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लाभानां श्रेय आरोग्यम्

Of all the gifts,
the most precious is health

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āryavaidyan

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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.

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ANTILIPID PEROXIDATION ACTIVITY OF THE STEM OF *CISSUS QUADRANGULARIS* L.

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Abstract: *Cissus quadrangularis* belonging to the family Vitaceae, is a climber which grows commonly in the hotter and drier regions of India. The young shoots of the plant are administered in dyspepsia and indigestion. The whole plant is used in fractures, sprains, rheumatism, haematuria, elephantiasis and various wounds. Anti oxidants are compounds which even at relatively small concentration act as inhibitors of the process of oxidation. The present study is an attempt to explore the anti oxidant activity of this plant and was tested by measuring the levels of malonaldehyde (MDA) using goat liver homogenate.

Introduction

The plant *Cissus quadrangularis* L. belonging to the family Vitaceae is a climber which grows commonly in the hotter and drier regions of India. It is also widespread in the drier parts of Africa and Arabia. It is an ornamen-tal plant having a variety of stems with three or four sides. The tendril climber has quadrangular, very long, fleshy, glabrous stems (Fig. I). The leaves are 2.5-5 cm long, broadly ovate or reniform, glabrous, cordate and rounded. Flowers are in shortly peduncled cymes with spreading umbellate branches. The fruits are globose or obovoid berries and red when ripe. It is sweet in taste. The young shoots of the plant dried and powdered, are burnt to ash in a closed vessel and administered in dyspepsia and indigestion and certain bowel complaints. Juice of stem is dropped into the ear in otorrhea and into the nose in epistaxis. It has also a reputation in scurvy and in irregular menstrua-tion. A paste of the stem is used by traditional healers, applied as a poultice over bone fracture and swellings. The whole plant is used in fracture, sprains, rheumatism and various wounds. The preliminary phyto-chemical studies reveal the presence of flavonoids, phytosterols and terpenoids.

Anti oxidants is our first line of defense against free radical damage and are critical for main-taining optimum health and well being. The need for antioxidants becomes even more critical with increased exposure to free radicals. Pollution, cigarette smoking, drugs, illness, stress and over exercise can increase free radical exposure.

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Free radicals are capable of attacking the healthy cells of the body causing them to lose their structure and function. Cell damage caused by free radicals appears to be a major contributor to aging and to degenerative diseases of aging such as cancer, cardio vascular disease, cataracts, immune system declination and brain dysfunction. Overall free radicals have been implicated in the pathogenesis of at least 50 diseases.

To protect the cells and organ system of the body against reactive oxygen species humans have evolved a highly sophisticated and complex antioxidant protection system. Phyto-chemicals are becoming increasingly known for their antioxidant activity. Phenolic compounds such as flavonoids are ubiquitous within the plant kingdom. Flavonoids have been demonstrated to have anti-inflammatory, anti allergic, anti viral, anti-aging and anti-carcinogenic activity. The broad therapeutic flavonoids can be largely attributed to their antioxidant properties. Since *C. quadrangularis* shows the positive reaction for flavonoids in preliminary phyto-chemical analysis the present work aims at evaluating its antilipid peroxidation activity.

Fig. I. *Cissus quadrangularis*

Materials and methods:

The stems of *C. quadrangularis* were collected from the medicinal garden, AKCP, Krishnan koil in the third week of March 2009. The plant material was identified, authenticated by taxonomist and a voucher specimen (PCG CQ 21) was deposited in the herbarium of the Department of Pharmacognosy, AKCP.

Preparation

Stem extracts: - The stems were garbled and dried under shade and powdered. The powder was loaded into soxhlet extractor and subjected to extraction with distilled water and petroleum ether. After extraction, the solvent was distilled off and the extracts were concentrated on water bath to a dry residue and kept in a desiccator. The percentage of yield values obtained was 3.46 and 2.21 for aqueous and pet ether respectively. All other chemicals and reagents were procured from authorized suppliers and were of analytical grade.

Liver extract: - The freshly collected goat liver was purchased from the local market and washed with phosphate buffer p^H 7.4. After washing, the liver was homogenized in phosphate buffer p^H 7.4 to get a 10 % liver homogenate.

Antlipid peroxidation activity

Aqueous and petroleum ether extracts of the stem of *C. quadrangularis* were used in various concentrations. 1 ml of fresh liver homogenate was mixed with 1 ml phosphate buffer. Then 1 ml of different concentrations of aqueous extract was added to liver homogenate (100 µg/ml to 600 µg/ml in various test tubes). The *in-vitro* lipid peroxidation was initiated by addition of 1 ml of ferric chloride solution. After incubation for 4 hours, Trichloroacetic acid (TCA) was

added to all tubes containing liver extract in 1:1 ratio and centrifuged for 30 min. The supernatant liquid was collected and thiobarbituric acid (TBA) was added in1:1 ratio and heated for 1 hour in water bath, cooled; and the absorbance was measured at 530 nm. The experiment was carried out in triplets for each concentration. The same procedure was adopted for petroleum ether extract of the same plant material. The percentage of anti oxidant effect was calculated by assuming the lipid peroxidation produced in the presence of distilled water as 100%. The percentage of antioxidant activity was calculated by using the formula: $PP = 100 - \frac{ODTS}{ODC} \times 100$; where PP is percentage of protection, ODTS is Optical density of drug treated sample and ODC is Optical density of control.

Result

The analysis of data confirms that the anti lipid peroxidation property was concentration dependent and it shows a direct relationship with variable concentration (Table 1). The

TABLE 1
Antilipid peroxidation activity of the stem of *Cissus quadrangularis* (Linn)

CE in (mcg/ml)	Optical density at 530 nm + SEM		% Protection	
	A	PE	A	PE
Control	0.583±0.02	0.583±0.02	-	-
Vit C	0.198±0.01	0.198±0.01	66.04	66.04
100	0.434±0.02	0.520±0.03	25.56	10.81
200	0.364±0.03	0.489±0.01	37.51	16.13
300	0.355±0.04	0.463±0.02	39.11	20.59
400	0.324±0.02	0.423±0.01	44.43	27.45
500	0.290±0.01	0.418±0.04	50.36	28.31
600	0.248±0.03	0.398±0.02	57.47	31.74

CE - Concentration of Extracts; A - Aqueous; PE - Petroleum Ether; SEM - Standard Error Mean of 3 readings. Statistically significant at 5% level ($P < 0.05$).

aqueous and pet ether extract both has the maximum peroxidation inhibition potential at 600 mcg/ml concentration. From the experimental results it was concluded that the aqueous extract of *C. quadrangularis* has significant antioxidant property in comparison to pet ether extract of the same plant material.

Discussion

Oxidative stress has been implicated in the pathology of many disease and conditions including cardio vascular diseases, diabetes, inflammatory conditions, cancer, ageing, artherosclerosis, pulmonary dysfunction and Parkinson's disease. The overall free radicals have been implicated in then pathogenesis of at least 50 diseases. Antioxidants may offer resistance against oxidative stress by scavenging the free radicals, inhibiting the lipid peroxidation and other mechanisms. Involvement of anti lipid peroxidation activity is also possible in its other activities such as anti pigmenting and body slimming. The aqueous extract of *C. quadrangularis* was found to significantly inhibit lipid peroxidation induced non enzymatically in the goat liver homogenate which indicates the strong free radical scavenging and anti lipid peroxidation properties.

In conclusion the present study shows that the aqueous extract of *C. quadrangularis* has significant anti lipid peroxidative and free radical scavenging activity, which might be helpful in preventing or suppressing the progress of various oxidative stress related diseases.

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A SCIENCE INITIATIVE IN ĀYURVEDA (ASIIA)*

M.S. Valiathan**

In the early part of the 20th Century when the British had established dominance in Bengal and Calcutta was our capital, the first event of the East West encounter took place in Calcutta. It affected all aspects of our intellectual life including the science, art and what not.

The encounter in science produced very great figures like ācārya J.C. Bose, ācārya P.C. Ray, Mehandlal Sarkar etc. They laid the foundation for modern science in India. P.C. Ray was a remarkable personality among all these giants. He was a very distinguished chemist, far ahead of his time. I do not go into the details of his work in chemistry but he is remembered for the great classic that he wrote, '*The history of Indian Chemistry'*. He also established The Bengal Immunity and Chemicals. Ācārya Ray opined that unless science is applied for the benefit of the society it is not serving any purpose. This was more than a hundred years ago. In that great work he calls the period from BC 600 to AD 800 the *Ayurvedic Period*. That is something of great interest to us. If you read that book it becomes clear, why he described the span of time of more than a thousand years as the Āyurvedic Period. Āyurveda was not only the medical tradition of India, but it was also the cradle of Chemistry. Rasatantra was the nursery for chemistry, and he was an expert in Chemistry. It was the nursery for plant science and he doesn't say explicitly that it was also the nursery for animal sciences. So you are quite justified while regarding āyurveda as the mother of life science in the true sense. But, if you look at the picture today more than 100 years later, the researches in āyurveda; there are three types of research in āyurveda. The first is on herbal drugs. Now, almost 99.9 % of research in āyurveda today is on herbal drugs and in fact, they are considered synonyms - identification of taxonomy of plants, conservation of plants, preparation of herbal drugs, standardization of herbal drugs, looking for molecular drugs from herbal preparations and so on. A number of agencies, and multinational Companies, all are chasing the herbal drugs. That is what is known as research in āyurveda today. If you read any journal, you will find that most of the papers relate to the testing of some herbal drugs.

Secondly, it relates to the trial of drugs and procedures for the safety and efficacy and this forms a part of a separate area. You are trying it on human beings. The WHO in 2000 had a conference in Hong Kong. It had a large section dealing with the traditional system of medicines of India, China and South America etc. India

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also was a participant in that meeting. They have come out with detailed guidelines for evaluation of traditional drugs. These standards are different from those of modern medicines. In many ways, the standards of evidence are different. All these are recognized. I would say that they are greatly liberalized. But, in spite of that, looking from India, how many papers are we publishing? We have more than 200 Āyurveda Colleges and hospitals. Considering the number of papers we publish and their standards conforming to the prescribed norms, on the trial, safety and efficacy, they are very few. Compared to herbal drugs, this area has received very little attention.

Thirdly, there is the application of basic science. There, we have done almost nothing. By basic science, I mean Biology and Chemistry particularly. There may be many reasons for that. One of them could be that when the modern science was coming to India the British authorities deliberately tried to suppress āyurveda. They did not even regard it as a science. There was an iron curtain separating āyurveda from the sciences such as Chemistry, Mathematics, and Physics. There was no forum, where the modern scientists could interact with the āyurvedic physicians. This iron curtain was there from the very beginning, barring communications. They could not talk to each other. This was a great problem.

The second problem was that the modern science itself had no tools to study āyurveda, especially, its Biology. It was only during the last 20 to 25 years, especially after the Gene structure was known, that Biology has grown. Today it has got very powerful tools to study. That was not the case quarter of a century ago.

Thirdly, the great concepts in āyurveda such as the pañcabhūta or ṛtucarya or tridoṣa; which are fundamentals to āyurveda. But to convert these ideas into questions that can be tested in the laboratory, is an exceedingly difficult job. You have a concept of rasāyana. Rasāyana as you know, and as Vāgbhaṭa says, is *satyavādi-namakrodham*, saying truthfulness, freedom from anger, tranquility, and doing good to others, are the real rasāyana. This is a great concept. How do you think one can convert it into a question that can be tested in the laboratory? It is very difficult to have āyurvedic concepts and procedures framed as experimental questions. Without experimental questions, science cannot be studied. This is a major difficulty.

Even if the question is identified, where do you find the investigators? Modern scientists are very few, with competence in most of the modern technologies and the willingness to spend time on studying these questions which are not frontline questions for them. Every scientist is interested on working with cutting edge research, as they say, publishing them in popular journals. What the scientists want is Global recognition. He wants global prize. How do you attract such people to these questions? Similarly, āyurvedic physicians, distinguished scholars, they are not interested in Science. How do you get them interested into this kind of joint investigations? It is difficult to find such couples - scientists and ayurvedic experts. Institutions also are not available. To do these, you need resources and scientific institutions. You need āyurvedic institutions with enough expertise and resources. How do you get them together? It is our experience that this area has not made much progress. With a result, a few years ago there was a Walton committee, in Britain. Some of you will remember that this committee

classified āyurveda as herbal therapy. We took it as a national insult. How can you call āyurveda a herbal therapy? And there was protest also. But it came about. The point was not that it was anti-Indian. The members of the committee were not racists. Today, if they want to know about pañcakarma or any other aspect of āyurveda they look at the Internet. But when they look at it, there is nothing published - only data journals. Therefore they say that this is a traditional practice being done in India. Therefore they classified it thus. So this is because the science part is neglected in our country. This is the reason behind their classification of āyurveda as herbal therapy.

Two or three years ago it was possible to get a small beginning made. 'A science initiative in Āyurveda'. I wish to say a few words about this as there are many friends and practitioners of āyurveda here. They should be made aware of the new initiative that is taking place in India. The science initiative in India could find support from the Principal Scientific Advisor (PSA) to the Govt. of India Office. We have many agencies, ICMR, AYUSH, CSIR, DBT, DST. All these agencies support āyurveda. There is tremendous goodwill and pride in āyurveda today. But what happens in these government departments? Over a few years they all become very much compartmentalised.

They have certain thrust areas and they can do funding only in that area. Anything outside that, they can't do. This is a web we create around ourselves in India. We make rules and we are bound by those. We cannot break them. With the result something when we say, if we want to apply basic science to āyurveda, we will not look at herbal drugs. We will not look at safety and efficacy trials in patients. Those are other areas. Others are there to do that. You will only look at basic science applied to āyurveda. There is no way we can find support from these agencies. Fortunately, the PSA's office, they have some uncommitted funds. These kinds of orphan areas can be of great promise. His office was willing to support. That is how all this was started. We have five projects and we have made rules.

We will not get into herbal drugs. We will not get into safety and efficacy trials of drugs or procedures. Each project must have a science, Ayurveda Investigators and Joint investigators. And each project must have a monitoring committee who are external people. This monitoring committee consists of top scientists and top āyurvedic experts.

A few outlines of some of the projects

One is doṣaprakṛti. How fundamental this is? It is not to be said to this audience. The prakṛti is determined at the time of conception. It does not change throughout the life that determines the manifestation of the disease in that person. It also determines his response to the treatment. So, without knowing the doṣaprakṛti, one can neither diagnose the disease nor treat it. This has been well known. And these are determined on the basis of a series of physical traits, behavioural traits and mental traits. All these are described in the Bṛhattrayī in detail. But they are not identical. However, more or less, they are in agreement. Now Biology has the tools to see. They have the Genomic basis. In other words, they have geno types, characteristics of vāta, characteristics of pitta, characteristics of kapha. Today we have the means, the technology to know the geno types; we have the technology to look for gene expression. We have the means to check what are the epigenetic factors. We

have the DNA in us. But the DNA gets modified by the environmental influence. It is something like saptasvara. All the ragas are based on saptsasvara. But when an ālāpana is going on, the singer is not simply repeating those svaras, he creates so many things; but all based on that. He will not deviate from that. Similar are the epigenetic factors. That is what makes us what we are. The genes are there. How are epigenetic alterations taking place? We can test that today.

There are 300 subjects taken. The selection itself is rigorous. A traditional āyurvedic physician, who is having ten years of experience and regular practice, determines intuitively after a 45 minutes interview, that this is vāta, this is pitta and this is kapha. Now that subject goes to another young āyurvedic physician who is an MD in Āyurveda and who has had a training in the use of what is called Ayursoft. Ayursoft is interesting. Ayursoft is an āyurvedic programme developed in Pune by āyurvedic physicians of C-DAC, University of Pune and CSIR over 5 years. What they have done basically is that all these traits, physical, mental behaviours, etc have been given weightage.

Āyurvedic texts do not give any weightage. But if you talk to a senior āyurvedic physician he will tell you all that. They are not of the same importance. Some are more important than the others. Now you have to talk to them. These 5 years interaction they have, given weightage to these traits. They have given importance to these traits. So, based on that they have developed this Ayursoft programme. Every time a person is interviewed, the code is added. The data is fed into the computer and using the Ayursoft they determine that this is vāta, this is pitta and this is kapha. So what one intuitively determines is seen by the āyurvedic physician who is trained in the use of Ayursoft. He also determines. The young physician does not know what the determination made by the senior physician was. It is blinded. The agreement is only around 35 to 40%. We only take that. This is as rigorous as we can make it. This SDM College is a very well known one. Two professors are involved in that. 300 subjects from there. Another 300 from Dr. Gangadharan, FRLHT, Bangalore. His hospital they would select 300. And Vaidya Nana in Pune, they select another 300. So, subjects are selected, blood samples are taken and the molecular studies I mentioned and all the epigenetic studies are done in my institution, Manipal Life Science Centre. All the Gene expressions are done in Indian Institute of Science, Banglore and what are called SNPs, alterations taking place in the DNA, they are studied by CCMB (Centre for Cellular Molecular Biology) in Hyderabad. All these are the top institutes of India and are done by highly competent scientists. These studies have been done for two years. So we cannot come to any conclusion. But the significance of this is that if this comes about then there are more molecular markets which are finger prints of vāta, pitta and kapha that would be to my mind the very first biological evidence of this very ancient concept of doṣas.

I remember, in an āyurvedic conference some time ago, I heard a physician saying that these doṣaprakṛtis are only concepts. But this is not what Caraka says. Caraka is explicit. He says that vāta, pitta, kapha are dravyas. They are substances. To say that there must be some biological evidence. But with today's technology we may be able to find it. This is one project that we are doing.

Another project is plants. As you know, in āyurveda, the anti-vāta, pittaśamsana, kaphaśamsana - there are plants, groups of plants. There are overlaps. But broadly this classification is given in the Bṛhattrayī. If you look at those plants taxonomically, they are indistinguishable. Morphologically also you cannot say that is anti-vāta, anti-pitta. You cannot say that there is a lot of mix-up. But therapeutically, they are common. Anti-vāta action. Morphologically different, taxonomically different. But therapeutically the effect is the same. Is there any basis for this? This study is done by Centre for Rheumatic and Medicinal Plants in Lucknow, which is a very famous CSIR institute and the plants are chosen. It is very difficult again for the plant genome is very unstable, unlike the human genome.

And secondly, we do not know how significant this genomics are in plants. In āyurveda, the root may be effective but the leaf may not be effective; may be the fruit but not the bark. The genome is the same. It is not really how much the gene structure that matters, it is the gene expression. This gene expression studies are much more important. That is another study taking place in Lucknow and Banaras under the spearhead of Dr. Shasani and his colleagues and Prof. Joshi. Now in that study, they are looking at secondary metabolites, their pathways and also the genomic study corresponding to that.

The third is pañcakarma which I am sure many of you know that very familiar, enormously popular perturbation of doṣas - you have to use the pañcakarma therapy. It is also used during change of seasons especially in North India where the whole body gets shaken up from winter to summer. This is used there also. But what happens when this is done. You have snehana, svedana and you have all these evacuative procedures. What happens in the body when you do this - metabolically and humanologically?

A systematic study is done in Podar Hospital, Bombay which is recognized by the ICMR as the center for pañcakarma. They do all the procedures by the original protocol given in one of the āyurvedic texts. In our programme we do not insist the text. It is the physician who decides. We only say that this must be done exactly like what is mentioned in the original text. You cannot make changes. We must stick to the text. Otherwise, internationally it is not accepted. When you publish something from Caraka, Sūtrasthāna is the verse; it has to be like that. You cannot change it which I think will be acceptable to the traditional physicians.

Many people go to Podar Hospital for pañcakarma. Five different conditions are selected: i) Asthma, ii) Osteo-arthritis, iii) Psoriasis - these are non-metabolic; iv) Diabetes and v) Dislepedemia. There are the five conditions taken and also controls. People who do not have any disease are also considered. Thirty of each class; these subjects when they came their metabolic profile are measured. It is being done in the Nair Hospital Medical College. There are 21 metabolic parameters. There are metabolisms of carbohydrates, proteins, metabolism of fat, organ functions, enzyme levels etc. They are some 21 parameters measured before they start from the day zero, half way through and 90 days later. So they have three types of measurements. The humanolgoical studies are equally important. If a patient feels improvement after the treatment for arthritis, it is quite possible that there are significant humanological changes and these studies are highly complicated. They

are done in the Tata Hospital. This is a big center where one of the humanologist is doing this.

Next is rasāyana. In science, reductionism is a must. We are not attacking the whole question. We are only taking a small part, which we can study. A small part of it is taken for study and this limitation has to be accepted. So in rasāyana, āmalakīrasāyana it is made in Kottakkal as per the original protocol and tried on human subjects in Udupi. SDM College is involved. The subject's blood sample is taken and the marker we are looking for is the DNA chain break. The DNA which is our basic structure - DNA breaks all the time in all of us. For all the breaks, they heal themselves. If we cut, we have an abrasion on our skin and even if we do nothing, it will heal. If you cut the muscle, it will heal. This is the beneficence of nature. That is how we survive. Otherwise, we will all bleed to death. So the healing takes place in the DNA also. The rate of repair of the DNA changes. If we take a newborn, the rate of repair is faster. Whereas we take an old man, the rate of repair is slower. The speed of the chain break in the DNA is studied in subjects grouped for the study.

One group taking the rasāyana. Another group not taking rasāyana. Is there difference in the speed of the DNA? This study is being done in Manipal.

The same āmalakīrasāyana is given to rats. That is in Hyderabad. The repair in chain break is studied. The pioneer is a very well known scientist Prof. K. Subba Rao who is a professor in the Jawaharlal Nehru Technology University. He is doing the study on rats. The life of rats is only 2 to 2 ½ years. He gives this to them, looks at the DNA taken from the brain and the liver and he has already found that in six months the results are much faster than in the human beings. Already there is some indication that this chain break repair is indeed speeded up in rats.

The same rasāyana is also tried in fruit flies Grosofilla by Dr. Hakotra, Banaras. So there are three models. Life is really one. The same āmalakīrasāyana is tried. The DNA in worms is almost very similar to our DNA. There is very little difference. We are all one in the sense that if there are 30,000 genes, we may find that we are sharing 22,000 with the worms. So life is really one. If a particular test is done and valid in human beings, then we can say we have every reason to prove/think that it is the same in other species also. This study is going on in Benaras.

The last of this project is on Asthma. This as you all know is a riddle. Fifty years back, when I was a student in Medical College, Trivandrum, we did not have oral diuretics. So, the only way to treat the patients with congestive heart failure and fluid retention in the body was mercurial diuretics - mercurial diuretics was used to drain the fluid,. They were injections. We had to admit those patients. They were dangerous drugs; a good percentage of them would develop kidney complications, sometimes, renal shut-down. So we were literally terrified while giving these mercurial drugs. So in modern medicine, any heavy metal preparation is banned. They will not consider it.

We are looking at the micro structure and not the chemistry. There are not many labs in India where we can do this detailed characterization. IIT, Kharagpur has a very famous lab which does material science studies and Prof. Roy has come here to Kottakkal to interact with Dr. Murali and others. Now the Rasasindūram preparation from here was taken to IIT Kharagpur for a detailed

characterization. If you synthesize this mercury sulphide, the base components are mercury and sulphide. They have taken mercury and sulpher synthesized according to modern chemistry. They have Rasasindūram made from here. They have also khajali state.

The modern preparation is only mercury and sulpher. The ancient, rasasindūram also is only mercury and sulpher - nothing else. Now, when we look at the crystalline phase, there is one physical phase in which a material exists, the synthesized mercury sulphide has only one phase whereas the rasasindūram has two phases. That is a very significant result. And most importantly when you look at the particle sites, unlike the modern mercury sulphide, the Rasasindūram almost 80% of the particles are less than 700 mm power. That means there is what is called a nano transformation taking place. So it is a nano structure. The structure is entirely different from that of substances. It is well known that the properties of substances have nothing in common; e.g. nano carbon and characoal. This is a thorough study where they have found evidence that these particles interact with biological molecules like albumin which the khajali what is the micro structures, final stage what is the micro structure, whereas the synthesized mercury sulphide does not. This is another approach to the study for bhasmas. So there are just five examples as to how basic science is applied to āyurvedic concepts, āyurvedic practices and also to āyurvedic products like bhasma and what is the expected outcome of all this?

All these studies, whether pañcakarma or rasāyayana, new leads come out of all these. That is how science grows. If you study one question, 10 questions come out of that. So if these happens in 10 institutions, a number of new questions will arise and they attempt to study these questions, I believe this will open up a new field of science which I would like to call Ayurvedic Biology. That is the most important outcome.

Second it leads to a series of collaborations. Now there are IIT Professors coming here and discussing with the physicians in Kottakkal Arya Vaidya Sala. They have the ability to communicate with reach other. This did not exist earlier. This is happening at the National level. So we have many many collaborative groups all over India. This whole culture of applying science to āyurveda will grow.

Thirdly the publication of these in the top class journals of the world. A little while ago, I was telling Dr. Ekbal, about the paper. Many of us used to make fun of acupuncture 30 years ago. What is this? It did not make any sense. How can you do acupuncture for a problem in the brain by applying a needle into to the toe? It did not make any sense in modern science. But three years ago there was a paper published on acupuncture in the PNAS (Proceedings of National Academy of Science) of the United States, one of the most highly prestigious journals. Now such 2 or 3 papers change the international outlook of the people on the whole Chinese medicine for example.

Similarly, Science Initiative in āyurveda we hope for outcomes, which would be publication of a few papers in these top journals so that the international outlook on āyurveda changes. They will look at āyurveda differently. This is what we are hoping for.

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Clinical observation

POLYCYSTIC OVARIAN DISEASE - CLINICAL EXPERIENCES

Praveen M. Varier*

Brief background

Polycystic ovarian syndrome (PCOS) or disease (PCOD) was earlier known as Stein-Leventhal syndrome. 1% of female population suffers from PCOS, and the patients are mostly 15 to 25 years of age. The fault often lies with the ovary itself, but may be also related to hypothalamic-pituitary-ovarian axis and adrenal gland. (Shaw's Text Book of Gynaecology)

Microscopically, the ovaries are often bilaterally enlarged, with thick capsule. The surface may be lobulated but the peritoneal surface is free of adhesions. Multiple cysts 0.5 to 1 mm and at times up to 20 mm in size are localized along the surface of the ovary giving a "necklace" appearance on ultrasound. The symptoms of PCOD include oilgomenorrhoea and often amenorrhoea. Obesity and hirsutism are the additional features. Infertility occurs in 30%. (Shaw's Text Book of Gynaecology)

Treatment in modern medicine

Weight loss of more than 5% of previous weight is important. Oestrogen suppresses androgen and adrenal production. It is given with progestogen with no androgenic properties, cyclically as in oral contraceptives. Dexamethasone 0.5mg or prednisone 5mg at bedtime also reduces androgen production. Hirsutism is treated with cyproterone acetate or spironolactone. Infertility is treated with clomiphene: 80% ovulate and 40 % conceive. Surgery is reserved for those in whom medical therapy fails and hyperstimulation occurs. Surgery comprises laparoscopic multiple punctures of the cysts with electrocautery or laser.

Case 1

A 40 year old lady, having a child, came to the clinic in February 2004, with the complaints of irregular, scanty menstruation and obesity for last 2 years. She was weighing 85 kg at the time of first consultation. She was diagnosed to be having PCOD. She was not on any allopathic medication.

USG abdomen (03.02.2004):- *Both ovaries are enlarged and show multiple, small, peripheral cysts - PCOD.*

The medicines were prescribed as follows:

1. *Mahatiktam kashayam* 15 ml each at 6 am and 6 pm, in empty stomach
2. *Kaisoraguggulu* 1 each after breakfast and dinner
3. *Gandharvahastadi erandatailam* 10 ml at bed time

*Arya Vaidya Sala, Kottakkal

She was advised to continue the medication for 12 months. Her weight was reduced by 10 kg by one year. The menstrual problems were corrected. Her periods became regular with normal blood flow.

USG abdomen (28.03.2005):- *Both ovaries are of normal size and echotexture - NORMAL STUDY.*

The medicines were stopped after one year.

Case 2

An 18 year old nullipara came to the clinic in March 2005, with complaints of irregular menstruation, hirsutism, blackish discoloration of skin in the back of neck (Acanthosis nigricans) and obesity (90 kg). She was diagnosed to be having PCOD.

USG abdomen (03.02.2005):- *Both ovaries show multiple small rounded anechoic areas - PCOD*

The medicines were prescribed as follows:

1. *Mahatiktam kashayam* 15 ml each at 6 am and 6 pm, in empty stomach
2. *Kaisoraguggulu* 1 each after breakfast and dinner
3. *Gandharvahastadi erandatailam* 10 ml at bed time

She took the medicines for 6 months. She had an episode of heavy bleeding in between, which was controlled with *Chandanosiradi kashayam*, *Annabhedisinduram* and *Pravalabhasmam*.

USG abdomen (26.09.2005):- *Both ovaries show normal echo pattern - essentially a NORMAL STUDY.*

The menstruation became regular. She had reduced 15 kg of weight. The dark discoloration of skin improved. However hirsutism remained same. The medicines were stopped after 9 months.

Case 3

A 15 year old girl came to the clinic in November 2007 with the complaints of scanty bleeding, hirsutism and Acanthosis nigricans. She was diagnosed to be having PCOD.

USG abdomen (28.08.2007):- *Bulky ovaries with multiple sonolucent small cysts 14-16 in number and 1-2 mm in size seen in periphery making pearl string appearances - PCOD.*

The medicines were prescribed as follows:

1. *Mahatiktam kashayam* - 15 ml each at 6 am and 6 pm, in empty stomach
2. *Kaisoraguggulu* - 1 each after breakfast and dinner
3. *Gandharvahastadi erandatailam* 10 ml at bed time

Medicines were continued for 9 months. The periods became regular with normal flow. The dark discoloration of the skin reduced. The hirsutism remained unchanged.

USG abdomen (25.08.2008):- *Both ovaries are normal in size, shape and echo pattern - NORMAL SCAN,*

Discussion

More and more PCOD cases are reported now a days. The above treatment helps in controlling the symptoms of the disease. The following concepts support to modulate the therapeutic approach:

- Vāta plays an important role in the pathogenesis of gynecological diseases.
- Rajas is related to the functions of pitta
- In view of the above two concepts, combined administration of *Mahatiktam kashayam* and *Gandharvahastadi erandatailam* in a specific manner appears to be justifiable. *Mahatiktam kashayam* is effective in normalizing *pittam*. *Erandatailam* (castor oil) restores the *anulomana guna* of vāta.

It may also be mentioned that āyurvedic treatment is cost effective in the treatment of PCOD.

Acknowledgement
The author is thankful to Dr. T.M.U. Varier, Arya Vaidya Sala, Kottakkal for his support and guidance and to late Dr. N.V.K. Varier for his theoretical contribution in the subject.

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PHARMACOGNOSTICAL EVALUATION OF *CALOTROPIS PROCERA* ROOT AND THE ANTIFUNGAL ACTIVITIES OF LEAVES

G.V. Karunakar, Anita Sharma and Vinod Kumar Gothecha*

Abstract: *Calotropis procera,* belongs to the family Asclepiadaceae, is a large hardy much-branched milky shrub found throughout India in dry waste places. Phytochemical and physico chemical analysis of the root were carried out. Also, the anti-fungal activity of different crude extracts of leaves was evaluated against two human pathogenic fungi viz. *Candida albicans* and *Aspergillus niger*. The extracts of *Calotropis procera* showed high anti fungal activity along with multi purpose medicinal activity.

Introduction

Arka is one of the herbs mentioned in all ancient texts of āyurveda. Dhanvantarīnighaṇṭu and Madanpala nighaṇṭu have mentioned only two verities of arka viz. arka and alarka (rajarka). Bhāvaprakāśa, while describing two kinds of arka says that there is another variety called raktarka and describes its properties separately. The author of Rājanighaṇṭu also enumerates three kinds of arka viz. arka, svetarka and rajarka and describes all of them seperately. However, only two varieties of arka are commonly met with, one with white flowers (*Calotropis procera*) and the other with rosy or purple tinted flowers (*Calotropis gigantia*). In āyurvedic texts the white-flowered variety (Fig. I) called alarka are said to be of superior quality, though all the commentators are of the opinion that either of these can be used with equal effect, as both have the same properties. Caraka has categorised arka as bhedanīya (accumulated mala breaking), svedopaga (an adjunct to sweating therapy) and vamanopoga (an adjunct to emesis)[1]. It is cited to be useful for external application in ascites[2].

Materials and methods

Root

The dried root, free from its outer cork layer, is called mudar. The plant materials, collected from Kanchipuram University, Tamilnadu, India were taxonomically identified by plant Anatomy Research Centre, Chennai, Tamilnadu, India. Care was taken to select healthy plants and the required samples of roots were cut and removed from the plant and fixed in FAA (Farmolin - 5 ml + Aceticacid - 5 ml + 70%, Ethyl alcohol - 90 ml.). After 24 hours of fixing, the specimens were dehydrated with graded series of Tertiary - Butyl alcohol. Infiltration of the specimens was carried by gradual addition of paraffin until TBA solution attained super saturation.

Pharmacognostical studies:- The morphological

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characters of the root were identified based on the shape, size, colour, surface, fracture and appearance of cut surface. In microscopical evaluation the paraffin embedded specimens were screened with the help of Rotary microtome and the thickness of the sections made properly. Dewaxing of sections was done by customary procedure and the section were stained with Toluidine blue method. Powdered material of root was cleared with sodium hydroxide and mounted in glycerin medium after staining with pholoroglucinal and Hcl.

Photomicrographs: - Photographs of different magnifications were taken with microscopic unit; for normal observations bright field was used for the study of crystals, starch grains and cells, polarized light was employed (Fig II)

Phytochemical studies: - The roots were dried under shade powdered with grinder. The sieved powder was stored in air tight container and kept in room temperature for further study. The dried, and powdered material was extracted with petroleum ether, chloroform, ethyl acetate, ethanol and water (cold maceration) successively in a soxhlet apparatus. The solvents were completely removed under reduced pressure by using vacuum evaporator. All extracts were subjected to phytochemical tests in order to identify the nature of chemical constituents present in the plant material.

Fig. I. *Calotropis procera*

Physico chemical analysis:- The dried and powdered material was subjected to physio-chemical analysis like moisture content. Total ash, water soluble ash, acid insoluble ash, alcohol soluble extractive and water soluble extractive to determine the quality and purity of the plant material.

Leaves

The leaves collected from the campus of Kanchipuram University were cleaned and shade dried at room temperature for 10-15 days. The samples were authenticated in the department of Botany, Kanchipuram University. The dried plant materials were powdered using mixer and stored in labelled air tight containers.

Extraction:- Dried and coarsely powdered plant materials (25 gm of each sample) were individually extracted in muslin bags with various solvents such as petroleum, petroleum ether, chloroform, methanol, water by using continuous hot extraction with soxhlet extractor for 18 hours. The crude extracts obtained were filtered through Whatman filter paper No. 1 and the filtrates were evaporated at low temperature and under reduced pressure to give a gummy solid residue. The dried extracts were stored in labelled sterile screw capped bottles in refrigerator. The extracts were weighed,

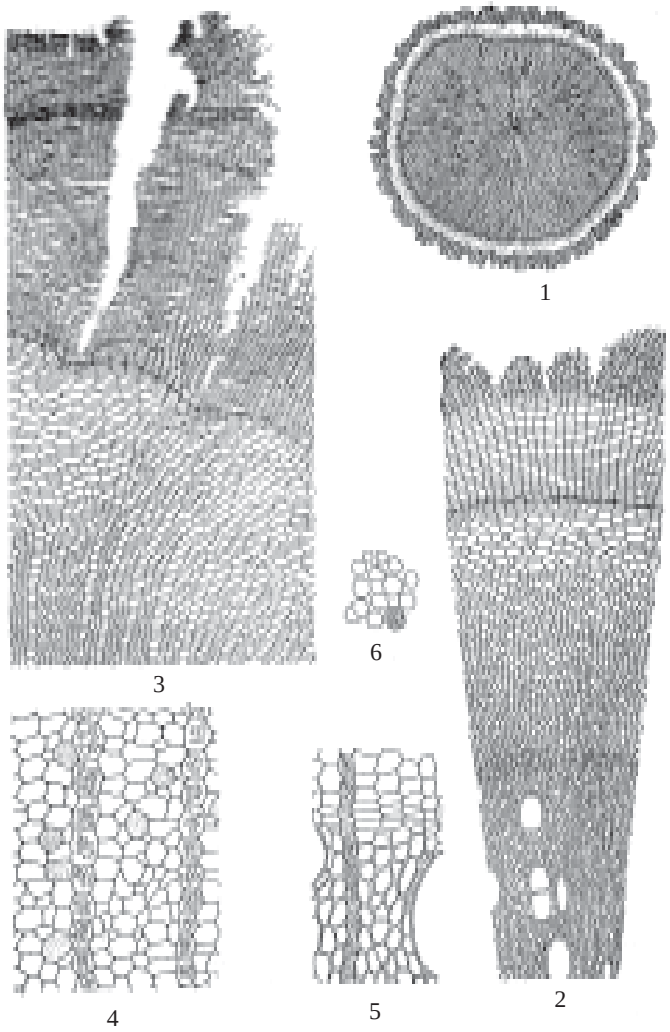

Fig. II. Histology of *Calotropis procera* - root

1 Transverse section (Diagrammatic); 2 A sector of the TS enlarged; 3 Cork, cortex and adjacent tissues; 4 A portion of bark region; 5 A portion of newly formed wood and phloem; 6 Starch grains

dissolved in dimethyl sulfoxide (DMSO) in sterile test tubes to obtain concentration of 100 mg/ml and subjected to antifungal screening.

Anti-fungal activity: - The isolated fungal cultures used in the screening such as C*andida albicans* and *Aspergillus niger*, these cultures were studied using morphological and staining techniques. The media used for antimicrobial testing was sabouraud agar Inocula; the test organisms were prepared by inoculating a loopful of organism from 24 hours old cultures into sterile saline. The turbidity was matched with 0.5 MC farland standard. One ml of this suspension was diluted aseptically to 10 ml with sterile saline to give culture density properly.

The plant extracts were tested for antifungal activity by the cup plote (well plote diffusion) method. 0.1 ml of bacterial suspension was thoroughly mixed with 25 ml of sterile molten sabouroud agar, poured in presterilized petriplotes and set aside. After congealing the seeded agar with punched out with sterile cork borer in order to make 3 cups (10 mm diameter) at a spaced out position in the petriplate, all the three cups were filled with 0.1 ml (100 ml) of the extract (100 mg/ml) with micropipette. Culture control and DMSO (Dimethyl sulphoxide) as solvent control were also maintained. These agar plates were set aside in room temperature for one hour for diffusion and then incubated at 25°C for 48 hours. After incubation the zone of inhibition was measured in mm diameter and the mean value of triplicate was recorded. Miconazole (1000 mg/ml) was the standard antifungal agent used.

Observations and results

The anti-fungal activity of extracts of *C. procera* is shown in Table 1. Chloroform extract, showed low activity against *Candida albicans*. Water and chloroform extracts were not found to be active against *Aspergillus niger*. Methanol and petroleum ether extract showed low activity against *Aspergillus niger*.

Discussion

Phytochemical screening:- Preliminary phyto-chemical screening of the extracts of root and leaves showed presence of a yellow bitter resin, a black acid resin, madar album a crystalline colourless substance - madarfluavil, on amber coloured viscid substance cautchouc and a peculiar principle with gelatinizes one being heated called mudarine.

Lewin is found as neutral principle. Calatropin is a very active poison of the digitalis type. Mudar root-bark is widely used in the treatment for elephantiasis and leprosy and is effective in cases of chronic eczema, as well as for diarrhoea and dysentery.

TABLE 1
Anti fungal activity of extracts of calotropis procera
[Zone of inhibition (mm)]

Sample name	*Candida albicans*			*Aspergillus niger*		
	ME	CE	PE	ME	CE	PE
D-Calotropis procera	-	6.3 + 0.47	-	6.0 + 0.81	-	7.3 + 0.47
DMSO-Dimethyl Sulphoxide	-	-	-	-	-	-
Miconazole	34 +1.63		-	-	24 +1.63	-

ME - Methanol extract; CE - Chloroform extract; PE - Petrolium ether extract

Pharmacological action and toxicity: - i) Calotrapis resembles ipecacuanha in its action; small doses are diaphoretic and expectorant and large doses cause vomiting and diarrhoea, ii) the isolated compounds showed considerable cytotoxic activity, iii) the aqueous extracts exhibited significant changes in the electro-cardiogram pattern of adult anesthetized dogs and induced arrhythmic manifestation in doses of 2, 4 and 8 m/kg body weight, iv) the alcoholic extracts stimulates rabbits intestines, the rectus abdominus muscles of frogs and contracts the uterus of virgin female rats.

Conclusion

The study *of Calotropis procera* roots and leaves showed its anti-fungal activity. The indegenous knowledge about its multipurpose usefulness is briefed hereunder:

- A decoction is used in veterinary medicine as anti leprosy
- Powdered dried leaves are vemifuge in small doses
- Dried leaves smoked for asthma
- Fresh leaves are used in the form of cataplasm for sun stroke
- Leaf extracts are cardio tonic

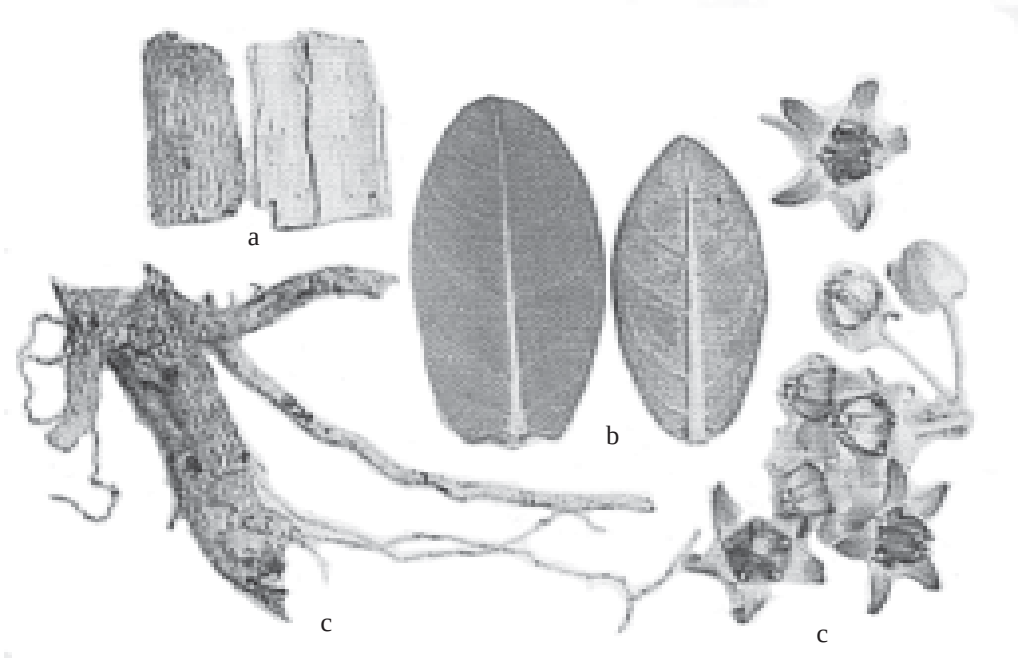

Fig. III. *Calotropis procera*
a A portion of bark; **b** leaves; **c** A portion of root; **d** flowers

- Roots are emetic, expectorant
- Root bark is used for dysentery
- Latex causes serious inflammations and may lead to blindness
- It is used as drastic purgative, emmenagogue for different poisons and skin diseases
- It was used by Ancient Indians as arrow poison due to its slow effect on the heart similar to digitalis
- Poultices made from the leaves were applied to joints to heal rheumatism
- Arkapatrasvarasam (juice of leaves) is used as ground material to prepare so many external application for 'darvikara' snake poison. It is used to prepare lepana along with laśuna, marica, ārdraka and pippali
- In 'mandali' snake bite, it is useful orally along with equal quantity of lodhra, dāruharidra, arka, mañjiṣṭha and root of pāṭala

Acknowledgement

The authors are thankful to the Departments of Dravyaguna and Agada tantra, Kanchipuram University, Tamilnadu, India for providing facility for Pharmacognosy experiments and Toxicological studies on animals.

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IMPORTANCE OF EVIDENCE-BASED ĀYURVEDIC TREATMENT - A CLINICAL TRIAL ON PSORIASIS

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Abstract: Well established randomized clinical trials involving large number of patients are the tool for evaluation of theories or efficacy of herbal medicines. According to the theories and concepts of traditional medicine, prevention, diagnosis, improvement and treatment of illness are often based on the specific needs of the individual patient. So even a single case study itself is significant. In this context, an observational clinical study was conducted on 20 patients of psoriasis. It is amazing that our traditional medical knowledge could impart better outcomes in the management of psoriasis with scientific back ground.

Introduction

According to the 'General Guidelines for Methodologies on Research and Evaluation of Traditional Medicine' published by WHO, there are various scopes for unconventional medical fields, for research. Well established randomized clinical trials involving large number of patients may be a very valuable tool for the evaluation of theories or efficacy of herbal medicines. According to the theories and concepts of traditional medicine, (as mentioned in Part-1, Section 1.3 of the guideline) the prevention, diagnosis, improvement and treatment of illness are often based on the specific needs of the individual patient. So even a single case study itself is significant.

In this respect, an attempt was made to practice evidence-based medicine with a trial disease, psoriasis. Psoriasis is an ancient and universal inflammatory disease of the skin, initially described at the beginning of medicine by Hippocrates (460–377 BC). He used the term *psora*, meaning 'to itch'. The cause of psoriasis is still unknown, but experts agree that the skin lesions are the result of inflammation in the dermis and hyper proliferation with abnormal differentiation of the epidermis. Psoriasis is a chronic (ongoing and persistent) skin disorder. Treatment can often control the disease for long periods. However, none of the available treatments is a cure. The disease can come back when treatment stops. Research continues to find more effective treatments and, eventually, a cure for psoriasis. Considering this problem, present medical world is ready to incorporate any valuable knowledge, which could be helpful for a better management of these lesions. In this scenario, it is amazing that our traditional medical knowledge of āyurveda could impart a better outcome in the management of psoriasis with scientific background.

Materials and methods

20 patients of psoriasis, who attended the O.P and I.P of Ayurveda Hospital during the period

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April 2006 to September, were selected irrespective of sex and creed.

Research design: - An observational clinical study within the group comparing the pre and post test design.

Objective: - To assess the combined therapeutic effect of snehapāna, virecanakarma, takradhāra and external application of Dantappālataila.

Diagnostic criteria: - Patchy circumscribed skin lesions with erythematic infiltration and scales as well as positive Auspitz and Candle grease sign, with a history less than 2 years.

Inclusion criteria: - Patients between the age group of 20 to 60 years, suffering from psoriasis.

Exclusion criteria: - Patients suffering from psoriatic arthritis, and from any other systemic diseases along with psoriasis - like diabetes mellitus, hypertension, ischemic heart disease, etc.

Treatment

The patients were treated with sequential administration of rūkṣaṇa, snehapāna, virecana, takradhāra and external application of Dantappālatailam.

The patients were subjected to takrapāna for rūkṣaṇa (as a preparatory procedure before snehapāna). From the third day onwards snehapāna was given with tiktakaghṛtam. It was started with a minimum of 50 ml on the initial day and increased by 50 ml/day. Snehapāna was continued for four to seven days till the patients develope desired effect of snehana. The specific dietary regimen of snehapāna was also observed during this course. Following snehapāna, abhyaṅga and bāṣpasveda were done for the next three days. Guggulumaricādi taila was used for abhyaṅga. Then the patients were subjected to virecana, induced by oral administration of Avipatti cūrṇa - 30 g with honey. Agnisandīpana was carried out for the next four days. After the samsarjana, takradhāra was done for 14 days. During this period, Dantappālataila was used for external application.

Assessment criteria

The PASI (Psoriasis Area Severity Index) scoring system was used to assess the patients before and after the treatment.

Skin sections: - For the PASI, the body was divided into four sections. Each of these areas was scored by itself, and then the four scores were combined into the final PASI. The four areas were: i) the legs (which have 40% of a person's skin) ii) the body (trunk area: stomach, chest, back, etc.) at 30%; iii) the arms (20%); and iv.) the head (10%).

Area:- For each skin section, measured the amount of skin involved, as a percentage of the skin just in that part of the body and then assigned it a score from 0 to 6 as follows:

Coverage	Score
0%	0
< 10%	1
10-29%	2
30-49%	3
50-69%	4
70-89%	5
90-100%	6

So, if the head is 37% covered, the area score for the head - A_{head} - would be 3. Find the area score for the other three skin sections - A_{legs}, A_{body} and A_{arms}.

Severity: - The severity was measured by four different parameters: i) itching, ii) erythema (redness), iii) scaling and iv) thickness (psoriatic skin is thicker than normal skin). Again, each of these was measured separately for each skin section on a scale of 0 to 4 from none to 'maximum', according to the following chart:

Severity	Score
None	0
Some	1
Moderate	2
Severe	3
Maximum	4

So, if the head psoriasis itches moderately, that would mean that I_{head} would be 2. If it is only somewhat red, the E_{head} score would be 1. Also calculated the S_{head} (scaling on the head) and T_{head} (thickness of the head psoriasis) scores, as well as all four scores (I, E, S and T) for the other three skin sections.

Toting up the index: - After the above scores figured out for all the 20 cases, the PASI was calculated. For each skin section, added up the four severity scores, multiplied the total by the area score, and then multiplied that result by the percentage of skin in that section, as follows:

Head : $(I_{head}+E_{head}+S_{head}+T_{head}) \times A_{head} \times 0.1 = Total$

Arms : $(I_{arms}+E_{arms}+S_{arms}+T_{arms}) \times A_{arms} \times 0.2 = Total$

Body : $(I_{body}+E_{body}+S_{body}+T_{body}) \times A_{body} \times 0.3 = Total$

Legs : $(I_{legs}+E_{legs}+S_{legs}+T_{legs}) \times A_{legs} \times 0.4 = Total$

Finally, the PASI is $Total_{head} + Total_{arms} + Total_{body} + Total_{legs}$. This PASI will range from 0 to 96 (covered head-to-toe, with complete itching, redness, scaling, and thickness).

Assessment criteria of overall effect: - Total effect of the therapy was assessed considering the overall improvement in the PASI scores. Reduction >75% was considered as best improvement, between 75% and 50% was considered moderate improvement and reduction <50% considered minimal improvement.

Observation

Out of 20 patients, 62% were males. Most patients were (67%) between the ages of 25 and 45. 65% patients were depended allopathic as their first choice of treatment.

Effect of the treatment: - All the patients responded favourably to the treatment. Extent of body area affected reduced markedly after the treatment. The changes were statistically highly significant (Table 1). The overall effect of the treatment was as follows:

- Complete remission 30%
- Marked improvement 11%
- Moderate improvement 52%
- Minimal improvement 7%

Conclusion

The study justifying the scientific evidence-based āyurvedic treatment proved very effective in psoriasis. As the disease belongs to the category of immensely vitiated doṣas, sequential administration of the above treatments worked better. It also reveals that a rational approach is beneficial in remission of this chronic illness.

TABLE 1
Effect of the treatment on signs and symptoms of psoriasis

Assessment criteria	Mean score		Mean diff SD	Paired 't' test		
	BT	AT		SE	t	p
1. Itching	3.813 (0.834)	2.500 (1.095)	1.313 (1.302)	0.326	4.032	=0.001
2. Erythema	3.813 (0.750)	2.375 (0.957)	1.438 (1.263)	0.316	4.552	<0.001
3. Scaling	3.938 (0.929)	2.313 (1.078)	1.625 (1.088)	0.272	5.975	<0.001
4. Thickness	3.144	1.487	1.656	0.33	4.979	<0.001
5. PASI	30.664 (17.838)	10.558 (8.952)	20.006 (16.199)	4.050	4.940	<0.001

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MICROSCOPIC APPROACH IN STANDARDISATION OF AVIPATTIKARA CŪRṆA

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Abstract: Standardisation of herbal formulation is essential in order to assess the quality of drugs. Microscopy can be used for the qualitative analysis of āyurvedic formulation containing a limited number of herbal ingredients. The current paper reports on standardisation of Avipattikara cūrṇa, a poly herbal āyurvedic medicine used as remedy for acidity and complications associated with it like headache, nausea and vomiting based upon microscopic characters.

Introduction

Standardisation is an essential factor for polyherbal formulation in order to assess the quality of drugs based on the concentration of their active principle. It is very important to establish a system of standardisation for every plant medicine in the market, since the scope of variation in different batches of medicine is enormous. The increasing demand of the population and chronic shortage of authentic raw materials have made it incumbent; so there should be some sort of uniformity in the manufacture of āyurvedic medicines so as to ensure quality control and quality assurance[1]. The World Health Organisation (WHO) has appreciated the importance of medicinal plants for public health care and has evolved guidelines to support the member States in their efforts to formulate national policies on the traditional medicine and to study their potential usefulness including evaluation, safety and efficacy[1]. Avipattikara cūrṇa is a polyherbal āyurvedic medicine used as remedy for hyperacidity, indigestion, anorexia, urinary retention, constipation and piles[2]. The present paper reports on the microscopial standardization of Avapattikara cūrṇa based on the microscopic plant characters.

Materials and methods

Plant material

Avipattikara cūrṇa consists of fourteen ingredients viz., *Zingiber officinale*, *Piper nigrum*, *Piper longum*, *Terminalia chebula*, *Terminalia bellirica*, *Embelica officinalis*, *Cyperus rotundus*, salt (vida lavaṇa), *Embelia ribes*, *Elettaria cardamomum*, *Cinnamomum tamala*, *Syzgium aromaticum*, *Operculina terpethum*, and *Saccharum officinarum*[2]. All these ingredients were procured from the local market and authenticated by the department of botany, M.G.M College, Udupi, Karnataka. A voucher specimen of the same has been deposited in the museum of Department of Pharmacognosy,

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Manipal College of Pharmaceutical Sciences, Manipal, for future reference.

Preparation

Avipattikara cūrṇa was prepared as per the procedure given in āyurvedic text[2, 3]. All the ingredients were powdered separately, passed through 80 # sieve and then mixed together in specified proportions to get uniformly blended cūrṇa.

Microscopial mounts

A small quantity of cūrṇa (powder) was taken on the glass slide. The clearing reagent used was chloral hydrate (75 per cent)[4, 5]. The powder was heated with chloral hydrate over flame for a short while to remove chlorophyll and then stained with phloroglucinol (2 g phloroglucinol in 100 ml of 95 % alcohol), along with conc. Hydrochloric acid (1:1) to stain lignified tissue to pinkish red[5]. A drop of glycerine was added and the slide was then covered with cover slip. It was viewed under microscope (10 x 10 magnification) for studying microscopic characters. The powder characters found were matched with those mentioned in the standard texts.

Results

Among various other ingredients, the presence of seven ingredients viz. *Elettaria cardamomum, Piper longum, Cyperus rotundus, Terminalia bellirica, Terminalia chebula, Embelia ribes* and *Cinnamomum tamala* was confirmed based on the powder microscopial characters. The presence of *Piper longum* was indicated by the presence of fragments of thin walled cells and stone cells which are thick walled and almost round in shape (Fig. Ib & IIb)[6]. Epidermal hairs, calcium oxalate crystals (spherephides), parenchymatous cells with thickening and stone cell, which vary from elongated to nearly spherical form (Fig. Ic,e,g,h & IIa), indicated the presence of *Terminalia bellirica*[6]. The presence of *Elettaria cardamomum* was confirmed by the presence of several epidermal cells which were thick-walled, narrow and axially elongated (Fig. Id)[6]. Several long lignified fibres, polygonal epidermal cells and several horizontally elongated and round stone cells confirmed the presence of *Terminalia chebula* (Fig. If,h & IIa,f)[6]. The fragments of perisperm, which were of brown colour, and thick walled round shaped stone cells also indicated the presence of *Embelia ribes* which is one of the ingredient of Avipattikara cūrṇa[6]. The presence of glandular trichomes was a strong evidence for the presence of *Cinnamomum tamala*[6] (Fig. IIc) as it is the only ingredient among various other ingredients of Avipattikara cūrṇa to possess this character. The vessel elements with spiral thickening indicated the presence of *Cyperus rotundus*[6].

Discussion

In the context of resurgence in the use of herbal products, a booming market for natural products and a rapidly growing consumer acceptance of complementary medicine, it is imperative to evolve sensitive modern standards for the quality, safety and efficacy of traditional medicines[13]. The quality standards for herbals described by pharmacopoeias covers aspects such as morphology, microscopy, physicochemical characteristics, nature of phytoconstituents and chromatography profiles. Quality assurance of traditional medicines involves the quality of both raw materials, not only plants but also animals, metals and minerals, as well as of finished products. Biological (morphological), microscopic, chemical and biochemical methods are available to undertake standardisation of

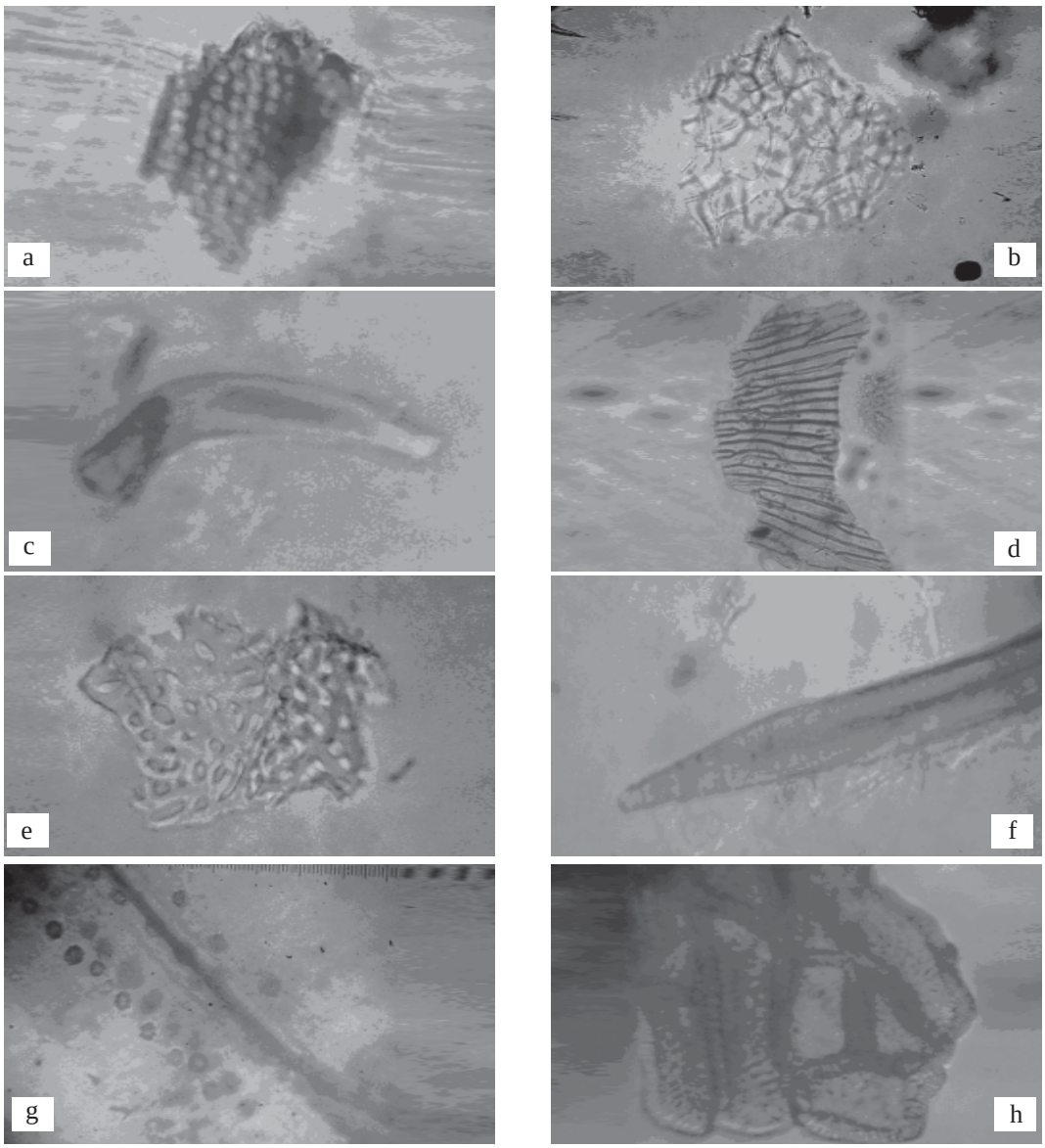

Fig. I a-h - Powder microscopial characters of Avipattikara cūrṇa

a Sclerenchyma of testa; **b** Fragments of thin walled cells; **c** Epidermal hairs **d** Epidermal cells; **e** Parenchyamatous cells with thickenings; **f** Lignified Fibre; **g** Calcium oxalate crystals (spherophides); **h** Elongated stone cells

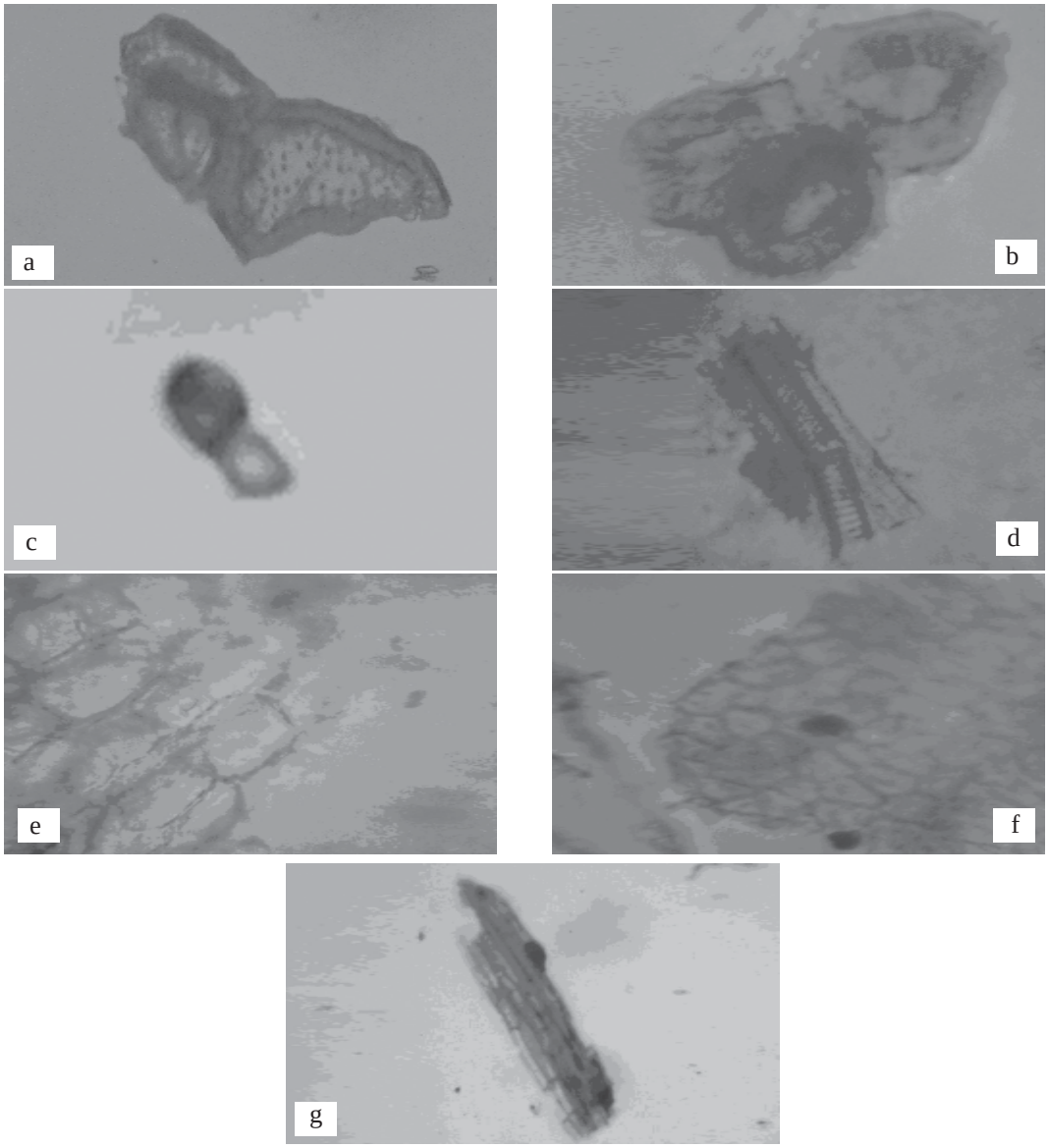

Fig. II a-g - Powder microscopial characters of Avipattikara cūrṇa

a Stone cells with calcium oxalate crystals; **b** Round shaped stone cells with thick walls; **c** Glandular trichome; **d** Vessel elements with spiral thickenings; **e** Parenchymatous cells; **f** Polygonal epidermal cells; **g** Fragments of perisperm

traditionally identified material and they should be appropriately applied. Establishing standards for identity is only first stage or level of standardisation of raw material. Higher level standards can be established when a raw material is also standardised in terms of traditionally prescribed collection time, region of collection, manner of processing and storage conditions[14]. In this study, the Avipattikara cūrṇa was tried to standardise on qualitative basis based on the microscopical characterisation of plant cells.

Conclusion

The powder characteristics of Avipattikara cūrṇa were studied and based on these microscopic powder characters the presence of seven ingredients viz. *Elettaria cardamomum, Piper longum, Cyperus rotundus, Terminalia bellirica, Terminalia chebula, Embelia ribes* and *Cinnamomum tamala* was confirmed.

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ROLE OF ĀYURVEDIC DRUGS IN ŚVITRA (VITILIGO) AND THEIR IMPACT ON LIVER - A CLINICAL STUDY

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Abstract: Vitiligo is an obstinate, autoimmune pigmentation skin disorder with a poor outcome characterized by depigmented macular lesions on exposed parts of the body and richly pigmented areas like nipples, axillary folds, anal verge and genitalia. The pathogenesis and the symptomatology resemble with the kilāsakuṣṭha in āyurveda. The outcome of treatment in 50 cases of śvitra vis-à-vis vitiligo received Śvitrahara kaṣāya and Śvitrahara lepa was analyzed. The clinical trial revealed that āyurvedic drugs are efficacious at par with the modern PUVA therapy and are least affected with unwanted affects in comparison to Oral Psoralens and UV-A therapy.

Introduction

Vitiligo (leukoderma) is a pigmentation disorder in which melanocytes, the cells that make pigment which give colour to the skin, are destroyed. This results in smooth, white patches in the midst of normally pigmented skin. People with vitiligo may also have eye abnormalities and have a higher incidence of thyroid disease, diabetes mellitus, and pernicious anemia. White patches appear on the skin in different parts of the body. Similar patches also appear on both the mucous membranes (tissues that line the inside of the mouth and nose), and the retina (inner layer of the eyeball). The hair that grows on areas affected by vitiligo sometimes turns white. It can begin at any age but in about 50% it starts before the age of 20[2].

The reported incidence of vitiligo in various dermatological clinics in India varies from 3.5% to 4.3%. Oral and topical Psoralens have both been used with varying results for the treatment of vitiligo[1]. This trial was undertaken to compare the results of various modes of psoralen therapy on the repigmentation process in vitiligo.

Material and methods

50 patients with vitiligo at quiescent stage were studied and routine laboratory investigations on urine, stools, haemoglobin and liver function tests were done.

Inclusion criteria: - Uncomplicated, diagnosed cases of vitiligo either segmental or generalized involvement of both sexes in the age group 16-60 years.

Exclusion criteria: i) Vitiligo associated with other diseases like hypothyroidism, anaemia, diabetes, hypertension, etc. and ii) Vitiligo

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patches rapidly spreading and become associated with redness, blister formation, itching during therapy or as such.

Assessment criteria

Surface area: - Mild- <3.14cm^2 (i.e. circular area with less than 1cm radius); moderate: 3.14 -12.57 cm^2 (i.e. circular area with radius1-2 cm); severe: >12.57 cm^2 (i.e. circular area with radius >2 cm). Surface area of white patches was measured by marking the margins of the patches one by one on a transparent paper. This sketched transparency was put on a graph paper and surface area noted in square cm.

Number of patches: - Mild - <5 patches; moderate - 5-10 patches; severe: >10 patches.

Itching: - No itching; mild itching but no need of medication; moderate with need of anti histamines; severe - not relieved by anti-histamines.

Colour of patches: - Normal; reddish-brown; reddish; whitish.

Colour of hair: - Normal black; reddish-black; reddish; whitish

Grouping of sample

Group-I (n-25) patients were treated with Svitrahara kashaya 50ml twice a day and Śvitrahara lepa for topical application and exposure to sunlight for 10-15 minutes in between 9:00AM-11:00AM after 45 minutes of intake of decoction.

Group-II (n-15) patients were given Śvitrahara lepa only for topical application and exposure to sunlight for 10-15 minutes in between 9:00 AM - 11:00 AM

Group III (n-10) patients were given oral psoralen in the dose of 0.6mg/kg body weight followed by exposure to sunlight for 10 minutes for 6 months.

All the patients were advised to wear optical dark glasses during the sun exposure and for 4 to 5 hours thereafter. The patients were examined once in a month for 6 months to record the degree of repigmentation.

Trial drugs

Svitrahara kashaya:- Bakuci (*Cullen corylifolium*), haridra (*Curcuma longa*), khadira (*Acacia catechu*), śāriba (*Hemidesmus indicus*), kakoduambara (*Ficus hispida*), cakramarda (*Cassia tora*), cakṣuṣya (*Cassia absus*) in equal quantity (1kg each) were thoroughly mixed, grounded to a coarse powder and stored in a dry container. 50gm of coarse powder was soaked in 500ml of water and boiled to reduce it to $^1/_5{}^{th}$ i.e. 100 ml, and administered in two divided doses.

Śvitrahara lepa[5] was prepared according to Rasaratnasammuchaya (20/205-207) with a slight modification. To prepare 500gm of ointment the following materials were used: Śvitraharakaṣāya (100ml); kalka of Śvitraharakaṣāya (25g), sphaṭika (alumen) (25g), haratāla (orpiment) (25g) mustard oil (100ml) and beewax (100g)

Mustard oil was boiled with kaṣāya and kalka. Bee wax was melted in a pan and the prepared oil and powders of sodhita haratala and sphaṭika were added one by one to obtain a mixture by constant stirring. The whole mixture was allowed to cool and the ointment stored in dry containers.

Duration of trial: - 6 months with bi-monthly follow-ups.

Results and observations

The effect of Śvitrahara kaṣāya and lepa on total surface area of mild, moderate and severe patches, and percentage of eosinophils and liver

function tests values are shown in Tables 1 and 2 respectively.

The youngest patient was a 16-year-old girl and the oldest was 62 years. In 35 patients, the disease had started around 20 years of age and majority was females. Out of 50, 16 cases had a family history of vitiligo. All routine laboratory investigations were within normal limits except for the presence of intestinal worms in 14 cases. Genitals were the least affected area - only 2 male patients were registered. Segmental vitiligo was found in 72% of cases. Four patients had universal vitiligo but with surface area, $1cm^2$. Distribution of patients according to areas involved and lesions are shown in Table 3. Pitta kaphaja prakṛti was predominant in majority of the cases.

There was good improvement in Group I and partial repigmentation in Group II. Group III responded well but some developed adverse

TABLE 1
Effect of Svitrahara kashaya and Lepa on total surface are of mild, moderate and severe patches

Total surface area	Paired 't' value		
	Group I	Group II	Group III
Mild	4.70 p<0.01 HS	8.16 p<0.01 HS	7.84 p<0.01 HS
Moderate	5.60 p<0.01 HS	4.09 p<0.01 S	3.70 p<0.01 S
Severe	1.05 p<0.01 NS	2.71 p<0.01 NS	5.40 p<0.01 S

TABLE 2
Effect of Svitrahara kashaya and Lepa on % of Eosinophils and Liver function tests

Variable	Paired 't' value		
	Group I	Group II	Group III
Eosinophils (%)	2.23 p<0.05*	2.02 p<0.05*	2.54 p<0.05*
Sr.Bilirubin	2.61 p<0.05*	2.48 p<0.05*	1.68 p<0.05*
Sr.Albumin	0.71 p>0.05**	0.43 p>0.05**	0.32 p>0.05**
SGOT	1.68 p>0.05**	1.60 p>0.05**	3.79 p<0.01*
SGPT	1.26 p>0.05**	1.62 p>0.05**	2.16 p<0.01*
Alkaline Phosphatase	2.6 p<0.05*	1.6 p>0.05**	2.37 p<0.01*

TABLE 3
Distribution of patients according to area involved and lesions

Description	No. of patients
1. Area involved	
- Exposed areas	40
- Front of legs	26
- Hands	24
- Face and neck	19
- Genitials	2
2. Lesions	
- <5	24
- <10	18
- >10	8

TABLE 4
Improvement in signs & symptoms in three groups

Group	Improvement	No improvement	Dropped out
Group I	17 (80%)	8	-
Group II	9 (partial)	1	5
Group III	3 (well)	7	-

effects like sunburn, severe itching and gastric upset on taking oral psoralen and UV-A therapy. (Table 4)

Discussion

In 22 cases of Group I, 8 cases of Group II and 6 cases of Group III, the initial response to treatment was erythema of the lesion, and blister formation in the remaining cases. The blisters were common in Group III cases that used Methoxypsoralen and UV-A and were not seen in any patients of Śvitrahara kaṣāya or lepa group. As the blisters appeared, further applications of psoralen lotion were stopped and a soothing lotion or cream was prescribed. Later, the psoralen lotion was used in more diluted form. After 4-6 weeks of therapy, erythema was followed by repigmentation. In 35 cases, the repigmentation was rapid in mild patches group, but was delayed in the severe patches group.

Best results were obtained in Group I and Group II, where Śvitrahara kaṣāya or lepa was administered orally as well as applied topically followed by exposure to sun rays. But group III was responded with tanning, sunburn and itching upon taking the modern therapy.

Among the main ingredients of Śvitrahara kaṣāya and lepa, bakuci is a renowned herb with many beneficial therapeutic properties[7a]. It has been extensively used by all the āyurvedic scholars in all hypopigmented disorders with great success. Haridra, whose synonyms are named after its beneficial effects on the skin, is a potent drug with adaptogenic, hypoglycemic, antimicrobial, antiallergic, hepatoprotective and antioxidant properties[7b]. Cakramarda and Cakṣuṣya are bestowed with similar properties and are popular for skin disorders. Bakuci, which contains psoralens, has a property of regenerating the melanocytes which are chiefly concerned with the pigment synthesis in the depleted areas[7a]. Haridra and cakramarda are potent antimicrobial, antiallergic with immune modulating properties. They correct the deranged immunity associated with the autoimmune destructive process of svitra[7d].

The impact of Kaṣāya and Methoxypsoralen was studied on liver was assessed by the eosinophils percentage and liver function tests. There was no alteration in the values of SGOT, SGPT, Alkaline Phosphatase in Group I and Group II but there was a significant alteration in the values of LFT in Group II indicating the hepatotoxic nature of Modern PUVA therapy.

Conclusion

50 diagnosed cases of vitiligo were randomly allocated into three groups. Śvitrahara kaṣāya and lepa, which contain bakuchi, a natural herb containing psoralens, has a property of regenerating the melanocytes which are chiefly concerned with the pigment synthesis in the depleted areas. Modern PUVA therapy is associated with intense side affects like sunburn, itching and blister formation. Śvitrahara kaṣāya has shown potential results in comparison with modern medicine with no adverse effects in mild to moderate cases of vitiligo.

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EFFECT OF BINDU AGNIKARMA (CAUTERISATION) IN GṚDHRASI (SCIATICA) - A CLINICAL STUDY

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Abstract: Gṛdhrasi is one of the most common disorders of vāta and symptoms of which simulate that of sciatica. When standard vātavyādhi line of treatment fails, agnikarma is specially indicated. This clinical study is carried out to assess the effect of bindu agnikarma in gṛdhrasi. The result was statistically highly significant.

Introduction

Improper sitting postures, continuous exertions and overexertion, jerky movements during traveling and sports and weight-lifting create an undue pressure over the spinal column and play an important role in producing low backache and sciatica.

Gṛdhrasi (sciatica) is one among 80 types of nānātmaja vātavyādhis. The cardinal signs and symptoms of gṛdhrasi are ruk (pain), toda (pricking sensation), stambha (stiffness) and muhuspandana (twitching) in the sphik (buttock), kaṭi (hip), uru (thigh), jānu (knee), jaṅgha (ankle) and pāda (foot) respectively and śaktikṣepa nigraha i.e. restricted lifting of the leg. In kaphanubandhata tandra (tiredness), gaurva (heaviness) and arocaka (anorexia) will be present[1].

'Sciatic Syndrome' resembles gṛdhrasi. In sciatica there is pain along the distribution of sciatic nerve, which begins from buttock and radiates downwards to the posterior side of thigh, calf and to the outer border of foot. Herniation or degenerative changes in intervertebral disc is the most common cause. There is often history of trauma, as twisting of the spine, lifting of heavy objects or exposure to cold.

Agnikarma, one of the unique procedures explained for the management of gṛdhrasi, is indicated where other managements are failed.

Material and methods

10 patients of gṛdhrasi fulfilling the inclusion criteria were selected for the study from the O.P.D and I.P.D of S.D.M. College of Ayurveda & Hospital, Hassan, Karnataka, irrespective of sex, religion, etc.

Diagnostic criteria: - Patients with classical features of gṛdhrasi such as:

- Stambha, ruk and toda over the sphikapūrva, kaṭi, pṛṣṭa, ūru, jānu, jaṅgha, pāda, pārṣṇi paryanta vedana
- Arocaka (anorexia)
- Saktnoh utkṣepana vedana (pain on elevatin)
- Dehapravakrata (scoliosis)
- Sakthana-hakṣepam-nigraṇiyat (SLR test $+^{ve}$)

Inclusion criteria:- i) Diagnosed cases of

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gṛdhrasi, ii) patients between age group 20-60 years of either sex, iii) chronicity of less than three years and without any deformity.

Exclusion criteria: - i) Contraindicated for agnikarma, ii) patients with tuberculosis and malignancy, iii) surgical indications such as progressive neurological deficit and iv) fractures of pelvis and femur.

Lab investigations

- Blood: Differential leukocyte count, total leukocyte counts, erythrocyte sedimentation rate, hemoglobin.
- Urine: for albumin, microscopic, sugar.
- X-ray: lumbo-sacral region

Treatment protocol

Pūrvakarma: - Patients were made to lie comfortably in prone position over the treatment table. The area of maximum tenderness was elicited and marked. The kumāri pulp (*Aloe vera*) was sliced vertically in the middle and ghṛta mixed with haridra was kept ready.

Pradhāna karma: - Agnikarma was carried over the marked area using the śalāka; after heating it to red hot, bindu agnikarma was done over the kaṭi, uru, janu and jaṅgha region. Immediately after dahana (cauterisation), kumāri pulp was smeared over the area. It was done in two sittings in such a manner that it produced only samyak dagdha lakṣaṇa (symptom of proper cauterisation)[2].

Pāścāt karma: - Patients were advised to protect the area subjected to agnikarma from exposure to moisture at least 24 hours after the dahana-karma and to apply powder of haridra - *Curcuma longa* (Q.S) mixed with ghee twice a day for three days. Also, advised not to carry out heavy work and to avoid straining of the back during the days of treatment.

Assessment criteria

Assessment of effect of the treatment was done on the basis of clinical changes observe by assessing numerical score for each of the following signs and symptoms: i) pain, ii) stiffness, iii) pricking sensation, iv) numbness, v) fasciculation, vi) anorexia, vii) heaviness, viii) SLR test, ix) standing and x) distance of walking. The scoring system was as follows:

Symptoms/signs	Gradation
1. Ruk (pain)	
i. No pain	0
ii. Painful, walks without limping	1
iii. Painful, walks with limping without support	2
iv. Painful, can walk only with support	3
v. Painful, unable to walk	4
2. Stambha (stiffness):	
i. No	0
ii. Mild	1
iii. Moderate	2
iv. Severe	3
3. Toda (pricking sensation):	
i. No	0
ii. Mild	1
iii. Moderate	2
iv. Severe	3
4. Spandana (fasciculation):	
i. No	0
ii. Mild	1
iii. Moderate	2
iv. Severe	3
5. Aruci (anorexia):	
i. No	0
ii. Mild	1
iii. Moderate	2
iv. Severe	3
6. Tandra (torpor):	
i. No	0
ii. Mild	1
iii. Moderate	2
iv. Severe	3

Cont....

7. Gaurava (heaviness):
   i. No 0
   ii. Mild 1
   iii. Moderate 2
   iv. Severe 3
8. Straight leg raise test:
   i. More than 90° 0
   ii. 71°-90° 1
   iii. 51°-70° 2
   iv. 31°-50° 3
   v. up to 30° 4

Functional disability

1. Walking distance
   i. Pain does not prevent me walking any distance. 0
   ii. Pain prevents me walking more than 1 mile 1
   iii. Pain prevents me walking more than 0.5 miles. 2
   iv. Pain prevents me walking more than 0.25 miles. 3
   v. I can only walk using a stick or crutches 4
2. Standing time
   i. I can stand as long as I want without extra pain 0
   ii. I can stand as long as I want but it gives me extra pain 1
   iii. Pain prevents me from standing for more than 1 hour 2
   iv. Pain prevents me from standing for more than 30 minutes. 3
   v. Pain prevents me from standing for more than 10 minutes. 4

Assessment of total effect:- i) complete remission - 100% relief in signs and symptoms and walking without any pain, ii) marked improvement - 51-99% relief in signs and symptoms, iii) moderate improvement - below 50% relief in signs and symptoms and iv) unchanged - no reduction in signs and symptoms.

Observations

The symptom-wise distribution of patients is shown in Table 1.

While doing the agnikarma, the characteristic features like appearance of little smoke with a peculiar smell similar to that of burning hair and characteristic sound similar to chit-chit were observed.

The dagdhavraṇa formed was around 1mm in diameter and about ½ -1mm deep. The central zone was whitish and peripheral area was blackish like a circular boundary around the central zone. On the day of agnikarma, the vraṇa was slightly raised and there was reddish discoloration around it and no any discharge observed.

The patients complained of severe burning sensation when the red-hot śalāka touched to the skin. Burning sensation lasted for 5-6 seconds and was relieved on smearing kumāri pulp. Subsequently, patients had no complaints of pain or discharge or any other complications

TABLE 1
Symptom-wise distribution of 10 patients

Signs & symptoms	No. of Patients	%
Ruk (pain)	10	100
Toda (pricking sensarion)	10	100
Stambha (stiffness)	8	80
Spandana (fasciculation)	04	40
Aruci (anorexia)	04	50
Tandra (torpor)	02	20
Gaurava (heaviness)	04	40
Saktana: kṣepam nigrahaṇiyat (SLR test)	10	10
Dehasyāpi pravakra (scoliosis)	03	30

in the areas subjected to agnikarma. Patients were allowed to take their routine diet and were assessed before treatment and then on 9th day after completion the procedures.

Result

While the mean score of pain and stiffness was reduced by 52.7% and 48.4% respectively (statistically highly significant - P<0.001), pricking sensation and SLR test was reduced by 55.17% and 13.7% respectively (statistically significant - P<0.01). Fasciculation (spandana) was remained unchanged whereas anorexia, torpor and heaviness was statistically insignificant (P>0.05). Regarding functional disability, the standing test and walking distance were improved highly significant (Table 2). The overall result of agnikarma is shown in Table 3.

Discussion

The positive result obtained during the study shows beneficial effects of agnikarma in the management of gṛdhrasi especially on radiating type of pain. This was due to the effect of agnikarma, which acted as cell killing agent, increased metabolic activity and blood flow, heated nerves and stimulated neural receptors in the skin or tissues (sedative effect). These changes in the tissues may be produced by local, general or remote effects[3].

The extent will depend on various factors like, size of area heated, duration of heating, method of application, depth of absorption of specific radiation.

Conclusion

Application of agnikarma in patients of gṛdhrasi showed promising and significant result in reliving its cardinal symptoms like pain, stiffness, etc. It also showed improvement in standing and walking time thus the treatment enable the patient to lead their day-to-day activity without much discomfort**.**

Heat appears to produce definite sedative

TABLE 3
Overall result of agnikarma

Agnikarma	Cured	Mi	Im	Uc
Vātaja	Nil	02	02	Nil
Vāta-kaphaja	01	04	01	Nil

Mi - Marked improvement; Im - Improvement; Uc - Unchanged

TABLE 2
Effect of agnikarma on signs and symptoms of grdhrasi.

Signs & Symptoms	n	Mean Score		%	SD	SE	't'	p
		BT	AT					
Ruk (pain)	10	3.6	1.7	52.7	0.57	0.18	10.58	<0.001
Toda (pricking sensarion)	7	2.9	1.3	55.1	0.70	0.22	7.24	<0.01
Stambha (stiffness)	9	3.3	1.7	48.4	0.75	0.22	7.24	<0.001
Spandana (fasciculation)	1	2.8	2.5	10.7	0.48	0.15	1.96	>0.05
Aruci (anorexia)	3	0.40	-	100	0.70	0.22	1.80	>0.05
Tandra (torpor)	1	0.10	-	100	0.31	0.10	1.00	>0.05
Gaurava (heaviness)	2	0.30	0.10	66.6	0.62	0.20	1.00	>0.05
SLR test	10	2.9	2.5	13.7	0.52	0.16	2.45	<0.05
Standing	10	3.1	2.2	32	0.74	0.23	3.85	<0.01
Walking distance	10	2.8	2.2	35.7	0.47	0.15	6.71	<0.01

effects. The effect of heat on nerve conduction has still to be thoroughly investigated. Heat has been applied as a counter irritant, which is the thermal stimulus, may affect the pain sensation.

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ACCELERATED STABILITY STUDIES OF FLOATING TABLETS OF VĀŚAKA (*JUSTICIA ADHATODA*) EXTRACTS

Aswatha Ram H.N.[1], Annie Shirwaikar[1] and Arun Shirwaikar[2]

Abstract: Vāśaka (*Justicia adhatoda* L. = *Adhatoda vasica*), commonly known as adusoge is much used for its bronchodilatory, anti-asthmatic and oxytocic properties. The effervescent floating tablet of vāśaka extracts was formulated by direct compression technique and evaluated for various physical parameters. In the present study, accelerated stability studies of the self-fabricated floating tablets of vāśaka extracts were carried out according to ICH guidelines.

Introduction

Stability study is very necessary to establish the shelf life and label storage instructions applicable to all future batches of the drug product manufactured and packaged under similar circumstances. Accelerated testing studies are designed to increase the rate of chemical degradation or physical change of a drug product by using exaggerated storage conditions as part of the formal stability studies[1]. Shelf life of any medicine can be defined as the time period or duration up to which it is expected to retain its active ingredients i.e. 90% of label claim when stored in recommended conditions[2]. Every product has a definite shelf life which depends on various physical, chemical, environmental and biological factors[3]. Vaṭi/guṭika formulations retain their potency for up to two years from the date of manufacture if stored properly[4]. In the present paper an attempt was made to carry out the accelerated stability studies of self-fabricated floating tablets of vāśaka extracts according to ICH guidelines.

Materials and methods

Preparation of vāśaka extracts

Ethanolic extract: The non-infected leaves were shade dried, powdered and extracted with 80% ethanol by maceration in a closed flask with occasional shaking, for about 36 hours at room temperature[5]. The resultant liquid extract was filtered and evaporated to dryness under vacuum to give a yield of 1.75–2.27% dry extract.

Methanolic extract: - Standardised methanolic extract containing 1-1.5% w/w vasicine was obtained as a gift sample from Sami Labs, Bangalore, India.

Fabrication of tablets: - In the present study, all the tablets were formulated by direct compression technique using polymers like HPMC, K4M and Rosin. Polymers were blended thoroughly with sodium bicarbonate in suitable

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proportions and later with the drug which was previously well mixed with aerosil and other excipients like talc and magnesium stearate.

Methanolic extract (industrial extract) was used as the model drug (due to its similar solubility characteristics vasicine of ethanolic extract) to optimize the release and floating characteristics of the formulations. The final optimized formulations were then prepared with the ethanolic extract (in-house extract).

Procedure: - The extracts, polymers and other excipients were passed through the sieve No #80 and the required quantities of the drug, polymers and other excipients were weighed accurately. The extract was well mixed with aerosil and kept separately. The polymers were thoroughly mixed with sodium bicarbonate. After mixing the extract with the polymers, finally talc and magnesium stearate were mixed properly to get a blend of uniform distribution. The blended mixture was then weighed individually according to the formula and compressed into tablets using a single punch tablet making machine. The level of polymers was optimized to obtain a formulation that could release more than 95% of the drug in 8 hours and which would have a potential as a thrice daily dosage form. Different formulations viz. F1, F2, F3 to F10 of methanolic extract were fabricated as per the procedure described above; whereas, the final formulation F11 was prepared with ethanolic extract.

Stability studies

Accelerated stability studies of the self-fabricated optimized floating tablets of vāśaka extracts were carried out according to ICH guidelines. At the accelerated storage condition, a minimum of three time points, including the initial and final time point (e.g. 0, 3, and 6 months) has been recommended for a 6-months study. The optimized tablet formulations of vāśaka extract were packed using aluminum foil and were kept in stability chamber at $40^0C \pm 2^0C$ and 75% RH ± 5% RH. The stability study was carried out for a period of 6 months. As specified in the guidelines, tablets were taken and evaluated for their drug content at definite intervals. The tablet stability was also tested by evaluating the dissolution study of samples (as mentioned above) and the release rate at the end of 8 hours was noted. A plot of log percentage of drug remaining versus number of days was drawn to analyze the stability of the formulation.

Results

The accelerated stability studies were conducted according to ICH guidelines. The stability profile of methanolic and ethanolic extracts tablet formulations is shown in Table1. The accelerated stability study graphs are shown in Fig. I&II.

TABLE 1
Accelerated stability studies of methanolic and ethanolic extracts tablet formulation

Parameter	% Drug remaining	Log % drug remaining
I. Methanolic extract		
Time in days:		
- 0	100	2
- 90	99.4	1.9973
- 100	98.5	1.9934
II. Ethanolic extract		
Time in days:		
- 0	100	2
- 90	99.2	1.9965
- 100	98.2	1.9934

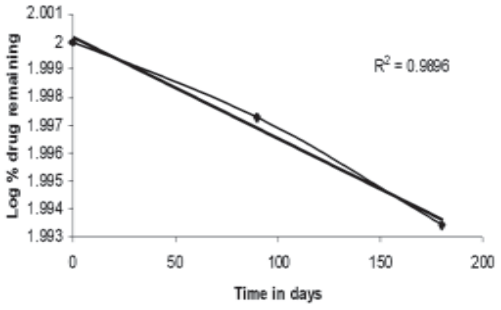

Fig. I
Accelerated stability studies of methanolic extract tablet at 40^0C and 75 RH

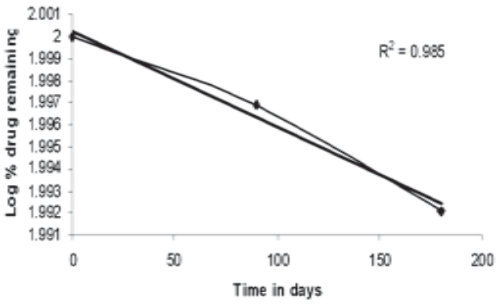

Fig. II
Accelerated stability studies of ethanolic extract tablet at 40^0C and 75 RH

Conclusion

A comparative graph of *in vitro* release of vasicine from the floating tablets of methanolic and ethanolic extract tablet formulations before and after stability studies indicated that there was no significant difference in the release rate of the formulations. The drug content of the tablets was within the limit of 90% of the initial content indicating the overall stability of tablets. From the results it is concluded that the floating tablet of vāśaka extracts are stable at room temperature for more than three years.

Acknowledgements

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CLINICAL EVALUATION OF VRAṆAŚODHANA TAILA IN THE MANAGEMENT OF WOUND

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Abstract: This is a clinical study on wound management. The efficacy of Vraṇaśodhana taila [having ingredients - tṛvrt (*Merremia turpethum*), haridra (*Curcuma longa*) and tila (*Sesamum orientale*), nimba (*Azadirachta indica*) svarasa and taila of tila (*Sesamum orientale*)] on wounds was evaluated. The study showed good result.

Introduction

Wounds or trauma and phenomenon of repair are very common events. The management of wounds is fundamental to the practice of surgery. In this the surgeon's task is to minimize the adverse effects and abnormal sequel of wound healing like keloids, contractures etc. In āyurveda, the types and management of wound have been elaborated in great detail by ācārya Suśruta.

The subject of wound healing described as 'Vraṇaropaṇa' by Suśruta is a good source of material for research in the field of wound management. So far few attempts have been made for evaluating the wound healing property of certain formulations. A herbal oil named Vraṇaśodhana taila mentioned in the Āyurvedic pharmacopoeia Andhrapradesh (A.P), which is being supplied to all the government āyurvedic dispensaries and government āyurvedic hospitals of A.P, shows better wound healing property and requires a proper scientific validation. Keeping this in view an attempt was made for documenting scientific evidence on its efficacy.

Materials and methods

20 cases of wounds were selected from OPDs of General Surgery and Ayurvedic Specialty Clinic, District HQ Hospital, Rajahmundry, A.P., after duly taking consent from the patient and permission from the Ethical committee. The patients were divided into two groups (10 in each) i.e. Group I - General wounds and Group II - Fistula-in-ano wounds.

Inclusion criteria: i) Wounds having classical signs and symptoms, ii) patients suffering from non-healing ulcers without any severe systemic disease in the age group of 10-70 years of both sexes and iii) patients having wounds with borderline Diabetes Mellitus.

Exclusion criteria:- Patients suffering from varicose ulcers, lepromatous ulcers, syphilitic ulcers, skin malignancies and HIV.

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Preparation of the trial drug: - Vṛaṇaśodhana taila was prepared as per the text[1]. The ingredients i.e. tṛvṛt (*Merremia turpethum*), haridra (*Curcuma longa*) and tila (*Sesamum orientale*) as kalka and patra svarasa of nimba (*Azadirachta indica*) and oil of tila, were collected and the formulation was prepared by snehapāka method. The taila after preparation was stored in a clean auto-claved container.

Application of the drug: - The drug was applied locally on wound by soaking it in sterile cotton gauze and dressed daily. Dressing of wounds that were having extensive sloughing and necrosis, was done in the morning and evening after initial surgical debridement.

Clinical assessment: - Wounds were observed daily for various clinical symptoms like edema, discharge, indurations and pain. Area of wound on day zero was noticed and recorded by planimetry and observed after 15th, 30 th, 45th and 60th day or after complete healing of wound. The area of the wound was calculated by the formula: Area of wound = Wound length x Breadth in cms. The assessment of symptoms is shown in Table 1.

TABLE 1
Assessment of symptoms

Symptoms	Score
1. Pain	
- No pain	0
- Mild pain - analgesic not required	1
- Moderate pain - mild analgesic required	2
- Severe pain - strong analgesic required	3
2. Discharge	
- Serous discharge < 5ml	0
- Sero-purulent discharge > 5 ml	1
- Purulent discharge >5ml	2
- Purulent discharge with offensive smell	3
3. Oedema	
- No swelling	0
- Mild swelling area < 5 cm	1
- Moderate swelling with tender area <5cm	2
- Severe swelling with tenderness area >5cm	3

Observation and results

Of 20 cases, maximum were males under the age group of 2-30 years coming from low socio-economic group (Table 2). Assessment and effect of Vṛaṇaśodhana taila was done on the basis of average Unit Healing Time (UHT) and scoring of signs and symptoms. The Unit

TABLE 2
Distribution of patients according age, sex, etc.

Parameter	No.	%
1. Age group (years)		
- 10-20	2	10
- 20-30	6	30
- 30-40	0	0
- 40-50	5	25
- 50-60	5	25
- 60-70	2	10
2. Gender		
- Male	17	85
- Female	2	10
- Children	1	5
3. Economical status		
- Low socio economic group		60
- High socio economic group		40
4. Area of inhabitation		
- Rural		62
- Urban		38
5. Systemic diseases and predisposing factors		
- Diabetes (border line)	3	15
- Diabetes (D.M)	2	10
- Anemia	2	10
- Smoking habit	2	10

Healing Time (UHT) means number of days required for healing of per sq. cm area of wound, The UHT was calculated by formula: $\frac{\text{TDRH}}{\text{IAW Sq.cm}}$; where TDRH = total number of days required for healing and IAW = initial area of wound in square centimeter. The UHT of general wounds and fistula-in-ano- wounds is shown in Table 3. The average UHT was assed by: $\frac{\text{AUHT}}{\text{TNC}}$; where AUHT = Average UHT days/ sq.cm and TNC = total number of cases (Table 4).

Assessment of symptoms: - The progress of wound healing is assessed on the basis of scoring of various signs and symptoms. The assessment was made at the beginning of the treatment (initial) on 15th (F_1) and on 30th (F_2).

Discussion

- Vṛaṇaśodhana taila reduced symptoms like pain, discharge and oedema when applied locally and promoted proper wound healing.
- The oil synergistically produced pain relieving, anti-inflammatory, anti-microbial and anti-pruritic effects providing a non invasive solution to the management of wounds.
- The therapeutic effect of oil on wound healing may be due to anti-inflammatory, anti-toxic and anti-microbial action of different herbs incorporated in the formulation.

TABLE 3
Unit healing time of wounds in both the group

General wounds (Group I)			Fistula-in-ano-wounds (Group II)		
n	days/sq.cm	UHT	n	days/sq.cm	UHT
1.	10d/4	2.5	1	30d/9	3.3
2.	25d/20	1.2	2	35d/10	3.5
3.	30d/35	0.8	3	42d/12	3.5
4.	20d/9	2.2	4	50d/15	3.3
5.	15d/15	1	5	18d/4	4.5
6.	35d/12	2.3	6	25d/6	4.1
7.	30d/16	1.8	7	35d/9	3.8
8.	20d/12	1.6	8	19d/4	4.7
9.	10d/12	0.8	9	18d/4	4.5
10.	07d/6	1.1	10	30d/6	4.6

TABLE 4
Average UHT - Group I & II

Group I	No. of cases	UHT
Group I	10	1.53
Group II	10	3.98

Conclusion

- This oil is safe and effective for general wounds and fistula-in-ano wounds.
- The formulation is cost effective and can be prepared easily.
- Its semi-occlusive nature provides moist environment over wound and can be removed easily without pain and damage to the newly growing granulation tissue.
- It prevents scab formation on wound.
- After completion of healing fibrosis or keloid did not develop at the site of wound surface

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FOLK CLAIMS OF NORTH-EAST REGION OF INDIA - A COMPARATIVE STUDY

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Abstract: The North East region of India is renowned for its herbal medicinal treasures and in the area grows a number of plants diverse flora and fauna. The plants of this region have been traditionally used by the village elders - Kabiraj, Bej and Ojahas for various ailments. During the period of five years' ethno-botanical surveys carried out by RRI. (Ay.) Guwahati in all over the North East India, have gathered more than 150 species of plants used by different communities on folk medicines. In this paper 30 species having potential curative effect in some particular diseases of this region are highlighted.

Introduction

Majority of population of North East India dwells in rural areas and hence modern health care facilities are a far cry for them. This wide gap has been filled by the traditional healing system of medicine. The different communities of this region largely depend upon a number of endemic plants that contributes to the richness of the vegetation of the region. Of India's 15-20% contribution to medicinal plants, North Eastern states have a share of 6-8%. But the value of this wealth of the region has been degraded due to the want of specific scientific studies in this regard. Now the recent development in the study of empirical knowledge system has been given due consideration by WHO and as per WHO's estimate about 80% of the population in the developing countries depends directly on plant-medicines as modern health care facilities are still to reach them. Taking due consideration to this world wide view of assessing the medicinal plant resources and researches for new medicinal plants, the RRI (Ay.) Guwahati have been undertaking a task in a period of last five years to assess the medicinal plant resources and to research in that front i.e. ethno-botanical or ethno-medicinal investiga-tion to bring to the light the hidden treasures of this region.

The main objective of this study is to highlight the collected information of traditional practice. Further, it will be great scope for research studies in various ailments to global health care and to explore new drugs for some of incurable diseases.

Methodology

The study is concentrated to explore and assess the medicinal plants resources used by the various indigenous systems of medicines and for this, during the last five years, most of the

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TABLE 1
List of plants (used as Ethno-medicines in N.E. region)

Scientific name	Sanskrit	Local name	Parts used	Folk claims	Textual view
01 *Achyranthes aspera* L.	Apamārga	Soh-byrthied (Khasi)	Seeds and Roots	Seeds are used to control hunger; the roots are tide on the head (hair) for easy delivery	Piles, boils, skin eruption and emetic
02 *Acorus calamus* L.	Vacā	Bis-bifang (Boro)	Leaves and Rhizome	Paste is applied on the head for unconsciousness.	Rhizome is used in emetic, dyspepsia, remittent fever and tonic
03 *Acorus calamus* L.	Bhadra	Bajaio (Sikkim)	Rhizome	Consumption of rhizome decoction (20 ml twice daily) relieves rheumatism	Emetic, dysentery, fever, nerve tonic and snake-bite
04 *Justicia adhatoda* L. (= *Adhatoda vasica* Nees)	Vāsaka	Bahak (Assam)	Leaves	Intake of juice of roasted young shoots (20 ml twice a day for 7days) relieves liver and spleen enlargements	R.T.I., rheumatism and insecticidal
05 *Alstonia scholaris* R.Br.	Saptaparṇa	Thuamriat (Mizoram)	Barks	Consumption of boiled juice of bark (twice daily for 30 days) allieviates jaundice	Malaria, diarrhoea, dysentery and snake bite
06 *Alstonia scholaris* R.Br.	Saptaparṇa	Chatian (Assam)	Barks	Boiled juice of bark (half glass twice) is used for high blood pressure and tuberculosis	Malaria, diarrhoea, dysentery and snake bite
07 *Ananas comosus* (L.) Merr.	Anannasa	Lakhuihe (Mizo)	Leaves	1 glass crushed juice taken daily for 1 month relieves kidney stone	Anthelmintic
08 *Andrographis paniculata* Nees	Bhūnimba	Kalpatita (Assam)	Leaves	Juice is poured on swelling limbs repeatedly	Anthelmintic, tonic, dysentery and dyspepsia
09 *Angelica archangelica* L	Coraka	Khomog (Tripura)	Roots	Root paste is applied on skin diseases	Stimulant and expectorant
10 *Annona squamosa* L.	Gandagātra	Ataiphal (Assam)	Fruits	Intake of fruit relieves boils and stomach disorder	Insecticide, fish poison and to remove lice from the head

Cont.....

	Scientific name	Sanskrit	Local name	Parts used	Folk claims	Textual view
11	*Benincasa hispida* (Thunb.) Cogn.	Bṛhatphala	Maipall (Mizoram)	Fruits	Intake of fruit juice (1 cup - 50gm) every 2 hours is prescribed in diarrhoea and dysentery	Laxative, diuretic, tonic, aphrodisiac and haemoptysis
12	*Brassica campestris* L.	Sarṣapa	Khariah (Assam)	Leaves	Juice is given in cold, cough and leprosy	Stomachic
13	*Callicarpa macrophylla* Vahl	Priyaṅgu	Sinpho Likhipalp (Arunachal Pradesh)	Leaves	Inhalation of smoke of the dried leaf cures headache	Rheumatism
14	*Carica papaya* L.	Eraṇḍa karkaṭi	Thngfanghna (Mizoram)	Seeds	1 gram powder in empty stomach for 5 days is effectual in intestinal worm	Vermifuge, quench thrist
15	*Cassia fistula* L.	Suvarṇaka	Sonalu (Boro)	Pods	10 g pod is given thrice daily in pratiśyāya, kāsa and mukharoga	Rheumatism, snake bite and skin diseases
16	*Clerodendrum infortunatum* L.	Bhantak	Phuihnam (Mizoram)	Leaves Roots	Juices of root and leaves (10ml) are used in udaraśūla, loose motion and dandruff	Tumours and skin diseases
17	*Clerodendrum serratum* L.	Bhārṅgī	Nephafu	Roots Leaves	Decoction of roots and leaves relieves jaundice, blood pressure and malaria	Root in malaria, leaves in snake-bite, ophthalmia and cephalalgia
18	*Cocus nucifera* L.	Narikela	Narikal (Assam)	Fruits	Eating dry fruits helps females to be conceived and gets a male child	Aphrodisiac and diuretics
19	*Costus specious* (Koen.) Smith	Kushtha	Debitokan (Boro)	Whole plant	Paste is applied on the forehead to subside fever	Astringent, anthelmintic and tonic
20	*Cyperus rotundus* L	Musta	Bank-ada (Khasi)	Rhizome	Crushed juice (20ml) taken orally every 2 hour relieves diarrhoea	Diuretic, anthelmintic and irritation of bowels

Cont.....

	Scientific name	Sanskrit	Local name	Parts used	Folk claims	Textual view
21	*Dillenia indica* L.	Bhavya	Ou Tenga (Assam)	Fruits	Fruit is kept under the bed to prevent chicken pox	Fever and cough
22	*Euphorbia hirta* L.	Pusitoa	Zawhte Hlo (Mizo)	Leaves	15 ml boiled juice taken orally (thrice a day for 1 month) cures kidney stone	Worm infestation and cough
23	*Hedyotis scandens* Roxb.	INA	Kelhnamatur (Mizoram)	Leaves	One glass crushed juice taken orally every 2 hours (for 7 days) relieves malaria and liver enlargement	Eye diseases
24	*Hedyotis scandens* Roxb.	INA	Aiarhoor (Arunachal Pradesh)	Roots	Intake of two pieces of root (1 cm) relieves diarrhoea and colic abdomen	Eye diseases
25	*Hibiscus rosa-sinensis* L.	Japā	Udal (Tripura)	Stems / Roots	25 ml crushed juice taken orally every 2 hours stops blood dysentery	Root in cough
26	*Mikania scandens* Willd	INA	Japan Hlo (Mizo)	Leaves	10 ml crushed juice is taken orally in every two hours in dysentery	Snake bite
27	*Mimosa pudica* L.	Lajjālu	Nilajibon (Assam)	Whole plant	Intake of extract juice (20ml) stops excess menstrual bleeding and local application relieves skin diseases	Snake bite
28	*Ocimum basilicum* L.	Muñjariki	Krishna tulsi (Boro)	Leaves Stems	Leaf juice (10ml) taken orally every 2 hours relieves dysmenorrhoea	Leaf juice useful in the treatment of croup
29	*Oroxylum indicum* (L.) Benth. ex Kurz	Śyonāka	Samba (Manipur)	Leaves	Decoction of leaves and bark are used in all type of cancer (ulcer)	Root bark in diarrhoea and dysentery
30	*Rauvolfia serpentina* (L.) Benth. ex Kurz	Sarpagandha	Sarpajiva (Assam)	Roots	10 g root paste is taken in krimi and jvara	Reduces insanity, blood pressure and udaraśūla.

North Eastern states were considered for their probable hidden treasures. Intensive field studies were conducted and interacted with different communities, tribes, their village elderly peoples - Bej, Kabiraj, Ojahas - and other traditional healers, and from them different information's regarding folk medicines, local names of the plants, process of preparation and therapeutic application were recorded. Most of the plants used in folk medicine were identified in the spot itself and the rest were identified by consulting with references and other herbaria's of this region. The collected informations is enumerated in the form of a table (Table-I)

Result and discussion

The North-Eastern States, particularly Assam (Kokrajhar), Mizoram (Lungley and Darlawn) and Meghalaya (Pynursla), were considered for the study as it is evident that herbal treatment for health and curing various diseases by using plant remedies is most popular among the masses in these States. From the study of about 150 spp. only 30 species comprising herbs, shrubs, trees were found to be relevant from the point of view of its folklore importance (Table -I).

During the study it is observed that some of the prevalent diseases of this area viz. diarrhoea, dysentery, kidney stone, fever, jaundice and menstrual disorders were freely cured by the use of these folk medicines from generations.

Conclusion

It is observed that a lot of folk claims are there and still lot of information is lying beneath the treasure. More efforts are necessary to provide experimental and scientific clues in wider range.

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EFFICACY OF MĀYĀPHALA AND DHĀTAKĪPUṢPA IN THE MANAGEMENT OF ŚVETAPRADARA (LEUCORRHOEA) - A CLINICAL EVALUATION

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Abstract: Śvetapradara (leucorrhoea) is one of the common gynecological problems encountered in females. Dhātakīpuṣpa (*Woodfordia fruticosa*) and māyāphala (galls on *Quercus infectoria*) are popular drugs used traditionally in the management of śvetapradara. In this context, a single blind study was carried out to evaluate the efficacy of dhātakīpuṣpa and māyāphala in the management of śvetapradara. The result was statisticaly highly significant.

Introduction

Śvetapradara (leucorrhoea) is one of the common gynecological problems liable to cause much mental distress, sexual anxiety and even fear of cancer.

Caraka has indicated dhātakīpuṣpa in various formulations for the management of pradara and yonivyāpat[1]. Bhaiṣajyaratnāvali also mentions various formulations of dhātaki for śvetapradara[2]. Māyaphala (galls on *Quercus infectoria*) belongs to the family Fagaceae; Soḍhala has mentioned its effectiveness in śvetapradara[3].

Materials and methods

Māyaphala and dhātakīpuṣpa, collected from the local market of Belagavi, identified by the Botanist, were dried in shade and made into coarse powder.

30 patients, attended the OPD and IPD of K.L.E.'s BMK Ayurvedic Hospital, Belagavi, were selected randomly for the clinical trial and were divided into 3 groups containing 10 patients in each group.

Group 'A' was given Māyāphala cūrṇa in the dose of 2gm twice daily for 21 days. Freshly prepared māyāphala decoction was used for yonidhāvana (vaginal douche) for 10 days. Group 'B' was given Dhātaki cūrṇa in the dosage of 2 gm twice a day for 7 days and freshly prepared dhātakīpuṣpa decoction was used for yoni dhāvana for 10 days. Group 'C' was given wheat flour in the dose of 2gm twice a day and yoni dhāvana done with warm water for 10 days.

Inclusion criteria

- Females between 14-45 years of age
- Non-infective type of white discharge per vaginum
- White discharge due to vaginal cause and cervical cause

Exclusion criteria

- Infective vaginitis

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- Discharge due to foreign body, chemical douche or latex condom
- Neoplasm

Diagnostic criteria

White discharge per vaginum with or without mucus, yonikaṇdu (vaginal itching), śītalata (coldness), kaṭīśūla (law back pain), udaraśula (abdominal pain), arocaka (anorexia) and bhrama (giddiness).

Observation and result

Maximum number of patients belonged to age group of 26-30; 93.33% were married, 100% was having cardinal symptom of śvetasrava and 50% was using oral contraceptive method (Table 1).

Effect of the treatment on cardinal symptoms of śvetapradara was highly significant in both the treated group, whereas in control group the result was insignificant at the level of 0.05. Both the drug showed highly significant (0.001) result in yonikaṇdu (vaginal itching) and śītalata (coldness) (Table 2). The result was insignificant in yonivedana (pain in the vagina) in all the three groups.

Effect on general symptoms: - In-group 'A' kaṭīśūla (law back pain), udaraśūla (abdominal pain), piṇḍikodveṣṭana (cramps in calf muscle), bhrama (giddiness) and daurbalya (weakness) showed highly significant result. Similarly, Group 'B' also showed highly significant result. Arocaka (anorexia) was found completely relieved in 61.53% of the patients in Group B. This indicates that both the drug have kaphahara property. In group A all the results except udaraśūla (abdominal pain) were insignificant ($p>0.05$).

Effect on local pathology:- Both the drugs showed highly significant results in cervical erosion and in vaginitis it was significant at the

TABLE 1

Distribution of patients according to sex, age, etc.

Parameters	Total (in %)
1. Age-group	
- 26-30	50
- 20-25	20
- 15-20	10
2. Marrital status	
- Married	93.33
- Unmarried	10
- Widow	20
3. Occupation	
- Employee	83.33%
- Unemployed	16.67%
4. Diet	
- Vegetarian	73.33 %
- Non-vegetarian	26.67%
5. Dehaprakṛti	
- Vātakapha	50%
- Vātapitta	30%
- Kaphapitta	20%
6. Contraceptive method used	
- Oral	50%
- IUCD	10%,
- Tubectomy	30%
- No contraception	10%
7. Chronicity	
- <1 year	i6.67%
- 1-2 years	33.33%
- 2-3 years	26.67%
- 3-4 years	16.67%
- >4 years	6.66%
8. Cardinal symptoms	
- Śvetasrava	100%
- Yonivedana	63.33%
- Yonikandu	86.67%
- Śītalata	60%
9. General symptoms	
- Kaṭśūla	100%
- Udaraśūla	70%
- Bhrama	70%
- Arocaka	86.67%
- Piṇḍikodveṣṭana	90%
- Vibandha	23.33%
- Dourbalya	96.67%
10.PIS, P/V findings	
- Cervicitis	13.33%
- Cervical erosion	20%

TABLE 2
Effect of mayaphala and dhātakīpuṣpa on cardinal symptoms of śvetapradara

Cardinal symptoms	Group - A (Māyāphala)						Group - B (Dhātakāpuṣpa)					
	Mean		SE	't'	p	%	Mean		SE	't'	p	%
	BT	AT					BT	AT				
Śvetapradara	2.5.	0.6	0.1	19.00	0.4.78 <0.001	76.00	2.70	0.4	0.21	10.98	4.78 <0.001	85.18
Yonikaṇḍu	1.9	0.6	0.25	5.16	4.78 <0.001	68.42	1.8	0.5	0.21	6.1	4.78 <0.001	72.22
Śītalata	1.30	0.6	0.15	4.58	3.25 <0.01	53.85	0.8	0.3	0.19	2.55	2.26 <0.05	62.50
Yonivedana	1.20	1.0	0.13	1.50	2.26 >0.05	16.66	1.00	0.7	0.15	1.97	2.26 >0.05	30.00

level of 0.05. But in cervicitis, only Group B showed significant results.

Discussion

In tṛdoṣa, kapha is the main dosa, which produces śvetapradara. Atipravṛtti of kapha is the main symptom hence drugs having stambhana and kaphahara properties should be used. Both māyāphala and dhātakīpuṣpa have kaṣāyarasa, laghu-rūkṣa-guṇa and kaṭu-vipāka. They were administered internally as they have stambhana and kaphahara properties - this was the main criteria in selection of these drugs.

Conclusion

The overall effect of the treatment showed complete cure in 40% of the cases, marked improvement in 23.34%, improvement in 6.66% and unchanged in 30% of cases. It was concluded that both the drugs have doṣaviparīta, vyādhiviparīta properties; and due to their kaṣāya rasa, they do the upaśoṣaṇakarma and due to rūkṣaguṇa, they reduce kapha, kḷeda and stambhana which is needed in śvetapradara.

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HYPOTHYROIDISM - AN ĀYURVEDIC PERSPECTIVE

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Abstract: Man is suffering from various kinds of diseases that are often caused by physical and mental disorders. And a great number of such diseases are contributed by the disturbances in endocrinal function of the body. One of the common and most prevalent endocrinal syndromes is hypothyroidism and it share almost similar position like diabetes. In the present context an effort is made to develop an understanding towards the syndrome and possibly use principles of āyurveda in a practical approach towards the management part of the same.

Introduction

Hypothyroidism is a clinical syndrome which results from the deficiency of thyroid hormones. Usually, it runs a chronic course with slow and insidious onset. Sometimes it is only accidentally diagnosed. Thyroid gland abnormality, where, on one hand influences body metabolism up to a great extent, on the other hand, it affects functioning of other glands too. It is found more in females with ratio of male to female being 1:6. If left untreated it can lead to severe complication.

Signs and symptoms

Symptoms:- Tiredness, weakness, dry skin, feeling cold, hair loss, difficulty in concentrating and poor memory, constipation, weight gain with poor appetite, dyspnea, hoarse voice, menorrhagia (later oligomenorrhea or amenorrhea), paresthesia and impaired hearing

Signs:- Dry coarse skin; cool peripheral extremities; puffy face, hands, and feet (myxedema); diffuse alopecia, bradycardia, peripheral edema, delayed tendon reflex relaxation, carpal tunnel syndrome and serous cavity effusions

Āyurvedic perspective

In āyurveda there is no clear cut evidence of hypothyroidism, but on the basis of its clinical presentation, it can be correlated with different entities which one explained either as symptoms or diseases, so it is difficult to give a single āyurvedic term for it. There are many systems which involves in the pathogenesis of hypothyroidism. The mixed signs and symptoms of all these systems leads to a complex clinical picture of hypothyroidism. The various entities which correlate with the hypothyroidism are Rasapradoṣajavikāra, atisthūla, galgaṇḍa, pāṇḍu and kaphajaśotha.

Rasapradoṣaja vikāras:- Bojana aśradha (aversion to food), aruci (anorexia), mukhavirasta

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(tastelessness), rasājñānata (loss of taste perception), hṛllāsa (nausea), gaurava (heaviness of the body), tandra (lethargy), aṅgamarda (body ache), jvara (fever), pāṇḍu (ananemia), srotorodha (blockage of micronutrient channel), kḷaibya (infertility), aṅgasāda (lethargy), kṛśaṅgta (leanness), agnināśa (loss of digestive power) and ayatākāla vali and palita (premature graying of hairs and wrinkling). All the symptoms except kṛśaṅgta and jvara match with the generalised symptoms of the hypothyroidism.

Atisthūla:- Āyuśraṣa (diminished vital strength), javauprodha (inability to perform activities), kṛchavyāyata (reduced sexual vitality), daurbalaya (general weakness), durgandha (foul smelling), svedabadha (excessive perspiration), kṣudatimātra (excessive hunger) and atipipāsa (excessive thirst). The symptoms durgandha, svedabadha, kṣudatimātra, atipipāsa did not match with the symptoms of the hypothyroidism.

Gaḷagaṇḍa:- In Samhitas, three types of gaḷagaṇḍa are described viz. a) vātaja, b) kaphaja and c) medaja. In the present context gaḷgaṇḍa is correlated with the goiter-associated thyroid disorder. In modern medicine, the goiter is classified into three: i. Simple goiter. [It is further subdivided into: (a) colloid goiter, (b) diffuse parenchymatous and (c) nodular (adenomatous)], ii. Goiter with hypothyroidism and iii. Goiter with hyperthyroidism i.e. toxic goiter.

From the āyurvedic point of view, if see the three varieties of goiter on the basis of doṣa-dūṣya siddhānta, it can be correlated with three types of galgaṇḍas i.e. i) vātaja gaḷagaṇḍa (can be correlate with toxic goiter), ii) kaphaja gaḷagaṇḍa (can be correlate with hypothyroidism) and iii) medaja gaḷagaṇḍa (can correlate with simple goiter). The symptoms of the hypothyroidism which match the kaphaja gaḷaganḍa is the presence of goiter.

Pāṇḍu:- Karṇaśavarda (tinnitus), mandāgni (diminished digestive power), durbalata (generalised weakness), sāda (lethargy), annadaveṣa (aversion to food), śrama (exertion), bhrama (vertigo), gātraśūla (generalised body ache), jvara (pyrexia), śvāsa (dysponea), guruta (heaviness), aruci (anorexia), gātrapīḍa (generalised body ache), akṣikūṭaśotha (periorbital edema), kṛśata (leanness), romapāta (falling of hairs), kāntināśa (loss of lusture), kopana (irresistibility), śiśara dveṣi (intolerance to cold), nidrālu (sleepiness), kṣṭīvana (excessive salivation), alpavāk (reduced talking), piṇḍikodveṣṭana (cramps in calf muscle), kaṭi ūru pāda ruk sāda (pain in lower extremities) and ārohaṇa āyāsa (exertion in climbing). The symptoms śvāsa, kṛśata, jvara does not simulate with the symptoms of hypothyroidism. The rest of the symptoms match exactly .

Kaphaśotha:- Guruta (heaviness), sthirata (persistence), pāṇḍu (anemia), aruci (anorexia), lālapraseka (excessive salivation), nidra (excessive sleep), vamana (vomiting), agnimāndhya (loss of digestive capacity) and kṛchajanma praśama sopha (slow arise and settling of edema). The kapha śotha is simulated with the myxedematous condition of the hypothyroidism in addition to the generalised symptoms of the hypothyroidism.

General symptoms

Hypothyroidism presents sings and symptoms in many systems. For the critical study of the signs and symptoms in the light of āyurvedic principals, the relationship of doṣa and dūṣya in each sign and symptom of hypothyroidism has to be studied.

Doṣa:- Clinical picture shows the dominance of kaphadoṣa. Majority of the nānātmaja roga of kaphadoṣa can be included as a signs and symptoms of hypothyroidism. As Caraka said, whiteness, coldness, heaviness, firmness, unctuous-

ness, numbness, obstruction, chronicity, etc. are the effects produced in the body by the action of kapha; the condition accompanied with any of the above symptoms should be diagnosed as a kapha disorder[1].

Dūṣya:- Duṣṭi of rasadhātu plays a major role in pathogenesis. Many of rasajavikāras as mentioned by Caraka are similar to the clinical features of hypothyroidism[2] i.e. aśradha (negligence), aruci (anorexia), gaurava (heaviness), tandra (tiredness), aṅgamarda (pressuring pain), pāṇḍuroga (anaemia), kḷaibya (infertile), srotorodha (channel obstruction), agnimāndya (low digestive power), etc. Hormonal disturbances are the dysfunction of agni (digestive fire). Rasadhātvāgnimāndya leads to rasavṛdhi and over production of mala of rasadhātu i.e. mala-kapha-vṛdhi. The involvement of doṣa, dhātu and dhātvāgni is more clear by following comparison of signs and symptoms:

Anorexia: - It is due to mandāgni by influence of kapha doṣa and rasa duṣṭi.

Constipation: - From the āyurvedic point of view, the apakarṣaṇa gaṭi of mahāsrotas, which play a role in anulomana of mala and vāyu, gets to slow down, owing to the aggravated kapha in pakvāśaya with increase of mandaguṇa of kapha.

Weight gain: - Weight gain occur because of guru guṇa of kapha doṣa and pṛthvi and jala mahābhūta involved in kapha doṣa. It can also be considered as, hypometabolism i.e. hypofunctioning of dhātvāgni.

Hoarseness of voice: - Śārṅgdhara has mentioned hoarseness of voice as a kaphaja vikāra[3]. It can also say that, due to increase in mandaguṇa of kapha, hoarseness of voice appears.

Anaemia: - According to āyurveda, pāṇḍutva is due to rasaduṣṭijanya as well as kapha doṣa[4].

Menstrual disturbances: - Rasavṛdhi occurs in hypothyroidism as augmented rasa is in asthāyi avastha (unstable state). It may be unable to nourish upadhātu ārtava and uttaradhātu rakta. As a result of this ārtava pravṛti (menstration) is disturbed.

Coldness: - Propagation of rasadhātu and kapha doṣa with its śītaguṇa leads to coldness[5].

Coarse and dry skin: - Augmented rasa can not nourish raktadhātu and leads to dryness and coarseness of skin[6].

Coarse, dry-hair and hair loss: - Dhātvāgnimāndhya leads to augmentation of dhātu which can not nourish uttara dhātu i.e. asthi which results in coarse and dry hair or hair loss[7].

Bradycardia: - Bradicardia may result from propagation of kapha with its mandaguṇa.

Excessive sleep: - Kaphavṛdhi causes tandra and atinidra[8]. It also leads to excessive sleep[9].

Forgetfulness: - It is said that, natural state of kapha is strength (bala) for the body. But in hypothyroidism, kapha is in vitiated state. As a result the three types of bala - dehabala, agnibala and manobala - are diminished. Abated manobala may cause forgetfulness.

Generalised pain: - Hypothyroidism can be considered as dhātvāgnimāndyajanyavikāra. Aggravation of vāta by vaiṣamya of dhātus create generalised aches and pain. Aṅgamarda is mentioned as a rasaja vikāra[10].

Sluggishness: - Sluggishness means slowness in performance. Ālasya and aṅgaśaithilya can be included in it. Due to the increased of manda guṇa of kapha, results lack of enthusiasm for performing any work[11]. Śithilata is the symptom of rasavṛdhi[12]. Caraka also mentions that śithilata as a rasaja vikāra[13]. Vāgbhaṭa considers śithilata and ālasya due to kaphavṛdhi and rasa vṛdhi[14].

Weakness: - Capability or strength for doing work or exercise depends upon the normal state of dehadhātu. Dhātuvaiṣmya leads to daurbalya and kḷama. Balakṣaya is included in a nānātmaja vyādhi of kapha doṣa.

Puffiness of the face: - Vitiated kapha obstructs rasavāhisrotases. As kapha is composed by ap (water) and pṛthvi (earth) mahābhūtas and dominated by properties of heaviness and steadiness, thickened features and puffy features appear.

Myxedema: - This non-pitting type of oedema found in hypothyroidism is due to increase in mucoprotein ground substance. This is due to sthiraguṇa of kaphadoṣa. All the above symptoms indicate the involvement of kaphadoṣa, rasadhātu and rasadhātvāgni in hypothyroidism. Above all kapha doṣa plays a major role in the disease hypothyroidism.

Duṣṭi of rasadhātu plays an important role in pathogenesis. Dhātvāgnimāndya is a major feature of the disease. Etiological factors aggravate kaphadoṣa resulting jaṭharāgnimāndya and dhātvāgnimāndya. In hypothyroidism, hormonal disturbances make many metabolic disturbances and decrease in basal metabolic rate which leads to this pathogenesis. Many signs and symptoms are related with decreased metabolism. Vāgbhaṭa has mentioned this pathogenesis clearly. According to him, the part of the jaṭhrāgni, its exacerbation and diminution causes respective dhātuvṛddhi and dhātukṣaya[15].

Samprāpti ghaṭakas

For the study of manifestation of hypothyroidism in the light of āyurvedic concepts of doṣa, dūṣya and srotas, involvement the following factors play their role in samprāpti of hypothyroidism.

- Doṣa - a) kapha - avalambaka kḷedaka, b) vāta - Samāna
- Dūṣya - Rasadhātu
- Agni - Jaṭharāgni, rasadhātvāgni, bhūtāgni (mainly earth and water)
- Srotas - Rasavahasrotas, manovahasrotas
- Srotoduṣṭi - Saṅga, vimārgagamana
- Adhisthāna - Sarvāṅga (whole body)
- Udbhavasthāna - Āmāśaya
- Prasara - Rasāyanies
- Rogamārga - Bāhya and ābhyantara
- Āma - Jaṭharāgnimāndyajanita, dhātvāgnimandyajanita
- Vyaktisthāna - Śarīra

Sādhyāsādhyata

The prognosis of the disease is both sādhya and yāpya; the cause behind the disease should be detected first, then the regime of the auṣadha (medicine), āhāra (diet) and vihāra (activities) should be decided. Since the main causative factor is agnimāndya and if the management is quite effective in dealing with the proper management of the agni, then it is prognosed as sādhya.

Suśruta says that, the patient of gaḷagaṇḍa who breaths with difficulty, whose whole body has become flaccid, whose disease has lasted more than a year, who has anorexia, who is emaciated and has hoarseness of voice, is incurable[16]. According to modern science, the prognosis is good in case of adult hypothyroidism which return to normal health after treatment. In cretinism, the condition should be diagnosed before neurological damage and treated as early as possible, otherwise neurological abnormalities may not reversible with therapy.

Management

Hypothyroidism is not as such mentioned in ayurveda, but on the basis of its clinical presentation it can corelate with kaphaja gaḷagaṇḍa for local symptom related with thyroid gland, and rasaja-vikāra, pāṇḍu, kaphajaśotha for its

general symptoms. Basically the idea behind the treatment is kapha-dominated vātadoṣa-cikitsa in which the paittika guṇas of the śarīradhātu has to be elevated and the elevatation of the guṇa should be according to the samprāpti of the doṣas.

General treatment

Since the disease is maximally having auto-immune origin and the etiology is obscure, the treatment should be according to the following principles:

Firstly laṅghana i.e. the four śodhana karmas, and also pipāsa, vāyusevana, ātapasevana, uses of pācanadravyas, upavāsa (hunger) and exercise should be incorporated in the life style on regular basis[17]. Here vāyusevana is considered as prāṇāyāma because the lungs are an important organs for elimination of toxins and their metabolites dissolved in the blood in gaseous form. The volatile substances dissolved in blood are easily excreted with the exhaled air. Exhalation is very effective way of elimination of lipophilic substances in gaseous form. This is explained by the great closeness of capillary and alveolar membranes which are thin and allow exchange of gases.

Here, ātapasevana is the mode of rūkṣasveda, and svedana is the method in which sweating is induced. In conditions of intensive sweating, excretion of toxic substances with the sweat may reach considerable amount. Some metals like cadmium, copper, iron, lead, nickel and zinc may be excreted in large amount with sweat.

Use of pācanadravya is advised to enhance the digestive power and stimulate the liver and thyroid functions. Pācana drugs like śuṇṭhi and pippali are famous for their alkalising and detoxifying properties. This measures cause increase of diuresis and alkalisation which helps elimination of toxins by the kidneys. And the same time the water demand of the body increases due to diuresis. This demand is compensated by the accumulated interstitial oedema.

In upavāsa it is advised to have a diet having low level of protein, carbohydrate and fat, since high protein diet significantly influences the re-absorption and excretion of urine. pH (the acidity) of urine is very important for the elimination of weak electrolytes. If the urine is alkaline, the elimination of weak acids is increased. If the urine is acidic, weak acids are re-absorbed and their excretion is reduced. The diet has a strong influence on pH of the urine and is an important factor determining the degree of elimination of numerous toxins. High protein diet causes acid urine. At the same time diet having low protein, carbohydrate and fat causes breakdown of glycosaminoglycans, since thyroid hormone deficiency affects every tissue in the body, so that the symptoms are multiple. Pathologically the most characteristic finding is the accumulation of glycosaminoglycans - mostly hyaluronic acid in interstitial tissues. Accumulation of this hydrophilic substance accounts for the interstitial oedema that is particularly evident in the skin, heart muscles, and striated muscle. The accumulation is due not to excessive synthesis but to decreased destruction of glycosaminoglycan

The interpretation of pipāsa is to minimum intake of water content; because water when ingested tends to accumulate as interstitial oedema after associating with glycosaminoglycans. And when the oral ingestion of water is restricted, the water content associated with glycosaminoglycans is utilized to meet the metabolic demands and thus reduce oedema.

The benefits of exercise are: i) fasten the breakdown of the glycosaminoglycan and ii) mobilize

the accumulated fat tissue and help in dissolution of fat cells causing lowering the metabolic demands of thyroid hormone.

Four śodhanakarmas are: vamana, virecana, vasti and nasya. Vamana and virecana are meant to remove the accumulated toxins (hormone-binding inhibitors) that block the receptors of thyroid hormone thus increase the demands of thyroid hormone and lower the circulating auto-antibodies to T4. In snehapāna, Triphalādi and Pippalādi ghṛtas give better results. Phalatṛkādi-lekhanavasti (triphala, guḍūci, nimba, āragvadha, vidaṅga, kulatha and madanphala in kvātha dravyas, and vaca, hapuṣa, yaṣṭi, pippali in kalka dravyas) was administered in hypothyroidic patients in Pañcakarma unit of N.I.A. Jaipur and was found quite effective in significant reduction of T.S.H. level and increase in T4 level and also relief in sign and symptoms of hypothyroidism. Nasya could be used for pituitary stimulation in compensatory secondary hypothyroidism.

Symptomatic treatment

- Anorexia - Administration of liver stimulant and appetizer (arocaka cikitsa)
- Constipation - Snigdha virecana
- Weight gain - Atisthūla cikitsa
- Anaemia, menstrual disturbances could be corrected by pāṇḍucitiksa (Punarnavā maṇḍūram is a liver stimulant, diuretic and iron supplement).
- Coldness - Svedana (sāgni and niragni)
- Coarse and dry skin and hair and hair loss - corrected by abhyaṅga, śiroabhyaṅga and nasya
- Excessive sleep and sluggishness - Nasya.
- Generalised pain - Snehana and svedana.
- Puffiness of the face and myxedema - (kaphaja śotha and pāṇḍu cikitsa) diuretics, svedana.

Few indications for management

1. Cauṣatha prahri pippali is given for rasaja vikāras. It also increases selenium absorption that have important role in thyroid hormones metabolism
2. Bhallātaka (*Semecarpus anacardium*) is śothanaśaka (anti-inflammatory), dīpana (digestive), pacana (carminative), śitapraśamana (calefacient), kapha-vātaśamaka (pacifier of vāta and kapha), pittavardhaka (aggravate pitta), hṛdayottejaka (cardiotonic), and kāmottejaka (aphrodisiac). It also increases dhātvāgni. All these qualities of bhallātaka are beneficial for the treatment of the symptoms of hypothyroidism. Bhallātaka is specially anti kaphadoṣa, as Caraka mentions that there is no disease of kapha, which cannot be cured quickly by the use of bhallataka[18].
3. In Bhaiṣajyaratnāvali, Kāñcanār guṭika has been specifically described for the gaḷagaṇḍa treatment. It contains triphala (the three myrobalans), trikaṭu (*Zingiber officinale*, *Piper longum* and *Piper nigurm*) kāñcanar chhal (*Bauhinia variegata* bark), guggulu (*Commiphora mukul*) and madhu (honey).
4. Citraka (*Plumbago zeylanica*) is mentioned as śothahara (anti-inflammatory) and gaḷagaṇḍahara by Suśruta.
5. Devadāru (*Cedrus deodara*) is also useful in śotha and gaḷagaṇḍa, particularly in kaphaja gaḷagaṇḍa (Bangsena).
6. Vṛndmādhava and Bhāvaprakaśa have prescribed kṣāra of jalakumbhi for gaḷagaṇḍa.
7. Lekhanīya Mahākaṣāya (decoction with revulsives drugs) can also be used in hypothyroidism
8. Drugs used in kaphaj śotha - Punarnava (*Boerhavia diffusa*), lohabhasma, harītaki (*Terminalia chebula*), kuṭaki (*Picrorhiza*

kurrooa) and niśotha (*Merremia turpethum*) could be used .

9. Daśamūla could be used as śothahara (anti-inflammatory)

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ANALYTICAL STUDY OF VAṄGABHASMA

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Abstract**:** Vaṅgaśodhana was done by dāḷana in cūrṇodaka and nirguṇḍīkvātha mixed with haridra cūrṇa. Vaṅgamāraṇa was done by apāmārga jāraṇa and kumāri bhāvana. In FTIR, the only very strong and very broad band between 4000-500 cm^{-1}wave numbers appears between 640-670 cm^{-1} is due to tin oxygen tin bridge bond (Sn-O-Sn) signifying the polymeric structure of tin dioxide. EDX ray analysis revels that, Vaṅgabhasma contains 66.43% of tin. FESEM of Vaṅgabhasma revel clusters having smallest particle size and most dense structure.

Introduction

Loha that are having therapeutic importance are described in classical texts. So many herbal, mineral and animal origin drugs are used for śodhana (purification) and māraṇa (incineration) procedures. Clinically, Vaṅgabhasma is used abundantly as individual bhasma and along with other compound formulations. It is specially used in genitourinary disorders.

Materials and method

Vaṅga (tin) and associated materials were used for this preparation. The methods adopted were dāḷana (melting the metal and pouring in liquids), jāraṇa (roasting) and māraṇa (incineration) and the references followed as classical Rasaśāstra texts.

Śodhana:- Sāmānyaśodhana (general purification) was done by applying dāḷana process using cūrṇodaka (lime water) for seven times. Viśeṣaśodhana (specific purification) was done by using nirguṇḍī kvātha (decoction of *Vitex negundo*) mixed haridra cūrṇa (powder of *Curcuma longa*) for three times.

Māraṇa: - Māraṇa was carried by following jāraṇa and puṭa process. Jāraṇa process was done by using apāmārga pañcāṅga (coarse powder of *Achyranthus aspera* - whole plant). Jāritavaṅga was triturated with kumāri svarasa (juice of *Aloe vera*) and puṭa was given by using electric muffle furnace at temperature 600° C maintained for an hour. This was repeated for six times to obtain Vaṅgabhasma.

Results and conclusion

Slight loss in weight was noticed after sāmānyaśodhana due to process handling and fine particles which remained uncollected cause loss in the material. After viśeṣaśodhana slight gain in weight was noticed due to oxidation of tin metal or compound formation or due to addition of organic materials present in herbal drugs used

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for dāḷana. During jāraṇa, weight gain was seen due to oxidation of vaṅga and addition of remnants of apāmārga. During māraṇa weight loss was seen initially and later slight quantity of weight gain was occurred. Weight gain may be due to formation of vaṅga (tin) into compound form (Table 1)

Fourier Transmission Infrared Spectroscopic Analysis:- The first set of spectra in general shows small broad bands between 3400-3450, 2920-2925, 1460-1630 and 1020-1140 (Fig. I). All these bands are due to stretching and bending of OH group which is attached to tin as tin hydroxide SnOH. These bonds cannot be due to loose/ unbounded water molecules or lattice water molecules because such a water molecule is lost between 100-150°C. The only very strong and very broad band between 4000-500 cm^{-1} wave numbers appears between 640-670 cm^{-1} is due to tin oxygen tin bridge bond (Sn-O-Sn) signifying the polymeric structure of tin dioxide as shown below:

```
   |    |    |    |    |    |    |
Sn-O- Sn-O- Sn-O- Sn-O- Sn-O- Sn-O- Sn-
   |    |    |    |    |    |    |
   O    O    O    O    O    O    O
   |    |    |    |    |    |    |
Sn-O- Sn-O- Sn-O- Sn-O- Sn-O- Sn-O- Sn-
   |    |    |    |    |    |    |
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Field Emission Scanning Electron Microscopic Analysis:- Micrograph of vaṅga showed flakes like structure, their size varying from 150 µm to 300µm. Micrograph of jāritavaṅga showed less cluster formation but with small particles size than raw material. Micrograph of Vaṅgabhasma showed clusters having smallest particle size and most dense structure (Fig. IIa-c)

Energy dispersion X-ray Analysis:- It was found that the raw sample vaṅga contains 88.70% and bhasma contains 66.43% elemental tin along with trace elements. The elemental composition of (wt %) vaṅga and Vaṅgabhasma is shown in Table 2

TABLE 1
Rresults of sāmānyaśodhana, viśeṣaśodhana, jāraṇa and māraṇa.

Weight (g)	Sāmānya	Viśeṣa	Jāraṇa	Māraṇa
Initial	280	273	80	80
Final	278	273.37	86	81.34

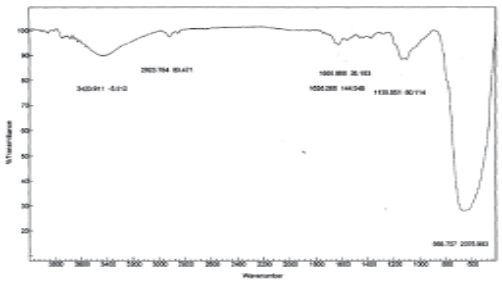

Fig.I.
Fourier transmission infrared spectroscopic analysis

TABLE 2
Elemental composition of (wt. %) vaṅga and vaṅgabhasma

Elements	Sample	
	Vaṅga	V1 sample
1. C	1.68	06.97
2. O	4.21	20.39
3. Mg	0.38	0.72
4. Al	0.41	0.38
5. Si	0.58	0.53
6. K	0.35	1.20
7. Sn	88.70	66.43
8. Ca	1.40	1.83
9. Fe	0.94	1.15

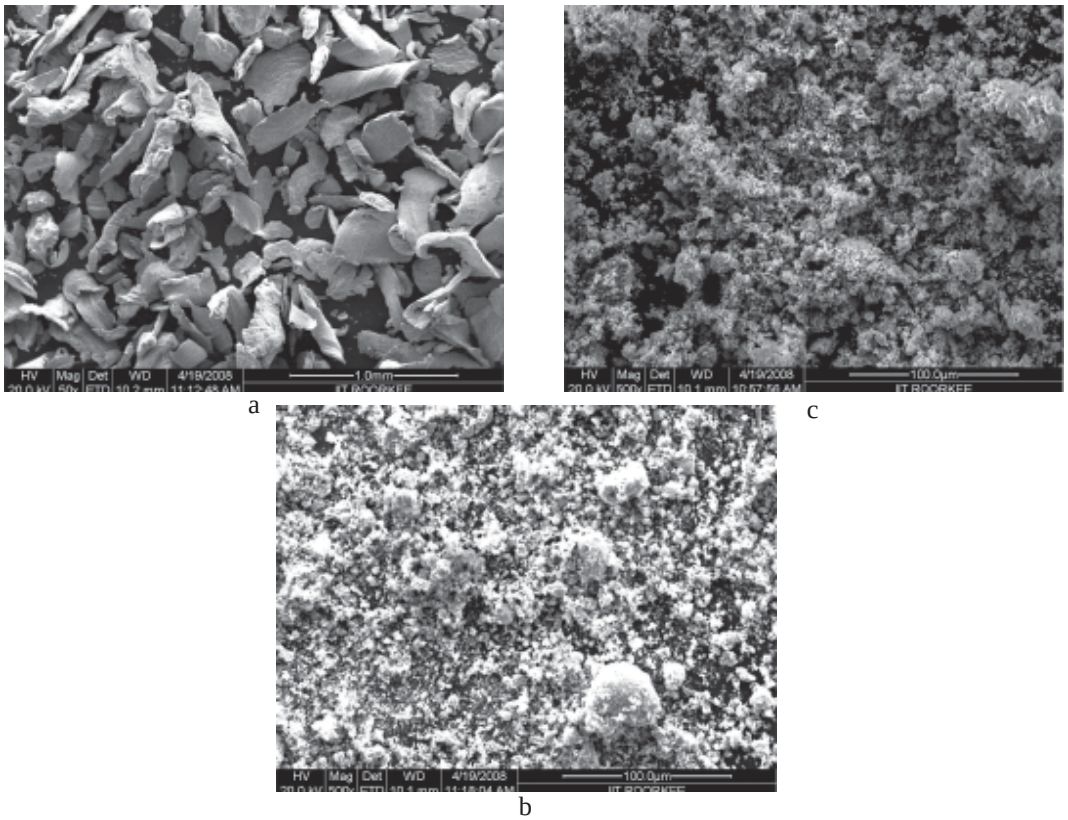

Fig.IIa-c : Field Emission Scanning Electron Microscopic Analysis

a Micrograph of vaṅga; **b** Micrograph of jārita vaṅga; **c** Micrograph of Vaṅgabhasma

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