LINK Natural Products Digest

Vol.1 Issue 2
September - October 2005

LINK NATURAL PRODUCTS (PVT) LTD

LINK Natural Products Digest

Volume 1, Issue 2, September-October 2005 ISSN : 1391-8869

IN THE PAGES THAT FOLLOW.....

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NATIONAL HEALTH CARE & AFFORDABILITY

In a small developing country such as Sri Lanka, Human Capital is the valuable asset we have. It has a proven record of quality in intelligence, the ability to pick up new techniques and technologies, and good brain and muscle co-ordination. For national development it is crucial that our resource of human capital is maintained in a healthy viable state. This is where healthcare assumes such importance. It is not sufficient for the country to boast of a level of healthcare second to none in the region or even the world. The equation must also include the factor of distribution and accessibility. A minimum of the requisite healthcare facilities must be available to the poorest in the remotest regions of the island. We have the asset of a good base healthcare system, with good trained personnel, some of whom are exemplary in skill and dedication. We also have the additional asset of a trusted traditional system of indigenous medicine, which is an asset we have yet to utilize to the full in the post-independence era. Both systems of medicine must forge a symbiotic service in the country and engage into a local research and development system. In the light of this requirement there are several worthy considerations that merit attention in this new millennium.

Firstly, there is the large question of the paucity of funds to enable the healthcare system to flourish. Healthcare in the modern context is indeed costly. There is also some concern as regards trust in the competence, the wisdom, the commitment, and the ethics of the healthcare system itself. This includes, the medical officers, the para-medical personnel, pharmaceutical companies and their agents, pharmacies and their personnel who retail the drugs, storage of pharmaceuticals, clinical, physical, and biochemical testing and diagnostic laboratories, and a variety of other service providers, who constitute the complex modern national healthcare system.

Equally, there are concerns in regard to the traditional system itself. This too reflects the flaws in the analogous constituents of the system like the quality of the medication provided even by factory-based suppliers, the training and competence of the personnel who deliver the services, and the authenticity of the promotional propaganda provided via the media, mostly, the electronic media.

In general many who have been hospitalized for any length of time have had to find out the hard way, the agonies, trials, and tribulations, of the transformation from a patient in need of care, into a hapless victim of the overpowering medical machine. Few could withstand the machinations of this with its endless maze of treatments, often not explained to the patients, or their kith and kin, examinations, diagnostic tests, and even complications resulting from all this.

Economic considerations leave no alternative to the option, that health costs must indeed be brought down, and that healthcare be made accessible to the poorest at an affordable price. Costs must be brought down so that the government can provide it to the needy. To do this the government will have to take considerably strong initiatives to utilize the best in alternative systems like our traditional indigenous medicine, by assisting and enabling it to benefit from modern science and technology. In doing this it will have to set forth strict legislative measures to ensure that bogus claims are not likely to endanger the health of the public.

Much use will also have to be made of the newly emerging systems such as Aromatherapy, Acupuncture, and other forms of complementary medicine, in addition to herbal medicine. Even the UK Government is considering the use of these and their report on Complementary Medicine is a worthy initiative.

Our own allopathic medical personnel are loathe to recommend even the proven Ayurvedic remedies when warranted. Obviously they are not in tune with modern scientific trends. One factor is that the subject of Phytotherapy, which is an integral part of the medical curriculum in Europe, is not so in the UK system, where most of our practioners have had their training. So Phytomedicines, so much the vogue in European countries are sadly unknown to Sri Lankan medical practitioners. Thus our population is deprived of a whole range of well-established medicines. After all, scientific intervention developed modern medicine from their own herbal origins to the present state and prowess.

Factory developed herbal medicines, now emerging in Sri Lanka too, have considerable advantages such as the following:

* Correct authentication of the plant species used.
* Ensuring of correct dosage proportions
* Scientifically optimized process protocols that closely simulate the original traditional methods
* Modern formulations that ensure stability and clinical efficacy
* Dependable Quality Control.

The above presupposes that the factory concerned has the needed scientific skills and expertise as well as the hardware to ensure quality assessment and control procedures at all stages of the production process.

The government can set in motion initiatives that will assist such factories particularly in the production of Herbal Health Care products and Ayurvedic generic products.

Another alarming factor of modern medical practice which is discussed openly by even conventional medical practitioners, is the prevalent over use of antibiotics especially among infants and children. Apart from the expense, the negative effects are well documented. Despite all warnings, antibiotics are still recklessly over-prescribed even for conditions for which they are ineffective such as viral illnesses. This undoubtedly increases the national expenditure on healthcare. The same applies to the over-use of the instrumental diagnostic tools, at great expense to the patient. The maxim: "Is this really necessary" should receive serious consideration.

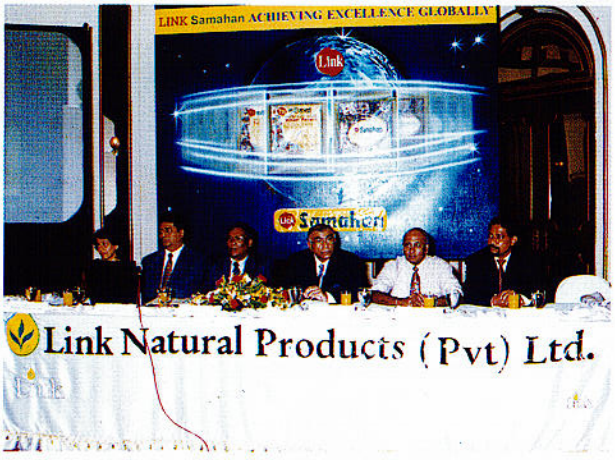
Measures by government, and even professional organizations, and private sector companies, that could help integrate use of alternative therapies such as Ayurveda in national healthcare, and reduce present reckless over-emphasis on antibiotics and spurious test reports, may contribute substantially in reducing the national healthcare expenditure. It would also help in the effort to make healthcare available to the many who need it and can ill afford what is available.

Dr. Andrew Wiel, M.D. the noted American Physician stated thus: "There is a herbal product from India, it is one of India's most famous herbal drugs, .. its called Thriphala. It is a bowel regulator, not a laxative; It is something you stay on regularly. It can be very helpful to you ....." In Larry King Live, 13th January 2004.

RECALLING THE LAUNCH OF *SAMAHAN* IN INDIA

SAMAHAN is now recognised as an essential household remedy for colds and flu. It is the "flagship" product of LINK.

In recalling the launch of Samahan on the 25th of February 2000 in Chennai, India, we reproduce the Key note address made by the Chief Guest, Dr. R.O.B. Wijesekera, then Chairman, National Science and Technology Commission of Sri Lanka.



Mr. Chairman, distinguished guests, Managing Director, and officials of Link Natural Products,

I count it as a very great privilege to be able to come here and participate in the launching of what is the first pharmaceutical product manufactured in Sri Lanka to be launched outside its shores. I must say that I am conscious of the fact that that herbal products are extremely familiar to the people of this great country.

It may be worthwhile to commence by recalling that mankind has enjoyed a symbiotic relationship with the plant kingdom ever since the dawn of civilization itself. Man's search for food gave rise to his discovery of plants that were safely edible, plants that were harmful, and plants that had healing properties. So, over the millennia since those early days, plants had been associated with healing. I don't need to remind you that there were several cultures in the millennia before the Christian era. These cultures developed the association of man with plants as the main source of healing agents. Many may be quite familiar with the Arabian culture, the Greco-Roman culture, the cultures of the Indus valley, the Chinese culture, the cultures of southern America such as the Inca and the Maya, the cultures of the African region, and even of Europe and Scandinavia; and all of these had one common feature. This was the association with plants for food and medicine. All of their healing agents came from plants. Today's plant-derived therapies therefore, owe much to the knowledge of the past, the methodologies derived from all these cultures, and there is evidence that they had even intermingled with each other.

Now Ayurveda is the dominant practical methodology that is associated with the Indian sub-continent, and the civilizations that grew from it. Doubtless Ayurveda itself derived much from the other contemporary systems of the time namely the Unani system, which itself is a derivative of those Arabian systems.

In Sri Lanka we identify Ayurveda as a combination of several systems, of which it is the main influence. There are interventions within it from the *Deshiya chikitsa* our own system, which prevailed prior to the influence of Ayurveda. Our Ayurvedic system is also influenced by the Sidda system from the Dravidian influence, and of course the Unani system as well. However Ayurveda is the dominant influence.

Ayurveda, when it reached countries like Sri Lanka, Myanmar, Nepal, Thailand and even Indonesia, and Malaysia, in time, absorbed some of the characteristics of the indigenous systems. It has been noted that one of the guiding principles of Ayurveda was "where the disease is, there lies the cure too". So the endemic plants of the habitat came sometimes to be absorbed in the plant prescriptions. This is very much evident in Sri Lanka. For instance where Ayurvedic preparations in India use the species *Berberis aristata,* in Sri Lanka the species *Coscinium fenestratum* is used. Both species contain the yellow alkaloid Berberine. There are many such examples in the countries neighbouring India, where plants of local origin comprise the Ayurvedic formulations. Thus in the Sri Lanka Ayurvedic Pharmacopoeia (SLAP), the influence from all of the systems is evident. This extends also to methodologies and formulations and is evidently inspired by the philosophy that has been mentioned before, *viz.* that: "where the disease is there must lie the cure".

What we are launching today is an example of a factory-produced modern preparation from the Sri Lankan Ayurvedic Pharmacopoeia. I am indeed referring to Ayurveda in its Sri Lankan context now, reminding you that this includes all the other influences that have been mentioned. What do we get as an advantage? In the modern context it is not often possible to prepare medicines in the home. Consider it; - picking herbs from the home garden, having grown them yourselves, preparing the prescription according to the prescribed methodology - this is no longer feasible in the milieu in which most of us live. So the factory-produced product has come in for the convenience and the expediency of the consumer. This same phenomenon is occurring all over the world even in all of the cultures from which plant medicines were derived. What are the advantages of factory-based production?

Firstly the plant material is authentic, because it has been identified and quality checked. There is a fidelity to the original prescription, as one does not take liberties that cannot be rationalized. The same is true of the regimen. Then, the dosage form can be controlled and monitored. The Total Quality Management reaches out from the raw material stage to the final product. The product therefore is faithful to the original formula, and more than if one were to do it in the home, where a certain element of waywardness would come in. Modern scientific methodology ensures the consistency and quality of the product. Indeed the quality management extends from the plant procurement stage through the process stage to the stage at which it reaches the consumer.

So what is the philosophy of the modern scientifically monitored drug development system for the Ayurvedic medicines? None could have expressed this better than that great Prime Minister of India, Shree Jawaharlal Nehru. He said:

"Learn all you can from the knowledge of the past, but do not imagine that the last word could have been said thousands of years ago."

What the great leader of India meant was quite simply this: Study all the old knowledge with all the tools of modern science and technology. Then use these tools to derive the best benefits from that knowledge. This indeed is the philosophy that should guide all modern drug development from plants. And what I have just said is, I know, the philosophy that the Company LINK NATURAL PRODUCTS has adopted in the development of its unique SAMAHAN that is presented here today.

First of all the rigorous requirements of quality assessment and control are well up to international level, this means Total Quality Management (TQM). The company conducts a continuing R & D surveillance on the products for not only quality but also for adherence to process protocols, quality of product, packaging, and storage life as well. So this makes product development and marketing of it a continuous exercise.

What is the stated GOAL of the company? It is to offer to the consumer, safe and efficacious products, faithful to the original formula, in convenient modern dosage forms and packaging. SAMAHAN is indeed an embodiment of this philosophy.

There is an almost unequivocal acceptance these days of herbal products. In fact it is a rage in the affluent nations of the world. There are, of course the hiccoughs, because all producers are not conscious of the need to conform to standards in products or the drug development process. That will take time and in time it can and must be achieved, because the larger portion of the world's population is dependent on these products. Then there is also the economic factor. Are the products affordable to them? These products can be produced in dosage forms that are economically accessible to even the poorer peoples of the world – the large majority of whom cannot afford the treatment in the allopathic systems of medicine.

Then there is the acceptance because of the merit of the herbal products. Today there is a global search for plants with immune related activity. HIV has accelerated this search. Ayurveda has much to offer in this direction. Samahan too is something that acts by stimulating the immune system against the flu virus. There is the global interest in drugs for anti-inflammatory activity; for cardio-active drugs, and others.

There are ample examples where research on drugs used in Ayurveda has contributed to allopathic medicine. The mechanisms associated with Ayurvedic healing have been a neglected area and merits research. I do hope that the proven efficacy of SAMAHAN will stimulate research into its mode of action. How it works will give important clues as to our immune systems response to such herbal products.

I have great pleasure in presenting SAMAHAN to our Indian consumers, on behalf of the Company. I say that it is a well-organized, well researched, and well-produced product, which is very popular in Sri Lanka and accepted where ever it has been informally introduced.

Permit me to end by quoting to you from the *Rig Veda:*

"GRANT US OF BOONS, THE BEST. A MIND TO THINK, A SMILING LOVE, ABUNDANT WEALTH, ABOVE ALL A HEALTHY BODY, SPEECH THAT IS WINSOME, AND DAYS THAT ARE FAIR"

This wish I hope will be yours, and everybody's.

Thank you all.

Ayurvedic Generic Therapy

Ayurvedic philosophy promotes the concept of a full span of life of quality as a useful member of the community. Ayurveda seeks to achieve this end by its diet, regimen and therapy.

'Rasayana' or Rejuvenation therapy as prescribed in Ayurveda is meant to improve the quality of life of older people. The great physician Charaka stated that Ayurvedic therapy aims to ensure that an individual is endowed with longevity, memory, intellect, health, agility, a healthy skin, strength of sensory and motor organs and vitality.

Rasayana therapy aims at keeping the enzymes in the tissues and cells in prime functioning condition. The cells are revitalized, tranquility of the mind is promoted, nerves and bones are kept in good condition.

Ayurveda is that which deals with good, bad, happy, as well as unhappy life, what promotes it, and what retards or obstructs.
Translation from Charaka

LINK FELICITATES DR. R.O.B. WIJESEKERA.....

Text of speech delivered by Dr. Devapriya Nugawela at the felicitation ceremony held at Hotel Taj Samudra on 27 March 2005.

Dr. R.O.B Wijesekera, Mrs. Wijesekera, the Members of Wijesekera family, Our most distinguished invitees,

It is my pleasure and very great privilege this evening, to welcome you all on behalf of LINK Natural Products. This occasion is indeed a unique one, and we value your presence here, doubly because of the special nature of it.

We have gathered here to felicitate one of our unique scientists whose contribution to science has received deserved recognition in this country and worldwide. We are further privileged in being able to have the felicitation lecture delivered by none other than Dr AL Jayewardene. Dr Jayewardene is one of the first research colleagues of Dr ROB Wijesekera having obtained his doctorate degree under his tutelage. I may be permitted here to recall some of the early days of research at the then CISIR where I too was a humble researcher at the time. The research work on Natural Products at the time by the team led by Dr Wijesekera was a landmark event. For his leadership and the quality of his research he won in 1976, the Guinness Medal for Scientific Achievement awarded by the Commonwealth Science Council. It was the very first time that scientific research carried out in a Sri Lankan laboratory was internationally recognized. Dr Jayewardene had been an able lieutenant in his team of researchers. Industry at the time, I refer in particular to the essential oils industry, was at a comparatively primitive stage. The Natural Products team at the CISIR was the pioneer in introducing the new dimensions of instrumental analyses to studying the composition of the essential oils of Sri Lanka. The CISIR group did detailed studies on the chemical composition of the oils of Sri Lankan Cardamom, Citronella, Cinnamon bark and leaf, Eucalyptus, Clove, Nutmeg etc. They also enabled the SLSI to be the first to introduce instrumental analytical standards for essential oils even before the ISO had stipulated such sophisticated methods. Dr Jayewardene accompanied Dr Wijesekera to attend the historic International Conference on Spices in 1972 where Dr Wijesekera delivered an invitation lecture describing his group's work at CISIR. This was the beginning of the recognition that the Sri Lankan industry was being well founded with a sound scientific base. It is obvious that this knowledge rapidly spread among the marketing circles internationally, and Sri Lankan essential oils came to be accepted and recognized for their quality. I may mention that subsequently the PAFAI or the Perfumery and Fragrance Industry of India, honoured Dr Wijesekera with the award to him of the prestigious NC Shah Memorial Award in recognition of his contribution to the industry, internationally. It was understandable that UNIDO too recognized his expertise and sent him on a technical mission to six countries along with the celebrated Mr. Govind Kelkar - the leading Fragrance baron of India.

I do not think that it is necessary to list national and international positions held by Dr. Wijesekera as all of you know him very well. His distinguished services to science and technology for over 50 years has been recognized by many scientific bodies in Sri Lanka, such as National Science and Technology Commission, Industrial Technology Institute, National Science Foundation and Sri Lanka Association for the Advancement of Science. This occasion is for LINK Natural Products to acknowledge and felicitate him for his contribution to the development of industries in Sri Lanka and abroad.

Dr. Wijesekera's association with LINK Natural Products started in 1982, the year the company was formed. Soon after the formation of the company, Mr. Wimoo Jayawardhane and myself together with Dr. Lakshman Jayewardena, the speaker today, worked for months and distilled several essential oils.

The next task was to find markets. With samples, a hurriedly produced brochure and a list of potential buyers I headed west and Mr. Jayawardhane headed east, in search of export orders for essential oils. First I went to the UK and had meetings with several essential oil buyers. Even after about ten days, I could not secure a single order. According to the initial plan my next destinations were France and Germany. But I was thoroughly upset and wanted to give up everything and return to Sri Lanka. By that time Mr. Jayawardhane had already returned to Sri Lanka with similar results. I changed my ticket and went to Vienna where Dr. Wijesekera lived at that time.

During my stay with him he listened to me, consoled me, corrected the brochure - both contents and English. He also gave a call to a friend in Hamburg and asked me to go there and meet him. Dr. Wijesekera's friend met me on arrival, took me to the hotel and gave me an address of an essential oils buyer in Bremen and asked me to meet him on the following day. I met that buyer on the following day, showed him samples and discussed. Immediately, I received the first export order of LINK Natural Products - 200 kg of Nutmeg Oil. I still do not know how Dr. Wijesekera performed this. Initially I thought he paid for the order, but the customer is still buying from us.

From that point onwards Dr. Wijesekera has been a part of LINK Natural Products, guiding the research and development team on product development and quality control. Providing valuable ideas and literature to the marketing team, starting the company journal - LINK Natural Products Digest, and performing the duties of the Chief Editor. We are proud to have him as a member of our Board of Directors.

The Speaker today Dr. Lakshman Jayewardena is an Honours graduate in Chemistry from the University of Ceylon. Immediately after graduation in 1967 he joined the Natural Products Group of Dr. Wijesekera at the CISIR. He was the righthand man of Dr. Wijesekera in all his pioneering work on Essential Oils, and obtained his Ph.D while working with Dr. Wijesekera.

Dr Jayewardene left CISIR and Sri Lanka in 1989 and took up a position at the University of California, San Francisco, where he had to steer away from his original interest in essential oils. It speaks volumes for his versatility and ability that he has made an equally significant contribution to research in his new field.

There can be none better suited than Dr Jayewardene to deliver this felicitation lecture to honour Dr Wijesekera and we are indeed privileged to have him today. So distinguished guests, may I ask you kindly to welcome and greet Dr AL Jayewardene, himself a scientist of the highest caliber, and may I call upon him to deliver the felicitation lecture.

Note by editor

The text of Dr. A. L Jayawardena's felicitation lecture is to be published in a future issue of Link Natural Products Digest

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Response by Dr. R.O.B. Wijesekera

Dr Devapriya Nugawela, Chairman of LINK Natural Products, Members of the Board of Governors, Friends, relations and well wishers,

It is a joyous occasion for a scientist, now in the extreme twilight of a long and varied career, to have his contributions to Science and Society recognized. I therefore receive this personal honour with much happiness and deep humility.

I particularly appreciate the endeavours of colleagues Deva Nugawela and Tuley de Silva, for enabling the felicitation lecture, delivered by no less a person than Dr AL Jayewardene. He, alongside myself, and the late Dr. Drupatha Fonseka, pioneered the researches on Essential Oils and Spices at the CISIR in the 1970's, involving the latest techniques of the time. He must indeed take equal credit for what we accomplished.

Our strategy was to build up a strong knowledge base on the subject. This enabled us to understand the problems concerning the industry and drew the industry to us. It was a successful strategy and enabled us to work alongside industry. It was mutually beneficial. It was in contrast to current methods. In those times industry was attracted to us on account of our knowledge base and we did not have to chase industry. We benefited from interaction with industry in that it gave us an insight to the real problems. I keep emphasizing this as a strategy, but few listen.

Science during those days, in the decades of the sixties and the seventies, was a somewhat informal activity. Tea was served in the labs in beakers! Work went on in shirtsleeves, and our lab coats had never seen a laundry! Jokes, and sometimes song and doggerel rent the air! The atmosphere was decidedly creative! The few instruments we had were looked after like household pets. We worked long hard hours, because our labs were a haven, and because we were curious and impatient. Most of all we enjoyed our work thoroughly. Things indeed have changed. Today, with "contractual research" and "demand-driven research" and such weird concepts, things indeed have to be different. However, in my view there is no replacement for the elements of dedication, thirst for knowledge, determination and joy in ones work, for success in scientific research.

After a very long career, one has to say that scientific research is indeed a strange activity. Progress is never smooth or predictable. Often it may follow a winding course, as through an uncharted rain forest, emerging now and then to a sudden burst of sunlight, and then getting lost again, and sorely troubled, not being able to see the great wood itself because of so many trees. Thus for any success, we have to pursue and persevere, till we see the light and begin to understand. It is by no means and easy mission, but it is a very satisfying one.

Tonight, I like to thank first of all Dr. Lakshman Jayewardene, for the nostalgic and wonderful felicitation lecture, and all my other collaborators over the years who made all things possible. There are many of them all doing very well - several overseas, and in this country too.

My renewed thanks to Devapriya Nugawela and Tuley de Silva, together with all my colleagues at LINK Natural Products, for making this splendid event possible; and once again tonight I am grateful to all those who shared my work, and supported me in a variety of situations. I must indeed acknowledge the debt I owe my wife, whose encouragement and ideas stimulated my work, and who was a great source of strength in difficult times. Finally may I thank all of you, friends, colleagues, and family for your presence here with us tonight.

Thank You

PHOTOGRAPHS FROM THE FELICITATION AT TAJ SAMUDRA

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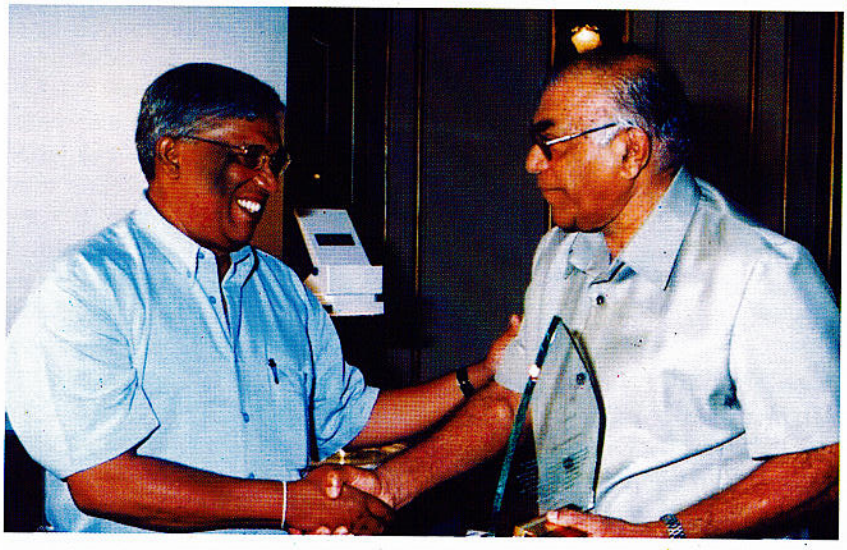

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1. Dr. Devapriya Nugawela, Chaiman & Managing Director of Link Natural Products, speaking on the occasion

2. Dr. Nugawela, Dr. Wijesekera (centre) with Prof. Tissa Vitharana, M.P, Minister of Science & Technology

3. Dr. A. L. Jayewardena delivering the Felicitation Lecture

4. Dr. Wijesekera being presented with a momento by Dr. Nugawela

5. A section of the audience at the Hotel Taj Samudra

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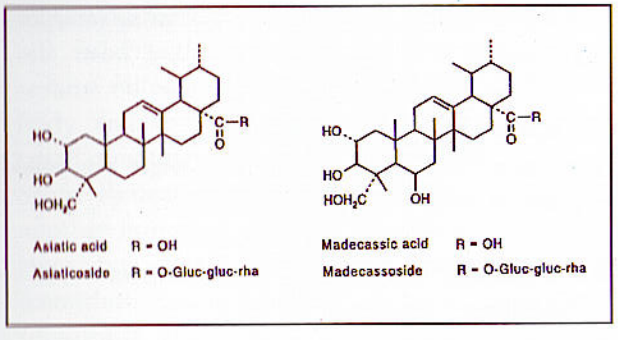
PROFILES OF SELECTED AYURVEDIC REMEDIES, FACTORY-PRODUCED BY LINK

GOTUKOLA TEA

The popular herb Gotukola is botanically identified as *Centella asiatica* L. (Fam. Umbelliferae). It is a prostrate herb with a short vertical rootstock and glabrous axillary stems with long internodes. It occurs in India, Sri Lanka and other tropical and subtropical countries. It is a very common weed in Sri Lanka - growing in waste grassy places from sea level to the highest elevations. In Sri Lankan households it is a popular vegetable as a salad, or in herbal porridges, or cooked sometimes as a *pol kiri baduma* that is boiled in coconut milk till the water evaporates.

Chemically, the plant (leaves and leaf stem) are known to contain a group of compounds known as triterpenoids, which exist as their glycosides. There are two main glycosides namely asiaticoside and madecassoside. The two respective aglycones (ie. the molecule stripped of its sugars) are Asiatic acid and Madecassic acid. In a standard extract there will be 35-45% glycoside and 55-65% aglycone approximately, when assayed by means of HPLC (High Performance Liquid Chromatography).



According to traditional medicine of South Asia, extracts of *Centella asiatica* have been used for the treatment of leprosy, varicose ulcers, lupus and certain obstinate eczemas. More recent pharmacological investigations and clinical observations have confirmed a positive contribution of *Centella asiatica* extracts to the healing of skin wounds, burns and duodenal ulcers (1). The most beneficial effect is the stimulation of maturation of the scar by production of type I collagen and the resulting decrease in the inflammatory reaction and microfibroblast production (2).

Creams containing extracts from Gotukola have recently been used in the treatment of "stretch marks" following pregnancy. In a clinical trial, oral administration of *Centella asiatica* to 87 patients with chronic venous hypertensive microangiopathy for 60 days was found to improve the micro-circulatory parameters (3).

The water soluble fraction of the herb is reputed to possess distinct health related properties. It is recommended for children to enhance mental alertness and to the elderly to fortify memory. In Ayurveda, its value is noted right across the age spectrum – from pediatric to geriatric. In the case of school children the Ayurvedic system strongly recommends Gotukola porridge as an item of daily diet, or Gotukola tea as a beverage. This, it is claimed, will serve to fortify the memory capacity of children.

Centella asiatica is an ubiquitous plant and is found all over tropical Asia, and even in parts of Africa. The sinhala term Gotukola was popularized by the American pharmacognosist Prof. V. Tyler in his book "*The Honest Herbal*".

Now LINK Natural Products gives the public a *Gotukola tea* in a conventional tea bag presentation.

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(2). Widgerow, AD., Chait, LA, Stals, R. and Stals, PJ. *Aesthetic Plastic Surgery* (2000) May June 24(3), 227-234

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GLOSSARY 3 * :- SOME LIQUID FORM AYURVEDA PHARMACEUTICALS

Complied by R. Gamage and Asanki Yatigammana

1. Expressed juices *(Svarasa)*

Juice expressed out of a fresh drug by mechanical pressure is *Svarasa*. The part of the drug is washed, cleaned (and crushed) and then juice is extracted out. Some of the juices recommended for specific conditions include,

* Juice of Emblica myrobalan – rejuvenating, digestive, appetizer, beneficial for eyes, hyperacidity and diabetes
* Pomegranate juice – appetizer and digestive

2. Decoction *(Kvatha)*

Decoction is prepared by boiling drugs in water and then straining.

* Decoction *Dasamoola*
* Decoction of Thriphala mixed with honey
* Decoction of *Phyllanthus emblica* (Emblic myrobalan)

3. Medicated milk preparation *(Ksirapaka)*

Milk processed with medicinal herbs is called medicated milk. Cows' milk is boiled with coarsely powdered drug and water, and filtered. Some herbs used in *ksirapaka* include,

* *Allium sativum* (Garlic) – This is useful in hyperlipidaemia (increased cholesterol), arthritis, sciatica, etc.
* *Zingiber officinale* (ginger) – The ingredient here is powdered dry ginger. It is useful in arthritis and abdominal problems like indigestion, pain in stomach, etc.
* *Withania somnifera* (Aswagandha) – This is prepared with powder of Aswagandha roots. It increases weight, improves body immunity and rejuvenates body cells.
* *Piper longum* (long pepper) – The fruits are used to prepare *ksirapaka*, and is used in treating liver diseases, bronchial asthma and as a general tonic.

4. Cold infusion *(Hima kalpana)*

Cold infusion is prepared by mixing one part of crushed herb in six parts of water, leaving overnight, and filtering it. Cold infusions are prescribed in cases of excessive thirst, burning sensation, diabetes and chronic conditions of fever.

5. Warm infusion *(Phanta kalpana)*

Warm infusion or fluid is obtained by mixing one part of powdered herb in eight parts of water, leaving to cool, and straining it for use. Tea is a good example of warm infusion. Medicinal tea can be prepared by adding ginger, basil, cardamom, mint, cinnamon, etc to attain different types of medicinal effects.

6. Beverage *(Panaka)*

Fruits such as mango, pomegranate, grapes, orange or pineapple is crushed and juice is expressed; sixteen parts of cold water is added into them and mixed well – this drink is called *Panaka*. Different fruits are prescribed in conditions such as burning sensation, urine infections and fever.

7. Squash *(Sharbat/sarkara)*

Fruit juices and double quantity of sugar are boiled together to obtain a thick syrup.

8. Fermented medicinal preparations *(Asava / Arista)*

Fermented alcoholic product of crude drugs *(Asava)* : These are the self-generated alcoholic preparations obtained through fermentation of raw herbal drugs along with honey, jaggery, etc. in earthen vessels.

Fermented alcoholic product of aqueous extract/decoction of drugs *(Arista)* : Those prepared in the same manner above, through fermentation of the decoction of the herbal drugs.

* For Glossary 1, and Glossary 2, *Vide;* Digest Inaugural Issue & Vol. 1 Issue 1

EXTRACTED FROM:

Sethi, R. (2004). Health Drinks – Ayurvedic concept, *Natural Products Radiance.* Vol 3(1) January-February, 2004

AYURVEDA SHODHANA CHIKITSA (PURIFICATION THERAPY) - PANCHA KARMA

R. Gamage and A.Yatigammana

Pancha karma is one of the unique therapeutic procedures in Ayurveda advocated for the radical elimination of disease factors and to maintain the equilibrium of doshas. This purification therapy is said to consist of five parts (hence the term *Pancha karma*), therapatic enemas, therapeutic nasal medication, therapeutic purgation, therapeutic vomiting and therapeutic release of toxic blood. These are considered to be the most radical way to cleanse the body and thereby eliminate, once and for all, the disease-causing humors. It is a system of several therapies and can be applied in different ways. Its methods vary according to the individual, specific disease, season, culture, etc.

Preliminary practices (*Purva karma*)

Preparation : Palliation therapy, consisting of preliminary detoxification and *Ama* reducing methods according to one's humor, is usually followed for a short period prior to *pancha karma.*

Oleation and sweating methods : Application of oils, *Snehana,* also called 'oleation therapy' is an important therapeutic method in Ayurveda, with oils used both externally and internally. Warm sesame oil or medicated oil is applied all over the body and special medicated oils are applied in small quantities to specific disease sites.

Steam therapy or therapeutic sweating : Svedana, is another important method. Sweating is done in a sweat box or with the steam of diaphoretic herbs (camphor, eucalyptus, beki, nika) or with tonics (dasamula and bala).

These are significant parts of *pancha karma* but in addition are useful in themselves for treating various conditions and for health maintenance.

Primary practices (*Pradhana karma*)

a. Therapeutic vomiting (Vamana karma) : Artificially induced vomiting should be approached with care to prevent damage to nerve reflexes. Strong teas of liquorice, salt, calamus, chamomile or lobelia are used here. Vomiting is contra indicated for weak, emaciated, anorexic, convalescent or those suffering from dry cough.

b. Purgation (Virechana) : Virechana is a purgative treatment that cleanses the small intestine and associated *Pitta* dominant organs. A strong purgative is given – aralu, jayapala, trivrith, senna or castor oil. Purgation therapy is contra indicated for the very young, very old, the weak, debilated, emaciated, pregnant or those suffering from chronic diarrhea.

c. Therapatic enemas (Vasti) : Enemas are a mild therapy and can be used for many conditions. These are often given after cleaning enemas as part of follow up practices and rejuvenation. Herbs such as calamus, fennel and ginger are commonly used as cleaning enemas.

d. Nasal application of herbs (Nasya) : Smoking of herbs has direct action on the nasal passage; this is called *Nasya,* what relates to the nose. For the purification of *pancha karma,* cleansing herbs are given through the nose, either as snuffs, decoctions or oils. Good herbs include calamus, mika and gotukola. Nasya allows for direct action on the brain. It has strong decongestion action and allows a more specific application of expectorant herbs.

e. Therapeutic release of toxic blood (Blood letting therapy : In proper application of blood-releasing therapy, toxic blood is taken out of various sites in the body.

Follow up practices (*Paschath karma*)

Pancha karma has several follow up practices. More than one session may be needed to cleanse deep-seated toxins, particularly if shortened versions of *pancha karma* are followed. After *pancha karma,* one should return to a diet and life style in harmony with the constitution. More importantly, if the treatment has been successful, the patient should be ready for a higher form of tonification therapy – to rebuild damaged tissues on a new level of purity and strength.

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PROCESS TECHNOLOGY - *REACHING FOR THE OPTIMUM*

R.O.B. Wijesekera

The Goal of Optimisation

An important factor in industrial processing is the optimization of processes and products. Optimisation is dependent on three major factors namely, economic factors, logistic factors and factors relating to resources.

First of all let us consider what we mean by the term Optimisation. Optimisation of an industrial process constitutes manufacturing a product of the highest possible quality, in the largest possible quantity while expending the minimum cost in regard to raw materials, energy consumption, work and time. So the final outcome of optimization of an industrial operation, in any particular context, must be found among a complex mixture of parameters. These include parameters that are technical, scientific, economic, environmental, social, cultural, as well as other situation specific considerations.

So it follows that to reach the goal of optimization of any industrial operation, in respect of its particular process and products, the organization concerned will have been engaged in a serious research and development effort. Accordingly, time and the capability of the R &D division will be dominant considerations.

Multiple Objectives of the Goal

The primary goal then, of optimization as defined above, will comprise of several objectives such as the following:

* Reduction of the total period of development to a minimum
* Determination of optimal, and, stable and reproducible process conditions
* Enhancement of the safety, efficiency, of the process within minimum cost levels
* Achievement of the best possible product quality
* Ensuring environment-friendly process conditions

Once process optimization is accomplished, the Optimised Process Protocol that will then result will be the exclusive property of the organization that developed it. This optimized process protocol must encompass *inter alia* the following:

* The methodology for producing the product with maximum quality
* The methodology for the minimum cost of production of the product.
* The shortest time for processing of the quality product
* Methodology for environmental friendliness
* Methodologies for social and practical feasibility of the process.
* Methods that ensure reproducibility of process, product quality, and yield.

Thus Scientific Process Optimization (SPO) and thereby the formulation of Scientifically Optimized Process Protocols (SOPP) for each operational process within a factory would present a challenging and often daunting as well as time-consuming task for an R & D division. Logically it has to be carried out with the active collaboration of all of the actors who have a hand in the unit operations that constitute the process. As a consequence it would be very much a cross-disciplinary, and cross-sectional effort to get the best result.

Processes involving Natural Raw Material such as Herbal Products

In the case of processes that involve natural raw materials such as the processing of herbal products, the process optimization and the development of optimized process protocols becomes much more complex. Bio-variability, that is the natural variations in the starting material, introduces another degree of complexity. In the processing of herbal raw materials, the raw material may come in several forms such as leaves, seeds, berries, roots, barks, flowers, grasses, and even exudates. The physical form of each material will be different, and some may be dry and others fresh. Questions will arise as to how the material should be comminuted for processing. The extractability with water or solvents will necessarily vary. Procedures have to be developed so that the best use is made of the raw materials. Optimisation of the procedures now includes added complexities.

On the other hand, in a straightforward chemical process, the physical features and the quality of the starting materials are relatively simple to assess. They would invariably be chemical reactants, having specific physical and chemical properties.

Their purity would be easy to assess by means of standard tests. In the herbal sector the different plant parts make the assessment of the raw material quality in itself a difficult exercise. However it is crucial that the Total Quality Management (TQM) in such processes commences with quality assessment of the raw materials themselves. This is termed Preventive Quality Assessment (PQA).

PQA must precede the preparation and storage of the raw material that will be used in the processing. The determination of appropriate storage conditions, and the optimum range of storage life are also important considerations within PQA. This is more so where the materials are biodegradable.

Optimisation of the Process to Produce Herbal Products

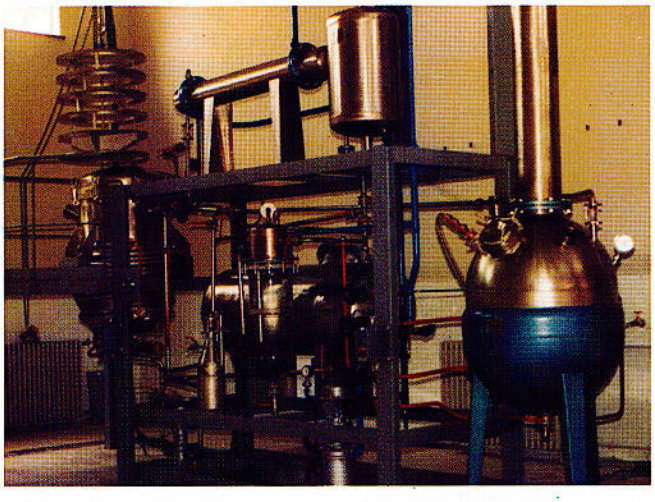
In terms of process technology, there are two basic types of products namely those produced by steam-distillation, i.e. essential oils; and those produced by solvent or water extraction. The description that follows considers the processes of extraction, although in general terms, the observations will be valid for the distillation process as well.

A typical process that employs vegetable raw material as the starting material, and is based on a traditional form of process technology, such as in the case of processing of plant extracts, will bear the following features:

* Quality Control of incoming raw materials for suitability and conformity with specifications
* Preparation of Raw materials (PQA)
* QA / Determination of Optimum Storage Conditions / Time...-> Storage for Processing
* Determining the degree of comminuting / grinding required
* Finalization of the Extraction Parameters; Duration in Time, Pressure, Solvents, Temperature, Packing in Extractor, etc.
* Filtration / Separation from extracted material
* Generating the Miscella, (Extract in solvent) and Marc. (Residue)
* Miscella: Working up the Miscella by desolventisation, ie. Removal or partial removal of the solvent.
* Marc: Discard or for use as fertilizer, environmental safeguards being observed.
* Miscella Concentrate : QA/QC. Prepare for inclusion in dosage forms.
* Preparation of Product based on required specifications. QA of basis of product. Physical features, Chemical analysis, Spectral data, Standard tests etc.
* Packaging, Market considerations

Process Protocols for Herbal Products and Property Rights.

It will be clear that production processes, for herbal products, constitute complex mechanisms of primary reactions, side reactions and a plethora of factors to control. The process technology therefore, cannot be described on the basis of a simple chemical equation. Processing natural raw materials are most complex, and cannot be represented in simple terms. Synthetic processes are more predictable in chemical terms. In these processes, optimization can often be achieved by the use of statistical methodology, such as regression analysis, to enable prediction of the reaction results, based on model systems. The qualitative factors involved in the processing of natural raw materials do not lend themselves to be integrated into such statistical methodology. Accordingly the parameters that the process technology involves in the case of natural raw materials have to be examined painstakingly, and the optimum conditions worked out after many scientifically monitored trials. The optimized process protocols therefore would have cost a company very dearly in terms of R & D expenditure, the skill of the workers and their dedication. Since there will be no innovative component, except perhaps the idea itself, such protocols, cannot be safeguarded by patents and have to remain in the domain of trade secrets, with the attendant risks involved. Many famous branded products have remained thus for decades. Thus the systematically optimized process protocols (SOPP) become the precious intellectual property of the company or organization that develops them. It is difficult to safeguard them and they are most vulnerable in the case of industrial espionage. It is therefore important to develop confidence and reliability among those privy to the details of such protocols, and this is the best way to ensure that the property rights are not jeopardized.a



BIOTECHNOLOGY IN THE HERBAL PRODUCTS INDUSTRY

Asanki Yatigammana

Plants are a valuable source of medicinal compounds, but the natural habitats for medicinal and aromatic plants are disappearing fast. Along with environmental and geopolitical instabilities it is increasingly becoming difficult to acquire plant-derived compounds. This has prompted industries as well as scientists to consider the possibilities of investigation into *in vitro* culture as an alternative supply to traditional agriculture, for the production of secondary plant metabolites.

In vitro micropropagation for mass production of true-to-type plants, and culture of plant cells for the extraction of secondary metabolites, have attracted the interest of many scientists and industrialists the world over. One of the reasons for this is the development of techniques of plant tissue culture; and secondly, the potential of some plant culture systems for the production of important compounds being demonstrated. This system can now provide a commercially realistic alternative to whole plants for the production of some drugs. However, it should be pointed out that the yield from products of *in vitro* culture needs to be increased in order to make it more commercially viable than that of whole plants which do not require sophistication like *in vitro* culture. The methods could prove to be useful for the production of compounds on a large scale.

Well known advantages *of in vitro* culture are:

a) Increase of the rate of propagation of plants.
b) Rapid multiplication of plants which do not give seeds or whose seeds have a low germination capacity.
c) Availability of plants throughout the year, i.e. in all seasons.
d) Resistance of plants to insects, disease and herbicides.
e) Uniform plants of a selected genotype.
f) Production of uniform clones from highly heterozygous plants.
g) Production of plants with changed genotypes (polyploid, haploid hybrids).
h) Conservation of genetic resources of species and threatened plants.
i) Plant improvement by regeneration technique in conjunction with *in vitro* cell manipulation.

In vitro cultures for the production of valuable secondary metabolites have for sometime been recognised as a means of avoiding many problems such as short supply and heterogeneity. Theoretically by growing undifferentiated tissues *in vitro* large amounts of biosynthetically active tissue could be generated under conditions in which both seasonality and time specificity of production would be circumvented. Thus it would be possible to grow large quantities of biomass for the production of complex secondary products by fermentation. But in practice, this is not always the case. This is due to the non-amenability of many plants to grow in culture. Furthermore, of those that could be easily grown under suitable conditions, many may lack desired biosynthetic activity, or yield very low concentration of the commercially most important secondary products. On the other hand, absolutely unknown compounds have been isolated from plant cell cultures although it is doubted that all these compounds really do occur in the respective plants. Table 1 lists some secondary metabolites obtained through *in vitro* culture of plants used in the traditional system of medicine.

Sri Lanka, like many other countries in the Indian subcontinent, has the favourable climate for the growth of most of the plants which are used in the Ayurvedic system of medicine. The rich biodiversity of this country, as well as the damage to it, has attracted much attention throughout history. The World Conservation Monitoring Centre has classified Sri Lanka under group three which includes 'islands or groups of islands which have fewer species in total, but have a large proportion of native species (endemics) that occur nowhere else'.

Despite there being a climate conducive for the cultivation of most herbs used in Ayurveda, the general practice has been to import the bulk of the raw material from India, Pakistan, etc. Authenticity and quality of the imported raw material, as well as the large expenditure have been major issues discussed at many a forum at varied levels of authority.

One of the major drawbacks of large scale cultivation of medicinal plants has been the lack or shortage of quality planting material. Traditional propagation methods very often do not produce sufficient stock for a large scale cultivation; stem cuttings take too long to regenerate and seeds are sometimes not viable.

Table 1 : Some culture secondary products obtained through in vitro culture

Species	Products/Compounds	Culture type
Anethum graveolens	Scopoletin	Root
Atropa belladonna	Hyoscyamine, Scopolamine	Root
Catharanthus roseus	Ajmalicine, Catharanthine Cephaeline	Root
Cinchona ledgeriana	Hyoscyamine, Scopolamixie	Root
Datura spp.	Hyoscyamine	Root
Digitalis lanata	Digitoxin	Root
Hyoscyamus spp.	Hyoscyamine, Scopolamine	Root
H. niger	Coniferin	Root
Papaver somniferum	Thebaine	Root
Pimpinella anisum	Aromaline, berbarine	Root
Valeriana officinalis	Valepotrates	Root
Zingiber officinale	Geranial, neral,6-gingerol	Root
Atropa belladonna	Hyoscyamine,scopolamine	Shoot
Catharanthus roseus	Ajmalicine,Catharanthine	Shoot
Citrus paradisi	Naringin	Shoot
Cinchona ledgeriana	Quinine, Quinidine	Shoot
Datura innoxia	Hyoscyamine,Scopolamine	Shoot
Dioscorea composita	Diosgenin	Shoot
Foeniculum vulgare	Anethole	Shoot
Origanum vulgare	Monoterpenes	Shoot
Papaver bracteatum	Thebaine	Shoot
P. somniferum	Thebaine	Shoot
Pimpinella anisum	Anethole	Shoot
Rauwolfia serpentina	Ajmalidine, Ajmaline	Shoot
Solanum nigrum	Solasodine	Shoot
Withanian somnifera	Withanolides	Shoot
Digitalis lanata	Digoxin	Liquid culture
Digitalis purpurea	Digitoxin	Liquid culture
Papaver somniferum	Codeine	Suspension
Papaver somniferum	Morphine	Suspension
Rauwolfia serpentina	Reserpine	Suspension
Matricaria chamomilla	Sesquiterpenes	Suspension
Pimpinella anisum	Anethole	Suspension
Papaver bracteatum	Thebaine	Callus
P. somniferum	Thebaine	Callus
Mentha piperita	Geraniol,linolool	Callus
Mentha piperita	Menthone, menthol	Callus
Matricaria chamomilla	Sesquiterpenes, a-bisabolol	Callus

Sources: Charlwood *et al.* (1990), Starford (1991), Rhodes *et al.* (1990)

Modern biotechnology and tissue culture procedures are currently used in India, etc for the production of planting material for cultivation. Extensive research is being carried out on various aspects, especially propagation, of plants with high economic value, which are hard to be propagated through vegetative means. The National Medicinal Plants Board of the Ministry of Family and Welfare, India, has identified 32 priority plants for cultivation. The priority plants include *Phyllanthus emblica* Linn. (Nelli), *Saraca asoca* (Roxb.) *De Wilde.* (Asoka), *Withania somnifera* (L.) *Dunal.* (Amukkara), *Aegle marmelos* Correa. (Beli), *Rauvolfia serpentina* Benth. Ex. Kurz. (Ekaveriya) and *Piper longum* Linn. (Tippili), which are identified as important plants in the Sri Lankan context too. Procedures for large scale production through micropropagation have been established for most of the species.

In Sri Lanka the current trend is the application biotechnology for mass production of horticultural plants. Several procedures have been established for many other plant types through research done in Universities and research institutions. The present need is to transfer this knowledge to the industry so that it can be applied for the intended purpose.

In vitro micropropagation is a procedure through which rapid and mass propagation of plants can be

achieved through a relatively short time period, starting from one explant (ie. the plant part which is obtained from the mother plant – shoot tip, leaf, shoot meristem, etc.). After a surface disinfection procedure to eliminate fungal and bacterial infection, the explant is inoculated under aseptic conditions in a semisolid or liquid nutrient medium, supplemented with growth regulators suitable for shoot proliferation (Fig. 1). Subculturing is undertaken at uniform time intervals, and is continued upto approx. 10 levels depending on the plant under consideration (Fig. 2). Next, the hormone combination is modified for root induction and elongation, after which the rooted shoots (Fig. 3) are planted in sterilized soil and maintained in a propagator for acclimatization. High humidity and reduced light need to be provided to the plant during this stage. Once hardened, the plants can be transferred to the field. (Fig. 4)

For most plants, subculturing is not continued beyond 10 - 15 levels in order to prevent the possible occurrence of mutations. Before micropropagated plants are released for cultivation, trueness-to-type can be checked through methods such as Polymerase Chain Reaction (PCR) and Ploidy Analysis.

Fig. 1 :- Initiation of shoot proliferation in *Plambago indica* in MS medium with growth regulators - 2 weeks after inoculation (x1)

Fig. 3 :- A rooted shoot of *Plambago indica* (x1/2)

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Fig. 2 :- Shoot proliferation in *Plambago indica* in MS medium with growth regulators - 4 weeks after inoculation (x1/2)

Fig. 4 :- Micropropagated plants of *Plambago indica* 8 weeks after transfer to the field (x1/4)

HERBAL MEDICINE, PHYTOPHARMACEUTICALS AND OTHER NATURAL PRODUCTS: TRENDS AND ADVANCES

An Account on The International Symposium on held in June 2005, Colombo, Sri Lanka

Herbal Medicine is the use of appropriate plants or plant parts for their therapeutic or medicinal value. It is the oldest form of healthcare known to humanity that has been used by all cultures throughout the history.

In order to acquaint the researchers, industrialists and academics who are engaged in natural products work with the recent developments in the field of herbal medicine, the NAM S&T Centre, in association with the Institute of Chemistry, Sri Lanka, and the National Science and Technology Commission (NASTEC), Sri Lanka, organised an international symposium on 'Herbal Medicine, Phytopharmaceuticals and other Natural Products: Trends and Advances'.

The symposium was primarily designed for the specialists and professionals from the government departments, academic institutions, private sectors and manufacturers in the member countries of the NAM S&T Centre and other developing countries, who are actively involved in production and application of Herbal Medicine, Phytopharmaceuticals and other Natural Products. The main objectives of the symposium were to enhance knowledge in research of natural products, latest practices, identification methods and bioassay techniques; provide knowledge to industrialists and researchers on recent technological advances in the spices and herbal industries, and provide opportunities for international collaborations of mutual benefit.

110 scientists and experts from 15 countries, viz. Bangladesh, Bulgaria, Egypt, Ghana, India, Indonesia, Nepal, New Zealand, Pakistan, Saudi Arabia, Sri Lanka, Syria, UK, USA and Vietnam attended the symposium.

The Symposium and an exhibition of herbal products by various institutions and industries were held in concurrence with the 34th Annual Sessions of the Institute of Chemistry, Sri Lanka. The welcome address by Dr. Lakshmi Arambewela, President of the Institute was followed by the address of the Chief Guest Prof. Leslie Gunatilaka, Director, Centre for Natural Products Research, University of Arizona, USA and Prof. Arun P. Kulshreshtha, Director, NAM S&T Centre.

Dr. R.O.B. Wijesekera, Founder Chairman of NASTEC/retired UNIDO Technical Advisor was felicitated at this occasion, for 50 years of dedicated service to science & technology. This was followed by the Kandiah Memorial Award 2005 Lecture on 'Content, Bioaccesibility, Bioavailability and Bioconversion of Carotenoids in Some Sri Lankan Fruits and Green Leafy Vegetables' by Dr. (Ms.) U.G. Chandrika from the University of Sri Jayawardenepura in Nugegoda, Sri Lanka. The Inaugural Session ended with the Vote of Thanks by Dr. Sujatha Hewage, President-Elect of the Institute of Chemistry, Ceylon.

The Symposium was spread over eight technical sessions. The Sri Lankan Minister of Science and Technology, Prof. Tissa Vitharana, addressed the first session, in which Dr. R.O.B. Wijesekera delivered the Keynote Address and Prof. Leslie Gunatilaka and Dr. Iqbal Choudhary (Director, HEJ Research Institute of Chemistry, International Centre for Chemical Sciences, Karachi, Pakistan) delivered the Guest Lectures on 'Current Trends in Natural Products Research' and 'Current Trends and Future Approaches in Drug Discovery from Plant Resource', respectively.

During the next sessions, Guest Lectures were delivered by eminent delegates. Dr. P. Pushpangadan, Director, National Botanical Research Institute, Lucknow, India delivered a lecture on 'The Need for Scientific Validation and Standardisation to meet the Primary Healthcare of the Third World in the 21st Century', Prof. Tuley de Silva, a former Special Technical Adviser of UNIDO, on 'Quality Control Procedures in Herbal Products', Prof. Murray Munro of the University of Canterbury, New Zealand on 'Drugs from Sea? Linking Biodiversity and Bioprospecting with Drug Delivery', Prof. Vijaya Kumar, Dean (Science), University of Peradeniya and Chairman, Industrial Technology Institute, Sri Lanka on 'Botanical Pesticides from Sri Lankan Plants', and Dr. Alan Cork of the University of Greenwich in UK on 'Technology and Application of Semiochemicals in Pest Control Problems and Perspectives'.

Scientific and country status presentations were made by Experts from Bulgaria, Egypt, India, Indonesia, Nepal, Saudi Arabia, South Africa and Sri Lanka.

The concluding session was devoted to the discussions on plans for further studies of the herbal drugs and their promotion. Several recommendations were drafted, which are expected to be finalised shortly.

Reviewed by Asanki Yatigammana

PROCESS VALIDATION – AN OUTLINE

Compiled by Shamila Wickramaarachchi

Validation establishes documented evidence that a specific process will consistently produce a product that meets its predetermined specifications and quality attributes. It comprises all activities necessary to obtain this documented evidence: planning, organising, measuring, analysing, reporting and approving. It starts before the design of a new product and ends only after the last product ends its functional life. There are various reasons for validating processes. Some include improved customer satisfaction, cost reduction, improved product quality and regulatory requirements.

Process validation is a requirement of the Current Good Manufacturing Practices Regulations for Finished Pharmaceuticals, 21 CFR Parts 210 and 211, and of the Good Manufacturing Practice Regulations for Medical Devices, 21 CFR Part 820, and therefore is applicable to the manufacture of pharmaceuticals and medical devices.

The Food and Drug Administration (FDA) definition of process validation is: "Establishment of documented evidence which provides a high degree of assurance that a specific process will consistently produce a product , meeting its pre-determined specifications and quality characteristics."

Depending on the situation process validation can be mainly classified into two categories namely, prospective process validation and retrospective process validation. Prospective process validation is approached when a company introduces an entirely new product or when there is a change in the manufacturing process which may affect the product's characteristics. On the other hand retrospective validation approach is employed when validating an existing product which may have been on the market without sufficient pre-market process validation.

A validation process consists of at least four distinct steps. They are software validation, hardware (instrumentation) validation, method validation and system suitability (Figure 1).

The validation process begins with validated equipment and validated software. Then a validated method can be developed. Finally all the above things are validated using system suitability.

The timeline approach of the hardware and software validation process can be illustrated as in figure 2.

During the structural and software validation stage, the hardware and software are developed, designed and produced in a validated environment according to the Good Laboratory Practices (GLP), Current Good Manufacturing Practices (cGMP) and/or ISO 9000 standards.

During the next stage, i.e. functional validation or qualification stage, the installation qualification (IQ), operational qualification (OQ) and performance qualification (PQ) are performed. After the instrument is placed on-line in the laboratory and after a period of use, regulations are required to test whether the system is performing with the desired qualities. Maintenance qualification is performed at this stage with the help of calibrations and standardizations.

The next distinct step of process validation is the method validation step. This is the process of proving that an analytical method is acceptable for its intended purpose. For pharmaceutical methods, guidelines from the United States Pharmacopoeia (USP), International Conference on Harmonization (ICH) and the Food and Drug Administration (FDA) provide a framework for performing such validations.

The eight steps of method validation according to United States Pharmacopoeia (USP chapter 1225) are illustrated in Figure 3.

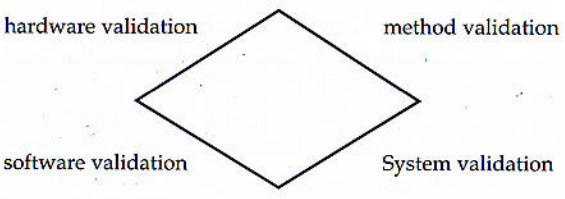

Figure 1: Steps of Validation process

Structural And Software Validation	Functional Validation			Calibration Maintenance System Suitability
	Installation	Operational	Performance	
DQ	IQ	OQ	PQ	OQ, PQ
Before purchase		Before use		After use

Figure 2 : The timeline approach of the hardware and software validation process

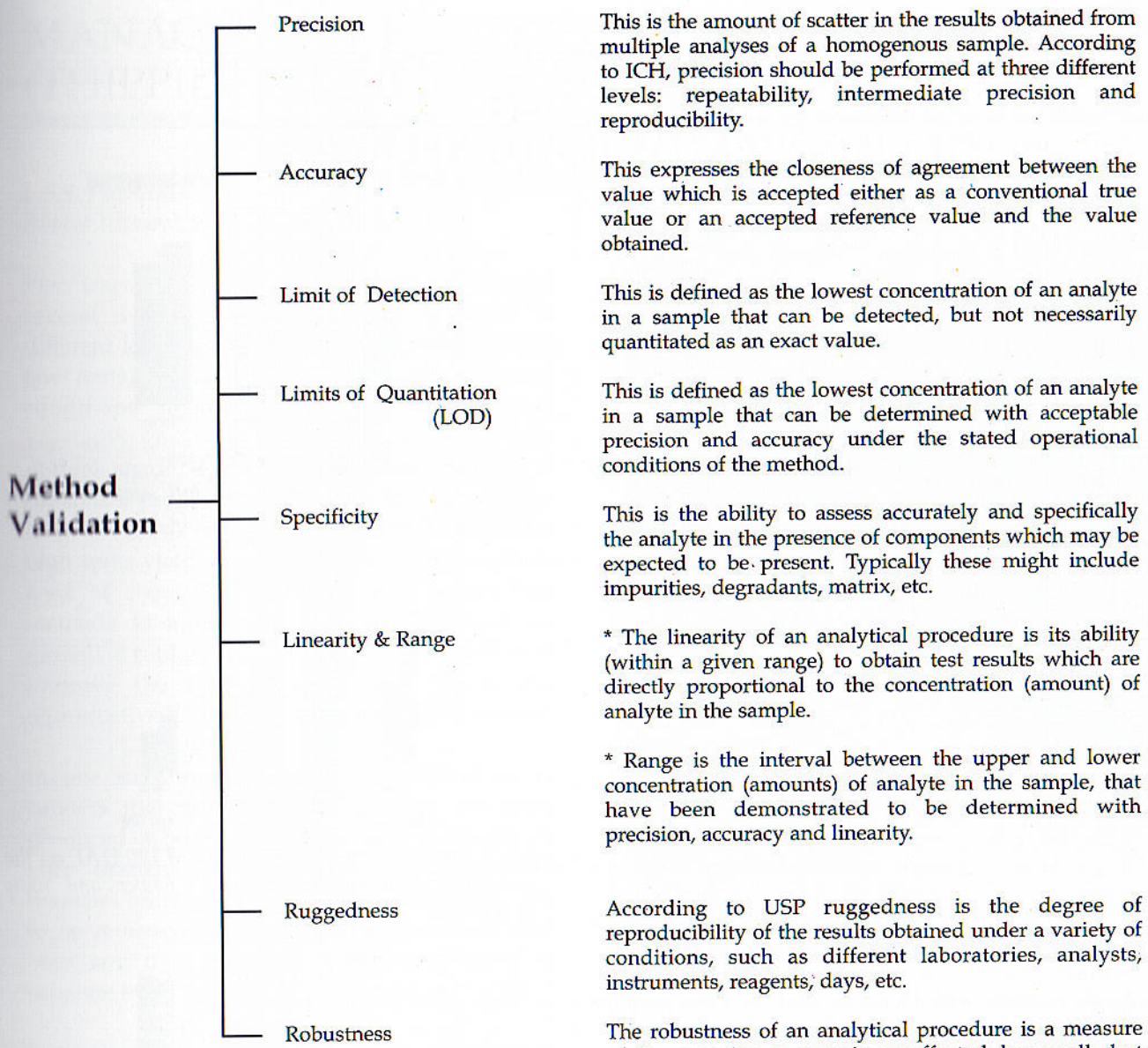

Figure 3: The USP Eight Steps of Method Validation

These steps are also referred to as "analytical performance parameters" or "analytical figures of merit". ICH has described these steps somewhat differently to USP. ICH considers system suitability as a part of method validation, whereas USP considers it as a distinct step of process validation.

The final distinct step in process validation is the system suitability. System suitability testing is an integral part of many analytical procedures. The tests are based on the concept that the equipment, electronics, analytical operations samples to be analysed constitute an integral system that can be evaluated such.

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Orginal Contributions :

EFFECT OF CULTURAL PRACTICES ON YIELD IN *AERVA LANATA* (POLPALA) AND *SOLANUM VIRGINIANUM* (KATUWELBATU)

L. S. S. Pathiratna
Rubber Research Institute of Sri Lanka

Aerva lanata (Polpala) and *Solanum virginianum* (Katuwalbatu) are not usually cultivated but collected from naturally growing stock. They are used in large quantities in Ayurvedic medicine. The present study reports the effect of light conditions under which they grow, type of fertilizer used and harvesting times on yield.

Aerva lanata (Polpala)

Light : The total dry matter yield of *A.lanata* plants grown under 50% light was 35% lower compared to those grown under 100% light at 50 days after planting (DAP). Percentage composition of stems and flowers was also greater in plants grown under 100% light while those under 50% had more leaves (Fig 1).

Harvesting time : *A.lanata* plants harvested at 140 DAP had 27% and 20% more total dry matter (DM) than those harvested at 60 or 100 DAP. Increase of time for harvesting increased the percentage composition of stems and flowers while that of leaves were reduced. (Fig 2)

Solanum virginianum (Katuwalbatu)

Fertilizer : Total DM produced at the 120 DAP in *S. virginianum* was 45.4% or 45.3 % lower when inorganic or organic fertilizer, than when a combined application of inorganic and organic fertilizer was used (Fig. 3).

Harvesting time : Early harvesting ie.70 DAP or 90 DAP of *S. virginianum* reduced the total DM yields by 70.0% and 6.6% respectively compared to those harvested at 110 DAP. Delay in the time to harvest also greatly increased the percentage composition of berries while those of leaves and stems were reduced (Fig 4).

Conclusion

The variations in the percentage composition of plant parts in these species due to differences in cultural practices or time of harvesting are not taken into consideration at present. But their importance with regard to any possible changes in the medicinal quality of the material seems to be important.

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[2] Pathiratna L.S.S. *et.al* (2004) Ceylon Journal of Science (Bio Sci) 32, 75-80

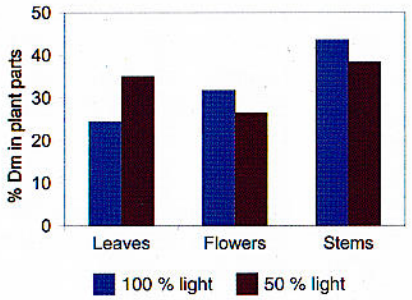

Fig 1. Effect of 50% shade and full sunlight on the percentage composition of plant parts in A.lanata 50 DAP

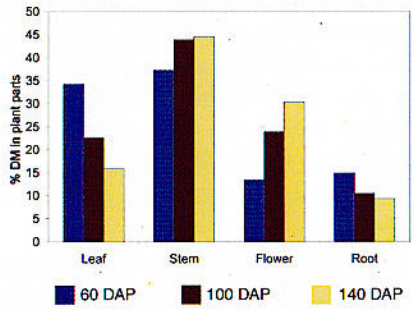

Fig 2. Effect of harvesting 60, 100 and 140 DAP on the percentage composition of leaf, stem, flowers and roots in A.lanata

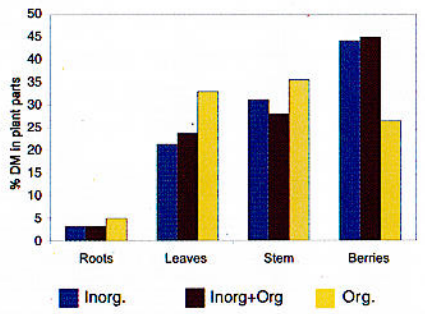

Fig 3. Effect of three packages of fertilizer on percentage composition of roots, leaves, stems and berries of S. virginianum harvested 120 DAP

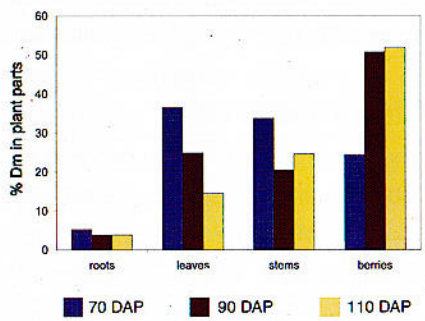

Fig 4. Effect of three packages of fertilizer on percentage composition of roots, leaves, stems and berries of S. virginianum harvested 120 DAP

MANAGEMENT PRACTICES FOR *PIPER LONGUM* (THIPPILI) TO IMPROVE SPIKE YIELDS

L.S.S. Pathiratna
Rubber Research Institute of Sri Lanka

Piper longum grows as a creeping under shrub and several 'varieties'('selections') can be found in different localities. But in all these 'varieties' very few female spikes are produced under natural conditions mainly due to the uncontrolled vegetative growth of the runners, over story and mutual shade. Every node of these runners is capable of producing main stems and they branch to give rise to reproductive branches. To obtain high spike yields it is essential to manage a shade level of about 50% [1] along with appropriate methods to induce main stems. Curtailing the growth of runners was the most suitable method to improve the production of main stems and reproductive branches in three 'selections' studied.

In one selection ('selection 1') removal of all runners that arise from the base of the plant produced a bush with many main stems which later branched to give rise to reproductive branches bearing spikes. Old main stems will have to be removed to encourage the growth of new ones and this 'selection' is best maintained as separate bushes [1].

In another selection ('selection 2') trimming of runners right at the base retarded the plant and trimming at a distance of 40 cm from the base of the plant encouraged the production of the most number of main stems, reproductive branches and spikes [1].

The creeping runners of a third 'selection' virtually produced no main stems or spikes under natural conditions. The creeping habit of these runners could completely be changed to a climbing habit when they were trained on to a vertical support and every node of these supported runners produced short main stems that gave rise to many reproductive branches. New runners will have to be trained when the earlier ones became old while removing the extra runners (Plate 1) [1].
Propagation of reproductive branches of this 'selection' produced plants with reproductive branches only and could be successfully be grown in a pot [1].

Plate 1. A plant of 'selection 3' trained on to a vertical support. Note the large number of reproductive branches and spikes produced

Summary
The spike yields of all these 'selections' of *P.longum* can greatly be increased by maintaining a shade level of about 50% and curtailing vegetative growth using suitable methods of plant pruning and training.

REFERENCE
[1] Pathiratna L.S.S *et.al* (2005) Ceylon Journal of Science, (Bio Sci) 33, 45 – 53

VIRTUES OF CINNAMON AS A FRAGRANCE

Cinnamon as a spice has been known to the world even in the early days of recorded time. The Romans knew of it and valued it so much that, Pliny has recorded how one Emperor was known to have burned a large quantity of it as a part of the funeral rites of his queen. It was the prized commodity in the sixteenth century and the Portuguese mariners went to the east in search of it. It was then in 1505 that Vasco da Gama reached Sri Lanka. The noted historian Dr. Colvin R. de Silva wrote thus (1),

"If the vagaries of wind and wave brought the Portuguese to this island, the lure of cinnamon caused them to stay."

The trade in cinnamon exchanged hands, the Dutch taking over command of the commodity in the seventeenth century, followed by the British, in the wake of colonization that characterized the time. It was the Dutch governor Falk, who began the systematic cultivation of cinnamon in the island of Sri Lanka. The "Cinnamon Gardens", - the prestigious seat of dwelling within the city of Colombo today - was once the site of cultivation. Thence it moved south to the area of Ambalangoda to Galle, where it is presently the region of cinnamon plantations. The Dutch also introduced the technique of steam-distillation used to produce the cinnamon oils from the bark as well as from the leaves (2).

Cinnamon is today known for much more than its role as a spice. We know that it is used through the ages in the Ayurvedic prescriptions or Decoctions, for a variety of ailments. It is known as an active digestive and as such it finds inclusion in the form of cinnamon bark oil in many liqueurs.

Now we see that it has long been used in deodorants and fragrances. There is an old doggerel which is attributed to Petronius (3), writing in the first century A.D. which goes thus:

Wines are out of fashion,
Mistresses are in
Rose leaves are dated
Now Cinnamon's the thing!

Cinnamon, it is stated, had been used to combat the ever-prevalent mal-odours during the 18th century. And so it entered the fragrance industry as well. The history of fragrances is as old as humanity itself (4). The ancients were conscious to have around them fragrant odours of flowers. The burning of incense for religious purposes was a beginning when a pleasant fragrance came to be regarded as a note of purity. Resins like myrrh were used at first in combination with flowers and it was noted that the fragrance became more intense when heat was applied. "Per fumum", in Latin " through the smoke" came to be regarded, in Europe, as the valued odour and this was the precursor to "Perfume". Fragrances were well known in the centuries before the Christian era in other cultures notably in Arabia and China. The tombs of ancient Pharaohs and their queens were found to have fragrances enclosed within them. It was the ancient notion that pleasant odours were closer to the gods. Perfumery was therefore an ancient art. However modern perfumery, which relates to the fragrance of flowers and spices, is very much "French-centered" and is even so today, although it commenced in Venice, and Florence, in Italy. The Florentine perfumer Rene opened the first perfumer's shop in Paris and exhibited a range of eau de cologne's, pomades, and beauty salves. These were all manufactured in Grasse in southern France, which even today is the seat of the French perfumery industry. The Fragonard Museum in Grasse houses exhibits which indicate that by the time of the French Revolution the manner of extraction of the odoriferous constituents of spices and other aromatic plants was well established. Since that time oriental spices have remained an indispensable part of the perfumery trade. The modern perfumery industry recognizes spices as the ingredients that render the warm, sensual character of perfumery creations. The odour characteristics of spices are marked by balsamic, and spicy notes which they render to the various creations in modern perfumery.

A fragrance creation almost invariably consists of three main components. To begin with, there is a "top note" or "head note" consisting generally of the flowery or citrus category of light aromas. The "heart note" or "middle note" consists, - in the case of the oriental or spicy perfumes that we are now talking about - a cinnamon, clove, nutmeg, all spice, pepper or similar oil with a strong spicy odour. Of times a combination of these are used. The final component is what is the "base note" or the "foundation note" of the fragrance and consists generally of heavy notes caused by sandalwood, vetiver, musk, vanilla, oak moss and woody ambery elements that make for a long lingering note.

Fred Naraschkewitz has described a list of fragrances (3) for several creations, for both feminine as well as masculine where spices are employed. The following examples are taken from that list to illustrate the use of cinnamon in fragrance creation.

Feminine perfumery creations

J.P. Guerlain created in 1925 the now classical, women's fragrance, ***Shalimar***. It belongs to the oriental ambery family of scents. Its top notes are composed of citrus – notably, lemon, mandarin and bergamot, together with rosewood. Cinnamon oil makes up most of the heart-note, augmented by rose, jasmine and iris. Cinnamon is supposed to express warmth and sweetness, while conveying the notes of spiciness. The notes delivered by the oil of cinnamon, blends easily with the final bottom notes of the creation which are benzoin, oppopanax, sandalwood, amber and musk.

The creation by Christian Dior in 1970, known as ***Dioressence,*** also uses the oil of cinnamon. Aldehydes and green notes form the head notes of this creation. The Cinnamon and Clove oils are combined with jasmine, rose, ylang-ylang, and tuberose, to harmonise with the spicy notes. Benzoin, vanilla and musk form the bottom notes. This is described as a floral, oriental perfume with spicy undertones.

The creation ***Opium,*** by Yves St Laurent, (1977) belongs to the family of oriental fragrances, and is a popular one. It is deemed a highly provocative fragrance, with a highly provocative name. It is regarded as an exceptional creation and recommended for sparing use. The top note is of allspice, and bay-leaf oils, in addition to lemon, mandarin, neroli and bergamot oils. Cinnamon, clove, cardamom and coriander, with a trace of ginger make up its dominant and powerful heart-note. Floral notes such as ylang-ylang, rose, jasmine and iris adorn its heart-note. The base note is benzoin, tolu, vanilla, sandalwood, patchouli, amber and musk.

Coco a creation by Mme Channel, in 1984, also belongs to the modern family of oriental fragrances. This too has a heart-note of cinnamon and clove oils, with floral notes from rose, iris, ylang-ylang and tuberose. The top notes are lemon, bergamot, mandarin, orange and neroli in combination with bay leaf oil and allspice oil. Combined with patchouli that leads to the base note, the dominant floral chord is about 45% of the formulation. The base note is sandalwood, amber and musk

Men's Fragrances

Old Spice is a name familiar to men even in this country and indeed all over the world. Shulton formulated it in 1931. As its name implies this men's fragrance is regarded as the ultimate in the spicy range of fragrances. The classic Shulton is still valued by men all over. In the parlance of the perfumery and fragrance trade it is supposed to represent masculinity, as well as individuality. To some its smell "reminds of a walk through a spice market." The top note of this "Spice" is composed of orange and lemon. The crucial heart note is star anise oil, bay leaf oil, cinnamon bark oil, all spice berry oil and nutmeg oil. These render a cascade of spicy notes. Musk, vanilla and amber in the base note are deemed to enrich this composition. "Old Spice" has been a popular men's fragrance for a long time.

Egoiste a composition by Chanel is of comparatively recent origin (1990). It has top notes of rosewood oil, bergamot, tarragon and coriander, and the heart note is composed of cinnamon, clove, fortified with clary sage oil, jasmine, iris and rose. The bottom or foundation note is of musk, sandalwood, patchouli, amber and cistus. In perfumery idiom it has a leathery and ambery note.

Thus cinnamon, and other spices like cardamom, cumin, dill, ginger, vanilla, allspice, pepper, nutmeg, etc, have had a place in perfumery as well, since man's early history; and they still maintain the role. As in flavours, so in fragrances as well, they are sometimes highly predominant and at other times more restrained. These are some of the natural ingredients that make the creators art so exotic. Matched often with selected synthetic aroma chemicals the perfumer creates, fragrances for the nose to behold, like the painter does to excite the sight with colour. In the mode of the now celebrated Aromatherapy, these creations play a role in changing moods from dull to vivid, helping the human being in the enjoyment of life.

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1. De Silva C.R. (1931). In Ceylon Under the British. pp 1795-1833
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3. International Journal of Aromatherapy 2000. vol. 10. 54. as in Dragoco Report No 2 . 2001. 48. as quoted in: A. Schwalb- Nolte, F Naraschkewitz: (2002). Spices in Perfumery. Dragoco Report:2002. Jan-Mar. 41
4. Rosengarten, F. (1969). The History of Spices, Livingston Publishing Co. Pennsylvania

OF TASTE, FLAVOUR AND SPICE

Practicing Modern Flavour Chemistry

Flavour chemistry in the modern era is no simple art. Being a flavour chemist, or "flavourist" is today an interesting though demanding profession, and lucrative too. It involves creating flavouring agents for foods, beverages, and deserts, even for personal and healthcare products.

Training to be a flavourist is exacting and the foundation is a knowledge of organic chemistry. During the inevitable period of training when would-be flavorists work as apprentices to senior flavorists, they become familiar with the materials of their trade – aromatic organic chemicals, solvents, excipients and other complementary materials. They also become familiar with regulations relating to flavour and fragrance ingredients, in respect of which ones have been approved for use in foods and beverages, and which are environmentally damaging. Such knowledge is crucial to a flavorist in formulations. Generally a degree with organic chemistry in particular is an asset but more crucial is the experience gained in apprenticeship. A flavorist needs a blend of talent and skills including a sensitive nose, creativity, smell of aroma, and knowledge of the materials.

A flavorist uses and manages aroma chemicals analogous to the manner in which an artist manipulates colour to produce creative images.

The Language of Flavours

Whereas for example, fragrance is dominated by the sensation of smell, flavour encompasses both smell and taste. So in the case of flavour the nose as well as tongue and palette come into play. Flavorists have their own unique language to express the sensation they perceive. Such adjectives as the following are commonly used in the flavour jargon.

Eg. Smoky, nutty, fruity, pungent, astringent, and combination words such as nutty-fruity, smoky-phenolic, sharp-astringent, etc.

What is Taste? – four or five basic tastes?

So flavour is a subtle combination of odour or smell, and taste. Taste itself is something everyone is familiar with. We are all familiar with sweet, sour, bitter, salty, which are regarded as the four basic tastes that the human tongue is able to perceive.

Early teachers of biology associated four regions of the tongue as responsible for the four basic tastes. However, Prof. Bernd Lindermann (Nature, Sept 2001) rejects this as "all wrong".

Now a new basic taste is accepted and termed "UMAMI". Prof. Kikunae Ikeda had in 1908 attempted to describe the taste of sea weed broth. He contented that this taste which he called Umami – after the Japanese word for "tasty" Umai – could not be composed through any combination of the previously accepted four basic tastes.

Umami is a good taste, a new basic taste also perceived separately by the tongue. It has remained extremely difficult to describe. A few of the wide range of attempts that have been made to put Umami into words are: Hearty, Spicy, piquant, meaty, rich, intensive or quite simply, delicious.

So now we have FIVE basic tastes: Sweet, Bitter, salty, Sour, Umami

What is this new taste of Umami?

Kikunae Ikeda had already discovered that mono-sodium glutamate was responsible for the taste of Umami. Ikeda sold his recipe to the Aji-no-moto Company (1917). (Aji-no-moto Company still holds the major share of the global market for synthetic monosodium glutamate). Now glutamic acid is a constituent of virtually all animal and vegetable protein. It is thus the most frequently taken amino acid contributing to human nutrition. Wheat protein contains 30% glutamic acid, cow's milk over 20%, and meat protein around 15%. When the proteins in such foods are hydrolysed the glutamates are released. This happens when meat or fish is cooked, when Soya beans or manioc ferments, when fruits and tomatoes mature, when cheese ripens, and in the curing process of such specialties of local cuisine like "*karawala*" (dried salt cured fish) or "*Jadi*" (salted gamboge-cured fish) or "*Umbalakade*" (Maldive fish).

In fact, in the processing of Maldive fish, both the dried product that is added as a flavour inducer to cuisine, and the remnant liquor "*Diya hakuru*" has abundant glutamate and tastes distinctly Umami. In South America, the Amerindian-Carribeans produce a similar liquor from fermented manioc called "Casereap" used as a food additive flavour enhancer. In Roman times cooks used a sauce called "Garum" which was obtained by fermenting pieces of fish like sardines, mackerel or tuna in brine. This process breaks down the proteins to amino acids and thence to glutamates,

whichare the chemicals that stimulate and trigger taste sensors

Taste is sensed by several thousand taste buds on the tongue. Each taste bud consists of 15-40 taste cells. From one end of these cells protrude the "microvilli" – finger like minute projections. The other end connects to the nervous system. Receptor cells by means of complex mechanisms, react specifically to generate taste sensation in response to various chemicals.
For example,

* Salty taste is caused by Sodium ions and other ions
* Sour is caused by H+ - hydrogen ions which are Characteristic of acids
* Sweet is caused by carbohydrates like glucose, fructose and even other molecules like steroids
* Bitter is caused by a variety of organic molecules such as quinine, caffeine, nicotine, gallo-tannins etc.
* Umami is caused by glutamates

Spice and Flavour

Spices are plants that usually contain volatile substances which bear the characteristic aroma of the spice and often non-volatile compounds that are responsible for the taste. The volatiles are usually separated as the essential oil by steam distillation. For example, the essential oils of ginger and pepper bear the characteristic odour of the spice. However, the complete flavour of the spice is only in the **Spice Oleoresins** – which are solvent extracts after removal of the solvent. Spice Oleoresins are used as food additives where the total flavour of the spice is needed.
Preparing the oleoresin from the spices is also a means of storing the spice flavour for long periods. The essential oils are generally responsible for aroma characteristics of a spice. The oleoresin is more representative of the whole spice.

Nobel Recognition !

The prestigious Nobel Prize for Physiology and Medicine for 2004 goes to Richard Axel and Linda B. Buck for their discovery of "Odorant receptors and the organisation of the olfactory system".

This is good news for Aromatherapists. The foundation of their practice is being scientifically secured.

Did You Know????

Chemistry began at Cambridge with material medica

A recent book bears the title "The 1702 Chair of Chemistry at Cambridge" and is edited by Mari Archer and Christopher Haley and published by the Cambridge University Press UK in 2004. It is claimed that the 1702 Chair of Chemistry is the oldest such continuously occupied chair in the UK. So far it has had fifteen holders including the redoubtable Alexander Todd (Lord Todd), nicknamed "Todd Almighty", in the 1950's who eventually won a Nobel Prize and even became Minister of Science in Great Britain. What is not so well known and surprising too was that the very first holder was more a Pharmacist than a chemist. He was Giovanni Francisco Vigani of Verona in Italy. He was appointed on 10th February 1703. It is revealed that Professor Vigani's Oak cabinet of material medica has still been preserved. It contains spices, medicinal herbs, jewels shells, resins, opium – used as a medicine in the good old beginnings of western allopathy - oils, metals, and even earths. It was not so long ago that medicine in the west was not so different from Ayurveda! One wonders if the practitioners of western medicine today who decry Ayurvedic practices are even aware of the beginnings of their own craft! It was chemistry then and added to pharmacy and physics that brought the western art to its pristine state. It was 1866 when Cambridge gave its first degree in Chemistry. In the days of Professor Vagani, the professor got no salary. He received money from those who attended his lectures.
It can be said that in Sri Lanka too, (in the British Crown Colony that was Ceylon), Chemistry at the then University College began with a purveyor of the same theme - material medica namely, Professor J.P. Chandrasena. Professor Chandrasena died young, but his book "The Chemistry and Pharmacology of Medicinal Plants" was published posthumously by his widow Mrs. Lucy Chandrasena (H.W. Cave & Co., Colombo) and is available in our libraries. In 1975 Professor Norman R. Farnsworth, a world authority on medicinal plants was present in Sri Lanka. He was given a copy of this book and he said of Chandrasena, "This man must have been fifty years ahead of his time".
The Institute of Chemistry, Ceylon, honours Professor Chandrasena with the award of a Chandrasena Memorial Medal for research on Natural Products.

Ayesha

KNOWLEDGE ROUND UP - *CULLED FROM LITERATURE*

Maturation of Wines – an update

In The Digest - Volume 1 Issue 1, some research cited on the aging of wines revealed the chemical basis of aging. More recent research on the aging process gives evidence that many of the compounds from the wooden casks that end up in the liquor can be used to estimate the age of a wine or sherry.
D. Guillen and colleagues at the University of Cadiz in Spain contended (1) that a measure of the content of short chain organic acids, higher alcohols and several phenolics can give clues as to the age of sherry that has been aged in wooden casks.
They analysed 30 sherries ranging from vintages 1932-1999. They determined the contents of the compounds as above as well as standard physico-chemical characteristics such as total acidity and pH. The contents of organic acids, tartaric and caffeic decreased with age. So did the calcium content. Most of the compounds including phenolics increased with time. No single variable could be used to predict age. So two regression models (Partial Least Squares – PLS) and Multiple Linear Regression – MLR) were used to analyse the results. The MLR model with six components gave a mean deviation from the declared ages of 3.3 years. The PLS model with a broad range of variables predicted ages to within 1.6 years.
The authors consider the suitability of either model for authentication of old (vintage) sherries.

Reference:
D.A. Guillen *et al.* J. Agric. Food. Chem. 2005, 53 2412

Water Hyacinth - A menace turned useful?

Decontamination of water is often a demanding problem in the countries of our region. Now researchers in the UK have shown that this water weed regarded as a menace can prove a saviour.
The dried roots of water hyacinth can reduce the levels of As++ in contaminated water to below the WHO guideline limit of less than 0.01 mg/L.
Powder produced from the water hyacinth root could dramatically reduce Arsenic from water. Water hyacinth roots can be a candidate to remove arsenic from contaminated irrigation and domestic water.

Reference:
P. Haris and S.W. Al Rmalli. J. Envion. Monit. 2005, 7, 278

Pomegranates and the Heart

The antioxidant polyphenols present in the juice of the pomegranate (Latin: *Punica granatum* Linn., Sin: *Delung*) could halt the development of atheroscelosis in patients. Studies by Claudio Napoli at the University of Naples have shown this in a study they have conducted recently. Michael Aviram who was the first to demonstrate the effect of the polyphenols of red wine on cholesterol oxidation also confirmed that pomegranate juice offered potent protection against cardiovascular disease.
Aviram heads the Lipid Research Laboratory at the Rambam Medical and the Technion Faculty of Medicine, Haifa, Israel.

Reference:
F.de Nigris *et al.* Proc. Natl. Acad. Sci. UAS. 2005, 102, 4896

ANTIMICROBIAL ACTIVITY OF PLANTS

Antimicrobial activity was displayed by several plants used in Sri Lanka Ayurvedic medicine and the most active were:

Morinda tinctoria
Mussaenda frondosa
Psychotria gardneri
Psychotria stenophylla

They displayed the wide spectrum of anti-bacterial activity when tested by the "disc diffusion" method.

Reference:
Jayasinghe *et al.* Fitotherapia 73 (2002) 424-427

Quotes – A Princely Pronouncement !

"Modern medicine remains too often a one-dimensional approach to illness which, however sophisticated and miraculous in some of its achievements, cannot itself understand more than a fraction of what there is to know, and can still be enriched and enlightened by more traditional approaches. Therefore, I am glad there are beacons of light seeking to integrate the modern and traditional approaches which I have come across over the years such as the Marylebone Health Center in London, or the Bristol Cancer Help Center"

The Prince of Wales
In a talk given in England at the Wilton Park Seminar on the Sense of the Sacred
December 1994

The Digest Mail Bag

Letter 1 – To The Editor

Prof. Finn Sandberg's interest in LINK

Professor Finn Sandberg, Emeritus Professor of the University of Uppsala, and doyen of the world of science with interests in Medicinal and Aromatic plants, has indicated his desire to work with LINK. In a letter to the Editor of Digest, Prof. Sandberg states:

When I received the LINK Natural Products Digest I said to myself: "there must be essential oils involved in the Company LINK." The initiative of the Digest is certainly good. The European market is generally a suspicious one. Quality is the most important factor, the price being secondary.

I feel it is nice to work with you in my final years, just like we did before. My co-workers Dr. Bo Erkmann heads our drug company MEDIPLANT. He proposes that MEDIPLANT be associated with LINK and could function as a General Agent for LINK.

Please provide me with a list of LINK's herbal products and I would wish to have future copies of the DIGEST.

Professor Finn Sandberg
Bultarbo Gard Skokloster
S19800, Balsta, Sverige.

Letter 2

Addressed to the Managing Director,
Dr. Nugawela

Thank you for sending the inaugural issue of the LINK Natural Products Digest. I have read it and found it a useful contribution to the Library of Natural Products. Please accept my congratulations, as a silent follower of your Company from scratch under your able direction, based always on scientific principles and modern technology. By issuing this Digest you a re crowning a success story.

K. Husnu Can Baser, PhD (London), FRSC
Professor of Pharmacognosy
Faculty of Pharmacy
Anadolu University
Turkey

16 Feb 2005

Letter 3 – To The Editor

Thanks for sending the inaugural issue of the LINK Natural Products Digest. I will appreciate being on its regular mailing list.

Please feel free to use the material in my paper for the digest. It will be gracious of you to acknowledge.

Professor B.N. Dhawan
Former Director
Central Drug Research Institute
Lucknow, India.

28 Feb 2005

Letter 4

Addressed to the Managing Director,
Dr. Nugawela

I was indeed happy to read through the inaugural issue of your Digest and was proud to observe the progress your Company has made especially over the last decade.

I wish to convey my best for your continued success and hope that in the near future LINK would become a household name in the international arena.

Ghulam Chatoor
22/2, De Fonseka Road,
Colombo 5.

13 Dec 2004

Letter 5 – To The Editor

Thank you for the copy of your excellent new journal. It was nice, and a pleasure to corporate with you at UNIDO. Twenty years have passed or something like that.

I am presently lecturing on Industrial Ecology. It is an important new science on account off environmental protection and sustainable development.

Oleg Scedrov
Professor,
Crnojezerska 18,
10090, Zagreb,
Croatia

NOTE TO POTENTIAL CONTRIBUTORS

Link Natural Products Digest

The DIGEST is a popular publication, albeit a scientific one, dedicated to medicinal plants, herbal healthcare and personal care products, essential oils, aromatherapy, herbal therapy and Ayurveda, and related healthcare systems. It is published bi-annually.

The DIGEST welcomes contributions in English in the category of reviews, brief communications, ethno reports in brief, phytomedical and phytochemical communications, book reviews, and reports on safety and efficacy of phytomedicines.

Potential authors may consult the Editor-in-Chief prior to dispatch of communications, reports and reviews.

Authors may submit manuscripts by post or e.mail to :

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Please forward to the editor one original hard copy and a soft copy in the form of a PC compatible diskette (Microsoft Word).

All manuscripts must include the following :

Title (in brief), author(s), address(es) of affiliated institutions. The authors' names must include initials and/or forenames as required in publication. All papers and submissions are subject to peer review, but the editors reserve the right to regulate the content. No proofs can be sent prior to publication. The decision of the Editor-in-Chief will be final in all matters.

Acknowledgements

The Editor wishes to acknowledge the comments and assistance provided by the following

Dr. N. A. Samarawickrama
Dr. W. K. Hirimburegama
Prof. M. I. Thabrew