plant slurry of exhibited significant hepatoprotective activity by reducing carbon tetrachloride-induced liver damage changes in biochemical parameters of hepatic enzyme activity. The whole plant slurry of exhibited significant hepatoprotective efficacy against carbon tetrachloride, comparable with a known hepatoprotectant, silymarin.[32]
9. The petroleum ether extract affects liver and kidney functions and metabolism and hematological parameters in high doses (40 and 80 mg/kg) whereas low weekly dose (20 mg/kg) and low and moderate daily/therapeutic dose (2 and 4 mg/kg) does not exhibit any appreciable toxic action.[33]
10. Shivashangari *et al*, (2004) studied the protective efficacy on acetaminophen induced liver damage in rats.[34]
11. The whole plant slurry was hepatoprotective activity against CCl4 induced liver dysfunction in rats. Later also reported that the slurry, aqueous extract and ethanolic extract of whole plant powder showed hepatoprotective effect against galactosamine induced hepatotoxicity.[35][36]

All these studies support its traditional role as being hepatoprotective.

C. Antitumor activity

1. Petroleum ether extract of the roots exhibited antitumor activity in Ehrlich ascites carcinoma (EAC) - and sarcoma-180 (S-180)-bearing mice. The extract suppressed significantly the tumor fluid volume at the end of a 3 weeks experiment. It decreased about 50% of packed cell volume and

increased the life span of EAC/S-180-bearing mice in a day-dependent manner. Red blood cell (RBC) count, hemoglobin content, and white blood cell count significantly increased to normal after extract treatment of the tumor-bearing mice. It also inhibited the rapid increase of the body weight of tumor-bearing mice. This finding supports its traditional use in cancer and blood disorders.[37]

2) Ahmed *et al* (2001) reported the anti-tumor activity of the seeds against experimental hepatocarcinogenesis in rats. Methanol extract of seed shows inhibition of hepato-carcinogenesis in Wistar rats. Increase GPx and CAT, ODC. They also showed that the seeds significantly affected the activities of the antioxidant enzymes, glutathione peroxidase and catalase, in a dose-dependent manner[38].

3. The hydroalcohlic extract of the whole plant at a dose of 300 mg/kg body weight, showed significant anti-tumour activity against 7, 12-dimethylbenz (a) anthracene (DMBA)-induced mammary tumours in female rats comparable with a standard drug, tamoxifen.[39]

D. Haematopoietic activity

1. Petroleum ether and chloroform extract of the leaves show haematopoietic activity as it significantly increases erythrocyte count, leukocyte count, and haemoglobin count.[40,41]

2. The haematopoetic activity was evaluated using cyclophosphamide-induced anemia in rats. Chloroform extract of the leaves at both 250 and 500 mg/kg doses significantly improves RBC and hemoglobin counts for 7 days and cyclophosphamide-induced bone marrow suppression after 21 days of treatment. It is also found that it increases bone marrow cellularity.[41]

3. Ethanolic extract (100 and 200 mg/kg, p.o.) of the aerial parts significantly increased the haemoglobin, haematocrit, RBC and total WBC, as compared with vehicle treated control rat. In anemic male albino rats, the extract significantly increased haemoglobin, haematocrit and RBC count (Gomes *et al*., 2001).[42]

4. Petroleum ether extract of root increases WBC count significantly.[43]

5. The haematopoetic activity was evaluated using haloperidol induced iron deficiency anemia in rats. The ethanolic extract of (leaf part) at the doses of 100 mg/kg and 200 mg/kg body weight, i.p., demonstrated a significant increase in erythrocyte count, haemoglobin count, serum iron and serum protein etc. This effect may be due to the presence of iron (622 µg/50 mg) in extract estimated by spectrophotometric method and other constituents as flavonoids, terpenoids, steroids, lupeol and betulin.[44]

E. Diuretic activity

The screening was performed according to the method described by Lipschitz et al. Male Wistar albino rats (150-200 g) were used for the experiment. The animals were divided into different groups: the control group received normal saline (25 ml/kg body weight, p.o.); the second group received frusemide (10 mg/kg, p.o.), and other groups received doses of extracts/fractions (200 mg/kg each), in normal saline. The volume of urine collected was measured at the end of 5 hours and the total

urine volume and concentrations of Na^+, K^+, and Cl^- in the urine were determined. The alcoholic extract at doses of 200 mg/kg showed a significant increase in the total urine volume and concentrations of Na^+, K^+, and Cl^- in the urine in the rats. This finding supports its traditional use as a diuretic. [45,46]

F. Anti-nociceptive activity

1. The aqueous extract of the aerial parts and roots at a dose of 200 mg/kg (p.o.), exhibited potent antinociceptive activity in a mouse model of thermally induced analgesia.[47]
2. The petroleum ether, choloroform, alcoholic and aqueous extracts of the leaves were screened for analgesic activity. Analgesic activity was studied by hot plate and tail flick tests in the thermal method, while the acetic acid-induced writhing test was used in the chemical method. The chloroform, alcoholic and aqueous extracts, at doses of 200 and 400 mg/kg body weight, significantly inhibited the abdominal constriction produced by acetic acid and also increased the pain threshold of mice to the thermal source in a dose-dependent manner comparable with the standard drug, aspirin (100 mg/kg body weight). This reveals its analgesic activity by central as well as peripheral mechanisms.[48]
3. The ethanolic extract showed significant analgesic activity by using Thermal method (Eddy's hot plate test) and chemical method (Acetic acid induced writhing test) and acid tail flick method. In acetic acid induced writhing test the test extract showed abnormal contraction same as that of the standard drug. In hot plate method the response of the test group, the response was 7.1 seconds which was comparable with that of the standard group 9 seconds. In the tail flick method, the response of the test group was equal to that of standard group. The ethanolic extract has shown good result comparable with the standard analgesic drug. Phyto constituent like alkaloids, glycosides, saponins, tannins and phytosterols may be responsible for the said analgesic activity.[49]

G. Antioxidant activity

1. Phytochemicals have been shown to possess significant antioxidant properties that may be associated with lower incidence and lower mortality rates of degenerative diseases in human. Various in vitro and in vivo antioxidant activities have been carried out on various extracts of different parts of H. spinosa. The root extracts showed the presence of the nonenzymatic antioxidants, total phenols, flavonoids, and tannins. This finding suggests its possible use in diseases in which free radicals play an important role.[50,51,52]

   The methanolic extract of leaves contain phenolic and flavonoid shows promising antioxidant activity.[53]
2. The aqueous extract of the leaves showed potent antioxidant activity in various in vitro model.[54]
3. Sunilkumar and Klausmuller (1999) screened 28 different plant species of Nepalese medicinal plants, including seeds used traditionally to treat inflammatory diseases for an inhibitory effect on lipid peroxidation and reported that the plant inhibited lipid peroxidation with an IC50 Value of 20 µg/ml.[55]

H. Anti-inflammatory

Patra *et al* (2009) examined the anti- inflammatory

and antipyretic activity of the petroleumether, chloroform, alcoholic and aqueous extracts of the leaves. The anti-inflammatory activity of the various extracts was studied based on their effects on carrageenan-induced paw oedema in rats while the antipyretic activity was evaluated on the basis of their effect on Brewer's yeast-induced pyrexia in rats. The chloroform and alcoholic extracts of leaves exhibited significant anti-inflammatory and antipyretic activities in a dose-dependent manner while the petroleum ether and aqueous extracts did not have any significant anti-inflammatory and antipyretic activities. The maximum anti inflammatory activities were produced by the chloroform and alcoholic extracts at a dose of 400 mg/kg body weight.[56]

I. Antipyretic activity

The petroleum ether, chloroform, alcohol, and aqueous extracts of leaves were evaluated for their antipyretic activity on the basis of their effect on Brewer's yeast-induced pyrexia in rats at doses of 200 and 400 mg/kg. The results showed that chloroform and alcohol extracts have significant antipyretic activity, but petroleum ether and aqueous extracts failed to lower the raised body temperature in rats. Chloroform extract significantly decreased the elevated rectal temperature 3 h after the administration of a dose of 400 mg/kg, whereas the alcoholic extract reduced the hyperthermia at both doses 1 h after administration.[56,57]

J. Antibacterial activity

1. The antibacterial activity of petroleum ether, chloroform, alcohol, and aqueous extracts of the leaves were evaluated using disc-diffusion method. At a concentration of 100 mg/disc showed a significant increase in the diameters of the zone of inhibition (mm) for *Escherichia coli*, *Staphylococcus aureus*, *Bacillus subtilis* and *Pseudomonas aeruginosa* in Petri dishes using disc-diffusion methods. This finding confirms its traditional use in bacterial infection.[58,59]
2. Boily and Vampuyvelde (1986) examined the antimicrobial activity of an ethanolic extract of the leaves, stem, fruits and root against *Staphylococcus aureus, Pseudomonas aeroginosa, Bacillus subtilis, Escherachia coli, Candida albicans* and *Mycobacterium smegmatis* and reported that the leaves exhibited potent anti-microbial activity against *Staphylococcus aureus, Bacillus subtilis, Candida albicans* and *Mycobacterium smegmatis*.[60.]
3. Vlientick *et al* (1995) investigated the antimicrobial properties of an ethanolic extract of the leaves, stem, fruits and root against *Staphylococcus aureus, Pseudomonas aeroginosa, Esterachia coli, Candida albicans, Tricophyton mentagraphytes* and *Mycobacterium canis* and reported that the leaves exhibited active anti-microbial activity against *Staphylococcus aureus, Candida albicans, Mycobacterium canis* and *Trichophyton mentagraphytes*, while the stem exhibited activity against *Candida albicans, Mycobacterium canis* and *Trichophyton mentagraphytes*.[61]
4. The methanol extracts showed antimicrobial activity specially against *Burkholderia pseudomallei* strain.[62]
5. The chloroform and alcoholic extract exhibited significant antibacterial activity, whereas the aqueous extract has moderate activity and the petroleum ether extract had the weakest activity against these micro-organisms.

K. Anthelmintic activity

The anthelmintic activity of petroleum ether, chloroform, alcoholic and aqueous extracts of the leaves was studied against *Pherithima posthuma* as a test worm, at different concentrations (10-100 mg/ml) in a bioassay which involved determination of the time until paralysis and time until death of the worms. The alcoholic extract showed significant anthelmintic activity at the highest concentration, 100 mg/ml, whereas chloroform and the aqueous extract were only moderately active and the petroleum ether extract exhibited the weakest anthelmintic activity.[58]

L. Antimotility

The antimotility activity was studied by the charcoal meal feeding method and atropine sulphate, at a dose of 0.1 mg/kg (i.p.), was used as the standard comparator drug. The alcoholic extract of the leaves at a dose of 400 mg/kg body weight, significantly decreased the distance travelled by the charcoal meal through the gastrointestinal tract suggesting that the extract exhibited antimotility activity.[48]

M. Aphrodisiac activity

The ethanolic extract of seeds shows androgenic as well as improvement of sexual behaviour of rat in dose dependent manner, it also improve the histoarchitecture of testis and increase the concentration of sperm count in epididymis and also increase testosterone level. The ethanolic extract exhibited pronounced anabolic effects in treated animals, as evidenced by gains in the body and reproductive organ weights. Increased spermatogenesis due to treatment with extracts was also witnessed in transverse section. The treatment further markedly affected sexual behaviour of the animals, as reflected by the reduction of ML, increase in MF and enhanced attractability towards females. A significant increase in the sperm count as well as fructose levels of seminal vesicles was noted.[63,64]

N. Free radical scavenging activity

The free radical scavenging potential of aqueous, alcoholic and other fractions of the whole plant has evaluated using 1, 1'-diphenyl-2-picryl-hydrazyl (DPPH), deoxyribose degradation against OH, nitric oxide and lipid peroxidation radical assays. Vitamin E was used as a standard in the study. The results obtained showed that the n-butanol fraction exhibited potent free radical scavenging activity in a dose dependent manner which was comparable with the standard, Vitamin E.[65]

O. CNS activity

Mazumdar *et al* (1999) carried out a chemical investigation of the petroleum ether extract of the root and reported for the presence of active constituents like lupeol and lupenone. They also reported that the i.p. administration of the crude petroleum ether extract in mice potentiates the sedative-hypnotic action of chlorpromazine, diazepam, phenobarbitone, chlordiazepoxide and protects against strychnine-induced convulsions.[14]

Conclusion

The plant *Hygrophila schulli* has a broad spectrum of activity on several ailments. Various parts of the plant have been explored for antitumor, hypoglycemic, aphrodisiac, antibacterial, free radical scavenging and lipid peroxidation, hepatoprotective, haemato-poietic, anthelmintic, anti-inflammatory and antipyretic activities. The pharmacological studies reported in this review confirm the therapeutic values of *H. schulli*. However, less information is available regarding clinical and

toxicity properties of this plant. The plant is pre-clinically evaluated to some extent; if these claims are scientifically evaluated clinically then it can provide good remedies to various ailments.

References:

1. Kshirsagar, A.D., Ingale, K.G., Vyawahare, N.S. and Thorve, V.S., "*Hygrophila spinosa*: A comprehensive review", *Phcog Rev*.,4, pp 167-71, 2010.
2. Pro. Krushnachand Chunekar, Chaukhamba Bharti Academy, Varanasi.
3. Nadkarni, A.K., *Indian Materia Medica*, Vol. 1, pp 668-669, Popular Prakashan, Mumbai, 2007.
4. Chopra, R.N., Chopra, I.C., Handa, K.L. and Kapur, L.D., *Indigenous Drugs of India*, P 353,603,665,693, UN Dhur and Sons Pvt. Ltd., Calcutta, 1958.
5. Kirtikar, K.R. and Basu, B.D., *Indian Medicinal Plants*, Vol.8, pp 2568-2570, Oriental Enterprises, Dehradun, 2001.
6. Guhabakshi, D.N., Sensarma, P. and Pal, D.C., *A lexicon of Medicinal plants in India*, Vol. I., pp 208-209, Naya Prokash, Distributor - N P sales Pvt. Ltd.
7. Rastogi, R.P. and Mehrotra, B.N., *Compendium of Indian Medicinal Plants*, Vol. I., P 220,: Publication and Information Directorate, CSIR, New Delhi, 1993.
8. Godbole, N.N., Gunde, B.G. and Shrivastav, P.D., "An investigation of oil from seed of Hygrophila spinosa", *J Am Oil Chem Soc*., 18, pp 206-7, 1941.
9. Balraj, P. and Nagarajan, S., "Apigenin-7-O-glucuronide from the flowers of *Asteracantha longifolia* Nees., *Indian Drugs*, 19: pp 150-2, 1982.
10. Usha, K., Kasturi, G.M. and Hemalatha, P., "Hepatoprotective effect of Hygrophila spinosa and Cassia occidentalis on carbon tetrachloride induced liver damage in experimental rats", *Indian J Cli Biochem.*, 22: pp 132-5, 2007.
11. Patra, A., Murthy, N.P. and Jha, S., "Pharmacognostical standardization of leaves of Hygrophila spinosa T. Anders", *Phcog J.*, 1, pp 82-7, 2009.
12. Sunita, S. and Abhishek, S., "A comparative evaluation of phytochemical fingerprints of Asteracantha longifolia Nees. using HPTLC", *Asian J Plant Sci*., 7: pp 611-4, 2008.
13. Misra, T.N., Singh, R.S., Pandey, H.S., Singh, B.K. and Pandey, R.P., "Constituents of *Asteracantha longifolia*", *Fitoterapia*, 72, pp 194-6, 2001.
14. Mazumder, U.K., Gupta, M. and Maiti, S., "Chemical and pharmacological evaluation of *Hygrophila spinosa* root", *Indian J Exp Biol.*, 61, pp 181-3,1999.
15. Parashar, V.V. and Harikishan Singh, "Investigation of *Astercantha longifolia* Nees", *Indian J pharmacol*, 27(4), pp 109-113, 1965.
16. Nair, N,C. and Henry, A.N., *Flora of Tamilnadu, India*, Vol-I, pp 184-89, Botanical Survey of India, Southern Circle, Coimbatore, India, 1983.
17. Quasim, C. and Dutta, N.L., "Presence of Stigmasterol in the root of *Asteracantha longifolia* Nees", *J Ind Chem Socie*, 44: P 82, 1967.
18. Choudhary, B.K. Bandyopdhyay, "Important of mineral content and Medicinal properties of *Moringa olifera* and *Hygrophila auriculata*", *Sachitra Ayurved*, 50(7): pp 543-49, 1980.

19. Vijayakumar, M., Govindarajan, R., Rao, G.M., Rao, C.V., Shirwaikar, A. and Mehrotra, S., *et al*, "Action of *Hygrophila auriculata* against streptozotocin-induced oxidative stress", *J. Ethnopharmacol.*, 104: pp 356-61, 2006.

20. Fernando, M.R., Nalinie Wickramasinghe, S.M.D.N., Thabrew, M.I., Ariyananda, P.L. and Karunamayake, "Effect of *Artrocarpus heterophyllus* and *Asteracantha logifolia* on glucose tolorence in normal human subject and in maturity onset diabetic patients", *J. Ethanopharmacol*, 31(3): pp 277-282. [24], 1991.

21. Fernando, M.R., Wickramasinghe, S.M.D.N. and Thabrew, M.I., "Extra pancreatic actions of *Hygrophila longifolia*", *Pharm Biol.*, 36: pp 352-356, 1998.

22. Fernando, M.R., Wickramasinghe, N., Thabrew, M.I. and Karunanayaka, E.H., "A preliminary investigation of the possible hypoglycaemic activity of *Asteracantha longifolia*", *J. Ethnopharmacol.*, 27: pp 7-14, 1989

23. Muthulingam, M., "Antidiabetic efficacy of leaf extracts of *Asteracantha longifolia* (Linn.) Nees on alloxan induced diabetics in male albino wistar rats", *Int. J Pharm Biomed Res.*, 1(2), pp 28-34, 2010.

24. Hewawasam, R.P., Jayatilaka, K., Pathirana, C. and Mudduwa, L.K.B., "Protective Effect of *Asteracantha longifolia* extract in mouse liver injury induced by carbon tetra chloride and paracetamol", *J. Pharm Pharmacol*., 55(10): pp 1413-18, 2003.

25. Shanmugasundaram, P. and Venkataraman, S., "Antinociceptive activity of *Hygrophila auriculata* (Schum) Heine", *Afr. J. Trad CAM*, 2: pp 62- 69, 2005.

26. Shanmugasundaram, P. and Venkataraman, S., "Hepatoprotective and antioxidant effects of *Hygrophila auriculata* (K. Schum) Heine Acanthaceae root extract", *J. Ethnopharmacol.*,104: pp 124-8, 2006.

27. Usha, K., Kasturi, G.M., Hemalatha, P., "Hepatoprotective effect of *Hygrophila spinosa* and *Cassia occidentalis* on carbon tetrachloride induced liver damage in experimental rats", *Indian J Cli Biochem.*,22: pp 132-5 [16], 2007.

28. Kshirsagar, A.D. and Ashok, P., "Hepatoprotective and antioxidant effects of *Hygrophila spinosa* (K. Schum) Heine Acanthaceae stem extract", *Biosci Biotech Res Asia*, 5: pp 657-62 [29], 2008.

29. Kalyani, M.1., Rathi, M.A., Thirumoorthi, L., Meenakshi, P., Guru Kumar, D., Sunitha, M. and Gopalakrishnan, V.K., "*Asteracantha longifolia* Inhibits Perchloroethylene - Induced Hepatic Damage in Rat", *Journal of Pharmacy Research*, 3(7), pp 1535-37, 2010.

30. Singh, A., Handa, S.S., "Hepatoprotective activity of *Apium graveolens* and *Hygrophila auriculata* against paracetamol and thioacetamide intoxication in rats", *J. Ethnopharmacol.*,49: pp 119-26, 1995.

31. Anubha Singh and Handa, S.S., "Hepatoprotective activity of *Apium graveolens* and *Hygrophila auriculata* against paracetamol and thioacetamide intoxication in rats", *J. Ethanopharmacol*, 49(3), pp 119-126 [17], 1995.

32. Shailajan, S., Chandra, N., Sane, R.T. and Menon, S., "Effect of *Asteracantha longifolia* Nees. against CCl4 induced liver dysfunction in rat", *Indian J of Exp Biol*., 43: pp 68-75 [20], 2005.

33. Mazumdar, U.K., Gupta, M. and Maiti, S.,

"Effect of petroleum ether extract from *Hygrophila spinosa* on hematological parameters and hepatorenal functions in mice", *Indian J Exp Biol.,* 34: pp 1201-03.

34. Shivashangari, K.S., Ravikumar, V. and Devaki, T. "Evaluation of the protective efficacy of *Asteracantha longifolia* on acetaminophen-induced liver damage in rats", *J Medicinal Food.,* 7: pp 245-51, 2004.
35. Shailajan, S., Chandra, N., Sane, R.T. and Menon, S., "Effect of *Asteracantha longifolia* Nees. against CCl4 induced liver dysfunction in rat", *Indian J Exp Biol.,* 43: pp 68-75, 2005.
36. Shailajan, S., Chandra, N., Sane, R.T. and Menon, S., "Effect of *Asteracantha longifolia* Nees. against galactosamine induced liver dysfunction in rat", *Toxicol Int* 14: pp 7-13, 2007.
37. Mazumdar, U.K., Gupta, M., Maiti, S., Mukherjee, D., "Antitumor activity of *Hygrophila spinosa* on Ehrlich ascites carcinoma and sarcoma-180 induced mice", *Indian J Exp Biol.*,35: pp 473-7, 1997.
38. Ahmed, S., Rahman, A., Mathur, M. and Sultana, S., "Anti–Tumor Promoting activity of *Asteracantha longifolia* against experimental Hepatocarcinogenesis in rats", *J Food and Chem Toxicol*, 39(1): pp 19-28[21], 2001.
39. Pattanayak, S.P. and Sunita, P., "Anti-tumor potency and toxicology of an Indian ayurvedic plant, *Hygrophila spinosa*", *Pharmacologyonline*, 2(1): pp 361-71, 2008.
40. Pawar, R.S., Jain, A.P., Kashaw, S.K. and Singhai, A.K., "Effect of *Asteracantha longifolia* on haematological parameters in rats", *Indian J Pharmacol.*, 38: pp 285-86, 2006.
41. Pawar, R.S., Jain, A.P., Kashaw, S.K. and Singhai, A.K., "Haematopoetic activity of *Asteracantha longifolia* on cyclophosphamide induced bone marrow depression", *Indian J Pharm Sci.*,3: pp 337-40, 2006.
42. Gomes, A., Das, M., and Dasgupta, S.C., "Haematinic effect of *Hygrophila spinosa* T. Andersonon experimental rodents", *Indian J Exp Biol*., 39(4), pp 381-382, 2001.
43. Mazumdar, U.K., Gupta, M. and Maiti, S., "Effect of petroleum ether extract from *Hygrophila spinosa* on hematological parameters and hepatorenal functions in mice", *Indian J Exp Biol.,* 34: pp 1201-203, 1996.
44. Rajesh Singh Pawar, Alok Pal Jain, Santram Lodhi and Abhay K. Singhai, "Erythropoietic activity of *Asteracantha longifolia* (Nees.) in rats", *Journal of ethnopharmacology*, Vol. 129(2), pp 280-82, 1996.
45. Haddian, W. and Kerpscar, A., "Bioassay of diuretics", *J Pharmacol Exp Ther.*, 79: pp 97-110, 1943.
46. Ahmed, N., Hussain, K.F., Sarfaraj, M., Zaheen, M. and Ansari, H., "Preliminary studies on diuretic effect of *Hygrophila auriculata* (Schum) Heine in rats", *Int J Health Res.,* 2: pp 59-64, 2009.
47. Shanmugasundaram, P. and Venkatraman, S., "Anti-nociceptive activity of *Hygrophila auriculata* (Schum.) Heine", *African J trad CAM*, 2(1): pp 62-69, 2005.
48. Patra, A., Jha, S., Murthy, N., Roy, D. and Sahu, A., "Analgesic and antimotility activities of leaves of *Hygrophila spinosa* T. Anders", *Pharmacologyonline*, 2(1): pp 821-28, 2008.
49. Avvari Sanjeeva Kumar, Sandeep Kumar, B.V.V.. Pavan Kumar, D., Naresh, Y. and

Priyanka. A., Analgesic activity of ethanolic extract of *Astercantha longifolia* seeds", *IJAPN* Vol. 1 (2), pp 56-59, 2011.

50. Usha, K., Kasturi, G.M. and Hemalatha, P., "Hepatoprotective effect of *Hygrophila spinosa* and *Cassia occidentalis* on carbon tetrachloride induced liver damage in experimental rats", *Indian J Clin Biol.*,22: pp 132-5, 2007.
51. Malick, C.P. and Singh, M.B., *Plant enzymology and histoenzymology*, P 186, Kalyani Publishers, New Delhi, 1980.
52. Shandrel, S.H., *Method in food analysis*, P 709, Academic Press, New York, 1970.
53. Sawadogo, W.R., Meda, A., Lamien, C.E, Kiendrebeogo, M., Guissou, I.P. and Nacoulma, O.G., "P.henolic content and antioxidant activity of six Acanthaceae from Burkina Faso", *J. Biol Sci.*, 6: pp 249-252, 2006.
54. Dasgupta, N. and De, B., "Antioxidant activity of some leafy vegetables of India: A comparative study", *Food Chem*, 101: pp 471-74, 2007.
55. Sunil Kumar, K.C., "Klausmuller Medicinal plants from Nepal; II. Evalution of inhibitors of lipid preoxidation in biological membranes", *J. Ethanopharmacol*, 64(2): pp 135-139, 1999.
56. Patra, A., Jha, S., Murthy, N., Roy, D., Vaibhav, A., Chattopadhyay, P. and Panigrahi, G., "Anti-inflammatory and antipyretic activities of *Hygrophila spinosa* T. Anders Leaves (Acanthaceae)", *Tropical J of Pharm Research*, 8(2): pp 133-37, 2009.
57. Jain, B.B., Rathi, B.S., Thakurdesai, P.A. and Bodhankar S.L., "Antipyretic activity of aqueous extract of leaves of *Cocculus hirsutus*", *Indian J Nat Prod.*, 23: pp 26-9, 2007.
58. Patra, A., Murthy, P.N., Jha, S., Aher, V.D., "Anthelmintic and antibacterial activities of *Hygrophila spinosa* T Anders", *Res J Pharm Tech*, 1: pp 531-2, 2008.
59. Mali, R.G., Hundiwale, J.C. and Sonawane, R.S., "Evaluation of *Capparis decidua* for anthelmintic and antimicrobial activities", *Indian J Nat Prod*.,20: pp 10-3, 2004.
60. Boily, Y. and Vnpuyvelde, L., "Screening of medicinal plant of Rawanda for Antimicrobial activity", *J. Ethanopharmacol*, 16(1): pp 1-13, 1986.
61. Valientic, A.J, Vanhoof, L., Totte, J., Lasure, A., Vanden Berghe, D.R., Wangaboo, P.C. and Mvukiyuwami, J., "Screening of hundred Rwandese medicinal plants for antimicrobial ana antiviral properties", *J Ethanopharmacol*., 46(1), pp 31-47, 1995.
62. Samy, R.P., "Antimicrobial activity of some medicinal plants from India", *Fitoterapia*, 76: pp 697-99, 2005.
63. Chauhan, N.S., Sharma, V., Dixit, V.K., "Effect of *Asteracantha longifolia* seeds on sexual behavior of male rats", *Nat Prod Res* 14: pp 1-9, 2009.
64. Chauhan, N.S., Saraf, D.K. and Dixit, V.K., "Effect of Rasayana herbs on pituitary gonadal axis", *Europ J Integr Med.*, 2: pp 89-91, 2010.
65. Hussain, M.S., Nazeer Ahamed, K.F.H., Ravichandiran, V. and Ansari, M.Z.H., "Evaluation of in-vitro free radical scavenging potential of different fractions of *Hygrophila auriculata* (K.Schum) Heine", *Asian J of Trad Med*., 5(2): pp 51-59, 2009.

Āryavaidyan Vol. XXVIII., No.1, Aug. - Oct., 2014, Pages 27 - 30

EFFECT OF KATAKAKHADIRĀDI KAṢĀYA IN TYPE 2 DIABETES MELLITUS ASSOCIATED WITH HYPERCHOLESTEROLEMIA

Roopa Mathew, V.N. Radhakrishnan and N.Subhash Babu*

Abstract: Non communicable diseases are on the rise worldwide and are a global health concern. Among these, diabetes is a leading cause of morbidity and mortality. Lipid abnormalities in diabetes are major medical concerns owing to various macrovascular complications like CHD, cerebrovascular disease and peripheral vascular diseases. Katakakhadirādi kaṣāya showed statistically significant effect in reducing the FBS, PPBS and total cholesterol levels in patients of type 2 diabetes mellitus associated with hypercholesterolemia.

Introduction

Chronic non communicable diseases (NCD) account for about 60% of total deaths in India annually and among these, diabetes is the most common that undermines the health of the people. The metabolic dysregulation associated with diabetes causes several secondary pathologic changes in multiple organ system.

Cardiovascular risk factors tend to cluster together in diabetes associated with dyslipidemia. Individuals with diabetes may have several forms of dyslipidemia.[1] Elevated levels of fasting plasma total cholesterol are almost always associated with a raised plasma LDL; since LDL carries about 65-75% plasma total cholesterol. The targeted lipid values in diabetes are usually total cholesterol Â5mmol/L (approx.190mg/d) and LDL cholesterol Â3mmol/L (approx.115mg/dl).

Āyurvedic perspective

Apathyāhāravihāra (improper food habits and deeds) in a genetically predisposed individual (sahaja bījaduṣṭi) leads to a tridoṣa vitiation. Among the tridoṣa, the predominant vitiation occurs with respect to kapha and results in bahudravaśḷeṣma (excessive liquidity in kapha). Ācārya Caraka has clearly stated that prakṛta (unvitiated) kapha is bala (strength); and sthairya (firmness) is the property of kapha. In bahudravaśḷeṣmadoṣaviśeṣa, śarīraśaithilya (laxity) occurs. So, once this bahudravaśḷeṣma spreads to the whole body, there is a potential affliction of medodhātu (fat) in particular, owing to their similarity in properties and āśrayā-śrayībhāva. Subsequent dhātvāgnimāndya (metabolic dysregulation) leads to improper utilisation of poṣakāhārarasa (nutrients) reaching the dhātus, leading to malformation of

**Department of Kayachikitsa, Govt. Ayurveda College, Thiruvananthapuram, Kerala*

dhātus. Bahu abadhamedas (abundant and non-compact fat) occurring in these patients are the resultant of this defective transformation of dhātus.

Objective: To study the effect of Kataka-khadirādi kaṣāya in type 2 diabetes mellitus associated with hypercholesterolemia.

Materials and method

Method:- The data was collected from 25 patients attending the diabetic OPD. The FBS, PPBS and total cholesterol levels were assessed prior and after a time period of 3 months and statistically evaluated.

Inclusion criteria:- Patients of age group 30-80 years; diagnosed with type 2 diabetes mellitus and hypercholesterolemia; currently under conventional medication; having the FBS 120-160 mg%, PPBS 140-200 mg% and total cholesterol 200-300 mg%.

Exclusion criteria:- Diagnosed cases of hypothyroidism, coronary artery disease, gestational diabetes and patients on antipsychotics and steroids.

Mode of administration:- Katakakhadirādi kaṣāya 90ml bd, half an hour before food. The anupāna honey, as mentioned in the text, was avoided due to the controversies of glycemic levels of honey available in the market.

Result

Katakakhadirādi kaṣāya showed statistically significant effect in reducing the FBS, PPBS and total cholesterol levels in the study group (Chart 1a-c).

Discussion

Diabetes and dyslipidemia are two separate clinical entities according to modern perspective.

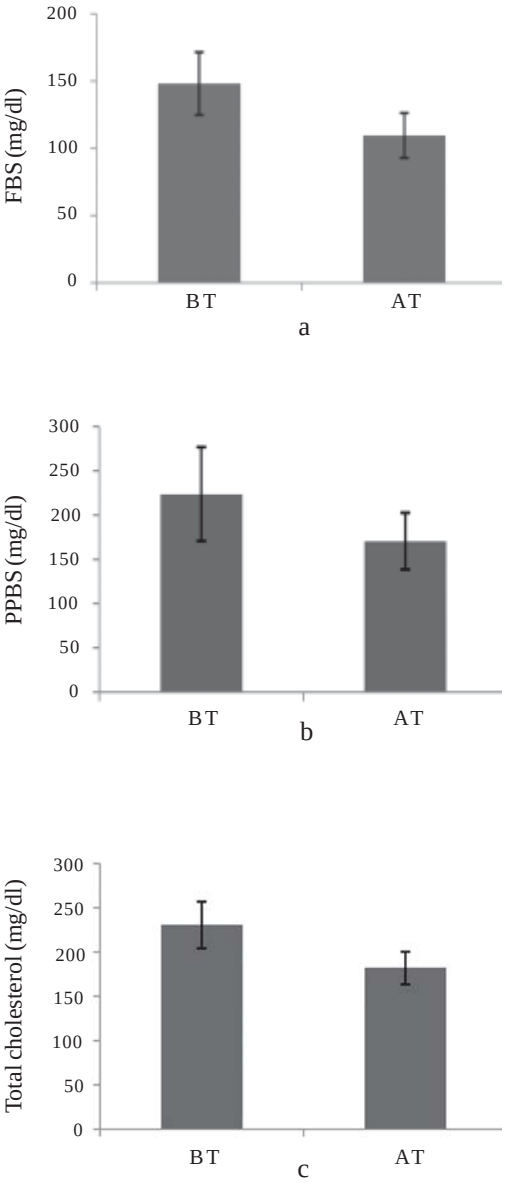


Chart1 a-c: Effect Katakakhadirādi kaṣāya on FBS, PPBS and Total cholesterol

a FBS (t - 8.752, p <0.001); b PPBS (t-7.024, p <0.001); c Total cholesterol (t-8.532, p <0.001)

In āyurvedic view, both of these can be considered to be santarpaṇajanyavikāras (diseases due to over saturation) resulting in kapha-medo pradhāna duṣṭi owing to dhātvāgnivaiguṇya in the body.

In samprāpti(pathogenesis)vighaṭana, kapha-pradhāna-tridoṣahara (alleviate tridoṣa which is kapha predominant), medohara (fat reducing), agnidīpana (digestive) and śrotośodhana (channel purifying) guṇas (properties) are to be highlighted.

Katakakhadirādi kaṣāya:- This formulation is described in Pramehādhikāra of Sahasrayoga. It possesses 12 constituent drugs. The predominant rasa (taste), guṇa (quality), vīrya (potency) and vipāka (taste after digestion)[2] in this formulation are as follows:

Katakakhadirādi kaṣāya (on samyoga)

Rasa	:	Tikta kaṣāya pradhāna
Guṇa	:	Laghu, rūkṣa, tīkṣṇa
Vīrya	:	Śīta pradhāna
Vipāka	:	Kaṭu pāka

It possesses tikta kaṣāya pradhana rasa. Ācārya Vāgbhaṭa states that tikta rasa acts as kḷeda, meda and śḷeṣma śoṣaṇa (drying up the moist, fat and kapha), besides being laghu (light), dīpana (digestive), pācana (carminative) and lekhana (scratches out adherents). The kaṣāyarasa has the qualities of kḷedaśoṣṇa and lekhana.

Guṇas like laghu (light), rūkṣa (rough) and tīkṣṇa

TABLE 2
Properties of some ingredients which possess hypoglycemic and anti-hyperlipidemic properties in Katakakhadirādi kaṣāya

Drug	Property	Reference
1. Kataka	Hypoglycemic Decrease cholesterol and triglyceride (mannogalactan content)	Ind. J. Pharm. Sci., 1991, 53, 53
2. Dhātri	Hypolipidemic, Hypoglycemic and Antiatherosclerotic. Decrease hypercholesterolemia	Mand *et al*, 1991; Thakur and Mandal, 1984; Tripathi *et al*, 1979; Bordia *et al*, 1985.
3. Harītaki	Decrease TG, LDL, VLDL and Total cholesterol, Increase HDL, Anti-hyperglycemic	Sood and Sharma, 2000; Thakur *et al*, 1988; Tripathi *et al*, 1979; Khanna *et al*, 1993; Amrithaveni *et al*, 2001.
4. Musta	Decrease serum Cholesterol and Triglyceride	Ansary, 1994; Simhadri, 1998; Tridev and Mann., 1980; Nityanand and Kapoor, 1981.
5. Vairi	Hypoglycemic Decrease Triglyceride and LDL	Shekhar *et al*, 2002; Karunanayake, 1984; Leena Raman, 1997; Gina Geslewitz Supplement, 2002.
6. Rajani	Hypocholesterolesterolemic, Decrease Triglyceride and phospholipid	Purohit and Daradka, 1999; Pachauri and Mukherjee, 1970.

(sharp) further facilitates in samprāptivighaṭana. The vīrya being śītapradhāna (predominant in cold potency), is helpful in controlling the excess kaphavilayanabhāva (liquidity state) in the body as bahudravaśḷeṣma is always caused due to uṣṇavīrya (hot potency). Kaṭu vipāka (acrid taste after digestion) helps in alleviating sneha, kḷeda and kapha. It also helps in śrotaśśodhana and has qualities like dīpana, pācana and lekhana.[3]

Musta (*Cyperus rotundus)*, haridra (*Curcuma longa*) and dāruharidra (*Berberis aristata*) are included under lekhanīyagaṇa. Musta is considered agrya among dīpana-pācanīya drug. Ācārya Suśruta considers āmalaki (*Phyllanthus emblica*) and harītaki (*Terminalia chebula*) in Mūṣakādi gaṇa. Both these class of drugs are most ideal in alleviation of a kapha-medo-pradhānavikāra.

Rasāyana dravyas have an indispensable role in the correction of dhātvāgnivaiguāyavikāra. This formulation possesses a good combination of rasāyana dravyas like āmalaki, harītaki, haridra, khadira (*Acacia catechu*) and musta, among which āmalaki and haridra are considered as pramehāgryauṣadha (chief remedies for prameha).

Various researches prove that almost 6 drugs among this formulation possess a marked hypoglycaemic and anti hyperlipidemic properties (Table 2). Besides this, many of these drugs such as kataka, khadira, āmalaki, dārvi, haridra, pāṭha, harītaki, musta, vairī and bādara also possess a potent hepatoprotective property.[4] Studies also show that plant compounds like berberine significantly improves fat induced insulin resistance in type 2 diabetes.[4] The major site of glucose and lipid metabolism in the body is the liver.

Considering the above mentioned facts, it is assumed that the probable mode of action of Katakakhadirādi kaṣāya in hypercholesterolemia associated with type 2 diabetes mellitus is through the reduction in the hepatic insulin resistance.

Conclusion

Lipid abnormalities should be assessed aggressively and treated as a part of comprehensive diabetic care in our practise. Dyslipidemia is the only mechanism by which diabetes promotes atherosclerosis. Diabetes is considered as coronary heart disease (CHD) equivalent mainly due to the associated lipid abnormalities. Macrovascular complications like CHD are the main cause of premature death in type 2 diabetes.[5] Katakakhadirādi kaṣāya, widely practised among the āyurvedic physicians, has a potent anti hyperglycaemic property along with a promising action against hypercholesterolemic levels.

References:

1. Anthony S Fauci and Eugene Braunwald, *Harrison's Principles of Internal Medicine*, P 2291, 17th Edn., Mc Graw Hill, 2008
2. Sastri, J.L.N., *Illustrated Dravya Guṇa Vijnana*, Vol. 2, Chaukhamba Orientalia, 2010
3. Srikantha Murthy, K.R., *Astangasangraha*, 9th Edn., P 338-340, Chaukhamba Orientalia, 2005
4. ncbi.nlm.nih.gov/pubmed
5. David A. Warrell, Timothy M. Cox and John. D. Firth, Oxford Textbook of Medicine Vol. 2, P 2040-2041, 5th Edn., 2010

Āryavaidyan Vol. XXVIII., No.1, Aug. - Oct., 2014, Pages 31 - 42

PLANTS USED IN THE TREATMENT OF BRONCHIAL ASTHMA IN AND AROUND BELGAUM REGION, KARNATAKA - AN ETHNOMEDICINAL SURVEY

Arun Chougale,[1] Harsha Hegde,[2] Satej T. Banne[1] and Ritesh Kumar[1]

Abstract: An ethno medicinal field survey was conducted in and around Belgaum, Karnataka. The survey yielded a total number of 24 formulations from 42 plant species, belonging to a total of 27 families which are used to treat asthma traditionally. Out of 42 plant species enumerated, 36 species belonged to dicotyledons and 6 to monocotyledons. Based on the life-forms there were 20 herbs, 5 shrubs, 6 twinners/ climbers and 11 trees. The dominant families were analyzed and found that Zingiberaceae was the dominant family with 4 species followed by Piperaceae, Euphorbiaceae, Combretaceae, and Asclepiadaceae with 3 species each. The species of Zingiberaceae and Piperaceae family were commonly used probably because of their aromatic principles. A total of 24 formulations were obtained among which 15 were combined and 9 were single drug formulations.

Introduction

Traditional medicine is a part of ethno medicine which deals not only with those that have relevant written sources (e.g. traditional Chinese medicine, āyurveda), but especially those, whose knowledge and practices have been orally transmitted over the centuries.[1] According to WHO reports it is estimated that up to 80% of world's population relies on traditional medicine to cure various ailments.

In India āyurveda and many other alternative systems such as Siddha, Unani, Yoga, Naturopathy, Traditional medicine are being practiced since centuries. India has got a unique property of medicinal plants and vast traditional knowledge. It is widely practiced, particularly in rural areas, where 70% of the population lives.[2]

WHO - facts about traditional healing

However, it is assessed that about 20,000 plant species with different properties are found in Indian flora, nearly 7% are on the edge of death. Consequently, it is essential to inspect such plants from core areas and unexplored regions and collect the ethnic knowledge about their efficacies.

The prevalence of asthma worldwide is around 200 million with a mortality of around 0.2 million per year. The estimated burden of asthma in India is more than 15 million.[3]

1. *P.G. Deptt. of Dravyaguna, KLE University, Shri B.M.K. Ayurveda Mahavidyalaya, Shahapur, Belgaum-590 003.*
2. *Regional Medical Research Centre (ICMR), Nehru Nagar, Belgaum 590 010.*

Study area

Karnataka is the 8th largest state in India with a geographical area of 4.33 million km2 and lies between 11030 North and 18030 north-latitudes and 740 east and 78030 east-longitudes. The total forest cover Karnataka is 22.6% of its geographical area, which includes Wildlife sanctuaries, Bird sanctuaries, National parks, Biosphere reserves. The area selected for this study is Belgaum region, as Belgaum district (15.520 N 74.300E/ 15.870 N 74.50E/) has the fifth place in forest area of Karnataka state, with the district touching the western ghats, at an altitude of about 779m, 100km from the Arabian Sea with the river Markandeya flowing nearby.

The pathological condition of bronchial asthma was selected considering its higher incidence in these areas probably because of arctic environment in and around Belgaum which is one of the commonest aggravating factor for bronchial asthma.[4]

Methodology

Basic information of survey:- Ethno medicinal survey was conducted between January 2012 to December 2012 i.e. one year, in order to get the information about the folklore medicinal plants and to collect them according to the appropriate season. The places of field-visit were identified and a pilot study was conducted in order to understand the survey area properly. The background study and basic information about ethno medicinal survey along with the practical problems to be faced during survey was discussed with senior staff members of ICMR in order to make the survey rightly. The villages and talukas of Belgaum District were noted followed by interactions with folklore practitioners of each area.

Selection of folklore practitioners:- The selection of folklore was based on their recognition as experts and knowledgeable members with regard to folk medicines. About 30 folklore practitioners having practical knowledge of plants were interviewed in 26 villages of the Belgaum District. The details of the healers were obtained from the village chief, crude drug venders and patients attending to traditional practices. The age group of the folklore practitioners being consulted was between 35-100 years.

Plant identification and herbaria:- The flowering plant species were collected, identified and authenticated by Dr. Harsha Hegde, Senior Taxonomist, using relevant published flora. The voucher specimens were prepared and deposited at the Herbaria, at AYUSH certified CRF, KLE Ayurveda College, Belgaum, for further reference.

Ethno medicinal survey:- Regular field surveys were carried out to the selected traditional healers living in and around the Belgaum region in different seasons of the year 2012. Sixteen traditional healers were involved in the interviews. 15 traditional healers were male and one female. All the traditional healers who gained knowledge on medicinal uses of plants from their parents and relatives, who were traditionally using the plants with effective results, were interviewed. Though Belgaum district is in Karnataka, it touches Maharashtra State also, hence prevails two local languages Marathi and Kannada. All the traditional healers were interviewed in their respective local language. The vital component of a traditional survey is interrogation with each traditional healer to assure the trustworthy of the gathered information. Each traditional healer was interviewed repeatedly to crosscheck the

TABLE 1

Ethno medicines of Belgaum district useful in the management of bronchial asthma

Species/Voucher specimen No.	Habit/ Habitat	Sanskrit name	Local name	Part used	NP*	NF*
01 Mimoseae *Acacia farnesiana* Willd. CRF 637	T/W	Irimeda	Jawari jali[K]	Leaf, fruit	1	1
02 Araceae *Acalypa indica* Linn. CRF 638	H/W	Harita-mañjiri	Jalamalagi[K]	Aerial part	1	1
03 Amarrhantaceae *Achyranthus aspera* Linn. CRF 627	H/W	Apamārga	Uttarani[M]	Seeds	1	1
04 Zingiberaceae *Acorus calamus* Linn. CRF 633	H/C	Vaca	Vekhand[M]	Rhizome	1	1
05 Acanthaceae *Adhatoda vasica* Nees. CRF 617	H/C	Vāśa	Adulsa[M]	Leaves	4	5
06 Polypodiaceae *Adiantum lunulatum* Burm f. CRF 632	H/W	Hamsapādi	Hamsapāda[M]	Kuppi	1	1
07 Rutaceae *Aegle marmelos* A.Juss. CRF 634	T/W	Bilwa	Belapatri[K]	Fruit	1	1
08 Liliaceae *Allium sativum* Linn. CRF 598	H/C	Rasoṇa	Laśuṇa[M]	Bulb	1	1
09 Liliaceae *Aloe vera* Mill. CRF 628	H/C	Kumāri	Korphad[M]	Leaf flesh	1	1
10 Meliaceae *Azadirachta indica* A.Juss. CRF 630	T/W	Nimba	Bevingīda[K]	Leaf	1	1
11 Barringtoniaceae *Barringtonia acutangula* Gaertn. CRF 614	T/W	Samudra-phala	Samudra-phala[M]	Fruit	1	1
12 Asclepediaceae *Calotropis gigantea* Linn. CRF 599	S/W	Arka	Rucaki[K]	Flowers	2	3
13 Verbenaceae *Clerodendron serratum* Linn. CRF 601	S/W	Bhārṅgi	Bhāraṅg-mūla[M]	Root	2	2
14 Asclepediaceae *Cryptolepis buchanani* Roem & Schult. CRF 612	Cl/W	Jambupatra śāriba	Uparsāl[M]	Root	1	1

Cont....

Species/Voucher specimen No.	Habit/ Habitat	Sanskrit name	Local name	Part used	NP	NF
15 Zingiberaceae *Curcuma longa* Linn. CRF 629	H/C	Haridra	Arṣina[K]	Rhizome	1	1
16 Cyperaceae *Cyperus rotundus* Linn. CRF 625	H/C	Musta	Nagara-motha[M]	Rhizome	1	1
17 Solanaceae *Datura metel* Linn. CRF 618	H/W	Dattura	Dhotara[M]	Leaves	2	2
18 Zingiberaceae *Ellettaria cardamomum* Linn. CRF 621	H/C	Ela	Elaici[M]	Fruit	1	1
19 Myrsinaceae *Embelia ribes* Burm .f. CRF 605	H/C	Viḍaṅga	Vaya-viḍaṅga[M]	Seeds	1	1
20 Euphorbiaceae *Emblica officinalis* Gaertn. CRF 608	T/C	Āmalaki	Nelli[K]	Fruit	1	1
21 Zygophyllaceae *Fagonia arabica* Linn. CRF 626	H/W	Yavasa	Dhamasa[M]	Aerial part	1	1
22 Leguminoseae *Glycyrrhiza glabra* Linn. CRF 611	H/C	Yaṣṭimadhu	Jeṣṭamadh[M]	Rhizome	3	3
23 Lamiaceae *Ocimum sanctum* Linn. CRF 620	H/C	Tulasi	Tulas[M]	Leaves	2	2
24 Euphorbiaceae *Phyllanthus niruri* Sensu Hook f. CRF 636	H/C	Bhūmyā-malaki	Bhūi āvala[M]	Aerial part	1	1
25 Scrophulariaceae *Picrorrhiza kurroa* Royle ex. Benth. CRF 604	H/C	Kaṭuki	Kuṭki[M]	Root	1	1
26 Piperaceae *Piper betle* Linn. CRF 635	Cl/C	Nāgavalli	Tinnuva eli[K]	Leaf	1	2
27 Piperaceae *Piper longum* Linn. CRF 613	Cl/C	Pippali	Hippali[K]	Fruit	3	3
28 Piperaceae *Piper nigrum* Linn. CRF 600	Cl/C	Marica	Kāle mire[M]	Seeds	1	1

Cont....

Species/Voucher specimen No.	Habit/ Habitat	Sanskrit name	Local name	Part used	NP	NF
29 Anacardiaceae *Pistacia integerrima* Stewart ex Brandis. CRF 624	T/C	Karkaṭa-śṛṅgi	Kakada-ṣiṅgi[M]	Galls	1	1
30 Santalanaceae *Pterocarpus santalinus* Linn. CRF 631	T/C	Rakta-candana	Rakta-candana[M]	Bark	1	1
31 Euphorbiaceae *Ricinus communis* Linn. CRF 619	S/W	Eraṇḍa	Eraṇḍamūla[M]	Root	1	1
32 Rutaceae *Ruta graveolens* Linn. CRF 145	H/C	Satāpa	Satāp[M]	Aerial part	1	1
33 Asteraceae *Saussurea lappa* C.B. Clarke. CRF 603	H/C	Kuṣṭha	Koṣṭha[M]	Root	1	1
34 Solanaceae *Solanum xanthocarpum* Sch & Wendl. CRF 609	H/C	Kaṇṭakāri	Riṅgni [M]	Root	1	1
35 Myrtaceae *Syzigium aromaticum* Linn. CRF 622	T/C	Lavaṅga	Lavaṅga[M]	Flower bud	1	1
36 Combrataceae *Terminalia arjuna* Roxb. CRF 616	T/C	Arjuna	Bili matti[K]	Bark	1	1
37 Combrataceae *Terminalia bellirica* Roxb. CRF 607	T/C	Bibhītaki	Behda[M]	Fruit	2	2
38 Combrataceae *Terminalia chebula* Retz. CRF 606	T/C	Harītaki	Hirda[M]	Fruit	2	2
39 Menispermaceae *Tinospora cordifolia* Willd. CRF 610	Cl/C	Guḍūci	Amṛtaballi[K]	Leaf, stem	1	1
40 Verbenaceae *Vitex negundo* Linn. CRF 615	S/W	Nirguṇḍi	Nirgud[M]	Root	1	1
41 Vitaceae *Vitis vinifera* Linn. CRF 623	Cl/C	Drākṣa	Kismis[M]	Fruit	1	1
42 Zingiberaceae *Zingiber officinale* Rosc. CRF 602	H/C	Śuṇṭhi	Adraka[M]	Rhizome	8	9

*NP - No. of practioner using; NF - No. of formulations; [K] Kannada; [M] Marathi; W - Wild; C - Cultivated; T - Tree; Cl - Climber

TABLE 2
Formulations used by Traditional practitioners in Bronchial asthma

Formulations	Mode of use
01. *Allium sativum* Linn., *Calotropis gigantea* Linn., *Piper nigrum* Linn.	Mix all the dravyas in equal quantity, prepare paste, make tablet of around 1 gm; prescribe 1 tablet two times a day for three days.
02. *Clerodendron serratum* Linn., *Zingiber officinale* Rosc., *Saussurea lappa* C.B. Clarke.	All are taken in equal quantity, paste is prepared and around 1-2 gm of the paste is licked with honey for fifteen days in expectorating dysponea.
03. *Vitex negundo* Linn.	Paste is prepared and it should be licked with honey till the symptoms get reduced.
04. *Picrorrhiza kurroa* Royle ex. Benth., *Embelia ribes* Burm .f., *Terminalia chebula* Retz., *Terminalia bellirica* Roxb., *Emblica officinalis* Gaertn., *Solanum xanthocarpum* Sch & Wendl., *Tinospora cordifolia* Willd., *Glycyrrhiza glabra* Linn., *Cryptolepis buchnani* Roem & Schult., *Piper longum* Linn., *Barringtonia acutangula* Gaertn.	Mix all the dravyas in prescribed quantity and prepare decoction and administer about 50 ml twice a day.
05. *Adhatoda vasica* Nees., *Datura metel* Linn.	Equal quantity of both the plants is burnt into black powder and that powder should be given in a dose of about 1gm in the night for 7 days.
06. *Adhatoda vasica* Nees., *Terminalia arjuna* Roxb.	Equal quantity of both the plants is taken and decoction is prepared and administered along with honey, ghee and sugar for three months or more than that, especially in dyspnoea occurring in old age.
07. *Ruta graveolens* Linn.	Tied in neck of children's to relieve the sputum
08. *Calotropis procera* Linn., *Datura metel* Linn., *Ricinus communis* Linn.	Paste is prepared and administered with betel leaves two times a day till the symptoms get reduced.
09. *Zingiber officinale* Rosc., *Piper longum* Linn., *Adhatoda vasica* Nees., *Ocimum sanctum* Linn., *Ellettaria cardamomum* Linn.	Decoction is prepared with equal quantity of drugs and administered in a dose of about 50 ml twice a day for 2- 3 weeks.

-/-

Formulations	Mode of use
10. *Terminalia chebula* Retz., *Terminalia bellirica* Roxb., *Vitis vinifera* Linn., *Pistacia integerrima* Linn., *Cyperus rotundus* Linn., *Fagonia arabica* Linn., *Azadirachta indica* A.Juss., *Syzigium aromaticum* Linn.	Equal quantity of all the drugs are taken to prepare fine powder and mixed with neem oil and given with honey two times for one month.
11. *Aloe vera* Mill., *Curcuma longa* Linn.	Paste of all the drugs taken in equal quantity is prepared and given with honey twice a day till all the symptoms of śvāsa disappear.
12. *Clerodendron serratum* Linn., *Zingiber officinale* Rosc., *Adhatoda vasica* Nees.	1 gm of fine powder is administered with honey or sugar three times a day for 15 days to 1 month
13. *Clerodendron serratum* Linn., *Zingiber officinale* Rosc., *Adhatoda vasica* Nees.	Decoction is prepared and 50 ml twice a day for seven days.
14. *Ocimum sanctum* Linn.	Fresh juice is given with honey twice a day for 5-7 days.
15. *Achyranthus aspera* Linn.	Smoking of seeds is advised 2 times daily for 5 days.
16. *Calotropis gigantea* Linn., *Zingiber officinale* Rosc., *Piper betle* Linn., *Acorus calamus* Linn.	Calotropis flowers and *Acorus* rhizome are dried and powdered. This powder is mixed with the powder of other two plants.This whole mixture of powder is mixed with honey and prepares tablets of about 1g. One tablet is given twice a day for 1 month after taking food.
17. *Adhatoda vasica* Nees.	Smoking of leaves is advised 2 times daily for 1 month.
18. *Adiantum lunulatum* Burm f.	Decoction is given twice a day for 1-2 weeks.
19. *Zingiber officinale* Rosc.	Decoction is administered twice a day for 15 days.
20. *Glycyrrhiza glabra* Linn., *Acacia farnesiana* Willd., *Aegle marmelos* A.Juss.	Fine powder of all the plants is prepared and 2 g is prescribed for 2-3 times a day.
21. *Zingiber officinale* Rosc., *Glycyrrhiza glabra* Linn.	30 ml of decoction of both the plants is given twice a day for 1-2 months.
22. *Zingiber officinale* Rosc., *Phyllanthus niruri* Sensu Hook f.	Fine powder of both the plants is prescribed along with guḍa (jaggery)
23. *Piper longum* Linn.	1 gm of fine powder is licked for 3 times daily for 15 days
24 *Acalypa indica* Linn.	Fresh juice is administered 3 times a day for 2-3 days, this causes expectoration and mucus is expelled out.
25 *Zingiber officinale* Rosc., *Piper betle* Linn.	Keep the betel leaves in home for 4-5 days till they become yellowish and then squize out its juice, which is mixed with the juice of Zingiber rhizome and this mixture is taken with honey in a dose of 1 teaspoon 2 times a day for 3 months.

TABLE 3

Drugs with important phytoconstituents and uses in literature with other pharmacological activities

Botanical name	Important phytoconstituents	Indications in literature	Other pharmacological activities
01 *Acacia farnesiana* Willd.	Tannins and several polyphenolic compounds.	Stomatitis, ulcers, swollen gums, dental caries, bronchitis, skin diseases.	Anti-inflammatory, antibacterial, cardiac depressant, sedative.
02 *Acalypa indica* Linn.	Kaempferol acalyphamide and amides.	Emetic, expectorant in bronchitis, asthma, pneumonia.	Antibacterial, anti-inflammatory.
03 *Achyranthus aspera* Linn.	Saponin, Alkaloids, Achyranthine	Asthma, cough, pile, diuretic, hepatoprotective, emmenagogue.	Diuretic, spasmolytic, anti-microbial, anti-biotic, anti-fungal.
04 *Acorus calamus* Linn.	Acolamone, acorenone.	Bronchial catarrh, chronic diarrhoea and dysentery.	Antimicrobial, hypo-tensive, CNS depressant, anticonvulsant, analgesic, sedative.
05 *Adhatoda vasica* Nees.	Vascicine, quinazoline.	Bronchial, asthmatic and pulmonary affections.	Antispasmodic, antifungal.
06 *Adiantum lunulatum* Burm f.	Higher carotenoids, adiantone.	Strangury, atrophy, emaciation orcachexy, muscular pain.	Antibacterial, anti dysenteric, ulcer healing, anti-diarrheal, antifungal, abortifacient, hypotensive.
07 *Aegle marmelos* A.Juss.	Marmelosin, tannic acids.	Specific for diarrhoea, colitis, dysentery and enteric infections.	Hypoglycaemic, spasmogenic, antiviral, anti-diarrheal, antifungal.
08 *Allium sativum* Linn.	Allin, volatile compunds.	Upper respiratory tract infections and catarrhal conditions.	Antibacterial, uterine stimulant, antifungal, anti-inflammatory, hypoglycaemic, anticarcinogenic.
09 *Aloe vera* Mill.	Hydroxyanthraquinone, barbaloin.	Wound healing, sunburn, constipation, ulcerative colitis.	Anti-inflammatory, anti-bacterial, anti-ulcerogenic, anaesthetic.
10 *Azadirachta indica* A.Juss.	Azadirachtin, azadirachtol	Inflammation of gums, gingivitis, periodonitis, sores, boils, enlargement of spleen, malarial fever, measles, smallpox.	Anticancer, antiviral, antibacterial, antigastric ulcer, antipyretic.
11 *Barringtonia acutangula* Gaertn.	Barringtonic acid, barringtogenol.	Prescribed in gingivitis as an expectorant	Anti-implantation, hypoglycaemic, hypothermic, antiprotozoal, antiamoebic.

-/-

Botanical name	Important phytoconstituents	Indications in literature	Other pharmacological activities
12 *Calotropis gigantea* Linn.	Calotropin, uscharin, calotoxin, calactin.	Lupus, tuberculous-leprosy, syphilitic ulceration.	Anti-implantation, anti-inflammatory, anticancer, and spasmolytic.
13 *Clerodendron serratum* Linn.	Serratagenic acid, queretaroic acid.	Dried roots in cough, bronchitis, dyspnoea, chest diseases, sinusitis.	Antihistamine, antiallergic, antiasthmatic, spermicidal.
14 *Cryptolepis buchanani* Roem & Schult.	Sarmentogenin, sarmentocymarin, cardiac glycoside.	Stem as a supporting drug in paralysis; root bark in rheumatism.	Antibacterial, antimicrobial, hypotensive, CNS depressant.
15 *Curcuma longa* Linn.	Curcuminoids, essential oil.	Cholagogue, hepatoprotective, blood-purifier, antioxidant, detoxifier, regenerator of liver tissue, antiasthmatic, stomachic, carminative.	Antibacterial, antihistaminic, anti-inflammatory
16 *Cyperus rotundus* Linn.	Cineol(+) copadiene, copaene.	Intestinal problems, indigestion, sprue, diarrhoea, dysentery, vomiting and fever.	Tranquilizing, anti-inflammatory, smooth muscle relaxant, antipyretic, antimicrobial.
17 *Datura metel* Linn.	Scopolamine, hyosine, hyoscyamine,	Headache, hemiplegia, epilepsy, delirium, convulsions, cramps, rigid thigh muscles, rheumatism.	Antimicrobial, antiasthmatic, antihistaminic.
18 *Ellettaria cardamomum* Linn.	Bornneol, camphene.	Flatulence, loss of appetite, colic, bronchitis, asthma.	Antimicrobial, antifungal, anti-inflammatory, analgesic, hepatoprotective.
19 *Embelia ribes* Burm.f.	Embelin, christembine, homoembelin.	Diseases of chest and skin.	Anti-inflammatory, hypotensive, nematicidal, anti-tubercular, hypoglycaemic, antipyretic.
20 *Emblica officinalis* Gaertn.	Vitamin-C, carotene, riboflavin, tannins, alkaloids.	Jaundice, dyspepsia, bacillary dysentery, eye trouble; and as a gastrointestinal tonic.	Anti-inflammatory, anti-bacterial, anti-microbial, anti-fungal.
21 *Fagonia arabica* Linn.	Galacto catechin(+) epigallocatechin	Cough, bronchitis, dyspnoea,	Anticancer, antimicrobial, antiviral, anti-inflammatory, CNS stimulant.
22 *Glycyrrhiza glabra* Linn.	Glycyrrhizine	Bronchitis, dry cough, respiratory infections, catarrh, tuberculosis, genito-urinary diseases.	Anti-inflammatory, anti-pyretic, antiviral

-/-

Botanical name	Important phytoconstituents	Indications in literature	Other pharmacological activities
23 *Ocimum sanctum* Linn.	ß-sitosterol, saponins, tannins.	Carminative, stomachic, antispasmodic, antiasthmatic, antirheumatic, expectorant, stimulant, hepatoprotective	Anti-stress, antifungal, Antiviral, anti-inflammatory.
24 *Phyllanthus niruri* Sensu Hook f.	Phyllanthin, hypophyllanthin.	Antispasmodic antipyretic, diuretic, antiviral, bactericidal.	Antifungal, anti-cancer, antiviral, hepatoprotective, hypoglycaemic.
25 *Picrorrhiza kurroa* Royle ex. Benth.	D-mannitol, kutkiol, kutkisterol.	Hepatitis, chronic dysentery, amoebiasis.	Antiviral, antipyretic, anti-inflammatory, smooth muscle relaxant, hepatoprotective, anti-stress, anti-asthmatic.
26 *Piper betle* Linn.	Vit. A & C, thiamine, riboflavin.	Respiratory catarrh	Cardiac and respiratory depressant, anti-tubercular, smooth muscle relaxant, antibacterial.
27 *Piper longum* Linn.	Piperlongumine and piperlonguminine.	Diseases of the respiratory tract, as sedative, cholagogue, emmenagogue, digestive, appetizer and carminative	Anti-inflammatory, Anti-spasmodic, Anti-malarial, Anti-bacterial
28 *Piper nigrum* Linn.	Piperine, piperethine, piperolein.	Fevers, dyspepsia, flatulence, indigestion, and gastro-intestinal stimulant	Antioxidant, anti-bacterial, muscle relaxant, anti-inflammatory, CNS depressant, sedative,
29 *Pistacia integerrima* Stewart ex Brandis.	Essential oils, resin, pistacionoic acids A & B.	In cough, bronchitis and dyspnoea	Anti-microbial, antifungal, antigiardial, antiallergic, expectorant, carminative.
30 *Pterocarpus santalinus* Linn.	Volatile oil, santalin A, santalin B.	Paste of wood is used externally for inflammations and headache	Antiarthritic, antispasmodic, antipyretic, antiallergic, anti-inflammatory, hypoglycaemic.
31 *Ricinus communis* Linn.	Ricinine, 1-methyl-3-cyano-4-methoxy-2pyridone.	Mature root in rheumatism, pain in the urinary bladder, lumbago, diseases of the abdomen and inflammations	Anti-inflammatory, spasmogenic, CNS depressant, purgative, hepatoprotective
32 *Ruta graveolens* Linn.	Coumarins, limonoids, arborinine, furanoacridones.	Decoction in convulsions and fever. Also used as a fumigant in infant catarrh	Antibacterial, anti-inflammatory, anti-implantation, cytotoxic activity

-/-

Botanical name	Important phytoconstituents	Indications in literature	Other pharmacological activities
33 *Saussurea lappa* C.B. Clarke.	Essential oil, castrol, taraxosterol.	Used as anti-tussive; applied as poultice to boils and chronic skin affections.	Anti-inflammatory, antibacterial, spasmolytic, antiseptic, antiulcer, immune stimulant, bronchodilator.
34 *Solanum xantho-carpum* Sch. & Wendl.	B-carotene, diosgenin.	Used in the treatment of cough, bronchitis, asthma, for dislodging tenacious phlegm.	Antibiotic, anti-inflammatory, antifungal, antipyretic.
35 *Syzigium aromaticum* Linn.	B-caryophyllene, eugenol, furfural.	Dyspepsia, gastric irritation.	Antihistaminic, antioxidant, antibacterial, antimicrobial, antiviral.
36 *Terminalia arjuna* Roxb.	Arachidic stearate, arjunic acid	Used as a cardio-protective and cardio-tonic in angina and poor coronary circulation; as a diuretic in cirrhosis of liver.	Cardioprotective, antibacterial, antifertility, antianginal, antifungal, cytotoxic.
37 *Terminalia bellirica* Roxb.	Fructose, galactose, glucose, mannitol.	Used in cough, bronchitis and upper respiratory tract infections, tropical pulmonary eosinophilia and allergic eruptions.	Anti-asthmatic, bronchodilator, antihistaminic.
38 *Terminalia chebula* Retz.	Anthraquinone glycosides, chebulinic acid.	Used for flatulence, constipation, diarrhoea, dysentery, cyst, cough and bronchial asthma.	Antimicrobial, antifungal, anti-stress, antispasmodic.
39 *Tinospora cordifolia* Willd.	Tinosporin, tinosporide, cordifolide.	Prescribed in high fever; rheumatic and bilious fevers.	Hypoglycaemic, anti-inflammatory, antiallergic, antiseptic, CNS depressant.
40 *Vitex negundo* Linn.	Phenol, dulcitol, alkaloid-vitricine	Prescribed in liver complaint, sperma-torrhoea and for promo-ting permiogenesis.	Anti-inflammatory, antibacterial, moderate CNS depressant, antihistamine releasing activity.
41 *Vitis vinifera* Linn.	Catechinepicatechin	Used for cough, respiratory tract catarrh, sub-acute cases of enlarged liver and spleen.	Antihistaminic, antioxidant, antibacterial, antifungal, angiotensin-con(ACE inhibitory activity).
42 *Zingiber officinale* Rosc.	Curcumene, zinziberens	Used in dyspepsia, loss of appetite, tympanitis, anaemia, rheumatism, cough and dyspnoea.	Anti-inflammatory, antirhinoviral, antipyretic, hypolipidaemic, antiatherosclerotic.

information given by them previously. They were interviewed with the help of questionnaire, information on plant/plant part(s) used for treatment, method of preparation, dose and duration of treatment.

Results

The present ethno medicinal field survey yielded a total number of 24 formulations from 42 plant species, belonging to a total of 27 families which are used to treat asthma traditionally. The details of the identified plant specimens with their botanical name, family, local name (Marathi/ Kannada language) and the parts used are shown in Tables 1, 2 & 3.

Discussion and conclusion

Of 42 plant species enumerated, 36 belonged to dicotyledons and 6 to monocotyledons. Based on the life-forms there were 20 herbs, 5 shrubs, 6 twinners/climbers and 11 trees. This shows that herbs were more commonly used followed by trees. The dominant families were analyzed and found that Zingiberaceae was the dominant family with 4 species followed by Piperaceae, Euphorbiaceae, Combretaceae, and Asclepiadaceae with 3 species each. The species of Zingiberaceae and Piperaceae family were commonly used probably because of their aromatic principles. A total of 24 formulations were obtained among which 15 were combined and 9 were single drug formulations.

Majority of traditional healers of Belgaum district collect the plants from natural habitat according to their proper seasons and use to prepare suitable dosage form. Some traditional healers collect the crude drugs from local drug dealer. Majority of the dosage forms were decoctions followed by pastes, fine powders and juices. Maṣi (the black powder obtained on burning) and inhalation were found to be rare form of dosage. Some of the traditional healers use plants individually and some in combination.

Acknowledgments

We are grateful to Dr. Harsha Hegde (Scientist B, Regional Medical Research Centre (ICMR), Nehru Nagar, Belgaum 590 010, Karnataka, India) for identification of all the plants with authentication certificate, and all folklore practitioners for their contribution towards society welfare.

References:

1. Mahajan, N., Dhar, K.L., Suri, P., Nepali, K., Kamra, N., Garg, A. and Sharma, A., "Synthesis of some N-hetrocyclic analogs of vasicine", *International Journal of Pharmaceutical Sciences and Research*, 1(2):, pp 0975-0823230, 2010,
2. Sapan Patel, Nidhi Saxena, Saxena, R. C., Neetu Arya, Rahul Saxena and Mahesh Tharani, "Evaluation of anti-asthmatic activity of *Glycyrrhiza glabra*", *Journal of Biosciences*, Biotechnology Research Asia, 6. (2), pp 761-766, 2009,
3. Parganiha, R., Verma, S., Chandrakar, S., Pal, S., Sawarkar, H.A. and Kashyap, P., "In vitro anti-asthmatic activity of fruit extract of *Piper nigrum* (Piperaceae)", *International Journal of Herbal Drug Research*, 1(1), pp 15-18, 2011.
4. http://www.phcog.com/text.asp? 2011/7/25/ 14/75879
5. Sharma, P.C. and Yelne, M.B., *Database on medicinal plants used in Ayurveda*, Vol.1-8, CCRAS, New Delhi, 2000.
6. Khare, C.P.(Ed.), *Indian Medicinal Plants, An Illustrated Dictionary*, ISBN: 978-0-387-70637-5 Springer-Verlag Berlin/Heidelberg, 2007.

Āryavaidyan Vol. XXVIII., No. 1, Aug. - Oct., 2014, Pages 43 - 46

ANALGESIC ACTIVITY OF VEDANĀSTHĀPANADAŚEMĀNI - A CASE STUDY

Dileep Kumar K.J. and Shreevathsa*

Abstract: In Carakasamhita, classification of drugs is made based on their karmas. They are called as gaṇas (groups) and are classified into 50 groups based on pharmacological actions. Vedanāsthāpanadaśemāni is one such group which is said to be effective in curing the pain of aliments. In the present study a case of sandhivāta (osteoarthritis) was treated with Vedanāsthāpana Mahākaṣāya ghanavaṭi (500 mg 2 capsules TID) for one week and the formulation found significantly effective in relieving the symptoms.

Introduction

Āyurveda, the science of life narrates the healthy and diseased conditions. It also gives the physician an opportunity to incorporate the new medicaments in the explained conditions and as well as to name the newly diagnosed conditions on the basis of doṣa-dūṣya sammūrchana. In the present case of sandhivāta, importance was given for lākṣaṇīkacikitsa as vedana (pain) was the prominent feature. Keeping this in view, an attempt was made to evaluate the analgesic (pain killer) activity of Vedanāsthāpanadaśemāni. The assessment of vedana (pain) was done by using 'universal pain assessment tool'.

Case

OPD No:-2978

Date: 10/3/2014

A male patient aged about 65 years developed complaints of difficulty in walking and sitting associated with predominant pain in right knee joint since two years. Patient had previously undergone surgery due to lumbar fracture one year back; after that the severity of pain increased in right knee joint. Patient was a known case of diabetic since ten years and he was under medication. Also, he had complained of sleeplessness and dragging type of pain in right leg during night time.

General examination: - Temperature - Afebrile; Pulse - 76/min; Respiratory rate - 19/min

Systemic examination:- C.V.S - S_1 and S_2 sounds heard; R.S - Normal vesicular breath sounds heard; P/A - No abnormalities detected; musculo-skeletal system; gait - limping; palpation - difficulty to perform flexion and extension of right knee joint; redness, swelling - absent; dollar, crepts - present; SLR test - positive; O/e - grade 5 type of pain.

Lab investigation (11/3/2014):- Hemoglobin - 14

*Dept of Ayurveda Siddhanta, Govt Ayurvedic Medical College, Mysore, Karnataka

gram%; ESR - 25mm; RBS - 190 mg/dl; urine - albumin, sugar, micro - absent.

X-ray report (11/3/14) - *Degenerative changes in right knee*.

Medication

Vedanāsthāpana mahākaṣāya ghanavaṭi - 2 capsules (500 mg each) TID was given for seven days.

Drug preparation:- A kaṣāya was prepared by the dravyas mentioned in the Vedanāsthāpana daśemāni (viz. śāla, kadamba, kaṭphala, padmaka, śirīṣa, aśoka, mocarasa, elavāluka, tumba and vetaśa[2]) and made the ghanavaṭis.

Drug review:- The properties and actions of dravyas[3] in Vedanāsthāpanadaśemāni are shown in Table 1&2 respectively.

Intervention:- The drug was administered in the dose of 2 Caps (500 mg) TID after food.

Assessment and result

The pre and post test assessments were done using the universal pain assessment tool (Table 3). The severity of pain was found to be decreased from grade 5 to 2.

Discussion

The term vedana (pain) in āyurvedic literature is used to denote healthy and diseased status of the body and mind. But, generally it is considered as a lakṣaṇa of vyādhi. In vyādhi too, it can be seen in the different stages as pūrvarūpa, rūpa or upadrava. The diagnosis and prognosis of a disease can also be determined by vedana. Vedana is exhibited as a typical characteristic feature specific to that disease. Vedana is due to vāta doṣa. The main reason for aggravation of vāta is either due to

TABLE 1
Properties of Vedanāsthāpanadaśemāni dravyas

Drug Name	Rasa	Guṇa	Vīrya	Vipāka	Prabhāva
1 Śāla	Kaṣāya (tvak) kaṣāya madhura (rāḷa)	Rūkṣa	Śīta	Kaṭu	Pitta kapha śāmaka
2 Kaṭphala	Kaṣāya, tikta, kaṭu	Laghu, tīkṣṇa	Uṣṇa	Kaṭu	Kapha vāta śāmaka
3 Kadamba	Tikta, kaṣāya	Rūkṣa	Śīta	Kaṭu	Tridoṣa śāmaka
4 Padmaka	Kaṣāya, tikta	Laghu	Śīta	Kaṭu	Kapha pitta śāmaka
5 Tumba	Kaṭu, tikta	Laghu, rūkṣa	Uṣṇa	Kaṭu	Kapha vāta śāmaka
6 Mocarasa	Madhura	Laghu, snigdha, picchila	Śīta	Madhura	Vāta pitta śāmaka
7 Śirīṣa	Kaṣāya, tikta, madhura	Laghu, rūkṣa, tīkṣṇa	Īṣad, uṣṇa, śīta	Kaṭu	Tridoṣa śāmaka
8 Vetaśa	Kaṣāya, tikta	Laghu	Śīta	Kaṭu	Kapha pitta śāmaka
9 Elavāluka	Kaṣāya	Śīta	Śīta	Kaṭu	Pitta kapha śāmaka
10 Aśoka	Kaṣāya, tikta	Laghu	Śīta	Kaṭu	Kapha pitta śāmaka

mārgavarodha or dhātukṣaya. No doubt, sandhivāta is due to dhātukṣaya and jara. As the patient was diabetiec there was a possibility of mārgavarodha also. As mentioned in Suśrutasamhita, no ruja or vedana occurs without the involvement of vātadosa. So, to alleviate the pain, Vedanāsthāpana ghanavaṭi was administered, among which, most of the drugs are having pitta-alleviating property due to their tikta, kaṣāya; madhura rasa and śīta vīrya properties. Some of these drugs are having kapha-alleviating property; and because of the presence of madhura rasa and guru, snigdha guṇas of the drugs, the combination doesn't provoke vāta. Though the drugs on combination are not directly acting as vāta alleviative, it

TABLE 2
Action of Vedanāsthāpanaghanadravyas

Drug name	Gaṇa	Part used	Pradhānakarma	Chemical composition	Pharmacological actions[5]
1 Śāla	Śalāsarādi[4] Rodhrādi*	Tvak, niryās	Vraṇaśodana, vraṇaropana, vedanāsthāpana		
2 Kaṭphala	Sandhānīya	Tvak, phala	Vedanāthāpana	Myricitrin, myrisetin, tanin	Analgesic, antibiotic
3 Kadamba	Śukraśodhaka** Rodrādi, Nyagrodhādi*	Tvak, phala	Vedanāsthāpana, śothahara	Cinchotannic acid, inodole glycoside, beta sitosterol	Analgesic, anti-inflammatory
4 Padmaka	Varṇya** Śāribādi and Candanādi*		Dāhapraśamana-hara, vedanā-sthāpana	Taxifolin, amygdaline	Anti spasmodic, anti oxidant
5 Tumba	Śirovirecaka	Tvak	Krimighna	Berberine, dicta-mnine, terpentine like volatile oil	Analgesic
6 Mocarasa	Śoṇitāsthāpana**	Niryās, puṣpa, phala	Śothahara, vedanāsthāpana	Tanin, saponin	Musculotropic, hypotensive, cardiac stimulant
7 Śirīṣa	Viṣaghna** Śālasarādi*	Tvak, patra, puṣpa	Vedanāsthāpana, dāhapraśamana	Teflitinin, saponin	Analgesic
8 Vetaśa	Śvāsahara** Nyagrodhādi*	Tvak, puṣpa	Vedanāsthāpana	Hydrocyanic acid, volatile oil, salicylic acid	Analgesic
9 Elavāluka		Fruit, seed	Vedanāsthāpana	Haemotoxylin, tannin	Nervine tonnic, antipyretic
10 Aśoka	Lodhrādi*	Tvak, puṣpa	Dāhapraśamana, raktaśodhaka	Tannic acid, gallic acid, tannin, catechin	Analgesic, anticoagulant

*Suśruta; **Caraka

TABLE 3
Universal pain assessment tool

Scale	Pain	Grade	BT	AT
0-1	No pain	0	-	-
1-3	Mild pain	1	-	+
3-5	Moderate pain (interferes with task)	2	-	
5-7	Moderate pain (interferes with concentration)	3	-	
7-9	Severe pain	4	+++	
9-10	Worst pain	5		

alleviates pitta and kapha without provoking the vāta. While screening the chemical compositions of the dravyas, it is found that some chemicals like hydrocyanic acid, salicyline, cinchotannic acid[5] are showing action on nervous system and are mild sedatives. Previous experimental studies shows that the dravyas like, arjuna, kadamba and kaṭphala[6] are good analgesics and anti inflammatory in nature. The drugs are having the property of kaphapitta-hara that in turn removes the āvaraṇa in vātadoṣa. Hence the vedana of the patient reduced tremendously.

Conclusion

Lākṣaṇīkacikitsa is one in which the treatment mainly concentrates towards the lakṣaṇas. In Carakasamhita, various treatment modalities explained focused on relieving the symptoms such as in Vātavyādhi, Vātaśoṇita etc.; here, a particular cikitsa is explained to alleviate the pain only, which in turn concentrates on the concept of lākṣaṇikacikitsa. Here the siddhānta is to decrease the presenting complaints only; there is no samprāptivighaṭanacikitsa. In this case, the patient was diabetic with unbearable pain (neuritic), and more anxious about pain. The capsule prepared out of Vedanāsthāpana daśemāni proved to be useful in relieving the pain. The result was satisfactory in terms of relief of pain observed i.e. from grade 5 to grade 2.

References:

1. Yadavji Trikamji, *Carakasamhita*, Sutra-sthana, 4/8, Chaukhamba Orientalia Varanasi.
2. Ibid, 4/9
3. Ojha, J.K., *Hand book of Dravyaguna*, P 29, 138, 167, 295 and 307, Sanskrit Pratishthan, Delhi.
4. Singhal, G.D., *Susrutasamhita*, Sutrasthana, 38/8, Chaukhamba Sanskrit pratishthan, Delhi, sutra, 9, Page no 310.
5. *Ayurvedic formulary of India*
6. *Dspace*, list of dissertations, RGUHS, Bangalore.

Āryavaidyan Vol. XXVIII., No. 1, Aug. - Oct., 2014, Pages 47 - 51

COMPARATIVE STUDY OF GAṆEŚAYĀGOKTA HAVANASĀMAGRĪBHASMA AND ŚILĀBHRARASA WITH MADHUMEHĀRICŪRṆA WITH SPECIAL REFERENCE TO ITS ANTI-HYPERGLYCEMIC EFFECT

Date, K.A.[1], Dwivedi, L. K.[2], Sharma, R.P.[1] and Rao, K.S.[1]

Abstract: Kṣāra, by the same guṇas of agni, increases dhātvāgni and bhūtāgni and thereby decreases kḷeda formation and ultimately the mūtra. It also helps in śoṣaṇa of excessive kḷeda by its rūkṣa and uṣṇa guṇas. Kleda formation is increased when there is śrotomukhasanvṛtata; kṣāra removes it and makes śrotomukhavivṛtata by its tīkṣṇa and vikaṣi guṇa. An analytical study of the bhasma revealed presence of Zn, Cr contain which helped in restraining insulin secretion. A comparative study of Gaṇeśayāgokta havanasāmagrībhasma and Śilābhrarasa with Madhumehāricūrṇa showed better results in the group C (Śilābhrarasa and Gaṇeśayāgokta havanasamagrībhasma) with a mean difference of 21.98%, 24.03% in FBS and PPBS respectively.

Introduction

A recent document of WHO states that globally about 388 million people may die of non communicable diseases like diabetes and heart diseases in the next decade. According to International Diabetes Federation's latest estimation, world prevalence of diabetes among adults (aged 20-79 years) will be 6.4%, affecting 285 million adults, in 2010, and will increase to 7.7% and 439 million adults by 2030. Between 2010 and 2030, there will be a 69% increase in numbers of adults with diabetes in developing countries and a 20% increase in developed countries. Around 3.2 million deaths every year are attributable to complications of diabetes i.e. six deaths every minute. The top ten countries enlisted are: India, China, USA, Russian Federation, Brazil, Germany, Pakistan, Japan, Indonesia and Mexico. Overall direct healthcare budgets are depending on local diabetes prevalence and the sophistication of the treatment available.[1]

In Hindu mythology there are so many scientific concepts (science was fed to laymen through Dharmaśāstra) such as vilva for Lord Śiva (it helps in reducing toxicity), kapittha for Lord Gaṇeśa (it acts on hyperglycemia), apamārga for Budhagraha (acts as śiroroga/medhya), etc.[2a] The Śukḷa portion of Yajurveda elaborately discusses most of the procedures of yāga while various yāgas are described in Upaniṣads, Brāhmaṇagranthas and Purāṇas. 'Gaṇanantva gaṇapatim havāmahe' and 'dūrvā dusvapna nāśayet" are referred to in Śukḷa Yajurveda (23/

1. *Deptt. of Rasasastra & Bhaishajyakalpana, National Institute of Ayurveda, Madhav Vilapas Palace, Amer Road, Jaipur - 302 002*
2. *Deptt. of Rasasastra, GJ Patel Ayurveda Mahavidyalaya, Anand, Gujarat*

18).[3a] Yajurveda describes various yāgavidhis; but it is Atharvaśīṣa that gives maximum references to yāgas related to health.

There are some other yāgas and homas like Dhanvantarīyāga, Lakṣmīnṛsimhayāga and Mṛtyuñjayayāga which are meant to cure diseases and make a healthy life. In these yāgas, havanadravyas are a also specific; for e.g., amṛta (guḍūci) is used in Dhanvatarīyāga and Lakṣmīnṛsimhayāga whereas dūrva is used in Mṛtyuñjayayāga as havanadravyas.[4] In India there is a tradition of various yāgas and the ash remnant of yāga is usually immersed in rivers, lakes; instead, it can be made use of considering its medicinal values.

Objectives

- To evaluate the anti-hyperglycemic effect of Gaṇeśayāgokta havanasāmagrībhasma and Śilābhrarasa.
- To evaluate the comparative anti-hyperglycemic effect of Gaṇeśayāgokta havanasāmagrībhasma and Śilābhraras with Madhumehāri cūrṇa.

Material and methods

All the 3 drugs were prepared in NIA Pharmacy, Jaipur as per classical references. 40 patients, randomly selected from Arogyashala, Bambaiwala & Satellite Hospitals of N.I.A Jaipur, were included in the single blind clinical study.

The patients were equally divided into 4 groups viz. Group A [Madhumehāri cūrṇa (Standard)], Group B (Śilābhrarasa), Group C (Śilābhrarasa and Gaṇeśayāgokta havanasāmagrībhasma) and Group D (Gaṇeśayāgokta havanasāmagrībhasma.

Inclusion criteria

- Patients between 35-75 years of either sex
- Pre-diagnosed cases of NIDDM
- FBS 120-200 and PPBS 150- 300 mg/dl of range

Exclusion criteria

- Patients below 35 and above 70 years
- Diagnosed cases of IDDM
- Pregnancy
- Complication of diabetes mellitus like triopathy (nephro, neuro, retino)

Investigation:- Blood sugar level- fasting and post prandial done on 1st and 30th day of treatment

Treatment

The patients in Group A was treated with Madhumehāri cūrṇa (3 gram o.d.); in Group B, Śilābhrarasa (500 mg o.d.); in Group C, Śilābhrarasa (500 mg) + Gaṇeśayāgokta havanasāmagrī bhasma (500 mg o.d.) and in Group D, with Gaṇeśayāgokta havanasāmagrībhasma (500 mg o.d.). The drugs were administered orally in the form of capsules with lukewarm water as anupāna for a period of one month. Follow up was done after 8 days.

Assessment criteria:- Assessment (objective) of the treatment was done on the basis FBS and PPBS levels.

Results

Total 44 patients were registered, of which 4 patients left the treatment against medical advice and 40 patients completed the course. The study showed better results in the Group C (Śilābhrarasa and Gaṇeśayāgokta havanasāmagrībhasma). The patterns of changes in laboratory parameters after the therapy in each group are shown in Table 1.

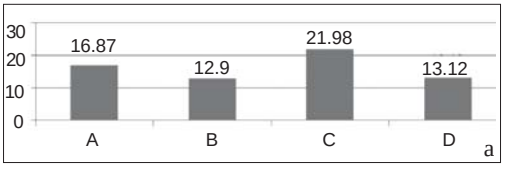
Analysis

One-way analysis of variance (ANOVA) done by using software INSTAT graph-pad version 3.10 showed the following P values: FBS 0.4750

(not significant) and PPBS 0.4607 (not significant). The variation among column means was not significantly greater than expected by chance (Fig I). The data of Tukey-Kramer Multiple Comparisons Test is showed in Tables 2 & 3.

Discussion

As referred to in the texts, we can use any of kāṣṭha like pipal (*Ficus religiosa*), vaṭa (*Ficus benghalensis*), palāśa (*Butea monosperma*), udumbara (*Ficus racemosa*), etc. (sapta samidha) as havyasāmagrī. Here, udumbara kāṣṭha was selected as havyasāmagrī as it is samidhavṛkṣa for śukragraha and so also it acts on śukradhātu.[5a,6a,2b-d] Also, udumbara has properties like medoghna, pramehaghna,[7] and according to Suśruta,[6b] one can use medicine in any form such as ariṣṭa, avaleha, etc. The white ash of udumabra possesses pramehaghna and medoghna properties. This concept is also used in the formations of various bhasmas and rasauṣadhis where bhāvana and puṭa are done to make the drug potent on specific diseases;[8a]



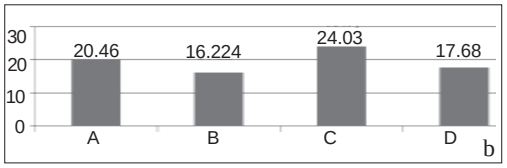


Fig. Ia&b. - Graphical presentation (ANOVA)
a. FBS (Mean Diff%); b. PPBS (Mean Diff%)

here the glycoside present in the drugs burn out and the bhasmas or rasauṣadhis becomes enriched with the properties of the respective drugs.

Gaṇapatītatharvaśīrṣa refers havana of ghṛta and samidha, dūrva, modaka and lāja for healthy life.[9] Haviṣdravyas are nidāna of meha and kuṣṭha.[10a] Ghṛta, yava, dadhi, etc. are used in the preparation of Pippalīmūlādi (pañcāṅg) kṣāra, which is a medicine for meha also.[10b] It is denoted

TABLE 1
The patterns of changes in laboratory parameters after the therapy in each group

Lab Investigation	Mean				SD	SE	't'	P	Result
	BT	AT	Diff.	%					
1. Group A									
- Fasting Blood Sugar	142.72	118.64	24.08	16.87	20.62	6.52	3.69	<0..01	MS
- Post Prandial Blood Sugar	199.81	158.91	40.9	20.46	18.46	5.83	7	<0.001	HS
2. Group B									
- Fasting Blood Sugar	134.42	117	17.35	12.90	15.45	4.88	3.55	<0.01	MS
- Post Prandial Blood Sugar	183.56	153.78	29.78	16.224	23.78	7.52	3.95	<0.01	MS
3. Group C									
- Fasting Blood Sugar	132.56	103.42	29.14	21.98	28.28	8.94	3.25	0.01	MS
- Post Prandial Blood Sugar	200.18	152.08	48.1	24.03	32.55	10.29	4.67	<0.01	MS
4. Group D									
- Fasting Blood Sugar	120.26	104.48	15.78	13.12	18.32	5.79	2.72	<0.05	mS
- Post Prandial Blood Sugar	187.58	154.4	33.18	17.68	32.91	10.40	3.18	<0.02	mS

HS: p = <0.001; MS: p = <0.01 mS: p = <0.02; NS: p = >0.05

TABLE 2
Tukey-Kramer Multiple Comparisons Test

Comparison	Mean Diff.	'q'	P
1. FBS			
- Column 'A' vs 'B'	6.730	1.003	>0.05*
- Column 'A' vs 'C'	-5.060	0.7544	>0.05
- Column 'A' vs 'D'	8.300	1.237	>0.05
- Column 'B' vs 'C'	-11.790	1.758	>0.05
- Column 'B' vs 'D'	1.570	0.2341	>0.05
- Column 'C' vs 'D'	13.360	1.992	>0.05
2. PPBS			
- Column 'A' vs 'B'	11.120	1.274	>0.05
- Column 'A' vs 'C'	-7.200	0.8246	>0.05
- Column 'A' vs 'D'	7.720	0.8841	>0.05
- Column 'B' vs 'C'	-18.320	2.098	>0.05
- Column 'B' vs 'D'	-3.400	0.3894	>0.05
- Column 'C' vs 'D'	14.920	1.709	>0.05

*NS; If the value of 'q' is greater than 3.813 then the P value is less than 0.05.

TABLE 3
Tukey-Kramer Multiple Comparisons Test
Summary of Data

Group	Np*	Standard		Standard Error	
		Mean	Dev.	Mean	Median
1. FBS					
- Col. A	10	24.080	20.625	6.522	17.700
- Col. B	10	17.350	15.452	4.886	20.000
- Col. C	10	29.140	28.283	8.944	33.000
- Col. D	10	15.780	18.321	5.794	14.000
2. PPBS					
- Col. A	10	40.900	18.461	5.838	39.000
- Col. B	10	29.780	23.787	7.522	26.450
- Col. C	10	48.100	32.557	10.296	49.800
- Col. D	10	33.180	32.910	10.407	22.500

*Np = No. of points

that intake of these havisdravyas in the form of ghṛta and dadhi, can cause meha but after offering to god as havya, agni makes samskāra (potential upgradation) and thus the properties causing meha change and the drug acts on meha.

There are various other references where kṣāra is used in prameha.[11a,5b] Other drugs like yava, tila (kṛṣṇa), saptasamidhavṛkṣa and jātīphala were used as referred to in Gaṇeśayāga.[9,12] These drugs are also proven to acting on prameha and hyperglycemia.

The clinical trial showed better results in group C patients treated with Śilābhrarasa and Gaṇeśayāgokta havanasāmagrībhasma. This can attribute to the following reasons:

1. Kṣāra predominantly constitutes teja and vāyu mahābhūtas; also, it has guṇasañcaya properties like uṣṇa, tīkṣṇa that ultimately increase tejomahābhūta in the body and makes equilibrium in prameha.[10c,6c,11b]
2. In prameha, kḷeda formation is increased due to mandāgni at dhātvāgni and bhūtagni level, which ultimately increases mūtrāśaya kḷedavahanam.[10d&e] Kṣāra, by the same guṇas of agni, increases dhātvāgni and bhūtāgni and thereby decreases kḷeda formation and ultimately mūtra.
3. It also helps in śoṣaṇa of excessive kḷeda by its rūkṣa and uṣṇa guṇas.
4. Kḷeda formation also increased when there is śrotomukha samvṛtata; kṣāra removes it and makes śrotomukha vivṛtata by its tīkṣṇa and vikāṣi guṇa.[8b]
5. Udumbara, yava, kṛṣṇa tila and saptasamidha have properties like medoghna, prameha-ghna, etc. The pramehaghna and medoghna properties of udumabra are being potentially upgraded by making it into white ash.
6. An analytical study of this bhasma has revealed the presence of Zn, Cr contain that help in restraining insulin secretion.
7. Śilājatu and Abhrakabhasma have medoghna and pramehaghna properties.[8b]

Conclusion

The clinical trial showed better results in group C patients treated wuth Śilābhrarasa and Gaṇeśayāgokta havanasāmagrībhasma; however, not significant in Anova group comparison test. Group A showed moderately significant on FBS and Highly significant on PPBS whereas Group B showed moderately significant and Group D mildly significant on FBS and PPBS.

Acknowledgment

The authors express their gratitude to Prof. Dr. L.K. Dwivedi, who has been the main source which prompted us for undertaking this study; also to Dr. K. Shankar Rao, H.O.D Dept of Ras Shastra and Bhaishajya kalpana, N.I.A Jaipur for the co-operation and everlasting inspiration. The faculty members of the department of Rasashastra & BK are acknowledged for their valuable guidance and kind co-operation during this research work.

References:

1. *The Asian journal of Dialectology,* Vol. II, No. 2, April 2009.
2. Albrecht Weber, *Satapath..Brhmana* (commentary of Sayana, Harisvamin and Dvivedaganga), Chaukhamba Sanskrit Series office Varanasi-1,1964.
   a) 1/3/3/19-20; b) 3/6/12; c) 4/6/9/21-22; d) 5/2/1/23
3. Pt. Ramkrishna Shastri Shree Mahajasaneyi Madhyandin *Shukla Yajurveda Sanhita* Mahamahopadhyay Shree Vatacharya virachit *Mantrabhashyen* Shree Manmahidhar kritdevdipakhyabhashyen cha sanchalita, Chaukhmba Varanasi 2007.
   a) 2/3/14; b) 33/65-72
4. Girvanendra, *Prapanch Sar Sar Sangraha* (Commentary on Prapanch Sar Sangraha of Aadi Shankaracharya) 16th patal.
5. Brahmshandar Shastri, *Bhavaprakasha Nighantu* (with Vidyotini commentary), 6th Edn., Chaukhambha Sanskrit Samsthan, 1984.
   a) Vatadi/ 9; b) Madhyam, 6/53-60
6. Bhaskar Govindaji Ghanekar, *Susruta-samhita,* Motilal Banarasidas, Delhi 2002.
   a) Sutrasthana 38/48; b) Cikitsasthana 11/10; c) Sutrasthana 11/6; d) Sutrasthana 11/5-6
7. Sharma, P.V., *Dravyaguna Vigyana,* P 19, 6th Edn., Vol-2., Chaukhambha Bharti Academy Varanasi, 1982.
8. Kashinath Shastri, *Rasatarangini* (with Hindi commentary of Dharmanand Shastri), Motilal Banarasdas, 2009.
   a) 20/42-52; b) 10/72-86 and 22/85-86
9. Shastri, J.L., *Upanishat Samgrhah*, Ganapati Atharvasheersha, pp 570-71, Motilal Banarasidas.
10. Vd. Yadavaji Triakamaji acharya, *Carakamhita* (Ayurveda Dipika commentary by Chakrapani Data), Chaukhamba Surbharati Prakashan, Varanasi, 2011

a) Chikitsasthanam, 7/1-2; b) Chikitsasthanam, 15/173; c) Chikitsasthanam 27/306; d) Nidanasthanam, 4/6; e) Chikitsasthanam, 15/238-239, 241.

11. Pandit Lalchandra Shastri Vaidya, *Astanga-samgraha,* 1st Edn., Shri Vaidyanath Ayurveda Bhawan, Nagpur, 1989.
    a) Chikitsasthanam, Cikitsasthanam,10/168; b) Cikitsasthanam, 24/1-3
12. Pt. Ashok Kumar Gaud, *Ganeshyag Rahasyam Arthat Ganeshyag - Paddhati with Ashokendu,* 1st Edn., Chaukhamba Surbharati Prakashan, Varanasi, 2004.

Āryavaidyan Vol. XXVIII., No.1, Aug. - Oct., 2014, Pages 52 - 56

MANAGEMENT OF SANDHIGATAVĀTA W.S.R TO JĀNUSANDHI BY AGNIKARMA AND SVEDANA - A COMPARATIVE CLINICAL STUDY

Mohasin Kadegaon,[1] Udayashankar,[2] Harshavardhan,[2] and Mahamad Yunus[1]

Abstract:- Sandhigatavāta (osteoarthritis) is a manifestation of morbid vāta in the joints characterised by sandhivedana (joint pain), śotha (swelling), ātopa (crepitus) and sthambha (stiffness). Treatment like snehana (oleation), svedana (sudation), upanāha (poultics), agnikarma (cauterisation) and vasti (enema) are advised in this disorder. Agnikarma, due to its uṣṇa guṇa (hot quality), eliminates the vitiated vāta-kaphaja doṣa; svedana is useful in diseases caused by vitiation of vāta, kapha or both. Both agnikarma and svedana enhance the local temperature and looks similar, but their procedure and mode of action is different. So this topic is chosen to evaluate the better efficacy in between them. The clinical study showed encouraging results in both the groups. Though there was quick reduction of pain in the agnikarma group, the benefits found sustained for a long time in the svedana group.

Introduction

The successful life of every individual is greater depend upon locomotion. i.e. ability of using joints and bones. Sandhigatavāta cripples the freedom of movement. Vāta, when vitiated by vāta prakopa āhara-vihāra [like rūkṣa (rough), laghu (light) sīta (cold), etc.] settles down in the sandhis and produces the features of sandhigatavāta. It is a manifestation of morbid vāta in the joints, characterised by sandhi-vedana, śotha, ātopa, and stambha.[1] Several methods of treatment like snehana, svedana, upanāha, agnikarma and vasti are advised in sandhigatavāta.[2] Among them, agnikarma, due to its uṣṇaguṇa, eliminates the vitiated vāta-kaphaja doṣa. The vyādhi treated by agnikarma will not recur. It is superior to kṣārakarma; and the diseases that are incurable by śastra, kṣāra and bhaiṣajya, can be treated by it.[3]

Svedana is advised in diseases caused by vitiation of vāta, kapha and both. It is a procedure which induces sveda, relieves śīta, śūla, and controls stambha, and gaurava (heaviness). Agnidīpana (appetizer), tvak-mārdava (skin softness), sandhiceṣṭha (joint movements) are also the benefits of svedana.[4]

Both agnikarma and svedana enhance the local temperature and looks similar, but the procedure and mode of action is different. This topic is chosen to evaluate the better efficacy in between them.

1. *Dept of Shalyatantra, Shri J.G.C.H.S Ayurveda Medical College Ghataprabha, Belgaum District*
2. *Dept of Shalyatantra, K.V.G. Ayurveda Medical College Sullia*

Aim and objectives:- To evaluate the efficacy of agnikarma and svedana in sandhigatavāta comparatively.

Material and method

Collection of data:- Patients who attended the O.P.D and I.P.D having the complaints of jānu-sandhigatavāta were screened and 30 patients fulfilling the inclusion criteria were selected randomly. The patients were divided equally into two groups viz. 'A' (agnikarma) and 'B' (svedana).

Inclusion criteria:- Patients between 30-50 years of age; irrespective of sex and occupation; diagnosed on the basis of sign and symptoms of sandhigatavāta.

Exclusion criteria:- Contraindication of agnikarma and svedana; associated with any other sever systemic disease like diabetes, hypertension.

Diagnostic criteria:- 1) Subjective criteria - sandhiśūla (pain) and sandhisthambha (stiffness) in jānusandhi; 2) Objective criteria - sandhiśotha (swelling) and sandhi ātopa (crepitus) in jānusandhi.

Assessment criteria:- As per parameters and gradation shown in Table 1.

Treatment:- Patients in Group A (15 Nos) were treated by agnikarma in single setting and followed up at the end of 7th and 14th day. Group B (15 Nos) were treated by svedana for a period of 7 days and followed up at the end of 7th and 14th day. (Fig. Ia-d)

Result

Group A:- The percentage of improvement on various parameters in group A&B is shown in Table 2. Comparatively, the overall improvement of sandhigatavāta in group A was 74.62% whereas in group B it found to be 70.19%.

TABLE 1
Assessment parameters

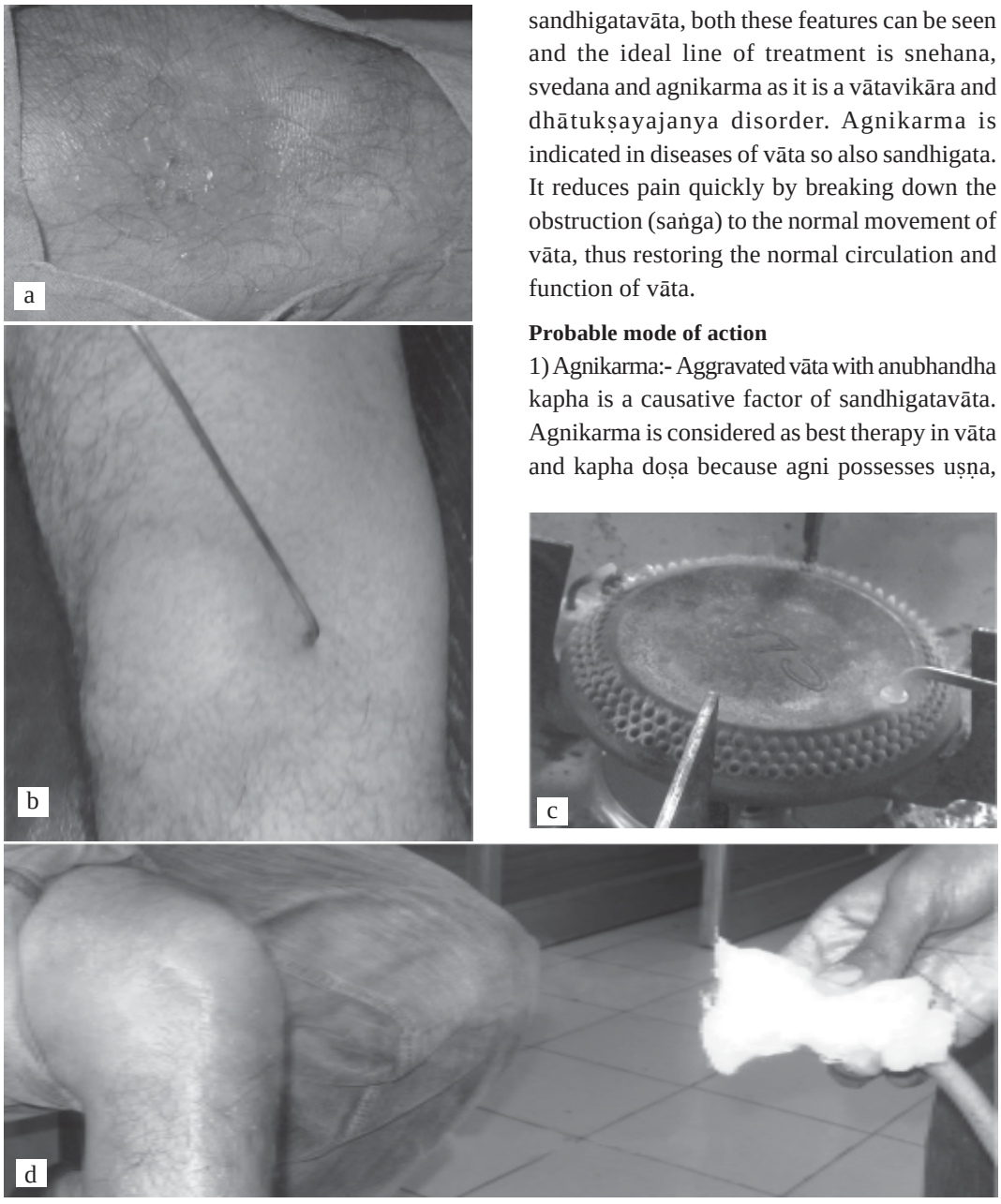
Parameters	Gradation
1. Sandhiśūla	
- No pain	0
- Occasional pain	1
- Mild pain but no difficulty in walking	2
- Moderate pain and slight difficulty in walking	3
- Sever pain and extreme difficulty in walking	4
2. Stambha	
- No stiffness	0
- At times for 5-10 minutes	1
- At times for 10-30 minutes	2
- Daily for 30-60 minutes	3
- Daily for more than a hour	4
3. Śotha	
- Absent	0
- Present	2
4. Sandhi ātopa	
- No sound	0
- Palpable crepitus	1
- Audible crepitus	2

TABLE 2
Effect of therapy in Group A&B

Parameters	% of improvement	
	Group A	Group B
1. Sandhiśūla	96	89
2. Sandhistambha	82	66
3. Sandhiśotha	42	85
4. Sandhi ātopa	28	21

Discussion

As the name suggests, Sandhigatavāta is one of the vātavyādhi affecting the joints of the body. It is explained under the various gata vātavyādhi.[5] Here, the kupita vāta gets localized in sandhi leading to the manifestation of disease. Asthidhātu is the aśrayasthāna of vātadosa,[6] and vātavṛddhi results in asthikṣaya. In



sandhigatavāta, both these features can be seen and the ideal line of treatment is snehana, svedana and agnikarma as it is a vātavikāra and dhātukṣayajanya disorder. Agnikarma is indicated in diseases of vāta so also sandhigata. It reduces pain quickly by breaking down the obstruction (saṅga) to the normal movement of vāta, thus restoring the normal circulation and function of vāta.

Probable mode of action

1) Agnikarma:- Aggravated vāta with anubhandha kapha is a causative factor of sandhigatavāta. Agnikarma is considered as best therapy in vāta and kapha doṣa because agni possesses uṣṇa,

Fig. Ia-d: Agnikarma and svedana procedures
a Madhu & ghṛta application (Paścātkarma of Agnikarma); b Agnikarma
c Red-hot loha śalāka d Svedana (Nāḍīsveda procedure)

sūkṣma, tīkṣṇa and āśukāri guṇa which are opposite to vāta and kapha. It removes śrotovarodha and increase the rasa-rakta-samvahana to the affected site. Therapeutic heat transferred by agnikarma increase the dhātvāgni, so metabolism at dhātu level increases, which helps to digest the āmadoṣa of metabolism.[7] The following are the possible scientific explanations of agnikarma:

- Gate control therapy:- Pain sensations are transferred by two types of fibers. 'A' fibres (stimulated by heat, cold and touch) and 'C' fibers (stimulated by pain). Here the gate mechanism is blocked by stimuli from 'A' fiber, so no feeling of pain.
- The place where heat burns the local tissue metabolism is improved and thus it leads to increased demand of oxygen and nutrient of the tissues. This causes enhanced delivery of nutrients and more efficient removal of waste products, hence speeding up the natural process of repair.
- Heat → Thermal receptors → Stimulation of Lateral Spinothalamic Tract → Stimulation of Descending Pain Inhibitory fibers → Release of endogenous Opoid peptide which bind with opioid receptors at Substantia Gelatinosa Rolandi → Inhibition of release of P-substance → blockade of pain sensation.
- Pain receptors of skin and motor end plate stimulate at 45^0C. Pathway for pain and thermal signals run parallel and ends into same area but only stronger one is felt. Therefore complete exclusion of pain impulse by heat occurs.
- Counter irritation theory:- A counter irritant stimulate sensory nerve endings and relieves pain.
- Effect on muscle tissue:- Heat induces muscle relaxation.

2) Nāḍīsveda:- Svedakarma has four major actions over the body viz. stambhaghnata, gauravaghnata, śītaghnata and svedakārakata.

- Stambhaghnata:- Stambha means stiffness which is produced as a resultant of excess śītaguṇa. According to Cakrapāṇi, stambha also means obstruction or block. Therefore, svedana not only relieves stiffness, but also clears blocking of passages (śrotorodha).
- Gauravaghnata:- Gaurava or heaviness of the body is relieved by svedana. By means of svedana, the fluids in the body are excreted through the sveda (sweat) and hence the feeling of lightness in the body. Svedana stimulates the nerve endings and promotes muscle strength.
- Śītaghnata:- This has to be understood as the patient is relieved of the coldness (śītasvabhāva) by the uṣṇaguṇapradhāna svedakarma (prominent of hotness in sudation).
- Svedakārakata:- Svedana (sudation) produces perspiration. This is a mala (excretory product) wherein the wastes of all the layers of skin, muscles, nerves, rasa, rakta, meda, etc. are mixed. Therefore, it is a mechanism of excreting the metabolic wastes in the body tissues.

Conclusion

Both the procedures (agnikarma and nāḍīsveda) found to be effective in treating jānusandhigata vāta. Agnikarma with lohaśalaka are effective in

treating vedana and sthambha in jānu-sandhigatavāta. Daśamūlanāḍīsveda is more effective in treating the sandhiśotha of janusandhigatavāta. The materials used were cost wise affordable hence handy modality in the hands of a trained doctor. And so cost effective, easy to handle procedure as claimed. Agnikarma gives quick result in symptoms while nāḍīsveda gives gradual effect.

References:

1. Jadavaji Trikamji. *Susrutasamhita* (with Nibandhasagraha commentary of Dalhanacharya), P 261&824, Chaukhambha Surbharati Prakashan, Varanasi, 2008.
2. Ibid, P 420&824
3. Ibid, P 51&824
4. Jadavaji Trikamji, *Carakasamhita* (with Ayurveda Dipika commentary of Chakrapanidatta), P 120&738, Chaukhamba Surbharati Prakashan, Varanasi, 2009.
5. Vidhyadhar Shukla and Ravidatta Tripathi, *Carakasamhita* (with Vaidhyamanorama Hindi commentary), P 694&999, Chaukhambha Sanskrit Pratishthan Delhi, 2007.
6. Hari Sadashiv Shastri Paradakar, *Astanga-hrdaya*,(with annotation by Anna Moreshwar Kunthe and Krishna Ramchandra Shastri Navre), Chap. 11, Chaukhambha Sanskrit Pratishthan, Varanasi, 2010.
7. Vishwa Ayurveda Parishad, Oct-2012

Āryavaidyan Vol. XXVIII., No.1, Aug. - Oct., 2014, Pages 57 - 58

Clinical Observation

PAKṢĀGHĀTA - A CLINICAL STUDY

Prashant M. Bhandi*

A 62 years female with complaints of weakness on the right side of the body, stiffness of right hand, slurred speech and hypertension since one and half month, was successfully treated with āyurvedic medicines.

History:- One and half month before, the patient felt slight weakness in the right side of the body and she was admitted in an allopathic hospital. A CT Scan report showed mild, age related cerebral atrophy for which medicines prescribed. She started walking without support but suffered from diarrhoea and switched base to bed ridden state. At the time of discharge after 15 days, she had slight weakness. After 4 days, the condition worsened. She was unable to speak and admitted in the Charitable Hospital, Arya Vaidya Sala, Kottakkal.

Vitals

Pulse - 68/min,
BP - 130/100 mm/Hg
Bowel - Constipated
Urine - Incontinence
Appetite - Less

Reports

CT Scan Head on 26/04/2010 showed mild age-related cerebral atrophy.

CT Scan Head on 14/05/2010 showed acute infarcts left ACA territory one of them showing haemorrhagic transformation.

Treatment

Internal

- Gandharvahastādi kaṣāyam 15ml + 60 ml of warm water + Gandharvahastādi eraṇḍataila - 1 teaspoon - in empty stomach at 6.00 am
- Aṣṭavargam kaṣāyam 15 ml + 60 ml warm water + Kṣīrabalātailam 7 āvarti - 10 drops - at 6.00 pm
- Guggulutiktakaghṛta 1 tea spoon - after dinner

External

- Abhyaṅga + Tailadhāra for 7 days with the Rāsnādaśamūlādi tailam for head and Koṭṭamcukkādi tailam for body.

*C/o Shankar S Chougule, Somnag, House No. 1079, Ashok Chowk, Solapur PO, Maharashtra

- Picu + Cūrṇapiṇḍasveda - for 14 days
- Kṣīradhūma nasya - for 7 days and Rāsnādi cūrṇa applied daily over the vertex.
- Anuvāsanavasti with Śatāhvādi tailam - for 5 days
- Mādhutailika kaṣāyavasti - for 3 days.

Result

Speech became clear, weakness much reduced, stiffness of right hand reduced and hypertension controlled. At the time of discharge, the patient felt better, could walk without any support. Advised to continue the same medicines for one month and asked to come for follow up after one month.

Diet restriction: - Prefer vegetable food, light liquids, fresh and warm food, boiled and cooled water for drink. Avoid non-veg. diet, excess salt, oily, spicy and dry foods; abstain from viruddhāhāra (incompitable food), vyavaya (intercourse), vyāyāma (exercise), upavāsa (fasting) and cinta (mental stress).

Follow up

The patient came after one month. She was feeling better. 90 % weakness reduced, speech was clear, could walk without support. Hypertension was normal. Stiffness of the right hand reduced completely. The same medicines. prescribed for a month. Now she is feeling better.

Discussion

स्नेहनं स्नेहसंयुक्तं पक्षाघाते विरेचनम्
स्वेदनं स्नेहसंयुक्तं पक्षाघाते विरेचनम्

The classical treatment of vātavyādhi is snehana, svedana and mṛdusamśodhana. Higher risk factors of stroke such as hypertension, diabetes mellitus, physical and mental stress, smoking and alcohol are to be taken into account.

Gandharvahastādi kaṣāyam is used in vātavyādhi; it reduces vāta and is agnibalakāraka. Aṣṭavargam kaṣāyam and Kṣīrabalātailam are also used in vātarogas. Guggulutiktakaghṛtam is used in sandhigata-astigata-majjāgata-jatrūrdhva vātavyādhis and also in hṛdroga. Koṭṭamcukkādi tailam is used in stambha (stiffness) and kaphanubandha (kapha-associated) vāta doṣa. Rāsnādaśamūlādi tailam reduces vāta. Rāsnādi cūrṇam alleviates vāta and is indicated in śirostodapratiśyāya. Vasti is the prime treatment in almost all vātavyādhis. It reduces vāta and gives strength to the body.

Āryavaidyan Vol. XXVIII., No.1, Aug. - Oct., 2014, Pages 59 - 64

PREPARATION OF MAUKTIKABHASMA BY TWO DIFFERENT METHODS AND ITS COMPARATIVE ANALYTICAL STUDY

Ketki Prakash Adhav and Kunal H. Lahare*

Abstract: Mukta is one of the nine precious stones. It bears qualities like śītavīrya (cold potency), madhuravipāka (sweet in after digestion), kapha-pitta śāmaka ((vata and kapaha alleviative), vṛṣya (aphrodisiac), āyuṣyam (age-promoting), balakara (health promoting) and bṛhmana (nourishing). It is indicated in kāsa (cough), śvāsa (dypsenoea), kṣaya (emaciation), agnimāndhya (indigestion), dāha (burning sensation), kaphaja unmāda (insanity due to kapadosa), vātavyādhi (rheumatic complaints), rājayakṣma (phthisis), viṣavikāra (ailments due to toxicity) and netraroga (ophthalmopathy). A comparative analytical study was carried out to evaluate Muktābhasma prepared by two different methods.

Introduction

Mauktika is one of the precious stones (ratna) used from ancient times. The name 'moti' or 'mukta' indicates freedom from physical and mental diseases.[1,2]

Lakṣaṇas:- Śveta, sthūla, snigdha, nirmala, mahat, toyaprabha, vṛtta and candrodbhasi are the grāhyalakṣanas, and rūkṣāṅga, nirjala, śyāma, tāmrabha, lavaṇopama/kṣārabhasa, ardhaśubhra, vikaṭa, grantila, yugmakam, vicayām, vyaṅgakaya and śuktispraśa are agrāhya lakṣanas of mukta.

Benefits of muktadhārana:- Āyuṣya, dukha-nāśaka, kāmya, ojovardaka, viṣaghna and aiśvaryakṛt. Sūryādi grahapīḍas gets relieved by the usage of navaratnas.

Mātra of mukta:- Analysing the roga-rogibala, avastha and also the kāla, etc. Muktābhasma is administered in the dose of ¼ to 1 ratti pramāṇa (30 mg to 125 mg). The mātra of muktā piṣṭi is ½ ratti to 1 ratti (62.5mg to 125 mg)

Anupāna:- Kṣīra, uṣṇajala, ghṛta, navanīta and madhu.

Guṇas of Muktābhasma:- Kapha-pitta śāmaka, vṛṣyam, āyuṣyam, balakara, bṛhmaṇa, madhura and śīta.

Indications:- Muktābhasma is indicated in kāsa, śvāsa, kṣaya, agnimāndya, dāha, kaphaja-unmāda, vātavyādhi, rājayakṣma, viṣa-vikāra and netraroga.

Viśiṣṭa yogas:- Pravāḷapañcāmṛtarasa, Kastūri-bhairavarasa, Kāñcanābhrarasa, Trailokya-cintāmanirasa, Puṭapakva viṣamajvarāntaka-rasa, Makaradhvaja vaṭi, Mahāmṛgāṅkarasa, Muktāpañcāmṛtarasa, Vasantamālatīrasa, Hiraṇyagarbhapoṭṭalīrasa and Kecāri guṭika.

Properties of śodhana and māraṇa dravyas:- 1) Jayanti is kaṭu and tikta in rasa; rūkṣa and laghu in guṇa; uṣṇavīrya and kaṭuvipāka. It is kaphavātahara, tridoṣahara and mūtraḷa, viṣaghna, dīpana, krimighna, śvitraghna and has kaṇṭhya properties also. 2) Kulatha kvātha has

*B-301, Krishna Residency, Kalanagar, Dindori Road, Meri, Nashik, Maharashtra - 422004

kaṣāya rasa; laghu, rūkṣa, tīkṣṇa guṇa; amḷa vipāka; and is aśmarībhedana, kapha-vātaśāmaka and rakta-pittaprakopaka. 3) Śudhodaka is madhura and tikta in rasa; guru, mṛdu, drava, śīta and sara in guṇa; śīta in vīrya. It has pācaka, stambhaka, pittaśāmaka, bṛhmaṇīya, dāhanāśaka, vraṇanāśaka, rakta-sravarodhaka and rogaghnata properties also. It is indicated in amḷapitta, dāha, vraṇa, mukha-dūṣika, kaṇṭhamāla and pramehapiḍika. 4) Godugdha has madhura rasa; guru, mṛdu, snigdha, bahaḷa, picchila and manda guṇa; madhura vīrya; jīvanīya, bṛmhaṇīya, rasāyana, ojovṛddhikara, vṛṣya, balya, rogaghna properties. It is indicated in pāṇḍu, gulma, śoṣa, udara, śvāsa, kāsa, mūtrakṛchra and raktavikāra.

Aim:- Preparation of 2 samples of Muktābhasma viz. Muktabhasma Godugdha Mārit (MBG) and Muktabhasma Kulatha Mārit (MBK), by 2 different methods.

Materials and methods

The pharmaceutical processes were carried out in Rasaśāstra Department of S.V.N.H.T'S Āyurveda College, Rahuri factory, Rahuri. Literary reviews of mukta, etc. were collected from the library of the Institute. Modern literary reviews on pearls etc. were collected from the digital library through internet sources.

Physico-chemical analysis of the bhasma was carried out at Jeevanrekha Laboratories, Aurangabad. The study encompassed: a) procurement of genuine raw material and associated drugs for śodhana and māraṇa by 2 methods and getting authenticated by the subject experts, b) Method of processing like śodhana and māraṇa and c) Quality control of the finished products.

Processing:- In method 1, the śodhana of mauktika was done by śudhodaka;[3] and māraṇa by godugdha and laghu puṭa.[4] In method 2, the śodhana was done by jayantīpatra svarasa;[5] and māraṇa by kulith kvātha.[6]

Size and shape:- The measurement of kukkuṭa puṭa was taken as referred to in Rasaratna-samucchaya i.e. 2 vasti pramāṇas [24 aṅgulas (46 cm)]

Results

The pharmaceutical and analytical results are shown in the Tables 1-7.

TABLE 1
Pharmaceutical results

Procedure	Qty (in gram) - MBG			Qty (in gram) - MBK		
	Before	After	Loss/gain	Before	After	Loss
1. Śodhita mukta	500	442	58	500	451	49
2. Cūrṇīkaraṇa	442	437.8	4.2	451	447.2	3.8
3. Bhāvana	437.8	464	26.2	447.2	472.6	45.4
4. Māraṇa (1st puṭa)	458	319	139	466.6	326.6	140
Māraṇa (2nd puṭa)	304	279	25	316.6	291.6	25
Māraṇa (3rd puṭa)	279	273	6	291.6	285	6.6
Māraṇa (4th puṭa)	259	250	9	-	-	-

MBG - Muktabhasma Godugdha Mārit; MBK - Muktabhasma Kulatha Mārit

TABLE 2
Physico-chemical analysis by āyurvedic method

Type of parīkṣa	MBG	MBG
Śabda (sound)	-	-
Sparśa (touch)	Smooth, soft	Smooth, soft
Rūpa (appearence)	White amorphous powder	White greyish powder
Rasa (taste)	Tasteless	Tasteless
Gandha (smell)	Odourless	Odourless

TABLE 3
Physico-chemical analysis of Muktabhasma

1. pH	11.97	11.80
2. Specific gravity	1.030	1.026
3. Loss on drying	0.6%	0.7%
4. Ash value	98.41%	98.85%
5. Acid insoluble ash	31.62%	31.14%

TABLE 4
Solubility test of Muktabhasma

Solvents	MBG	MBK
Distilled water	PS	PS
Ethanol	SS (+)	SS (+)
Methanol	SS (++)	SS (++)
Ether	NS	NS
CCl4	NS	NS
Tween 80	PS (Suspension form)	PS (Suspension form)

TABLE 5
Qualitative test of inorganic elements in Muktabhasma

Parameter	MBG	MBK
1. Calcium	+	+
2. Carbonate	+	+
3. Sulphate	+	+
4. Iron	-	-
5. Sodium	+	+
6. Potassium	-	-
7. Chloride	+	+

+ Present; - Absent

TABLE 7
Na, K, Ca by flame photometry

Sample	Na (mmol/L)	K (mmol/L)	Ca (ppm)
MBG	9±1.04	50±3.76	283 ±25.95
MBK	11±1.04	53±3.72	300±23.96

Discussion

Pharmaceutical part

Raw material:- Mukta was collected from professional suppliers of pearls. It was authentified first from Deccan Institute of Gem Technology, Hyderabad and then from the CRL (Central Research Lab) of the Institute. Grāhyā-grāhya lakṣaṇas are told in the classics. But in the present study, application of these grāhyā-grāhya lakṣaṇas was not suitable as the study itself was on cultured pearls. But, some lakṣaṇas like śḷakṣṇa, snigdha, śveta and nirmala were slightly observed.

Mukta śodhana:- As mukta is an aquatic gem, there are less chances of getting contaminated. Hence, śodhana of mukta is not compulsion with regard to its purification. However, to enhance its therapeutic properties, śodhana (by herbal juice) is necessary.

Fick's low of diffusion:- This law states: "the flux of an atom of a substance travels from one concentration to other concentration in a fix period of time." So, the diffusion between two planes X and Y in a non-homogenious solution can be expressed quantitatively by formula: ds/dt = DA (dc/dx); where 'ds/dt' is the rate of moment of solutes, 'D' diffusion constant, 'A' the area of planes and 'dc/dx' the concentration gradient between X and Y.

According to this law, there is diffusion of molecules between śodhana of dravya and media as there is a concentration gradient between the two. So, in the śodhana procedure,

TABLE 6
Qualitative test of inorganic elements in Muktabhasma

Sample	Sieve No.	Micron size µm	Particle size mm	% wt. retained	Cumulative amount retained
I. MBG	8/10	2057	>2057	-	
	10/12	1680	2057-1680	-	
	16/18	1003	1680-1003	0.190	0.163
	22/25	710	1003-710	0.346	0.595
	44/45	355	710-355	0.469	1.066
	50/52	300	355-300	0.050	1.00
	60	250	300-250	1.639	2.896
	80/85	180	250-180	5.100	6.584
	100	150	180-150	1.176	9.10
	300	53	150-53	0.50	9.53
II. MBK	8/10	2057	>2057	-	
	10/12	1680	2057-1680	-	
	16/18	1003	1680-1003	0.198	0.198
	22/25	710	1003-710	0.383	0.536
	44/45	355	710-355	0.469	1.016
	50/52	300	355-300	0.059	1.08
	60	250	300-250	1.690	2.750
	80/85	180	250-180	5.190	7.863
	100	150	180-150	1.183	9.05
	300	53	150-53	0.62	9.66

the solutes travel from jāyantīpatra/śudhodaka svarasa to mukta and in the same time, unwanted materials move from mukta to the śodhana media. Hence, the weight gain of mukta after śodhana can be attributed to the above said law. Also the pH of jayanti svarasa before śodhana was 6.37 and after śodhana, it was 5.84, and that of śudhodaka before śodhana was 6.37 and after śodhana was 5.84. This change may be due to continous heating for 3 hour or it may be due to interaction of svarasa with mukta.

Mukta māraṇa:- Śodhita mukta is triturated with godhugdha/kulatha kvātha after each puṭa by which there is reduction in particle size and also the chemical constituents of godugdha/kulatha kvātha (Ca) and the properties like śītavīrya, snigdhaguṇa increase the therapeutic efficacy of Muktābhasma.

During mukta māraṇa, cākrikas were found to be advantageous for the better agnipāka, maintenance of uniform heat for all the particles and availability of more surface area for the chemical conversion. Śarāva sandhibandhana is necessary to maintain the pressure inside the apparatus and also to avoid direct loss of material in the completely burnt ash of vanopala. Laghu puṭa was adopted which exerted maximum temp. range upto 700-850°c that maintained for 35 minutes. After giving 4 puṭas (MBG) and 3 puṭas (MBK) respectively, it passed all bhasma parīkṣas. The māraṇa in total can be understood with following principles and application:

Fourier's principle of thermodynamics:- Heat flow in laghupuṭa can be explained by mechanism of conduction i.e. heat flow from a hot surface to cold surface. During laghupuṭa, heat flow through cakrikas can be supported by this law. According to this law "the rate of heat flow through a uniform material is proportional to the area and the temperature drop and inversely proportional to the length of the path of flow." So, the area of cakrika is uniform in shape and even if the path of heat flow is very less, it will help in uniform and maximum heat flow.

Hess's law of thermodynamics:- In the process of māraṇa of mukta the conversion of material takes place in many steps. And it is necessary to maintain uniform temperature which is very difficult in laghupuṭa. There may be some difference in temperature but it is not significant, for according to this law, "the amount of heat evolved or absorbed in a chemical change is same whether the process takes place in one or several steps". Therefore, change of mukta into bhasma needs an average degree of temperature. Even if there is a slight change in the temperature during laghupuṭa, which is common, can be substantiated.

Analytical part

Bhasma parīkṣas:- Muktābhasma was straw in colour; smooth and soft to touch, odourless and tasteless. All samples fulfilled rekha-pūrṇatva, varitāratva, unama, jihva parīkṣa after four and three laghupuṭa respectively (MBG and MBK method).

Physico-chemical analysis in which pH, specific gravity, loss on drying, ash value, acid insoluble ash of Muktābhasma were done. Solubility test in distilled, ethanol, methanol, ether, calcium chloride of Muktābhasma were done. Qualitative test for inorganic elements like calcium, carbonate, sulphate, iron, sodium, potassium, chloride were done.

Modern view:- Physiologically, the integrity and permeability of cell membrane is regulated mainly by calcium which is abundantly present in mukta. Additional to Ca, Fe was also found to be present.

Conclusion

Marine originated mukta, one of the nine precious stones, possesses various qualities by which it has got wide spectrum applications from Daivavyapāśrayacikitsa to Yuktivyapāśraya cikitsa. Śodhana by svedana process in jayantī svarasa and śudhodaka; bhāvana with godugdha and kulatha kvāth; and then māraṇa by four and three laghupuṭa respectively are sufficient to obtain Muktābhasma that passes all the bhasmaparīkṣas.

References:

1. साध्येषु भेषजं सर्वमिरितं तत्ववेदिनाम्।
   असाध्येष्वापिदातव्यो रसोऽत: श्रेष्ठमुच्यते।।
   (रसेन्द्रसारसागर)
2. मौक्तिकं वृष्यमायुष्यं मधुरं शिशिरं परम्।
   दीपनं दाहशमनं नेत्र्यं वर्ण्यं च कीर्तितम्।।
   (र.त. २३/७२)
3. सुराप्रदीपवह्निना शरावगं तु मौक्तिकम्।
   सुधोदकेन पाचितं विशुद्धि मेत्यनुत्तमाम्।।
   (र.त. २३/६९)
4. विमलं मोक्तिकं गव्यपयसा परिपोषितम्।
   त्रिधा लघुपुटे पक्वं मृतं स्याच्छसुन्दरम्।।
   (र.त. २३/७०)
5. स्वेदयेद्योलिकायन्त्रे जयन्त्या: स्वरसेन च।
   मणिमुक्ताप्रवाळानां यामैकं शोधनं भवेत्।।
   (शा.स. ११/८९)

6. उक्तमाक्षिकवन्मुक्ता: प्रवाळानि च मारयेत्।
(शा.स. ११/९२)

कुलत्थस्य कषायेण घृत्वा तैलेन वा पुटेत्।
तक्रेण वाजमूत्रेण म्रियते स्वर्णमाक्षिकम्।।
(शा.स. ११/५६)

Bibliography

1. Vaidyapanchanana Gangadharshastree Gopalrao Gune, *Ayurvediya Aushadhi Gunadharma,* Part 1-5, 2005.
2. Vd. Satyartha Prakasha, *Rasendra-sarasangraha*, Krishnadas Academy, Varanasi, 1994.
3. Indrdeo Tripathi, *Rasaratnasamuchhaya*, Chaukumbha Sanskrit Samsthana
4. Sadananda Sharma and Kashinath Shastri, *Rasatarangini*, Motilal Banarasidas Publication, New Delhi, 2009.
5. Chandrabhushan Jha, *Ayurvedeeya Rasashastra*, Chaukambha Surabharathi Prakashan, Varanasi
6. Santosh Khandel, *Rasa-bhaishajya Kalpana Vigyan*, Publications Scheme, Jaipur
7. Sony, P.L., *Text book Inorganic Chemistry*, Sultan Chand and Son's.
8. Vd. Dhamankar and Vd. Puranik, *Ayurvediya Aushadhikaran*, Dhoot-papeshwar Ind.
9. Brahmananda Tripathi, *Sarngadhara-samhita*, Chaukhamba Surbharati Prakashan, Varanasi, 2004.
10. The Ayurvedic Pharmacopoea of India.
11. www.google.co.in; www.chemguide.co.uk
12. http://en.wikipedia.org

Printed at Premier Offset Prints, Kozhikode and published by Aryavaidyan P.K.Warrier, Managing Trustee, Arya Vaidya Sala, Kottakkal for and behalf of Arya Vaidya Sala, Kottakkal.
Editor: Dr. M.R. Raghava Varier. Typesetting: Department of Publications, Arya Vaidya Sala, Kottakkal.