



# *Natural Products* **Digest**

Vol.8, Issue 2, 2012

**SANDALWOOD**  
in *Australia*



LINK NATURAL PRODUCTS (PVT) LTD



# LINK Natural Products Digest

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# EDITORIAL

## NEW FRONTIERS IN THE HEALTH SCIENCES

The boundaries of Healthcare are moving faster than ever in the history of mankind. The movement as always is multidirectional. In the most spectacular areas, current research in fundamental chemistry, physics, and biology seeks to understand biological processes at the molecular level, and the chemical nature of disease progression. This calls for even more potent and sensitive tools and methods for the detection, tracking, and treatment of disease. Four main things demand attention:

- Research for better materials and prosthetics.
- New innovative approaches to drug discovery and administration.
- Rapid and facile methodology for early detection of disease.
- Therapies that are inexpensive, facile to administer, and accessible in the poor regions.

Progress can only be achieved with the collaborative efforts of many types of scientists working towards this common goal namely: improving and maintaining accessible health, and the prevention of disease.

In recent initiatives cognizance of the potency, the methodology, and the long enduring nature of the traditional remedies of the Ayurvedic and the Chinese medical systems, have brought a new dimension to research within the modern healthcare system. The traditional Ayurvedic and Chinese methodologies are being intensively studied by modern health scientists and this has brought credibility in modern scientific terms to the traditional concepts such as the strengthening the body's own defense mechanisms as a disease combating strategy. The relative efficacy of multiple

compounds such as in an Ayurvedic polyprescription, as against a single chemical entity, has also stirred modern scientific research in a new direction in synergistic efficacy.

It is of significance that traditional diagnostic methodologies could be enhanced with modern electronic and computer aided tools, and innovative diagnostic tools so developed. Research in process technology can also benefit the crusade towards better and more accessible healthcare in the poorer nations of the world.

There is here one of the most worthwhile initiatives all nations can take. Keeping the people healthy is the supreme goal and scientific research underpins such an initiative.

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## SANDALWOOD IN AUSTRALIA

Ian Southwell \*

### The *Santalum* Genus

*Santalum*, from the family Santalaceae has about 25 species spread across the Indomalaya, Australasia, and Oceania ecozones, from India through Malesia to the Pacific Islands, as far as Hawai'i and the Juan Fernández Islands off the coast of South America.

*S. album*, the genus' best known species, has been utilised, cultivated and traded since the 6th century, some cultures placing great significance on its fragrant and medicinal qualities. For these reasons it has been extensively exploited, to the point where the wild population is vulnerable to extinction. It still commands high prices for the essential oil which is distilled from the heartwood of mature trees. Because of the scarcity of mature *S. album*, other species such as *S. austrocaledonicum* (New Caledonia and Vanuatu) and *S. spicatum* (Australia) are being distilled in increasing quantities to produce replacement oils with similar fragrance and chemical constitution. Also, a number of countries have planted *S. album* but not in sufficient time to prevent a considerable shortage of oil until these plantings are of harvestable age (20-50 years).

### *Santalum* in Australia

In Australia, there are five endemic species known as sandalwoods or quandongs: *S. obtusifolium*, *S. lanceolatum*, *S. murrayanum*, *S. spicatum*, and *S. acuminatum* in addition to *S. album* which has a limited natural distribution in the Northern Territory. At least four of these have been developed commercially.

*S. acuminatum* has a fruit (native peach or sweet quandong) which may be eaten raw, but the main commercial use is for jams, jellies, chutneys and in pies.

*S. lanceolatum* has an edible fruit which the explorer, Leichhardt, remarked had 'a very

agreeable taste'. It was eaten by Aborigines, who also mashed the roots and soaked them in water to make a liniment. The seeds were also ground to a paste and used in the same way. The timber is aromatic and limited exports have been made to Asian countries for its value as an oil source and for its fragrant timber.

*Santalum acuminatum*:

Native Peach or Sweet Quandong



Tree



Leaf and Fruit

*S. album* is referred to commonly as East Indian or Indian sandalwood. Despite the common names, *S. album* is an Australian native plant occurring along the coast and adjacent islands

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between Melville and Elcho Islands (north coast of the Northern Territory). Like the other species of *Santalum*, East Indian sandalwood is a root parasite and will not grow well unless it has access to a suitable host. It takes about 20-50 years to be suitable for harvest, with the present expected value of the wood being in the order to A\$20,000 per tonne. The great value of this species is its timber and the oil that it contains. Sandalwood oil is used for a range of products as additives to the finest perfumes and cosmetics, whilst the wood has been traditionally used in carving and in religious ceremonies as a component of joss sticks. More recently, sandalwood has been recognised as a mosquito repellent and the powder is made into sticks for burning.

High demand, particularly from China and Europe, for the heartwood and oil product from India and Indonesia/Timor/Leste has led to increased pressure on native stands, and this together with the onset of the bacterial wilt disease (spike disease) in India, has created a world shortage. Plantation East Indian sandalwood systems were developed in the Ord River Irrigation Area, near the town of Kununurra in the East Kimberley region of Western Australia, to alleviate the pressure on wild sources and produce a sustainable supply of sandalwood oil to meet world market demands. Initiated in the late 1980s by the Western Australian State Government, the first deployment from this program was the establishment of commercial plantations in 1999.

More than 5000 of the possible 12000 hectares in ORIA (Ord River Irrigation Area) Stage 1 of the scheme have been established with East Indian sandalwood with further expansion expected. A small number of trials and commercial plantations have also been established in other regions of Western Australia (Broome and Carnarvon, in the north and numerous small trials in the south-west) and in northern Queensland and Northern Territory.

This species produces both the highest amount of santalol, the most sought after component of the oil, and the total oil extracted gives only minor variation in its composition within the species.

*S. spicatum*, Australian sandalwood, is a small, sparse, hardy, semi-root parasite that thrives in semi-arid areas of the continent. *Santalum spicatum* is widespread in central and southern Western Australia where, today, it is the

largest sandalwood reserve in the world, covering 1.6 million square kilometres; an area three times greater than that of France. It also occurs naturally in southern South Australia.

The essential oil of Australian sandalwood is contained in the heartwood, which can take up to 50 years to mature. Australian sandalwood oil differs from the Indian product (derived from another species, *S. album*) in regard to its constituents and olfactory characteristics.

The timber of this species, which is used in religious rites by Hindus, Buddhists, Parsis and Moslems in Asia, yields valuable sandalwood oil. It is presently harvested in the Goldfields area of Western Australia.

*Santalum spicatum* : Australian Sandalwood



Tree



Fruit



Leaf & Seed Stones



From the late 1840's through to the early 1900s Australia was a major exporter of sandalwood to India and China. In 1849, 1204 tons of sandalwood, valued at £ 10,711, were shipped from Western Australia and by 1899, 4,470 tons worth £ 33,525 were sent to Singapore and China.

In 1919, a West Australian, HV Marr had a bold vision, to extract sandalwood oil. At its peak in 1930s, a company called Plaimar produced up to 54 tonnes of oil a year mainly for the overseas perfume, soap and pharmaceutical industries. However, the project's viability was under threat by the 1960s, due to reduced demand for natural compounds and to the low oil content of Western Australian sandalwood oil as compared to the higher oil yielding East Indian species.

A redevelopment of the Australian sandalwood oil industry commenced during the 1990s. This was prompted by several factors:

- Government sponsored silvicultural projects that included replanting of sandalwood in the wheat belt area of Western Australia, designed to address the environmental problems (salinity, etc.) caused by decades of land clearance.
- The over-exploitation of India's *S. album* resource, which led to oil supply shortages and a growing market interest in the emergence of an alternative source.
- The belief in the future of the Australian sandalwood industry by a number of prominent members of the essential oil community. This resulted in the creation of the Australian Sandalwood Oil Co., which entered the world market in 1999 with a state of the art extraction facility and a guaranteed supply contract for raw material from the Western Australia Government.

Australia now produces around 13-14 tonne of *S. spicatum* oil each year.

These are substantial export quantities even though the species produces a different oil (Table 1) to the East Indian sandalwood (*S. album*). Recent work has shown that the oil yields and quality (see Figure 1) of *S. spicatum* plantations seem satisfactory from 20 years of age (J. Doran, Personal Communication, 2012), comparable with a rotation period of 20-30 years for *S. album*. More than 5,000 ha of *S. spicatum* plantation was planted in the Western Australia Wheat belt during 1997-2007 to capitalise on this market.

The Australian sandalwood reserve is today the largest wild-crafted natural resource in the world. This natural resource is complimented by plantations established for both financial return and environmental benefit. The natural resource is managed by the Arid Forest Branch of the Western Australian Government's Forest Products Commission

Table 1. Percent chemical composition of Santalum wood essential oils as specified in International Standards.

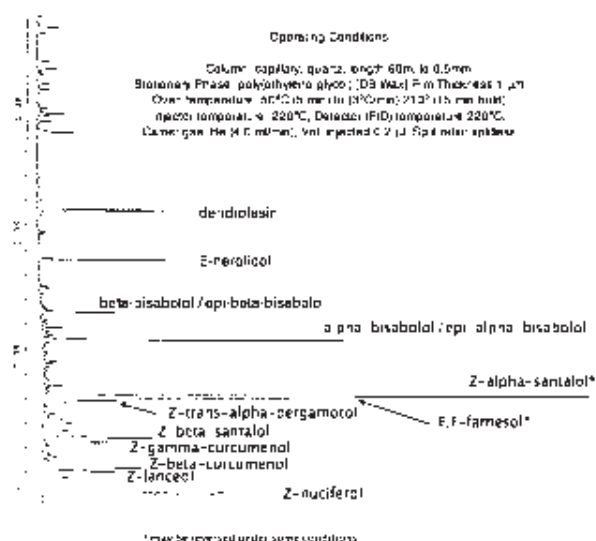
*S. spicatum* ISO 22769:2009

Z- $\alpha$ -Santalol	15,0 - 25,0
epi- $\alpha$ -Bisabolol	02,0 - 12,5
Z- $\beta$ -Santalol	05,0 - 20,0
epi- $\beta$ -Santalol	00,5 - 03,5
Z- $\alpha$ -trans-Bergamotol	02,0 - 10,0
E,E-Farnesol	02,5 - 15,0
Z-Nuciferol	02,0 - 15,0
Z-Lanceol	01,0 - 10,0

*S. album* ISO 3518:2002

Z- $\alpha$ -Santalol	41.0 - 55.0
Z- $\beta$ -Santalol	16.0 - 24.0

Figure 1.  
*S. spicatum* oil -  
Typical Chromatogram from a polar column



(FPC). The guiding principles of the FPC are to ensure long-term viability of forest products by:

- Applying ecologically sustainable forest management methods.
- Externally auditing the management system.
- Complying with International Standards.



- Setting maximum annual harvest limits.
- Setting minimum trunk diameters for harvested material.
- Maintaining a replanting program that ensures resource longevity and sustainability.

The FPC currently permit harvesting by 15 licensed harvesters allowing 2200 tonnes pa to be harvested from both live and dead (approx. 1/3) material. Of the total crop, only 35-40% is suitable for oil extraction. Amongst other factors, the composition of the oil is influenced by the geographical location of the natural sandalwood source.

Australian sandalwood oil is now being accepted by the world's leading fragrance houses, and it has developed its own unique market niche. Applications encompass fine fragrances, attars, incense, cosmetics and body-care, plus aromatherapy / relaxation and therapeutic products. There is a strong demand for the oil within Australia and nearby New Zealand. In Australia, new products have been created and centre around Australian sandalwood oil's efficacy and the popular natural, pure and clean Australian image. The principal export markets, apart from New Zealand, are Europe, the Middle East, Asia (including India) and the USA.

Australian sandalwood oil is strongly biocidal towards many disease-causing organisms, including *Staphylococcus aureus*, (MRSA, or 'Golden Staph', and EMRSA) and many species of *Streptococcus*, in addition to the organisms responsible for acne, thrush, tinea, Athletes Foot and ringworm. The growth of *Herpes Simplex* Viruses 1 and 2, are also significantly inhibited by the oil. The extremely effective anti-inflammatory mechanism of Australian sandalwood oil has been elucidated by studying the inhibition of enzymes causing inflammation. Sandalwood oil, like meditation, reduces stress (validated by physiological changes) and produces a physiological state of 'restful alertness'. Topical application of sandalwood oil leads to a greater degree of alertness, whilst at the same time, reducing physiological stress, and hence leaving the body in a state of relaxation: the body is calm, the brain is actively functioning, demonstrated by an increase in alpha waves in the brain (a definition of alertness).

There is also potential for a small industry to develop around *S. spicatum* seed oil for medicinal and cosmetic purposes.

## Acknowledgements

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### Mysteries of Royal Jelly



Royal Jelly is also referred as the Queen Bee substance and is directly connected with the propagation of bees. Royal Jelly is the substance secreted by honey bees and when it is fed to Queen Bee Larvae it ensures that they develop into healthy sexually active mature females. It was intensely researched in the 1950's by two groups one in Britain and the other in France. The British group was led by the redoubtable Nobel Laureate Sir Robert Robinson FRS and the French Group by Edgar Lederer, the originator of the method of Chromatography now universally used in a variety of forms. Both groups were successful in determining the structure of the Royal Jelly and in isolating it so that bee-keeping became possible without the presence of a Queen bee. Now scientists in Italy have created an environmentally friendly method of making the principal bioactive compound found in royal jelly.

They have also synthesized the compound the Queen Bee secretes, that halts ovarian development in the worker bees. It is also reported that the compound in royal jelly has the potential to treat can-

cer or could be used as an active agent in health foods and cosmetics. These biological compounds were isolated before and the steps being complicated were not really suitable for commercial production. The previous methods of synthesis too were not environmentally friendly as they employed the use of substances with toxicity. Sabriano Castellano, at the University of Salerno, Fisciano, and her colleagues have synthetically made 10-hydroxy-2E-decenoic acid (10-HDA), previously isolated from Royal jelly, as well as 9-oxo-2E-decenoic acid (9-ODA) previously isolated from the Queen Bee's ovarian development inhibitor, on a gram scale, using an environmentally friendly metal-free method. This method is more economical too. The compounds according to Castellano, are being used in research to clarify their role in the phenotypical shift from worker bees to Queen Bee.

Several pharmacological activities are being attributed to 10-HDA, such as anti-tumor activity. Castellano further contends that 10-HDA, is exclusively contained in Royal Jelly (1-2%), and thus dictates its quality and price in the international market. The synthesis of these important naturally occurring substances is a landmark achievement according to Eleni Melliou, a researcher from the University of Athens who specializes in substances produced by bees. Due to the synthesis and the ready availability of the compounds further pharmacological studies would become possible.

The news of the synthesis has prompted E. Anderson, a chemist of the University College, London to recall a verse published in the Alchemist Magazine in February- 1962.

In sex life the bee is most stoic,  
With forbearance almost heroic  
The Queen keeps them placid  
With sips of an acid  
Trans - 9-oxo-dec-2-enoic.

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# ESSENTIAL OILS & A SAGA OF FRAGRANCE

By R.O.B. Wijesekera

## Nomenclature & Historical Reflections

Let us begin by first understanding what essential oils. The earliest humans noted that certain plants were attractive because either their flowers, or leaves or some other parts just smelled good. Early civilizations used the property of attractive fragrance in these plants to adorn the human body, in particular the female of the species. They also attributed the fragrance of these plants to some divine authority and so used it for securing their state of health, to overcome evil influences, and even for embalming the dead. This was the commencement of the use of "cosmetics" and "fragrances" as we know at the present time. Archeological studies on tombs excavated in Egypt reveal the use of fragrant plant material in the tombs of an era *circa* 2920-2770 BC. They clearly showed aromatic materials entrapped in oils used during those early times.

Now how do essential oils differ from oils that are generally used in cooking or from oils that are drawn from the oil wells? Cooking oils are known as "fixed oils" or "fatty oils". They are related in chemical structure to natural fats. In chemical structure, they are built around the scaffold of the molecule of glycerol. Oils from petroleum deposits are chemically related to hydrocarbons. Essential oils on the other hand are chemically quite different and possess a variety of chemical structural types. They are volatile; a property that causes them to emanate a fragrance, and it is the feature that is attractive to mankind. Essential oils thus constituted the fragrant portion of the materials used in those early times. Spices which are also aromatic plants were used to add piquancy to foods and were in special use when in those early times hunting and harvesting were the main methods of food procurement and storage, gave rise often to unpleasant odors which had to be masked. So the term "Essential Oils" was derived from the word "essence" and did not possess a connotation of "need". Essential Oils are also called: "Volatile Oils" and "Aetherische Ol" in German, which literarily bears a reference to its volatility.

Archeological research has also shown that essential oils from plant materials were extracted even in early times. The method called

*enfluerage* was known in Europe and used and even as early as *circa* 3000 BC, the technique known as steam distillation was known and employed to isolate the essential oils.



*Distillation in Ancient Times*



*Copper stills in the middle ages*

This was at the zenith of the Arabian civilization. The method of production of the celebrated Attars, which probably percolated into ancient India, used a unique technique of steam distillation called the "Deg Bhapka" method which employed an angled bamboo, tightly and uniformly wrapped around with cotton rope, acting as the "condenser". This technique is now characteristic of the region of Kannauj in India and in this method flowers such as rose or "kewda", are distilled into a pre-distilled sample of sandal wood essential oil. The mixture is called Attars and is a concentrate of perfume. Latter day methods of distillation largely evolved in the South of France, particularly in the region of Provence, where Grasse is the town mainly linked in history with

the subject of fragrance and perfumery. Like Kannauj, Grasse too, remains to this day a centre of the Perfumery and Fragrance traditions.



*The Deg Bhapka System (Kannauj)*



*Lavender Distillation in Provence in France*

In ancient China, the Emperor Huang Ti published a book (*circa* 2000 BC) called the Book of Internal Medicine, which describes *inter alia* the techniques now identified as aromatherapy and acupuncture and the health benefits of aromatic oils.

The ancient Egyptians were aware of the antiseptic properties of essential oils, and used them for disease control and of course for their mummification processes. It appears that during the first century AD the Persian civilization extensively produced essential oils by distillation, and the technique had been simultaneously used in India from the Indus valley civilization onwards. The technique soon found its way to southern Europe particularly France and Spain.

In relatively modern times in Europe, the Fragrance and Essential Oils Industry developed around the 12th century AD. First, the perfumers

of the time began producing fragrances by the process of *enfluerage*, and then gradually, the process of steam distillation took over. Museums in France such as the Fragonard Museum in Grasse, display a staggering variety of designs of the copper distillation stills used during this period. These museums also display the vivid array of exotic designs of glass containers that were used to pack the formulated perfumes of the era for the satisfaction of their demanding clientele. The demands were even challenging to the glass makers of celebrated crystal glass in France, Germany, England and Czechoslovakia.



*Exotic antique designs*

It was around this medieval period that the technique of steam distillation to produce essential oils was brought to Sri Lanka, then called (Ceylan), by the Dutch colonists who used it first to produce Citronella oil from *Cymbopogon winterianus* (Maha pengiri) and *Cymbopogon nardus* (Lenabatu). The Dutch later took the technique, as well as the clones of Mahapengiri to the island of Java and hence it came to be known in later years in the trade, as Java Citronella, while the Lenabatu variety came to be identified as: Ceylon citronella. It was the Dutch - mainly through the efforts of their Governor Falk - who also



commenced placing cinnamon on a plantation footing, so that distillation technology was extended to include the production of cinnamon bark and leaf oils. This is now an established technology and a profitable industry in South Sri Lanka.



*A field of Citronella in South Ceylon.  
(Times of Ceylon 1906),*



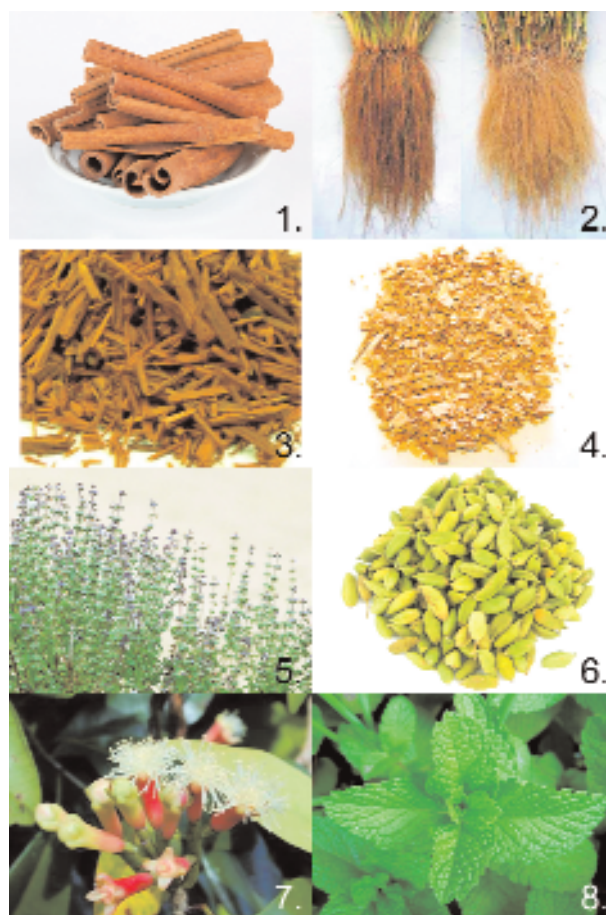
*Cultivated Citronella grass.*

### Natural Occurrences and compositional complexities

Essential oils occur in nature in almost every part of the aromatic plants. The aroma of these plants, are the observed signature sign. The fleeting fragrance one gets as the wind plays down on a citronella field is due to the slow volatilization of the essential oils from within the leaves of the citronella. The freshening aroma of a mint or the alluring scent of jasmine or rose, or the enticing fragrance one senses in walking through a field of Ylang ylang, arise from the same phenomenon. The molecules from the fragrance dominate the air one inhales and impart their characteristic odor which the human nose detects. Through this there then commences the human reaction to the odor profiles. Modern

science now determines this as ranging from the therapeutic as in the case of mint, to the mood changing as in the case of rose or lavender. The isolation and entrapping of these aromatic constituents from plants started what now are the Fragrance and Flavor industries that today determine modern lifestyles.

The parts of plants within which the essential oil bearing vessels are located vary greatly, They are within leaves such as in grasses like citronella, or in mint, basil or thyme; seeds such as in coriander and cardamom; in berries as in pepper, and pimento; and in woody sections such as in sandalwood and cedarwood; in roots as in vetiver; in barks as in cinnamon; in buds as in cloves; but most ostensibly and spectacularly in flowers.



### Range of plant sites that store essential oils

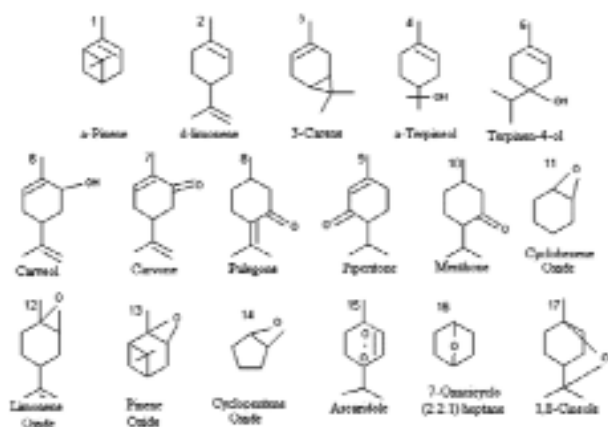
**KEY:** 1. Cinnamon quills; 2. Roots of Vetiver.  
3. Sandal wood sticks; 4. Cedarwood sticks;  
5. Basil; 6. Cardamom; 7. Clove buds;  
8. Spear mint leaves.

Aromatic constituents in plants are mainly the essential oils. These are odoriferous combinations of chemical entities that range in

number from a just a few, to many even up to and beyond a hundred. For example the plant known as *Gaultheria fragrantissima*, which generates the essential oil well known as Oil of wintergreen, has only a single dominant compound methyl salicylate and a trace amount of O-methyl, methyl salicylate and a few other related trace compounds. Whereas lavender or rose contains nearly a hundred which in combination gives us the fragrance of the flower. The exact composition can be determined by modern analytical methods such as Gas-liquid chromatography coupled with mass spectrometry, (GC-MS), but the secret is that man has not yet been able to reconstitute the exact fragrance of any of these complex naturals. Nor has man been able to fathom how the human nose can detect and identify the different fragrances.

The chemical entities range in types too. They mostly belong to the category known as the "terpenoids" - compounds with recurring isoprene units of C<sub>5</sub>, mainly with units of C<sub>10</sub>, and C<sub>15</sub>. They are called monoterpenes and sesquiterpenes respectively; and derivatives of these such as esters, aldehydes and alcohols, constitute the specific ensemble of compounds of which a characteristic fragrance or flavor is constituted.

#### Chemical scaffoldings of some common terpenoid constituents present in essential oils



#### Flowers whose aromas are most important in regard to perfumery

The fragrances of flowers constitute the most complex chemical ensembles, and the trace constituents are as significant in respect of overall effect as the most abundant ones. This is why it has not been possible so far to scientifically duplicate the natural fragrances. There are instances where a single constituent would be able to substitute for a composite natural fragrance or flavor

such as Vanillin for Vanilla extract, or Santalol for sandalwood, but this can be considered as only a substitute for the real thing. This fact accounts for the exclusive demand for the natural product.

Another dominant class of compounds present in essential oils is known to chemists as phenyl propanoids and this class is present in plant species such as cinnamon and clove. They too contribute to the characteristic odour profiles of the species concerned. For example eugenol and cinnamaldehyde are examples of phenyl propanoids.

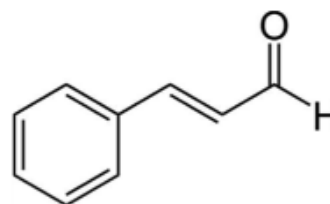


Jasmines

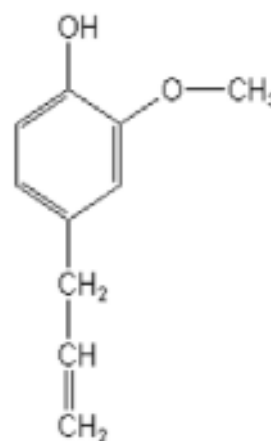
Roses

Ylang ylang

#### Chemical structures of Eugenol and Cinnamaldehyde



Cinnamaldehyde

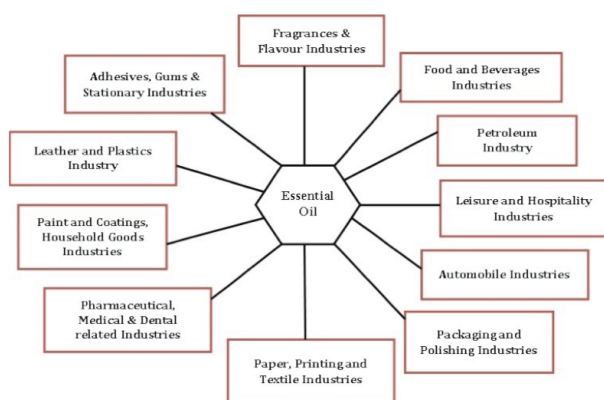


Eugenol



## Uses of Essential Oils

Essential oils find their use in a wide variety of industries that range from the petroleum and the automobile industry to the Food, Flavor and Fragrance industries. Modern day usage has extended to the use in Aromatherapy and complementary medicine, where there is now an even burgeoning interest. Essential oils remain a key player in the new wave of “back to nature” that is sweeping through the pharmaceutical and perfumery industries. Many household products have essential oils in them in order to make them more attractive to users and also to mask the unpleasant odors of their solvents.



Essential oils are an integral component of modern living. Quite apart from their direct use as a major constituent of the Flavor and Fragrance Industry, they play a role in a plethora of several other important industries that have a bearing on modern lifestyles. Their role in the cosmetics and toiletries industry follows from the part they play in the generation of new compounds for use as deodorants. Such compounds have to be devoid of toxicity to humans. Their use in the textile industry is considerable as is their use in the motor and petroleum industries. The chart above summarizes their use in some of the major industries that have a considerable bearing on our present day lifestyles.

## Commercial Production of Essential Oils

The method of steam distillation has been the choice for the commercial production of essential oils ever since it superseded the *enfluerage* method used in medieval times. Even the method of steam distillation in its earliest form had its origins in times of antiquity and it is not possible to date its beginnings. Primitive peoples used the method too, and nomadic tribes used it in Australia and the oceanic regions to distil eucalyptus oils while they moved from one site to another in

vast Australasian forests with naturally occurring trees of eucalyptus. In this way they were able to distill leaves from different areas of the forest each day. The essential oil of Eucalyptus leaves has served primitive tribes as a medicament for respiratory diseases as well as a liniment for inflammatory conditions.



*A nomadic type still used in Australia*



*A still constructed with an old barrel in Trinidad*

Modern distillation technologies have come a long way from these early designs, though the basic principles have stood the tests of time. Field distillation technologies for large scale cultivations of essential oil bearing plants have used mechanical harvesting trucks with mounted still bodies into which the harvested material is directly gathered, and these are driven to stations where they are connected to the steam sources for direct distillation and condensation of the vapors and further processing.

Production techniques based on distillation are now well established, but newer techniques such as extraction with supercritical fluids are used where the sensitivity of the oils to heat are of consequence.

The essential oils currently produced and exported from Sri Lanka on a regular basis are the following:



*A portable distillery in Fundulea farm in Rumania*



*A Bulgarian Lavender distillery*

Cinnamon bark oil, Cinnamon Leaf oil, Nutmeg Oil, Cardamom Oil, Citronella Oil, Pepper Oil, Clove Oil, and smaller amounts of other oils when desired by overseas customers.

### Looking to the Future

Naturally extracted flavoring agents, and indeed essential oils are the source of them, form the foundation units from which perfumers derive their compositions of fragrances for all requirements. Perfumers have also at their disposal a wide variety of synthetic aroma chemicals far larger in number than the natural ones at their disposal. Blending these to form an acceptable fragrance for a given situation is a perfumer's job. It is much like that of an artist, a painter for instance, who has a final identified mandate yet has a degree of flexibility to allow for his or her own ingenuity. The flavoring agents are analogous to the paints to weave unique and pleasant patterns to suit each occasion. It is the belief of leading industrialists that the driving force in the consumer market for products in the future will be in new and unique fragrances. Both from the standpoint of the industrialized countries and that of the developing ones this is believed to be true and more so in the case of the latter. Leading industrialists

believe that we shall have markets where the middle classes will be growing, both numerically and in sophistication, and hence there will be an increasing demand for fragranced products and new product categories. We have begun to see consumers in developing countries shifting from bar soaps to shower gels and to perfumed waters. Even men now value fragrances in products of ordinary usage such as shaving foams and deodorants which are daily used. There is a growing awareness that fragrances are agents of mood changes and they are used in community centres, work places and even hospitals.

Fragrance will be a key driver in the industry and this will bring opportunities to developing nations too where most of the essential oils have their origin. Rain forests, like our own Sinharaja Heritage site, and the new species of yet unharnessed plants they house within them, will offer a great chance if these forests are preserved. Perfumers, like the artists they are, have a penchant for nature, and this opens an opportunity to develop new and exotic essential oils and even therapeutic agents. There are many flowers with exotic odors whose fragrance is still wasted in the forest air or known and appreciated just by the birds, the butterflies, the monkeys, and the bees, those indigenous inhabitants of the forest. They could with the newer techniques now available be harnessed for mankind's use as well. Natural essential oils, it seems will continue to be an important constituent of the perfumers palette. A new ingredient is bound to give a perfume with just the spark that would be needed to create a new fragrance that will make a difference in the consumer market. This type of initiative is the need of the times. The realization of this has prompted many companies to venture into research into the new essential oils potential of the natural rain forests and to take initiatives to ensure their preservation. Rescue of endangered aromatic species is also of prime importance here.

### Further reading.

1. Link Natural Products Digest. Chemistry and technology of essential oils 1,1, 5-6
2. Link Natural Products Digest 3,1,20-21
3. Link Natural Products Digest 5,1, 17-23
4. Link Natural Products Digest 5,1 24-33
5. Link Natural Products Digest, 5,1 34-35



# SAFFRON AN ANCIENT MEDICATION, SEASONING, FRAGRANCE AND A DYE

By A. L. Jayewardene, Ph.D.

Saffron (Hindi - kesar, zaffran; Sanskrit avarakta; Tami. and Maly kunkumappu; Fr.and Ger -saffran) has been a key seasoning, fragrance, dye, and medicine product for over three millennia. One of the world's most expensive, if not the most expensive spice by weight, saffron consists of stigmas plucked from the vegetatively propagated and sterile flowers of *Crocus sativus* L, known popularly as the saffron crocus or autumn crocus. The resulting dried reddish orange "threads" are distinguished by their bitter taste, hay-like fragrance, and slight metallic notes. The saffron crocus is unknown in the wild; its most likely precursor, *Crocus cartwrightianus*, originated in Crete or Central Asia. Saffron crocus is native to Southwest Asia and was first cultivated in what is now Greece.

From antiquity to modern times the history of saffron is replete with applications in food, drink, and traditional herbal medicine: from Africa and Asia to Europe and the Americas the brilliant red threads were—and are—prized in baking, curries, and liquor. It coloured textiles and other items and often helped confer the social standing of political elites and religious adepts just as these groups act to-day. Ancient peoples used saffron to treat stomach upsets, bubonic plague, and smallpox; modern research studies have indicated possible health benefits, which range from cancer-inhibiting and allergy-moderating properties to effects that combat depression and promote satiety.



*Crocus sativus* style branches –  
Saffron as harvested by growers



*Crocus cartwrightianus* the 'mother' of *C.sativus*



*Saffron (C.sativus) flower*



*A saffron field in Switzerland*

As far back as 40 A.D. Pliny the elder the Roman naturalist said, "*caveat emptor*" - (buyers beware) and warned folks that saffron was a

"frequently falsified commodity", another way of saying adulterated. Buy your saffron from a reputable spice dealer and avoid "Mexican saffron," which is usually safflower. Saffron will always be expensive; if you see a packet of a couple ounces for a few dollars, just put it back. Never buy ground saffron. Far too often it's cut with turmeric, paprika, and/or safflower. Even if it's from a spice merchant you trust, remember saffron powder loses its flavor faster than whole threads. If you have the option to buy a small sample of saffron threads, drop them in some warm water in a small bowl. In two or three minutes, but not immediately, the water should become a bright, clean yellow, and the threads should retain their shape. If the water is murky or the threads fray, it's a sign of adulteration.

Saffron is one of the few things that truly are worth its weight in gold. This product of the crocus flower adds not only pungent and aromatic flavor to foods, but also a beautiful golden color. It is native to Asia Minor and the Mediterranean region where it has been cultivated for thousands of years and more recently come to India where the best saffron is produced in Kashmir. It is likely to grow well in Nuwara Eliya and Haputale regions in this country. If it does well in these areas saffron could be a useful smallholder crop and for home gardens.

Numerous medicinal uses have been attributed to saffron,

- Saffron stimulates digestion and soothes the stomach. It eases wind and lessens intestinal gas.
- It promotes menstruation and regulates periods.
- Research shows that several components of saffron may boost the memory and improve learning skills.
- Saffron is an important antioxidant and helps to protect the body's cells against damage from free radicals.
- Studies have shown that saffron may be taken in order to combat cancer and slow down tumour growth.
- It has been used as an antidepressant and a general tonic.
- Saffron is a mild sedative.
- It has been used to relieve muscle cramps and spasms.
- Saffron promotes sweating and perspiration, which is helpful in relieving fevers and high temperatures.

- Saffron is effective in relieving stomach pains including period pains.
- Saffron is used in kidney ailments and can also help to reduce the size of an enlarged liver.
- Saffron can relieve colic in children.
- Chinese herbalists used saffron to treat chest infections and disorders.
- Can be used to reduce headaches.

#### Saffron rice Pilaf - RECIPE -

1 teaspoon butter	1 cup long grained rice
2 teaspoons olive oil	1 bay leaf
¼ cup petit peas thawed if frozen	Chopped parsley for garnish
¾ cup minced onions	½ cup diced carrots
2 cups hot chicken stock	1 good pinch of saffron thread soaked in a little stock for 1 hour

*In a 2-quart saucepan over medium-high heat, melt the butter with the olive oil. Add the onion and carrots; cook, stirring occasionally, about 5 minutes or until the onions are translucent. Stir in the rice; cook and stir for another five minutes. Now pour in the hot chicken stock and add the saffron. Bring to a boil and reduce the heat enough to maintain a bare simmer. Drop in the bay leaf and add the peas. Cover with a tight-fitting lid and cook for 20 minutes without lifting the lid.*

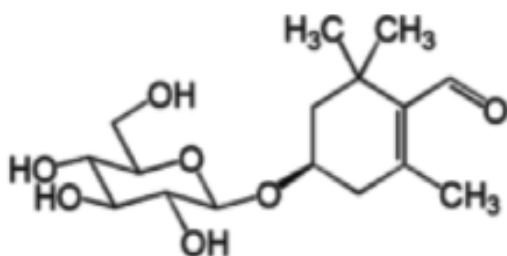
*After 20 minutes check to make sure all the liquid has been absorbed. If it has not, continue cooking for about 5 more minutes. When all the liquid is absorbed, remove from heat and allow to sit, with the lid still on, for another 5 minutes. Fluff rice pilaf with a fork and transfer to a warmed serving dish. Sprinkle with chopped parsley if using, serve right away and enjoy. Yum yum yum!!!*

#### Some of the chemical constituents of Saffron Picrocrocin

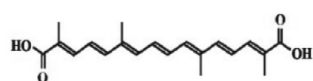
Picrocrocin is a monoterpene glycoside precursor of safranal. It is found in the spice saffron, which comes from the crocus flower. Picrocrocin has a bitter taste and is the chemical most responsible for the taste of saffron.

During the drying process picrocrocin liberates the aglycone (HTCC, C<sub>10</sub>H<sub>16</sub>O<sub>2</sub>) due to the action of the enzyme glucosidase. The aglycone is then transformed to safranal by dehydration. Picrocrocin is a degradation product of the carotenoid zeaxanthin

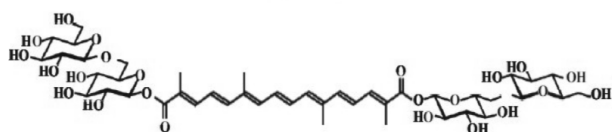




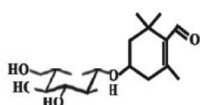
Other chemical components of saffron



Crocetin



Crocin



Picrocrocin



Safranal

### Asian R & D spending overtakes that of the US

According to a report from the US National Science Foundation a bloc of ten Asian countries account for 32% of the Global investment in scientific research. These countries are: China, India, Indonesia, Japan, Malaysia, Singapore, South Korea, Taiwan, Thailand and Vietnam. The US share is just 31%. The main share of this is by China but there are significant contributions from the other nations as well.

A group of countries identified as the ASIA 8, (India, Indonesia, Malaysia, Philippines, Singapore, South Korea, Taiwan and Thailand, are developing world class research and S&T infrastructures and act like a loosely structured supplier zone for China's high technology manufacturing export industries. China is now the second largest R&D performer globally with 12%

of the global spend overtaking Japan for the first time.

The report says that governments in many parts of the developing world viewing science and technology as integral to economic growth and development have set out to build more knowledge intensive economies. They have taken steps to open their markets to trade and foreign investment, develop their S&T infrastructures, stimulate industrial R&D, expand their higher education systems, and build indigenous R&D capabilities.

Source: Science and Engineering indicators 2012. US National Science Foundation.

### Philosophy of Science

The men of experiment are like the ant, they only collect and use; the reasoners resemble spiders, who make cobwebs out of their own substance. But the bee takes the middle course: it gathers its material from the flowers of the garden and field, but transforms and digests it by a power of its own. Not unlike this is the true business of philosophy (science); for it neither relies solely or chiefly on the powers of the mind, nor does it take the matter which it gathers from natural history and mechanical experiments and lay up in the memory whole, as it finds it, but lays it up in the understanding altered and digested. Therefore, from a closer and purer league between these two faculties, the experimental and the rational (such as has never been made), much may be hoped.

Francis Bacon, *Novum Organum, Liberal Arts Press, Inc., New York, p 93. (5)*

# OLEORESINS

By ROB Wijesekera

## General Characteristics

“Spice Oleoresins” represent the complete natural flavor of the original spice. It is a product that contains the volatile aroma-giving constituents of the spice as well as the other components that are not volatile, but contribute towards the flavor and piquancy that characterizes the spice. Accordingly an Oleoresin can be regarded as the true, concentrated essence of a spice, and can be used to replace a whole or ground spice in a food preparation without impairment of flavor, piquancy, or other natural characteristic of the spice itself. The high concentration of flavor-giving components in oleoresins enables their usage in very small dosages. They can be used wherever spices are used except where the appearance or filler aspect is important. Usage of oleoresins in place of whole spices in the food industry enables the easy standardization of products in terms of consistency in aroma, flavor, taste and texture. Oleoresins find wide application globally in production of beverages, meat and fish products, sauces, salad dressings, seasonings, and even nutraceuticals and pharmaceuticals.

## Technological Aspects

The processing of oleoresins from whole spices can be conducted in a single stage process or a double-stage one. In the single stage process the following sequence of operations takes place:

- Controlled Drying - Varies with the spice concerned.
- Comminution. The methodology is raw material specific. The equipment used, and the optimum particle mesh size is best worked out for each case experimentally. In the case of spices containing heat sensitive constituents cryogenic grinding processes are recommended to minimize loss of volatiles.
- Solvent extraction. The solvents used for the extraction of spice oleoresins are generally, Alcohol, Acetone, Ethylene dichloride, Hexane, and should be in accordance with the food laws in operation.

- Solvent stripping. This is generally carried out after draining off the extract and subjecting the clear miscella to reduced pressure distillation till only traces of residual solvent remain. This is governed by the permitted quantity of residual solvent in the oleoresin.

In the double stage process technology the spice is first subjected to steam distillation following the comminution stage in order to first obtain the volatile essential oils. The residual marc is then dried and subjected to solvent extraction. The extracted material is mixed with the dried essential oil of the spice in the predetermined proportions to obtain the exact flavor profile of the spice.

## Market considerations

The global spice oleoresin market is believed to currently exceed the million dollar mark, without including that of China for which the figures are not available. The global requirement of various oleoresins such as: Paprika, Chillie, Turmeric, Pepper, Ginger, Cardamom, Clove and Cinnamon is estimated to be over 17,000 metric tonnes. India is believed to account for over 70% of the global production of oleoresins while the competing countries are China, Thailand, the US, Brazil, Argentina, and South Africa and other countries of the Latin American region. International standards are available for oleoresins and these have to be observed in the trade. The increasing market is due to the burgeoning increase in the demand for snacks and fast foods globally, in which the convenience and reliability of oleoresins score.

Spice oleoresins offer the following advantages over whole spices:

- Consistency in flavor.
- Not effected by bacterial spoilage
- Much longer shelf life
- Easy storage and handling due to smaller quantity.
- Complete release of flavor during cooking.
- Blending possibility to obtain desired results



Small quantities of oleoresin will replace bulk amounts of spice.:

Black Pepper Oleoresin (1kg) =  
30 kg of Black Pepper.

Cardamom Oleoresin (1kg) =  
40 kg of Cardamom

Chillies (1kg) - = Dry Chillies (600 kg)

Garlic (1kg) = Garlic (10kg)

### Concluding Observations

Spice oleoresins are produced using technologies that are well within the reach of developing countries. The markets for spice oleoresins keep expanding as the demands for naturally flavored convenience foods show a burgeoning increase. Given the range of spices available for which there is a global demand, the processing of oleoresins represents a profitable prospect for the future.

### What makes a good scientific researcher ?

There are some characteristics that can be identified that those being acknowledged as good scientific researchers possess. Among these are the following.

- A skill for problem solving and an ability to make a detailed analysis of a given situation.
- Tenacity and perseverance.
- Ability to focus attention to a relevant situation.
- Ability to search out relevant information and use this as a resource for developing research ideas.
- A searching mind and a love for finding out the reasons why things happen. (*Rerum cognoscere causas.*)
- Ability to work as a member of a team in a goal oriented effort
- Ability to listen to others and imbibe new ideas.
- Ability to articulate ones knowledge and thought processes and impart them to others
- Ability to communicate by writing papers and giving presentations.

### Merck Index changes ownership

The widely acclaimed bible of all chemists, the Merck Index has now been bought over by the Royal Society of Chemistry. This monumental reference book has been much used by researchers throughout the ages, the publication having a history of 120 years. The Merck index provides comprehensive information on chemicals, drugs and biologicals, and RSC has plans to expand and develop it to be available on line. RSC will take over publication by launching the 15th edition in April 2013. and net-working with research colleagues with similar interests.

### Crick :- "Mad Pursuit"

When the war finally came to an end, I was at a loss as to what to do... I took stock of my qualifications. A not-very-good degree, redeemed somewhat by my achievements at the Admiralty. A knowledge of certain restricted parts of magnetism and hydrodynamics, neither of them subjects for which I felt the least bit of enthusiasm. No published papers at all... Only gradually did I realize that this lack of qualification could be an advantage. By the time most scientists have reached age thirty they are trapped by their own expertise. They have invested so much effort in one particular field that it is often extremely difficult, at that time in their careers, to make a radical change. I, on the other hand, knew nothing, except for a basic training in somewhat old-fashioned physics and mathematics and an ability to turn my hand to new things... Since I essentially knew nothing, I had an almost completely free choice...

*Francis Crick, What Mad Pursuit, Basic Books, New York, 1988, pp 15-16. (1) Available from Amazo*

## ALPINIA CALCARATA ROSCOE : A PROMISING CANDIDATE FOR PHYTOPHARMACEUTICAL INDUSTRY

L.S.R. Arambewela <sup>1</sup>, L.D.A.M. Arawwawala <sup>1</sup>, W.D. Ratnasooriya <sup>2</sup>, K.G.A. Kumaratunga <sup>3 \*</sup>

### ABSTRACT

*Alpinia calcarata* Roscoe (F. Zingiberaceae) rhizomes are often used in Sri Lankan traditional systems of medicine as a remedy for bronchitis, cough, respiratory ailments, diabetics, asthma and arthritis. This review summarizes chemical, pharmacognostical, pharmacological and toxicological investigations carried out on *A. calcarata* of Sri Lankan origin.

**Key words :** *Alpinia calcarata*, Bio-activities, Chemical constituents, Standardization, Toxicity, Zingiberaceae

### INTRODUCTION

*Alpinia calcarata* Roscoe (Synonyms: *Languas calcarata* Merr., *Alpinia erecta* Lodd. & Steud., *Alpinia bracteata* Rosc., *Alpinia cernua* Sims., *Renealmia calcarata* Haw., *Globba erecta* Retz.) belongs to the family Zingiberaceae. The vernacular names of the plant are Heen - araththa in Sinhala, Amkolingi in Tamil and Kattuchena in Malay. The plant is a perennial slender rhizomatous herb mainly cultivated in Sri Lanka and India for medicinal purposes. This species also occurs in Malay Peninsula, China and Indonesia.

The mature rhizomes are branched and dense with a light to dark brown color<sup>1</sup>. The rhizome of *A. calcarata* is recommended as an aphrodisiac and a decoction is widely used in the treatment of bronchitis, cough, respiratory ailments, diabetes, asthma<sup>2</sup> and arthritis<sup>2</sup>. A survey on "Traditional treatments in Sri Lanka for chronic arthritis" also indicated that *A. calcarata* is commonly used in the treatment of arthritis<sup>3</sup>.

Investigations carried out by Indian researchers have shown the presence of antimicrobial<sup>4,5</sup>, anthelmintic<sup>6</sup> activities and ameliorative effects in alloxan-induced diabetic rats<sup>7</sup>. Kong and co-workers<sup>8,9</sup> have isolated some diterpenes such as calcaratarins A-E, sesquiterpenes such as shyobunone and coumarins such as herniarin from the rhizomes of *A. calcarata* grown in China.



### CHEMICAL CONSTITUENTS OF *Alpinia calcarata* <sup>14</sup>

Some 18 volatile constituents have been identified in the essential oil (EO) of Sri Lankan *A. calcarata* rhizomes, leaves and roots by capillary GC and GC/MS studies. 1,8-cineol was found to be the major constituent in the oils of rhizomes and leaves while in the roots, it was  $\alpha$ -fenchyl acetate. Apart from 1,8-cineol,  $\alpha$ -pinene (3.1%), camphene (4.1%),  $\beta$ -pinene (9.3%), p-cymene (1.4%) and limonene (4.0%) were found as major compounds in EO of *A. calcarata* rhizomes.

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STANDARDIZATION OF *Alpinia calcarata* RHIZOMES<sup>15</sup>

Standardization of herbal drugs is an essential factor in order to assess the quality, purity, safety and efficacy of drugs based on the concentration of their active principles. It is very important to establish a system of standardization for every plant medicine, since the scope for variations in different batches of medicine is enormous.

*A. calcarata* rhizomes were standardized by estimation of (a) physico-chemical properties (b) quantitative analysis of chemical constituents and (c) Thin Layer Chromatography (TLC) – densitometric profiles according to the methods recommended by the World Health Organization<sup>16</sup>. Phytochemical screening revealed the presence of polyphenolic compounds, tannins, flavonoids, steroid glycosides, and alkaloids in both hot ethanolic extract (HEE) and hot water extract (HWE) made out of *A. calcarata* rhizomes. Physico-chemical parameters of *A. calcarata* rhizomes are summarized in Table 1.

Table 1. Physico – Chemical parameters of *Alpinia calcarata* grown in Sri Lanka

Physico – chemical parameters	Amount as % (dry weight basis)
Moisture content	5.5 – 6.8
Total ash	8.3 - 8.8
Acid insoluble ash	0.036 - 0.040
Water soluble ash	7.2 - 7.8
Ethanol extractable matter	22.6 – 24.8
Water extractable matter	18.6- 20.5

All the experiments were carried out in triplicate

INSECTICIDAL ACTIVITIES OF *Alpinia calcarata*

As protectants of cowpea against *Callosobruchus maculatus* (F.)<sup>17</sup>

The bruchid, *Callosobruchus maculatus*, (F.) causes major losses during the storage of cowpea seeds [*Vigna unguiculata* (L.) Walp.] in Sri Lanka. Essential oil extracted from *A. calcarata* and 1,8-cineole, which was identified as the major constituent of the essential oil, were tested for their potential insecticidal activity against *C. maculatus*. The adults of *C. maculatus* were susceptible to

both contact and fumigant toxicity of 1,8-cineole and *A. calcarata* oil. This study revealed that 1,8-cineole is one of the toxic components present in *A. calcarata* oil, and that the repellent activity of *A. calcarata* oil could be due to 1,8-cineole as well as the other constituents present in the essential oil.

Activity against American cockroach (*Periplanata americana*)<sup>18</sup>

American cockroach (*Periplanata americana*), is a common household pest in Sri Lanka. Six gas chromatographic peaks representing major component were found to possess electroantennogram (EAG) activity. The peaks were identified as  $\alpha$ -pinene, camphene,  $\beta$ -pinene, 1-8 cineol, camphor and fenchyl acetate. EAG assay of essential oil of *A. calcarata* did not elicit a significant response from antenna of the nymph males of *P. americana*, whereas the female nymphs showed EAG amplitudes similar to that of the adult female.

PHARMACOLOGICAL PROPERTIES

Antiinflammatory activity<sup>19</sup>

*A. calcarata* rhizomes are often used in Sri Lankan traditional systems of medicine as a remedy for arthritis. Generally, drugs that are used for arthritis have antinociceptive and antiinflammatory properties. Doses of 250, 500, 750 and 1000 mg/kg of HEE and HWE were orally administered to separate groups of rats and evaluated the antiinflammatory effect. The maximum antiinflammatory effect was evident with 500 mg/kg dose of both HEE and HWE. However, the overall antiinflammatory effect of HEE was superior to that of HWE. The antiinflammatory effect of 500 mg/kg dose of HEE was comparable to indomethacin (5 mg/kg), a non – steroidal reference antiinflammatory drug. Inhibition of histamine and prostaglandin were shown to be probable mechanisms by which *A. calcarata* mediates its antiinflammatory actions.

Antinociceptive activity<sup>20</sup>

Arambewela and co-workers also investigated the antinociceptive activity of HEE and HWE of *A. calcarata* rhizomes using rats and three models of nociception (tail flick, hot plate and formalin tests). Different doses (100, 250, 500, 750, 1000 mg/kg) of HEE and HWE were made and orally administered to rats and determined the reaction times.

The results demonstrate that all the tested extracts of *A. calcarata* have significant ( $P \leq 0.05$ ) antinociceptive activity as evaluated in the hot plate test & not in the tail flick test. This indicates centrally mediated antinociceptive activity of the plant extracts against the acute pain. *A. calcarata* extracts markedly reduced the licking time in both early and late phases of the formalin test in a dose-dependent manner with a bell shaped dose-response curve. The antinociceptive activity of *A. calcarata* extracts were dose dependent and the highest activity was evident at 500 mg/kg dose with both extracts. The antinociceptive effect was mediated via opioid mechanisms.

### **Hypoglycemic and antihyperglycemic activities<sup>21</sup>**

According to the investigations carried out by Arambewela and co-workers both HEE and HWE of *A. calcarata* rhizome possess marked hypoglycemic activity (when tested in fasted normoglycemic rats) and antihyperglycemic activity (by improvement of glucose tolerance in rats). Doses of 250, 500, 750 and 1000 mg/kg of HEE and HWE were orally administered to separate groups of rats and evaluated the hypoglycemic effect. The hypoglycemic and antihyperglycemic activities of the HEE was superior to that of the HWE and tolbutamide, reference hypoglycemic drug of sulphonylurea type. It is possible that both HEE and HWE may act as an insulin secretagogue and/or sensitize insulin receptors as proposed for some sulphonylureas. Therefore, *A. calcarata* exerts significant ( $P \leq 0.05$ ) hypoglycemic and antihyperglycemic activities, possibly through multiple effects involving inhibition of intestinal glucose uptake, pancreatic and extra mechanisms.

### **Gastroprotection<sup>22,23</sup>**

A study to evaluate the gastroprotective activity of HEE and HWE of *A. calcarata* rhizomes was carried out by Arambewela and co-workers. Three doses (500, 750, 1000 mg/kg) of HWE and HEE were evaluated for gastroprotective activity against ethanol induced gastric ulcers in rats. Oral administration of extracts provided dose dependent ( $r^2 = 0.98$ ) and significant ( $P < 0.05$ ) protection against gastric damage caused by ethanol. Among the tested extracts, HWE showed the maximum gastroprotective effect. Further, gastroprotective effect of HWE was superior to that of cimetidine, the reference drug. Findings also

indicate that decreasing the acidity of the gastric juice and antihistamine activity are probable mechanisms by which *A. calcarata* mediates its gastroprotective actions.

### **Effects on reproductive competence of male rats<sup>24</sup>**

Ratnasooriya and co-workers examined the effects of *A. calcarata* HWE on male sexual competence and fertility in rats. Different doses (150, 250 and 500 mg/kg) of HWE were orally administered to male rats and their sexual behaviour was monitored (for 15 min) 3 h later using receptive females. Fertility was determined in a separate group (with the highest dose) using a noncompetitive copulation test. The observations indicated a strong aphrodisiac action. The other parameters remained unchanged indicating non-impairment in libido, sexual arousability, sexual vigour and sexual performance or penile erectile ability. However, a slight impairment was evident in sexual motivation (with the highest dose) in a partner preference test. In the fertility test, HWE induced profound oligozoospermia but fertility was uninhibited. The highest dose of HWE also elevated the serum testosterone level and the number of spontaneous penile erections rapidly and markedly.

### **Antioxidant activity<sup>25,26</sup>**

Investigations have been carried out by Arawwawala and co-workers to evaluate the antioxidant potential of *A. calcarata* rhizomes, by the use of in vitro [(a) 2,2-diphenyl-1-picrylhydrazyl (DPPH.) scavenging assay and (b) thiobarbituric acid reactive substances (TBARS) assay methods. The extracts and essential oil obtained from rhizomes of *A. calcarata* had moderate antioxidant activity. The overall antioxidant effect of cold ethanolic extract (CEE) was higher than that of HEE, HWE and EO.

### **Antifungal activity<sup>26</sup>**

*Alpinia calcarata* ethanolic extract was taken and 0.02% solution was prepared using ethanol. The in vitro Sun Protecting Factor (SPF) of the solution was determined according to the UV spectrometric method of Mansur et al.<sup>29</sup> in the wave length range of 290nm – 320 nm. The SPF value of *A. calcarata* was 14.6 indicating substantial sun protecting activity



## Immunomodulatory activities<sup>30</sup>

The evaluation of immunomodulatory activities with different modes of actions which includes oxidative burst ROS, nitric oxide (NO) and proinflammatory cytokine production in essential oils, ethanolic and water extracts of rhizome and leaves of *A. calcarata* was carried out by Kathirgamanathar et al.<sup>30</sup>. The Oxidative burst ROS results showed that the ethanolic extract of the rhizome and the leaf oils have highly potent activity when compared to the standard drug, Ibuprofen. On the other hand, the ethyl acetate fraction of water extract of rhizome and all the fractions of leaf ethanolic extract showed NO inhibitory activity. In conclusion, some of the fractions of the ethanolic and water extracts of rhizomes as well as leaves and both the rhizome and of leaf essential oils showed in vitro oxidative burst ROS, nitric oxide and proinflammatory cytokine production activities.

## Toxicity<sup>27</sup>

Using rats as the experimental model, Arambewela and co-workers have demonstrated that extracts (HEE or HWE) of *A. calcarata* rhizomes do not produce any serious toxic effects or mortality even at a dose of 1500 mg/kg. Oral treatment with HWE or HEE for 42 days failed to bring about any overt signs of toxicity, stress, aversive behaviors and mortality. HWE and HEE treated rats showed normal food and water intake. The consistency of faeces and color of urine of the HWE and HEE treated rats were similar to that of respective control groups. The extracts also did not produce any signs of hepatotoxicity or renotoxicity (as judged by histopathological observations, liver and kidney function assessments).

## CONCLUSIONS

Eighteen volatile constituents have been identified in essential oil of Sri Lankan grown *A. calcarata* rhizomes, leaves and roots. Moreover, *A. calcarata* indicated strong activities such as anti-inflammation, antinociception, antidiabetic, gastroprotection and reproductive competence of male rats, validating the claims in traditional medicinal systems of Sri Lanka. In addition, hitherto unreported antioxidant, sun protective, insecticidal, antifungal and immunomodulatory activities are also reported. *A. calcarata* grown in Sri Lanka did not produce any serious overt signs of toxicity. All these studies indicate that

*Alpinia calcarata* grown in Sri Lanka is a promising candidate for phytopharmaceutical industry. However, it is imperative that more clinical and pharmacological studies are needed to explore the full potential of this plant.

## ACKNOWLEDGEMENT

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### A plus for Coconut?

Alzheimer's disease is a dreaded malady which arises as a person ages and causes memory loss. It has no accepted cure but many approaches to minimize the ill effects or even to delay these are available.

Alzheimer's Disease: What if there is a cure?-- by Mary T. Newport, is the title of a recent book. The author is from Laguna Beach, California, and she sets out her personal account of her struggle caring for a husband ailing with the onset of Alzheimer's disease. She proposes an emergent methodology of approach using a group of organic compounds, namely ketones as a successful treatment to stall the oncoming symptoms. When medium chain fatty acids such as those found in coconut oil are consumed, they undergo a series of reactions in the liver resulting in ketones, which can be used as an energy source to cell mitochondria. Now cell mitochondria are considered to be the "power plants" of the cells, including the mitochondria in the brain. These ketones can serve to re-energize brain cells. Newport recommends the intake of medium chain fatty acids such as those in coconut oil and other palm kernel oils so that on conversion to ketones by the liver they would have beneficial effect on patients at the onset of Alzheimer's disease.

*Basic Health Publications Inc., 2011, Paperback. 398 pgs. ISBN 978-1-59120-293-6*



## A RELIEVER FOR MUSCLE CRAMPS

by Dr. R. Gamage and Ms. N.M.M. Jayamanne



**Sudden, painful, involuntary contractions in the skeletal muscles are commonly known as Muscle Cramps. This is due to the inability of the muscle to relax.**

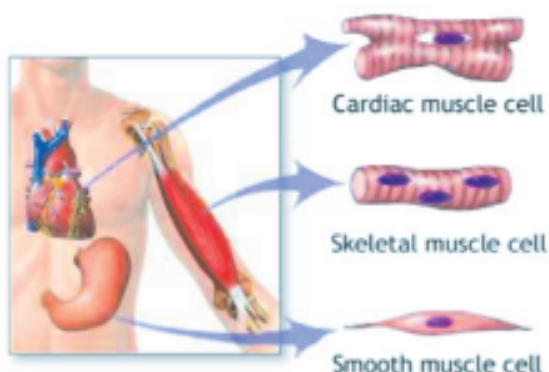
Muscle cramp is a common malady affecting many people, specially the ageing and the aged, and also those suffering from over exhaustion.

Whether they are minor or major, the reason for all muscle pains are malfunctioning of body muscles.

### What are body muscles?

Body muscles help the smooth functioning of the body by generating motion and force. There are three types of muscle tissues in human body:

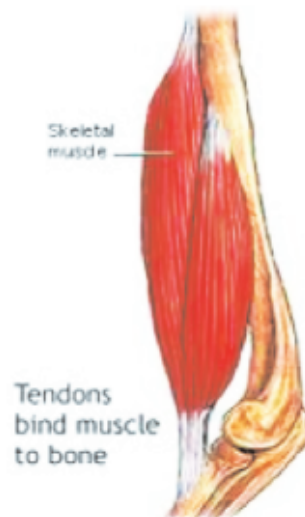
- 1. Skeletal muscles :** These are attached to the bones of the skeleton and have the ability to control the body movements.
- 2. Cardiac muscles:** These are found only in the heart, and moves blood through the circulatory system.



### 3. Smooth muscles :

These are primary muscle of internal organs and body tubes (stomach, blood vessels).

Among them skeletal muscles and cardiac muscles are classified as striated muscles as they have light and dark bands under light microscope. Further, skeletal muscles are voluntary (we can control their movements) whereas other two are involuntary (we cannot control their movements).



### What are the reasons for muscle cramps?

There are five main reasons for muscle cramps:-

1. Over exhaustion / Over use of the muscle (Ex: During exercise, running, swimming, etc)
2. Old age
3. Electrolyte ( $\text{Na}^+$ ,  $\text{K}^+$ ,  $\text{Ca}^{2+}$ ) imbalances in blood (Ex: Sweating, As a result of some diuretics, etc)
4. Intermittent claudication (Reduced blood supply to the muscle).
5. Muscular diseases
  - a. Myopathy: Muscle pain, muscle tenderness and inflammation with muscle weakness, characterized by increased levels of serum hormones. Most of the cases are congenital. (Ex: Duchenne muscular dystrophy)

- b. Myocytis: Muscle pain and muscle tenderness with inflammation
- c. Myalgia: Muscle pain and muscle tenderness

Among these muscle cramps due to over exhaustion and old age are the most commonly identified as muscle cramps.

### Treating cramped muscles

Primary treatment of muscle cramps is to relax the affected muscle by stretching, massage, and heat application. Other treatments that are directed to remove the cause of muscle cramps include rehydration, electrolyte repletion, hormone treatment, calcium supplementation, etc.

Special thanks are due to Prof. Colvin Goonaratne, for advice

#### A Time Tested Answer for Muscle Cramps... Link Kendaperalumhara Thailaya

Link Kendaperalumhara Thailaya is manufactured according to a time tested traditional formula which is proven to be effective for muscular cramps. Blending of the traditional knowledge with modern technology under Good Manufacturing practices provides a quality product to the market. It is enriched with the extracts of Kuth (Sinhala name : Suwanda kottan, Scientific name: *Saussurea lappa* Clarke) that is scientifically proven to be effective for the muscle cramps.

Link Kendaperalumhara Thailaya is especially effective for reduction of muscular cramps all over the body.

**Directions for use:**  
Apply over affected places and rub properly till absorbed.



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## ‘EARTH ESSENCE’ HERBAL HANDMADE GLYCERINE SOAP

Throughout the ages, beauty has been linked with healthy skin. By keeping the skin hydrated, it can create the foundation of a healthy skin. Glycerin is considered as a humectant, which has the ability to attract moisture. Because of this quality, glycerin soaps are able to draw moisture to the skin and hold it there, resulting in constant hydration to your skin. Its unique moisturizing properties allow for your skin to remain hydrated for several hours after use.

Proprietary blend of Gotukola and Weniwel herbal extracts in Earth Essence handmade glycerin soap leaves your skin feeling clean refreshed, re-energized, fragranced and moisturized naturally. It is available in following three fragrances.

Exotic :- A mix of Jasmine and Frangipani fragrance

Blush :- Sweet and romantic floral fragrance

Delight :- Spicy cinnamon type fragrance





## AYURVEDA, IN THE SRI LANKAN CONTEXT

by Vikrama

Ayurveda is a unique system of medicine which originated in ancient times in the continent of India. The Ayurvedic system is believed to employ the inherent principles of nature itself to maintain health in an individual, by keeping the body, mind and spirit in harmonious equilibrium with nature.

The term AYURVEDA implies "Knowledge or Science of Life". Through the ages the system of Ayurveda developed within the continent of India, and evolved into an intricate system of health care. It has been practiced widely since then up until modern times. Its fundamentals can be traced to the Hindu scriptures called the "vedas" or the Books of Wisdom of ancient India. For example within the Rig Veda written over six thousand years ago, can be found a series of prescriptions that can enable humans overcome various diseases and ailments.

The Ayurvedic system of medicine was introduced to Sri Lanka following the advent of Buddhism, and merged into the Deshya system which had prevailed in the island until the reign of the Physician King Devanampiya Tissa. Subsequently influences of other old parallel systems of medicine such as the Siddha system and the Unani system merged together, so that what we see in the island today is a system that is predominantly Ayurveda with discernible influences from these other systems. In Sri Lanka the system is now collectively referred to as Ayurveda.

The purpose of Ayurveda is primarily, to prevent illness, heal the sick and maintain a healthy life. In Ayurvedic terminology this means:

- *Swasthiyas rakshanan* - to protect health and prolong life.
- *Aturasya vikar prashamanmeha* - to eliminate disease and dysfunction within the body and mind.

### The TRIDOSHA theory

Ayurveda is based on the premise that the Universe is made of FIVE elements namely: Air,

Fire, Earth, Ether and Water. These elements have a role and controlling influence in humans with regard to the three "doshas" or "bio-energies" identified as: VATA, PITTA, & KAPHA.

The three doshas in the normal state are said to be in a state of balance. Each individual is believed to possess a definite state of balance or equilibrium with respect to the three doshas, and health and wellbeing is dependent on maintaining that equilibrium. When any of the doshas accumulate within a body beyond a desirable limit the resulting disturbance in the equilibrium state brings about the symptoms of disease.

Ayurveda recommends specific lifestyles and nutritional guidelines to ensure the maintenance of the tridosha state of equilibrium.

In one of the major Ayurvedic compendiums, the *Susruta Samhita*, a healthy individual is characterized thus:

"One whose doshas are in balance, appetite normal, all tissues of the body and all natural urges functioning well, and whose mind and spirit are cheerful and body lively.....".

The tridosha theory also characterizes the three doshas - "bio-energies" - as follows:

- **Vata:** It is energy that pertains to Air and other Elements. This energy is seen as a force which directs nerve impulses in the body, influences circulation, respiration and elimination.
- **Kapha:** This energy pertains to Water and Earth Elements; Kapha is seen as responsible for growth and protection. The mucosal lining of the stomach and the cerebral and spinal fluids are examples of those governed by the effect of kappa.
- **Pitta:** This energy pertains to Fire & Water Elements. This governs metabolism Eg. Transformation of food intakes into nutrients, and also governs

metabolism in the organ and tissue systems.

It is the belief in terms of Ayurvedic theory that these three doshas govern all physiological phenomena in the human organism. Every human being is considered to be unique and at the time of fertilization of the juxtaposition of the three doshas are believed to determine the constitution of the individual constitution which is termed the "*Prakruthi*".

### Ayurvedic Healthcare

Ayurvedic healthcare is a comprehensive system of holistic medicine and cannot be described as merely a component of what western texts term "Complementary Medicine". It has several elements functioning together prescribing a complete way of Life, rather than attention to specific symptomatic conditions that may emerge from time to time in the form of disease.

The healing science of Ayurveda is based on the understanding of the nature of the individual constitution namely the *prakruthi*. The Ayurvedic practitioner's duty is to determine this by a systematic examination and evaluation of the individual prior to administering treatment.

Some of the salient features of the treatment by Ayurvedic practice are the following:

*Panchakarma* : This is a five-operational practice to completely rid the body of the harmful effects and manifestations of the presence of toxins. The five elements are the following:

- Vaman or therapeutic emesis
- Virechan or purgation
- Vasti or Enema
- Nasya or Nasal elimination of toxins
- Raktha Moksha or Bleeding to eliminate toxins.

### Diet Regimen

Ayurveda regards food is a Life Force or Prana and foods are prescribed in accordance with the characteristic of the individuals constitution or *prakruthi*.

### Regimen for Yoga or Exercise

Medication, by Herbal or Mineral Preparations; including protocols, for gathering raw materials, and processing of the medicaments.

Detailed pharmacological data on the medicaments prescribed to counter disease. Medical Monitoring, and Meditation therapy.

Ayurvedic Healthcare is then a relationship between the Physician and the patient and the treatment is necessarily specific for the individual. There is no single treatment that is meant to be the one for every patient. The skill and expertise as well as the experience of the physician are of prime importance. The skill of the practitioner lies in the assessment of each patient's individual and characteristic constitution or *Prakruthi* in terms of the tridoshic theory of Ayurveda. and delivering the treatment that is uniquely appropriate to the case.

### Curie, Marie

Humanity needs practical men, who get the most out of their work, and, without forgetting the general good, safeguard their own interests. But humanity also needs dreamers, for whom the disinterested development of an enterprise is so captivating that it becomes impossible for them to devote their care to their own material profit.

Without doubt, these dreamers do not deserve wealth, because they do not desire it. Even so, a well-organized society should assure to such workers the efficient means of accomplishing their task, in a life freed from material care and freely consecrated to research.

*Eve Curie (translated by Vincent Sheean), Madame Curie, Pocket books, Simon and Schuster, New York, 1946, pp 352-253. (7) Newer edition available from Amazon.com*

## AYURVEDA - AN ALTERNATIVE OR COMPLEMENTARY ? - ASKS DR. ROBERT E. SVOBODA

By VIKRAMA



*Dr. Robert E. Svoboda*  
Dr. Svoboda is the first western scientist to graduate from an Ayurvedic College in India and obtain a license to practice Ayurveda in India as well as overseas. He graduated in science prior to his study of Ayurveda

This is the question posed by a leading American born Ayurvedic Physician Dr Robert E. Svoboda. In answering this question Dr Svoboda is convinced that modern medicine does indeed, need alternatives and complements. He believes that modern medicine responds admirably to crises which require quick, intensive, invasive intervention, but contends that it deals with conditions such as the slow progressing degenerative diseases far less effectively. He detects an oncoming climate change and a paradigm shift in the approach towards western medicine. This is based on observations such as this. Almost one half of the people in the United States are known to suffer from at least one chronic illness and that together these illnesses account for three quarters of the medical expenses in the United states. He contends that the crisis medicine has fanned a crisis-based lifestyle that has generated a physical imbalance that can be the result of disturbances of the mind, or the life force. Imbalanced individuals tend to perturb their surroundings and a polluted habitat will pollute its inhabitants.

Dr. Svoboda continues to give the Ayurvedic viewpoint. The world of today sees the human creature destroying its environment and itself and are thus one is not surprised to find what he calls the gargantuan imbalances that have created rampant disease.

According to Dr. Svoboda the inability of crisis-medicine to deal with the present situation in the western world has led to the resort to many alternative paradigms that now compete for the acceptance of scientists on the one hand and the public on the other.

Dr Svoboda quotes Dr. James Gordon of the Georgetown University School of Medicine who has stated that two out of every three persons who consult with M.D.'s in the United States are at the same time doing something else too: herbs, supplements, chiropractic, etc., and this he contends is a decisive majority.

Thus, states Dr Svoboda Ayurveda constitutes a worthy and viable alternative. Ayurveda has already contributed much to enrich western medicine itself, and Dr. Svoboda cites just two examples: firstly that of *Rauwolfia serpentina*, which revolutionized the western treatment of hypertension since the decade of the fifties, and then of Guggulipid from *Commifora mukul*, which brought in a new agent for the control of blood cholesterol. There are very many other examples that can be cited.

Dr Svoboda also states the little known fact that it was Ayurveda that gave the world plastic surgery. He states that during the nineteenth century the Germans translated the then 2000 year old Ayurvedic treatise of *Susrutha* wherein is described the details of an operation for repair of damaged noses and ears. This operation which appears in textbooks of modern surgery is known as pedicle graft and it led to the development of plastic surgery as a special branch of surgery. Today *Susrutha* is even regarded as the father of plastic surgery.

All Ayurvedic treatment is carefully tailored to the individual. It concentrates first on making simple changes of diet and behavioral patterns. Ayurveda does not hesitate to use surgery, shock treatments where mild interventions fail.

Finally, Dr. Svoboda believes that Ayurveda still has much to contribute to modern medicine, particularly in respect of the theory and nature of disease itself. These contributions will be derived from Ayurveda's way of seeing the world. Its Darshana will give a new vision and facilitate the method of proactively maintaining a state of health and not merely avoidance of disease.

Ref: <http://www.drsvoboda.com/ayurvedAlt.htm>



## HAR GOBIND KHORANA (1992 – 2011)

*By Dilmani Warnasuriya*

Har Gobind Khorana, the Indian born chemical biologist and Nobel Laureate who helped to establish the Genetic code, is alas no more. He died in November 2011 at the age of 80.



Har Gobind Khorana was essentially a chemist but his interest lay in applying chemistry to problems in biology. With this commenced the discipline of Chemical biology, which he pioneered and his work on uncovering the genetic code earned him a Nobel prize in Physiology or Medicine in 1968. The synthesis of the first gene in 1970, was attributed to Khorana and this was followed by a related gene, which he demonstrated was functional in a bacterium. This was a landmark development in genetics, and mar-shaled the era of recombinant DNA.

Khorana rose to this state from very humble beginnings, having been born in a small village in the Punjab province where educational facilities were at a minimum. His father being a strong advocate of education, was instrumental in Khorana completing high school and then going on to further his education at the

University of Punjab where he received both a bachelors and Masters degree in Chemistry. Upon receiving a Fellowship for further study, Khorana proceeded to the University of Liverpool in England where he received a Ph D for his work on the chemistry of Melanine.

Khorana had several short spells at the Swiss Federal Institute of Technology in Zurich, University of Cambridge in UK and the British Columbia Research Council in Vancouver where he set up an outstanding research programme. His work on gene technology actually commenced at the University of Wisconsin, Madison where he moved to in 1960. His last move was to the Massachusetts Institute of Technology in Cambridge, where he worked for more than 30 years, until his retirement in 2007.

Khorana was a deep thinker who put much effort into choosing a problem to work on. He was a exemplary mentor who was loyal to those who helped him and also the institutions he worked for. He was demanding equally of himself and those who worked for him. As said by an associate "He showed us what excellence in science was and we learnt to recognize it." Being a profuse investigative analysts, even at his death bed, he talked about the interaction of glucose and the brain.

With the loss of Har Gobind Khorana, we have lost a an extraordinary experimental scientist, who contributed much to the world of science. May he rest in peace.

### **According to Churchill, Winston S.**

...man will occasionally stumble over the truth, but usually manages to pick himself up, walk over or around it, and carry on.

*Quoted in: Irving Klotz, Bending perception, a book review, Nature, 1996, Volume 379, p 412 (1).*

## RESEARCHING ON AYURVEDA AT THE BMARI, 1957

*The following is an account written (1973) by the Late Dr. K. Mahadeva, former Director of the Medical Research Institute, Colombo. He was a specialist in Nutritional Science, and researched in this area. He retired aged 57. He was then recalled by the Ministry of Health to direct research at the Bandaranaike Memorial Ayurvedic Research Institute (BMARI), Nawinna, a few years later. Dr. Mahadeva enjoyed that stint, and he published this note when he was 63, in the British Medical Journal of 17th November 1973, (p 41), in a brief article entitled A PERSONAL VIEW. The following represents the latter part of this publication which is reproduced from the British Medical Journal, in memory of the late Dr. Mahadeva, and in appreciation of his efforts, as an allopathic medical man and a Ph.D. in Nutritional Science from Edinburgh University, in researching in Ayurveda.*

R.O.B. Wijesekera

“Ayurveda is a medical science and said to be of “divine” origin and practiced from time immemorial by the indigenous population, during which time they have built up an armamentarium of valuable drugs in the treatment of human diseases. These had to be evaluated.

80 per cent of the population of Sri Lanka are rural and are generally treated by Ayurvedic Physicians. They speak a language the patients understand. In Western Europe and the Americas, western drug firms have almost depleted the population of all its folk tales. Asia yet holds some of these secrets which have to be unraveled. Sri Lanka is one of the countries in which this can be done. Ancient medical practice is being rediscovered, revived and evaluated. Acupuncture, for instance, has come very much into the limelight. The ancient Chinese Yin-Yan concept of dynamically opposite yet harmonizing energies which are believed to wax and wane rhythmically in the universe has a close parallel to the concepts of Ayurveda.

The Ayurvedic Institute is a beautiful place perched on the top of a hill of sixteen acres of undulating land. The Institute has 48 beds available and a willing staff to help me. To be offered the opportunity to begin again in a new environment with ancient concepts was a challenge to me. I accepted it. This switching of activity from one field to another and yet to another varied the tempo of my life. With this new found interest I discovered life beginning again.

The code of ethics laid down by the well-known surgeon of old *Susruta* and the Physician *Charaka* preceded the Hippocrates oath by about five centuries. The text is almost similar. The Ayurvedic concept represents the human body as consisting of the functional, the structural, and the excretory aspects. The functional aspect is regulated by the biological factors – namely *Vata*, *Pitta*, and *Kapa*, termed the *Thridhaatus*, if they strike an ‘ideal’ quantitatively and qualitatively.

The ever-changing environment has an influence on every human being and consequently the ideal proportion may be upset and bring about a phase of stress reaction or *Doshaavasta*. If not arrested this would disturb the structural and excretory mechanism resulting in disease or *Vyadhiavasta*. The ultimate unit is the cell of the human body or *Paramanu* and forms the basis of the structural aspect. They go to form the seven-fold tissues, the *Sapra Dhaathus*, the various organs, or *Avayavaas*, and then the organism man or the *Purushas*.



*An ensemble of herbs used in an Ayurvedic polyprescription*

The vascular system, or *Srotas*, conduct nutrient materials to the tissues and take away metabolites or *Malaas* from them. The manifestation of a disease depends on the strength of the causative factor (*Nidaana*), the ability of the biological factors to maintain the ideal state and the strength or *Bala* of the tissues which contain immunological factors known as *Ojas*.”.....

## GREEN TINGE ON BACON STRIPS

During the festive season in December many super markets stock ample amounts and a variety of meat products. Among these foremost will be bacon, hams and smoked and cured meat. It is occasionally noticed that a green pigment “decorates” the surface of the meat and this is viewed with alarm by customers and concern by the sales authorities. Reference to scientific authorities, should reveal that the green tinge is not the result of poor refrigeration, and more importantly it is not harmful to consumers. The green pigmentation as it appears is no more than a version of the nitrite that has been used in the curing of the meat. Nitrite is produced naturally in the body and it has been used over centuries in the curing of meats. It is essential for preventing botulism and it gives cured meat that characteristic flavor and colour. The green coloration is termed “nitrite burn” and is the result of the interaction of the nitrite used in the curing of the meat with myoglobin in the meat. Some feared that either the nitrite itself or the nitrite burn would have harmful effects on those consuming the meat products but this is far from the case. Now scientists have employed X-ray diffraction methods in characterizing the nature of the nitrite burn. They have shown that it is the result of nitration at a site identified chemically as the 2-vinyl group of the haemacrocycle. The knowledge of the chemistry is the first step in the understanding of the chemical nature of the nitrite burn. This knowledge will give some idea as to how it will react with other constituents present in the human body. Though harmless in the context there is more to be discovered in regard to nitrite burn.

Yuandi Li, in : Chem World , May 2012, p28.

### Inventors

An inventor is a person who makes an ingenious arrangement of wheels, levers and springs, and believes in civilization.

*Ambrose Bierce, The Devil's Dictionary, Dover Publications, NY, 1958, p 70. (3) Available from Amazon.com*

## OLD HERBAL REMEDY REDISCOVERED

The Pitcher plant or botanically *Sarracenia purpurea* (Sarraceniaceae), is a strange and rare plant in many respects. It is known as a carnivorous plant and is found in the rain forests. Another species called the tropical Pitcher Plant or Monkey cups belongs to the botanical genus *Nepenthes*. (Nepenthaceae). An endemic of this genus namely *N. distillatoria*, was first discovered in Ceylon in the seventeenth century and was initially named *Bandura zinghalensium*, - a name derived from its local name Bandura. It is used in local Sri Lankan deshiya system of medicine, in the treatment of whooping cough. In the New World the species *Sarracenia* had been used in the treatment of Small Pox and now it has been found to kill the pox virus. Small pox, ravaged human civilizations for thousands of years until scientist Edward Jenner discovered the first disease preventing vaccine. In 1979 WHO announced that it has been eradicated from the globe, but, it is now known that unscrupulous parties had stolen the small pox virus from experimental laboratories and are privately storing the live virus. The rediscovery offers a counter methodology, in the disastrous event of a biological terror attack, or even in the event of the outbreak of a similar pox such as monkey pox.



*A picture of Nepenthes distillatoria*

The pitcher plant it is believed was used by the Micmac Native Americans of Nova Scotia in the treatment of small pox. They used an infusion of the insectivorous plant. In the Sri Lankan traditional medicine it was only the liquid content of the pitcher that was used in the treatment of whooping cough particularly in infants.





*A specimen of the Sarracenia spp*

Now scientists of the Arizona State University in Tempe led by Jeffrey Langland, have by way of *in vitro* experiments shown that the herbal extract is capable of inhibiting the replication of the variola virus, the causative agent behind small pox. It is known that unscrupulous parties have developed illicitly the small pox virus following the collapse of the USSR, and there is the danger that it could be an instrument of terror attack. The scientists in Tempe state that their results prove conclusively that the herbal extract is able to destroy the virus. This is a notable discovery from many points of view. The belief in old herbal remedies can only be discounted to the disadvantage of the human race. The discovery of new agents for diseases is ever strengthened by research on plant products which must emerge as the driver of new drug development.

The research team at Arizona State University made extracts of *S.purpurea* and found that it was highly effective in inhibiting the replication of the virus in rabbit kidney cells. They then looked at the replication cycle of the virus and found that the herbal extract inhibited mRNA synthesis, halting production of proteins that are vital for replication. The extract blocks early transcription and appears to have a distinct mechanism from two other antivirals currently in clinical trial was the opinion of a virologist Mark Buller from the St. Louis University in Missouri.

Source : James Urquhart in *Chem World* May 2012  
p22

## SUCCESS IN MALARIA CONTROL IN SRI LANKA

Sri Lanka has made great strides towards the eradication of malaria in the country, having achieved a reduction of 99% since 1999. If all goes well it is expected to totally eliminate the disease by 2014. This was reported in an on line open access journal, PLOS ONE, after researchers analyzed national data and interviewed staff of the malaria programme. The paper attempted to determine the success factors behind this achievement in the light of the 26 year old civil war which raged in the country. Typically it has been seen that in countries having conflicts, there has been a weakening of the malaria control programmes, with increased outburst of epidemics.

One of the key factors in its success was the programme's ability to be flexible and adapt to changing conditions. To illustrate this, to protect hard to reach, displaced populations, public health workers deployed mobile clinics equipped with malaria diagnostics and antimalarial drugs, whenever it was safe to do so. When it was not possible to routinely spray insecticides in homes in these conflict zones, the malaria programme distributed long lasting insecticide treatments, using non governmental partner organizations familiar in the areas to help with distribution.

My driving force is a love for truth and a belief that there is an objective truth in the world. It is beautiful and elegant and we are in this century very well equipped to understand it. We should not lose that privilege.

Richard Dawkins – author of “*The Selfish Gene*” quoted in the *Sunday Times* by Smitri Daniel.

## LINK SPONSORS EDUCATIONAL PROGRAMME FOR MEDICAL PRACTITIONERS

Link Natural Products (Pvt) Ltd sponsored a medical education programme of the prestigious Independent Medical Practitioners' Association (IMPA) on Sunday October 14, 2012 at the Waters Edge, Battaramulla. The meeting was chaired by Dr Sydney Jayasuriya, President IMPA. A distinguished gathering of over 175 doctors including Consultants from various specialities, Family Physicians, health care managers and senior professionals from Faculties of Medicine comprised the audience.



Dr Jithangi Wanigasinghe (MBBS, MD, DCH) Senior Lecturer in Paediatrics and Consultant Paediatric Neurologist, gave a state-of-the-art presentation on the putative neurophysiologic basis of febrile convulsions, and its evidence-based assessment and management. During the interesting discussion that followed her lecture she dispelled many outmoded ideas regarding this common condition, its management and prognosis.

Professor Colvin Goonaratna (MBBS, FRCP, PhD) described the methodology and outcomes of a randomised clinical trial of Link Samahan® on over 900 healthy volunteer participants. The co-author of this clinical trial was Professor Roshini Sooriyarachchi, a Professor of Statistics in the University of Colombo, who is a specialist in clinical trials. The results of this study had shown that the intake of one sachet of Link Samahan® in hot water daily, significantly reduced the incidence of 15 common upper

respiratory symptoms of colds and catarrh, as well as their incidence over time, and severity.

This is the largest ever randomized clinical trial conducted in Sri Lanka, and the largest ever randomised trial of a herbal formulation in Australasia.

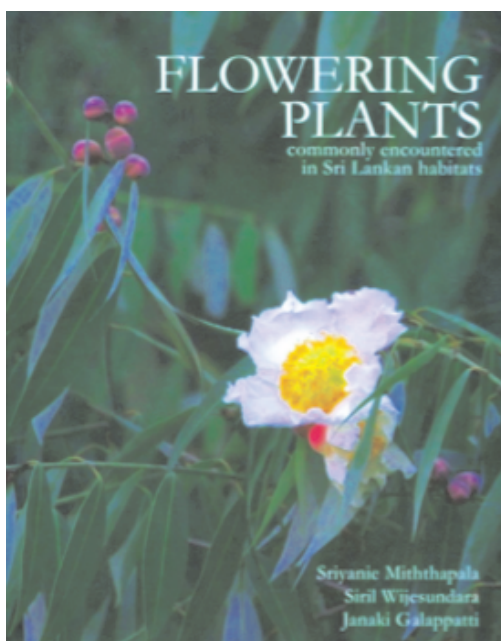


The piece de resistance of the evening's medical education program was the presentation by Dr Lasantha Malavige (MBBS, PhD, DIPM) entitled, "Sexuality in the Elderly". Dr Malavige emphasised that sexuality ought to be an important part of the life style in the elderly, contrary to local cultural and societal constraints that tend to discourage it. He highlighted the mental and physical health benefits of sexual activity in the elderly, and refuted the common belief that it is bad for common ailments in this age group such as diabetes, high blood pressure and arthritis. Dr Malavige outlined the modern remedial measures available for sexual problems, and observed that all clinicians should be aware of them or be aware of specialists to whom referrals could be made.

The evening ended with cocktails and a sumptuous dinner hosted by Link Natural Products (Pvt) Ltd.

## FLOWERING PLANTS : Commonly encountered in Sri Lankan Habitats

*Author : Sriyanie Miththapala,  
Siril Wijesundara, Janaki Galappatti*  
*ISBN : 978-955-99378-1-4*  
*Publisher : Central Cultural Fund*



Sri Lankan flora is rich with a great number of flowering plants that are grown with and without influence of humans. This book focuses on the flowering plants encountered in Sri Lanka. It mainly focuses on the plants that grow without intervention – i.e. that are not deliberately cultivated for use as food, wood, medicine, etc.

The book is rich with a beautiful picture collection of flowering plants and their flowers that makes it easier for the user to identify them. Passing through the pages, seeing the wonderful creation of nature, is a fascinating exercise for the mind.

According to the authors ' It is only when we are conscious of the beauty ..... that we begin to want to learn more about them and their integral role in life of earth. Once we do, we realize that they are vital for our own survival. Once we do, it is a love affair and a commitment for life'.

## BASIC PRINCIPLES OF CLINICAL RESEARCH AND METHODOLOGY

*Author : S.K. Gupta*  
*ISBN : 81-8448-086-5*  
*Publisher : Institute of Clinical Research (India)*



Clinical research is a common field in many western countries who are major suppliers of many pharmaceuticals and medical devices. However, it is still an emerging field in many of the Asian countries and many of them are subjected to clinical research without providing proper awareness. Further, the experiences on the clinical research in the West are very different to that in the East.

Clinical research requires specific cognitive and communication skills to handle the complex issue. Specialized training, following GCP and SOPs as well as exposure to the issues faced by the experts is essential for the beginners as well as all the other parties involved in clinical research.

The author of this book succeeded in catering this essential requirement on the clinical research education, knowledge sharing and sharing of his experiences during his research history. This book provides a vast knowledge on clinical research, its applications and the practical aspects of it.



# DIGEST MAIL BAG

## Letter 1.

*Sincere thanks for sending me copies of Link magazine and particularly the one that I wanted. I intend to share the analysis of the plant with the authorities here as there is a high incidence of Hepatitis in all its three forms. Malaysia is in many respects more advanced than us, and place a high value on research I am seeking to have them study Gotukola which improves vision.*

*I intend putting Dr. Thabrew in contact with the Malaysian authorities to enable them to share their experiences with her.*

*K. Godage  
High Commission.of Malaysia*

## Response:

*His excellency K. Godage,*

*We have been remiss in not replying your letter for so long. Please accept our sincere apologies. I am sure Prof. Thabrew will appreciate your initiative in putting her in contact with Malaysia authorities. I may add that Gotukola has been heavily researched on internationally and the chemistry is very well documented in the literature.*

*I am certain that the Malaysian researchers will be able to find the relevant publications through the internet. It's beneficial effects on the memory are recorded and no doubt there will be some on the effects of vision as well.*

*Wishing you all the best in your endeavours.*

## Letter 2.

*To Dr. Ian Southwell*

*I trust you are still receiving copies of our Link Natural Products Digest. Please confirm*

## Response from Dr. Ian Southwell:

*The last I received was Vol. 7 Issue 2, 2011. So now I have, A) Inaugural Issue, Vol. 1 & 2, Vol. 2 Issue 2 (Would appreciate a copy of Issue 1 as it contains my previous article) Vol.3 Issues, Vol 4, Issue 1*

*Vol. 5 Issue 1, Vol 6 Issue & 2, Vol 7 Issue 2 ( Issue 1 missing)*

## Response:

*We are herewith sending the missing issues available with us.*

*We have heard a lot about Australian Sandalwood Oil. Do you think you could do another article for us on that subject to be published in the Digest. Please consider this as we would very much welcome such a contribution from you.*

*(The above article is published in this issue, with compliments from Dr. Ian Southwell)*

## Letter 3.

*Just a few words of congratulations to the Editors for the interesting and thought provoking publication issued, as the Link Natural Products Digest. I find the articles most interesting and diverse. The article on Betel, although it was quite technical gave me some important points to ponder upon, having a number of plants in my back garden.*

*It is good if the scientists of this country, explore the many possibilities afforded by the several plants highlighted in the Digest and make practical use of them, rather than a mere analysis of the constituents of the plants, as is often seen.*

*Badrani Gunaratne*

## Letter 3.

*Dear Editor,*

*I'm a longtime reader of your excellent 'Link Natural Products Digest'. I eagerly await new issues and I (usually) share them with interested friends. What is most appealing is that the selection of articles covers a gamut of out of the ordinary areas in Natural Products. A unique reading experience and a pleasure to view the high quality appropriately selected pictures.*

*Good work!*

*Anithra*

# 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  
By email 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.

**The Digest Mail Bag**

**Welcomes Reader's**

**Views & Ideas**