



# Natural Products Digest

Vol.7, Issue 2, 2011



**Beli**  
(*Aegle marmelos*)  
**The Marvelous  
Fruit**

LINK NATURAL PRODUCTS (PVT) LTD



# Natural Products Digest

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## IN THE PAGES THAT FOLLOW.....



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# EDITORIAL

## INITIATIVES TOWARDS THE NATURAL FLAVOURS MARKET OPEN AN OPPORTUNITY.

Consumers generally worldwide are showing their preference for a good authentic taste or flavour that they can enjoy, albeit with a conscience which is untrammelled with a sense of guilt. The demand today is for all processed foods to be as natural as possible. This means that all flavourings too should be as natural as possible. Accordingly, the flavour manufacturers are shifting their emphasis to a "simulated" natural mode. For example SYMRISE, one of the leading manufacturers of Flavours, has put out an extensive line of nature-like flavorings which they call "Be Natural". The company's Director of marketing, Dr Anne Grunhagen says that the company is conducting research to continue developing this range so as to enable them to adjust to individual applications and consumer needs. It is conceded that Natural Products and a guilt-free enjoyment are not equally relevant to all consumer target groups. However they are deemed indispensable, to a growing class of consumers who are referred to as the LOHAS. These are people who are generally between the ages of 35-45 who have acquired what is now referred to as: the Lifestyle Of Health And Sustainability. They are also referred to as the Engine that drives the "back to Nature" crusade. The LOHAS group is also in any given situation the people who set the trends, and thereby dictate the nature of the production and development process. They are those who in marketing terminology, matter most.

The needs of this class revolve around factors such as these:

- Health, Fitness and Well-being.
- Sustainability and Security.
- Freedom from stress.
- Slowing down the pace of life.
- Leisure & Enjoyment.
- Recreation.

Conscious and selective food intake is crucial to this trendy lifestyle in the modern context.

It is not surprising therefore, that like their pharmaceutical counterparts who are going "herbal", leading flavour companies too, are responding to an emerging market trend. Another leading producer of Flavours, the Swiss company Givaudan, has set the pace in expanding their range of vanilla based products. In Sri Lanka the company Ceylon Cold Stores, has launched into the support of the Natural Vanilla Growing industry in Kandy, to incorporate the natural vanilla in its Elephant Brand ice creams with the

export market in view. (See LNP Digest, Vol.4, Issue 1, 2008).

Until the present time leading flavour companies had two major options:

- Direct use of the authentic, expensive and often scarce raw material itself.
- Compromise on quality of the flavour by the use of synthetic substitutes or extracts

The first option involved problems concerning the supply chain which often depended on logistic or other impediments. The second option compromises on quality because the substitution cannot duplicate the delicate nuances of nature's product.

The Givaudan initiative seeks to overcome the inevitable problems of sourcing authentic quality raw material in the face of global shortages and seasonal and geographic variations, while at the same time satisfying consumer demand for the knowledge of product origin, and provenance. The company has launched into sustainable production ventures in the countries of the developing world where the authentic raw material is grown.

Such programmes should open out new opportunities for the developing countries to join in collaboration with such ventures.

Flavours derived from fruits and exotic plants are increasingly in demand. Another company WILD offers a wide range of natural fruit Flavours in its FTNF range. They use choice raw material such as farm fresh fruits selected on site. The company Treatt, also renowned worldwide for flavours, has launched a similar programme to produce a 100% natural "Treatarome" range of clear distillates from fruits such as raspberry, blackberry and papaya. The company's proprietary technology ensures maximum flavour entrapment, to give colorless water soluble products suitable to be incorporated in many food and beverage preparations, as well as confectioneries and dairy products. The use of newer technologies such as extraction with supercritical carbon dioxide could also facilitate such initiatives.

The collaborative ideal has been launched, and researchers and entrepreneurs in the developing countries could make good use of the opportunity that has dawned.

## BELI : THE MARVELOUS FRUIT

By *Nirmala M. Pieris\**

### Introduction

Bael (*Aegle marmelos*) (Sinhalese - Beli, Tamil - Koovalam) is a fruit-bearing tree indigenous to dry forests on hills and plains of central and southern India, Myanmar, Pakistan, Bangladesh, Nepal, Vietnam, Laos and Cambodia. It is cultivated throughout India, northern Malaya, Java and the Philippines. The trees are naturally grown or in home gardens in the wet and intermediate zones in Sri Lanka. Bael is also popularly known as bel, or beli fruit, bengal quince or stone apple. In Sri Lanka it is popularly known as beli. Though more prized for its medicinal virtues than its edible quality, beli is an interesting member of the family Rutaceae.



The Hindus hold the bael tree extremely sacred. The history of this tree has been traced back to the Vedic era (2000 B.C. to 800 B.C.). Reference of bael fruit has been made in

Yajurveda (the third of the four canonical texts of Hinduism). The bael tree has immense mythological consequence and generally thrives near temples. Leaves of the tree are traditionally used as holy offerings to Lord Shiva, the God of health. Lord Shiva is thought to dwell beneath the bael tree. In the traditional culture of Nepal, the bael tree is part of an important fertility ritual for girls known as the Bel baha. During Bel baha girls are married to the bael fruit and as long as the fruit is kept safe and never cracks the girls can never be widowed, even if her human husband dies. This is seen to be a protection against the social disdain suffered by widows.

The tree, which is the only species in the genus *Aegle*, grows up to 15 meters tall and bears thorns and fragrant flowers. A tree may yield as many as 800 fruits in a season but an average crop will be about 150 to 200 fruits, or, in the better cultivars, up to 400. However, the trees take a long time to reach the fruit bearing stage (6 to 7 years and 15 years for full production).

A close relative of citrus, the fruit generally has a pale green-orange smooth, hard, woody shell about the size of a big orange (5-15 cm in diameter). The skin or shell of the fruit is so hard that it must be cracked open with a heavy knife or hammer. aromatic pulp. It has numerous seeds, which are densely covered with fibrous hairs and are embedded in a pale orange-colored, gluey, thick, aromatic pulp. Each seed is encased in a clear, glutinous substance which is valued for its medicinal properties.

In Sri Lanka many beli trees are cut down for their timber, which is said to fetch a better price in the market for ayurvedic medicine than its fruits and allows for greater short term economic gain. The wood is used for making herbal drinks and powders for Sri Lanka's flourishing ayurvedic industry.

\* *Dr. Nirmala M. Pieris is at present a Consultant for UNIDO and also for Link Natural Products.*

## The Living 'First-Aid' Kit

The beli tree itself is a living 'first-aid' kit being one of the most useful medicinal plants. Its medicinal properties have been described in the ancient medical treatise in Sanskrit, Charaka Samhita which is believed to be one of the oldest and the most important ancient authoritative writings on ayurveda. All the parts of the tree including stem, bark, root, leaves and fruit at all stages of maturity have medicinal virtues and has been used as traditional medicine for a long time.

The fruit's medicinal worth is extremely high when it just begins to mature. The fruit is fragrant, cooling and purgative. It holds back secretion or hemorrhage. Ripe beli fruit is regarded the best of all purgatives. It cleanses and strengthens the intestines. Its everyday usage for 2 or 3 months disposes even the old hoarded faecal matter. For better results, it should be taken in the form of sherbet, prepared from the flesh of the ripe fruit.

Approximately 70 grams of the fruit will do for an adult. Beli fruit taken in the form of a beverage also possesses incredible healing properties due to its mucilage content. This forms a

coating on the stomach, mucosa and thus helps heal ulcers.

The immature or half-ripe fruit is beneficial for digestion. It is useful in thwarting or curing scurvy. It also toughens the stomach and boosts its action. It is possibly the most effective remedy for continual diarrhoea and dysentery, where there is absence of fever. Best results are received by the use of dried beli or its powdered form. The beli fruit when it is still green, is shredded and dried in the sun. The dried beli slicings are powdered and stored in air-tight bottles. Mixed with roasted rice, a half-ripe beli can cure bleeding haemorrhoids, while in powdered form, it can be consumed like tea in the case of bleeding piles. The unripe beli can also be baked and consumed together with jaggery or brown sugar.

A concoction of beli leaves is considered an effective solution for peptic ulcers. The leaves are doused overnight in water. This water is sieved and taken in the morning. The soreness and uneasiness are relieved when this treatment is sustained for a few weeks. Beli leaves are rich in tannin, which alleviates swelling and helps in the curing of the ulcers. Medicated oil prepared from beli leaves is very effective for persistent colds and respiratory infections. The oil is prepared by mixing the distillate of beli leaves with an equal quantity of gingelly or sesame oil, heating exhaustively and adding a few seeds of black pepper and black cummin to the heated oil. A small quantity of this oil when massaged on the scalp before a head bath builds up immunity against colds and coughs. Beli leaves in a hot poultice are also reported to cure delirium and acute bronchitis.



The root of this tree is used as a home antidote for curing ear problems by using the oil that trickles from the burning end when a solid piece of the root is soused in neem oil and ignited. The antiseptic attributes of neem mixed with the astringent extract of the beli root, helps in healing the infection, persistent swelling and bleeding.

A decoction of the flowers (called beli mal) is used as eye lotion. Beli mal floral teas are also part of an ayurvedic diet as a cooling drink. Bael candy, bael powder, bael preserve and bael granules are convenient products that are manufactured on a commercial scale and used for the fruits medicinal properties.

### Consuming this Medicinal Marvel

The ripe fruit can be eaten fresh or dried. The fruit pulp is juicy but sticky, slightly sweet and fragrant but with a hint of astringency. The pulp, dressed with palm sugar and eaten for breakfast, is a common practice in Indonesia. The pulp is also processed as nectar or squash (diluted nectar). The fresh juice can also be sweetened to make a drink similar to lemonade and is also used in making a refreshing drink where the pulp is mixed with lime juice or by combining with tamarind. In India a "sherbet" is made by beating the seeded pulp together with milk and sugar. The ripe pulp is also used to make an interesting "smoothie" by blending with ice cubes and a sugar syrup or kithul treacle and jaggery.

Mature but still unripe fruits are made into jam, with the addition of citric acid. The pulp is also converted into marmalade or syrup, likewise for both food and therapeutic use, the marmalade being eaten at breakfast by those convalescing from diarrhea and dysentery. A firm jelly is made from the pulp alone, or, better still, combined with guava to modify the astringent flavor. The pulp is also pickled. The young leaves and small shoots are eaten as salad greens and as a vegetable in Thailand and used to season food in Indonesia. They are said to reduce the appetite.

Interestingly the beli fruit is also used to make various types of cakes ranging from fruit cake to sponge cake to cheese cakes. The Thai style bael fruit and ginger cake is compact but fully flavored. The taste of bael fruit gets along well with mild scent of ginger. Big pieces of bael



fruit in syrup topping also makes the cake so rich. Another secret of great taste is a caramel sauce making the cake taste perfect. The fruit is rich in riboflavin and is also used in numerous other products such as candy and toffees.



### The No-Caffeine Tea

In northern and southeast Asia, the dried fruit is boiled and consumed in sweetened hot or cold tea, or, more accurately, as a bael fruit infusion. The taste is best described as a robust fruity, nutty flavour with a tinge of a bitter undertone. Even when served at monasteries, it's sweetened with sugar. In Thailand, where monks can't eat in the afternoon, bael juice is still occasionally taken as an evening beverage to stave off hunger pains. Contradictory it may be, but Thais also believe that a bael drink can perk up appetite. Regardless, it's a suitable and soothing after-dinner or evening beverage because it contains no caffeine.

Shoppers in Asian supermarkets in the West can find bael in the same form as it is sold in online stores specializing in Asian, Thai or Indian foods or medicine: It comes in dried slices in clear plastic bags, with most of the seeds missing. In Asia, the same item can be found in traditional medicine and herb shops, organic food

stores, the dry goods sections of big open markets, and in the tea aisles of modern supermarkets. Less often, jars of "instant bael tea" turn up in supermarkets in Thailand. This is an off-white powder made from dried slices and already heavily sweetened with sugar.

### Aroma Components

The Beli fruit has always been a popular fruit with local communities due to its very pleasant and refreshing flavor. In Sri Lanka it is also an economically important commodity since it has proved possible to process the fruits with attractive flavor for export. The nature of the compounds responsible for this characteristic flavor have been reported subsequent to obtaining a representative samples of the aroma volatiles by means of a modified Likens and Nickerson apparatus using 2-methyl butane as the solvent, concentration by a low-temperature-high vacuum procedure and identification by GC-MS using both EI and CI mass spectrometry.

The major aroma component of the fruit is cis-linalool oxide which constitutes about one-third of the total volatiles. Other important aroma compounds include alcohols and esters (saturated and unsaturated), monoterpenes and sesquiterpenes. Alpha-phellandrene was the one compound described as having typical beli aroma on odour evaluation at an odour port during GC. The processed product, beli cream has a larger total quantity of volatiles than the fruit (about 10 times) and a broader spectrum of mono and sesqui terpenes. Overripe fruits contain much lesser amounts of linalool oxides and linalool and are probably not suitable for processing purposes.

### A Natural Antidote to Free Radicals

Some scientists believe that bael may have benefits beyond those traditionally acknowledged by ancient practitioners. For example, the fruit extracts may be an effective way of protecting against the effects of radiation during radiotherapy. Researchers from the Department of Radiobiology, Kasturba Medical College, in India have reported that bael fruit extracts reduce radiation sickness and protect cells against the toxic by-products of the radiation treatment. This is because the extracts act as natural antidotes to free-radicals and toxins that are produced when the radiation interacts with body tissues. This makes the bael fruit a valuable

supplement to use during radiotherapy for cancer.

### An Answer to a Sagging Skin

Beli has cosmetic uses as well. The fruit powder mixed with date extract and honey as a face pack yields amazing results for firming up a sagging skin. One of the newest ways to pamper one's body seems to be the pumpkin and bael fruit scrub which is served with fresh milk. Mainly intended only for winter skincare, this hydrating scrub brings optimal nourishment and special care to the holiday and winter season. Bael fruit is also used in various other spa products such as in hydrating face washes and herbal hot compress massages. Some excellent results have been reported when the bael fruit has been used in combination with lemon, turmeric and aloe for clearing skin pigmentation and blemishes. It is also a popular calming welcome drink at spas with the post treatment being a bael fruit hot tea.

### And in the End....

Looking at the wide prospects and potential of beli for various purposes, it is worthwhile to cultivate this plant on a large scale espe-

cially on unproductive and wasteland. Systematic and scientific research is also required to explore the maximum potential of this under-utilized 'Plant of Panacea' for human and environmental well-being.

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One hundred times a day  
I remind myself that my personal  
and professional life depends  
on the fruit of the work of other  
men, living and dead, ... and that  
I should make every effort to  
give in the same measure in  
which I have received and am  
receiving.

*Albert Einstein (1875 -1955)*



# TURMERIC : THE GOLDEN SPICE OF LIFE

by R.O.B. Wijesekera

## Introduction

Turmeric is regarded as the Golden Spice of Life. It is the main component of the ubiquitous curry in the Asian cuisine; it is a singularly important item in the Ayurvedic therapeutic armory; it is a popular flavoring agent, and even finds use as a natural dye, which was used to colour the robes of Buddhist monks in ancient times. The versatile plant known as *Curcuma longa* Linn., or *Curcuma domestica* Val., is now a cultivated herb, domesticated by man since antiquity. Its value as a flavoring agent has been well established throughout the world, gaining more and more acceptance during modern times. Turmeric has been classified as the newest "flavor of the month", in the nutritional supplement world. So it is, that this herb, with the strikingly yellow rhizomes that for centuries has provided the curry dishes with their attractive golden hue, has been re-discovered by the global community. In the countries where the herb is cultivated it is known by a variety of indigenous names: *Haldi* in India, where it is sometimes called Indian saffron, and where the bulk of the world's Turmeric comes from; *Kaha*, *Munjal*, in



Sri Lanka; *Wong geung fun* in China, *Kharkoun* in the Arab countries; *Kamin* in Thailand, and *Kunjit* in Malaysia and Indonesia. Worldwide it is a most popular spice and even known in German speaking Europe as *Gelbwurz*. Besides, now, exciting research has been cited to display its curative properties so well known in the past to the Ayurvedic community in countries such as India and Sri Lanka. The health related claims of this plant, now scientifically proven in different laboratories of the world, are wide and varied, and cover anti-inflammatory action to Alzheimer's disease. The anti-ageing properties of the plant have drawn particular attention, and have given impetus to its age old use as a cosmetic as well.

The Ayurvedic use of it as a medication as well as a systematically administered food additive is receiving the attention of researchers the world over. Experts cite the consumption of turmeric as a major factor in preventing

cognitive decline, and Dr. Julian Whitaker M.D. is one who believes, that the reason India's 1.2 billion of population has only a third of the rate of Alzheimer's disease as in the US, could be attributed to the consistent inclusion of turmeric in the diet of Indians. In the wake of this wave of enthusiasm, came attempts in recent times to patent turmeric as therapy for various ailments, attempts which were thwarted by India's considerable scientific thrust. Turmeric therefore has interest for the future, even more promising than its colorful past.

### Botanical & Agronomic aspects.

Turmeric which is identified botanically mainly as: *Curcuma longa*, Linn., belongs to the ginger family namely, Zingiberaceae; it is a stemless herb, with fleshy multiple-branched rhizomes. The rhizomes are bright orange or yellow within, with a characteristic odour. The leaves emerge directly from the main rhizome with an underground stem with overlapping petioles. The light green leaves are in the form of elongated blades, and a cylindrical inflorescence appears with the leaves, and develops at the centre. The turmeric plant is cultivated throughout the tropical regions of the world, and is found to grow very well in the warm climates with high humidity. It is found to thrive well under different kinds of soil conditions, both with irrigation or just rain fed. Rich loamy soils having good drainage are ideally suited for the crop wise cultivation of turmeric. It is shade tolerant, and its shallow roots make it ideal for intercropping for example under coconut palms, and particularly in homestead situations where variable shade is available. Generally, whole or split mother rhizomes are used as planting material and selection of well-developed disease-free material is



*Cultivation in Ampara, Sri Lanka,*

important. The rhizomes may be treated with fungicide and stored in earthen pits in a cool dry well-ventilated area before planting.

The land is prepared in the early part of the year before the pre-monsoonal showers in the tropics. Rhizomes are used for planting and are laid down with buds facing upwards. The rhizomes are covered with light soil or green manure or cow dung mixture and mulched with green leaves. Water management, weed management, nutrient management, pest and disease management conducted with knowledge and skill ensures the success of the crop. Harvesting time is dependent on the variety of the seed material and generally the term lies between 7-10 months.

India is the largest producer, consumer and exporter of turmeric in the world. In 2001 India produced over 700 thousand metric tonnes of turmeric grown over a total of 190 thousand hectares. Sri Lanka which is a major importer of turmeric is now embarking on a cultivation initiative and the main growing region is the Ampara district in the eastern province of the island.

### Processing methodology.

There are several distinct phases in the improved technology for processing that has now been developed with respect to the turmeric crop. They are sequentially as follows:

- Cleaning
- Boiling or Blanching
- Drying
- Polishing
- Colouring
- Grinding and Sieving
- Preparation of Oleoresin
- Quality Requirement and Uses

### Cleaning

The harvested rhizomes are washed with water to remove adhering mud and similar extraneous material adhering to them. Then they are soaked in water for 2-3 days in a form of curing which ensures the quality of the ultimate product.

## Boiling or Blanching



Here the “finger” rhizomes are separated from the “mother” rhizomes and boiled separately. (Some of the mother rhizomes are generally placed aside for vegetative propagation). Boiling is usually carried out in mild steel vessels or clay pots. The cleaned rhizomes are placed in a perforated or meshed tray with handles and this is immersed in the boiler vessel.

Boiling is carried out until the rhizomes are soft and “cooked”. There is a stage at which foaming commences and the characteristic aroma of turmeric can be detected. A judgment as to the correct stage of completion of the cooking operation is made by piercing some of the rhizomes with a thin wooden skewer, which should pass easily through a well-cooked rhizome. The well boiled rhizome displays a yellow colour inside when cut as against the original reddish yellow in the raw state. When the boiling process is completed the tray containing the cooked rhizomes is lifted off and the water allowed to drain. This cooking or blanching operation is a crucial one and the quality of the ultimate product is dependent on its successful completion.

## Drying



The cooked rhizomes are allowed to cool and in time they are then spread on thin bamboo mats or a suitable drying platform, and subjected to sun drying. It takes sometimes ten to fifteen days before the sun drying process is fully

complete. The mother rhizome takes even longer to completely cook as well as to sun dry. It is recorded that artificial drying under controlled conditions at 65 degrees gives a brighter coloured product.

## Polishing



*A Rotatory Polishing Machine*

The rationale for this is simply to gently remove the thin silken, tenacious outer skin of the rhizomes, which by this stage has been partially fractured, and thus roughened the outer surface of the rhizomes. Manual polishing consists of rubbing the rhizomes on an abrasive surface, or trampling the rhizomes in a jute gunny sack in a manner that mild abrasive action is simulated. Improved methods are available which use machines: a cylindrical rotating drum with the inside an abrasive surface. The rhizomes are loaded into such a drum which is axially rotated either manually or electrically. Another version consists of the use of an octagonal drum axially rotated, and there are many other variations of this method. The rhizomes are thus polished, the outer skin fully removed and the colour uniform and brighter.

## Colouring

This is an optional operation and carried out for particular trade requirements. The partly polished rhizomes are taken in a basket and shaken up with finely powdered turmeric to coat them thinly with the powder. The operation is completed by sun drying. The commonly sold turmeric for cooking purposes is treated this way. These rhizomes loaded into sacks are prepared for export.

## Grinding and Sieving

Turmeric powder is also one of the products much in demand in the trade. The processed turmeric is cut into smaller pieces and milled and sieved. The powder is suitably packed airtight and is ready for the export market.

## Preparation of Turmeric Oleoresin.

Turmeric oleoresin is also a product now much in demand. The turmeric rhizomes are comminuted and extracted with a food-grade solvent such as ethanol. The solvent is removed under vacuum and the pure oleoresin, dark orange red viscous oil is suitably packed for the buyer. A single kilogram of Turmeric Oleoresin will replace eight kilograms of ground spice in a food processing operation. Hence Oleoresin of Turmeric is an industrial need in the food industry.

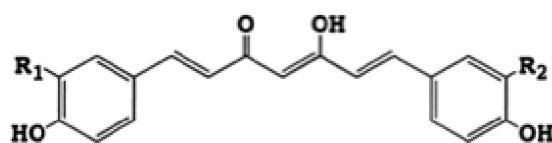
## Quality requirements & Uses

Oleoresin is often the preferred commodity in automated food industrial operations on account of the fact that it is a concentrated uniform product and its quality can be easily controlled. The quality of cured turmeric is however assessed based on several factors that depend on the end use of the product. Turmeric is generally used to colour and flavor food items. In this instance the quantity of the pigment curcumin, is a prime consideration. Many consumers prefer it in the form of polished fingers for spice applications. The aroma of a good sample is described in organoleptic terms as having a musky peppery aroma. Turmeric is the principle agent in almost all curry powders. Besides this it finds application in beverages, sauces, mayonnaise and relishes and is widely used in coloring cheeses and butter.

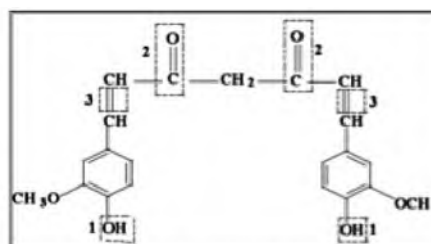
## Chemistry & Pharmacology

Turmeric contains an essential oil (about 5%), which is responsible for its characteristic aroma. The most important of the constituents of the oil are: Turmerone, Ar-Turmerone, and Zingiberene. The bouquet is described by flavorists as: Earthy and acrid. Curcumin and other similar diaryl heptanoids in Turmeric are responsible for the strikingly characteristic colour, taste, and biological activity of Turmeric, and these constitute around 3-5% of the spice. They belong to the class of compounds now styled as "Curcuminoids". (Vide below).

Recent research has identified curcumin as being responsible for much of the biological activities attributed to Turmeric which includes such hitherto intractable diseases as Alzheimer's disease and HIV., and various forms of cancer. Curcumin also acts as a free radical scavenger



	R <sub>1</sub>	R <sub>2</sub>	mol%
Curcumin	OCH <sub>3</sub>	OCH <sub>3</sub>	73.4
Demethoxycurcumin	OCH <sub>3</sub>	H	16.1
Bisdemethoxycurcumin	H	H	10.5



1. Parahydroxyl groups - antioxidant activity
2. Keto groups - anti-inflammatory, anti-cancer, anti-mutagen
3. Double bonds - anti-inflammatory, anti-cancer, anti-mutagen

and anti-oxidant. Some of the various therapeutic activities now attributed to Turmeric are summarized below:-

### Countering digestive disorders.

For long Turmeric has been known to have digestive properties. In traditional cooking it has been added to rice and vegetable preparations with this property in view. It is also reputed to reduce stomach gases and promote digestion, and bile action. These biological activities have been confirmed by modern scientific research.

### Liver disorders.

Turmeric exercises beneficial effects on the liver and this is attributed to the curcuminoids. There is scientific evidence that curcuminoids display anti-hepatotoxic properties against induced liver toxicity in laboratory animals.

### Anti-bacterial activity.

Extracts of turmeric, as well as the essential oil have been tested for anti-bacterial activity and they have shown positive results against: *Mycobacterium tuberculosis*, *Staphylococcus aureus*, *Streptococcus faecalis*, *Salmonella typhosa*, and others such as *E.coli*, *Bacillus sp.*, and *Clostridium sp.* Since some of these are enteric bacteria turmeric finds use in stomach disorders. Turmeric is useful as an external anti-biotic in the treatment of

wounds, and is employed as such in Ayurvedic therapy.

### *Alzheimer's Disease.*

Studies conducted at the UCLA by researchers Cole and Frautschy found Curcumin to possess potent anti-Alzheimer's effects and their conclusions, presented at the Society for Neuroscience in 2000 demonstrated that curcumin was particularly effective in reducing neuro-degeneration and oxidative damage, diffusing plaque deposition, aberrant inflammation, and impaired clearance, following beta amyloid infusion.

### *Atherosclerosis & Cardiovascular benefits.*

Turmeric has been shown to be effective in preventing the blockage of arteries that can give rise to heart attacks or strokes. It decreases the cholesterol levels and inhibits the oxidation of LDL. Oxidised LDL deposits on the walls of blood vessels, gives rise to atherosclerotic plaques; turmeric also prevents platelet build-up on the walls of injured blood vessels and blood clot formation.

### *Inhibition and of Cancers.*

Recent research has confirmed that turmeric restrains the growth of cancer cells that give rise to skin cancers. Accordingly both topical and internal uses in this regard are found to be beneficial. The anti-cancer effects are deemed to stem from the ability of curcumin to induce apoptosis in cancer cells without cytotoxic effects on normal cells. Studies have indicated that curcumin showed effective inhibition of tumour cell proliferation, migration, and invasion. Recent studies have also shown curcumin to possess estrogenic activity that may contribute to activity against breast cancers. However the extracts of Turmeric that are sold over the counter in drug stores do not fare so well in the stomach as only a small amount of the curcumin is absorbed into the blood stream. Bioavailability becomes a significant factor and is improved when curcumin is supplemented with another natural product the main alkaloid of pepper, namely piperine. Preparations with the supplement are available. The well known Italian company Indena S.p.A. has overcome this with their new innovation called "Phytosome". Here they have attached to curcumin another

natural molecule, phosphatidyl choline. It has been shown that the blood levels of curcumin are enhanced with the use of the phytosome.

### *Anti-inflammatory action.*

Recent studies on the anti-inflammatory activity, has been carried out, using turmeric powder as well as a range of extracts with water and organic solvents. The action of Turmeric has been found to be comparable with that of hydrocortisone acetate in experimentally induced inflammations in rats. Water extracts were found to be effective as well as the essential oil in controlling edemas. Patients with rheumatoid arthritis, treated with curcumin showed significant improvement in stiffness and joint swelling after two weeks, in a double blind clinical trial compared with those treated with phenyl butazone. Turmeric is also anti-inflammatory to the mucous membranes that coat the throat, lungs stomach, and intestines.

Following accidents and traumatic shock large quantities of blood loss can cause the body and its organ systems to shut down as a result of massive inflammatory reaction. Curcumin was found to lower the serum levels of certain inflammatory proteins to normal in such instances.

### **Ethnomedical uses.**

The use of turmeric In Ayurvedic therapy, or in Traditional Chinese Medicine, and the healing properties attributed to it cannot be easily described. It has a role like a panacea, and the main body organs on which it is said to exert its beneficial effects are the liver, heart, lungs and the skin. The main therapeutic uses are summarized as follows, mindful of the fact, that the theory and practice of Ayurveda, like Traditional Chinese Medicine, differ so much from western modern concepts, and terminological inter-relationships are at best approximations.

#### **• General Therapeutic Applications**

Turmeric is used for Anemia, cancers, diabetes, digestion of food, gall bladder problems, liver problems, circulation problems, infections and parasitic diseases. It regulates fevers, counters urinary disorders, controls hypertension, and is also used to control ailments of the upper respiratory system.

- **Reproductive system.**

Turmeric helps to regulate the female reproductive system, purifies the uterus and controls problems of lactation. In males it enhances semen production and regulates libido. It regulates reproductive function in both sexes.

- **Intake in normal foods**

When taken on a regular basis in normal foods, Turmeric - both in Ayurveda and in Chinese Traditional Medicine - is recorded as displaying the following activities:-

- Detoxification of the Liver
- Balancing the Cholesterol levels
- Countering Allergies
- Stimulating Digestion
- Boosting immunity
- Maintaining a healthy skin and complexion

In this last role it plays a part as a popular cosmetic with anti-ageing effects.

Thus the central role of Turmeric in Ayurveda and TCM is as a health maintaining commodity in the Asian cuisine.

### **Culinary Trends.**

The culinary use of Turmeric combines its value as a health maintaining commodity as well as one that gives immense scope and pleasure to cooking. It was once called "Indian Saffron" but that is a misnomer. It has no relationship with Saffron, a costly spice from the temperate climes whose botanical identity is: *Crocus* spp. A noted Chef has recorded that Turmeric is "extremely strong and actually gets stronger when cooked. Its colour is almost indelible. If you are working with fresh turmeric be careful of your clothes, and chopping surfaces. It may take a mighty effort to remove the dye, but sunlight and alkali will help remove it." This is indeed so, as curcumin is a tenacious pigment and being phenolic it could be removed with alkali; but the fabric will be endangered so soap will be preferred. That is therefore a precautionary warning. Plastic containers are also susceptible to staining with use of turmeric. Oriental cooks may need no introduction to the use of turmeric in their cooking. Traditional

methods take care of that. But with the globalization of culinary practices new emergent recipes have entered the menus worldwide. Some of the interesting new ideas may be summarized as follows:

- When making any Curry, Turmeric is an important commodity.
- It is delicious sprinkled on Steamed Cauliflower, boiled New Potatoes, Steamed Beans, or Cooked Onions.
- It will enhance any recipe with Lentils.
- Salad Dressings can have a bright yellow to - orange hue with a pinch of turmeric powder added.
- Cauliflower florets cut in half, tempered with butter, a pinch of turmeric, and some seeds of mustard, and salt and pepper added to taste forms a delightful accompaniment with drinks.
- Blended with melted butter and drizzled over steamed vegetables, pasta, or potatoes, makes a simple dish for a light meal

The celebrated Sri Lankan style KAHA BUTH = Yellow Rice, cooked with Turmeric spice in mild coconut milk, and flavoured with cardamom, clove, and pepper spices, is a feast for any occasion.



The Golden Spice of Life used in ancient India and the entire sub-continent gives us Health, and Satisfaction, with much pleasure in our Food.

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..The paradoxical and unfortunate mix of the modern and the mystical is understandable in terms of public trust of the scientific community. Debates on the environment, energy, and defense, engage apparent experts on every side of the issues. Hotly contested cases in court proceedings and legislative hearings may make it seem that scientific evidence is less reliable , less certain than was previously believed. Seeing this pattern students lose the natural curiosity about truthful explanations, become cynical about the motives of experts and wonder whether science and mathematics are worth the time and effort to master.

Rodney Nichols , 2001

## TRADITIONAL KNOWLEDGE

Victorian explorers called them "lost tribes", contemporary scientists call them "indigenous people" .....

Expelled from the planet by civilization sprawl, they will take with them knowledge we are only beginning to appreciate. Stored in the memories of elders, healers, mid wives, farmers, fishermen and hunters in the estimated 15,000 such cultures remaining on earth, is an enormous trove of wisdom.

Over the ages, indigenous peoples have developed innumerable technologies and arts. They have devised ways to farm deserts without irrigation; they have learned how to navigate vast distances in the Pacific using their knowledge of currents and the feel of intermittent waves that bounce off distant islands; they profit from the medicinal properties of little known plants.

Much of their expertise and wisdom has already disappeared and if neglected, most of the remedies could be gone within the next generation.

The most intractable aspect of the crisis is largely voluntary. Entranced by images of wealth and power of the first world the young are turning away from their elders and their ways breaking an ancient but fragile chain of oral traditions.

From : "Great Discoveries" Time 2001

A good boss is one who makes his men think they have more ability than they have, so they consistently do better work than they thought they could.

*Charles E Wilson ( 1890-1961)*

# BIOLOGICAL ACTIVITY OF ESSENTIAL OIL

by A. L. Jayewardene\*

Essential oils have very important applications in the daily human activities chiefly as perfumes, components of perfumes and in deodorizing hundreds of domestic and industrial products. Masking noxious odours of numerous technical products by adding essential oils make them much more acceptable to customers. Among the many other uses of these volatile natural products are their biological activity based applications among which are insect repellent / insecticidal action and antimicrobial action.

Pest control including insect repellency is an area in which essential oils already play some part, but could expand into much larger areas of application for the low cost large volume oils. One very important aspect of such application is eco-friendliness and comparative safety of these plant based material. There are numerous reports which indicate that essential oils and volatile compounds isolated from them are effective as insect repellents, insecticides, ovicidal (egg destroying), antifeedants, and inhibitors of egg deposition, among many other actions. As a consequence the value of these materials in the organic food production in USA and other developed countries is immense. Long ago in mid twentieth century those of us who knew our grand-ma and grand aunts remember the chests where they stored linen and then added a handful of vetiver roots (*Vetiveria zizanioides*) to prevent weevil (*sin.khava*) infestations. Similar traditional applications were also known in countries where Cedar wood was available and linen chests were constructed from the wood. Even presently cedarwood blocks or shavings are available in the market for repelling insects from closets and cupboards.

A common application of active components from essential oils is in termite control. For instance in the US the great majority of homes are constructed with treated timber frame work and with age when the repellent repellent treatment fades away, termite attacks can be

catastrophic. There is a thriving business in termite controlling area and many of these companies actively promote the orange oil treatment for termites.



*Vetiver Plant*



*Vetiver Roots*

Orange oil from the orange peel is a by-product of the large business of orange juice production in Florida and California, USA. The principal component (90-95%) of this volatile product is the monoterpene Limonene and it is reported to be repellent and as well as termiticidal.

Its advantages are it has a pleasant odour and also absorbs onto timber easily. The volatility makes it easy to apply into inaccessible areas of houses such as attics, basements and sub-floor crawl spaces. Obviously any low cost essential oil with limonene as the major component will be equally satisfactory for this purpose.

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*Red flour Beetle*

Another insect with a worldwide distribution that causes immense damage to stored food is the red flour beetle (*Tribolium castaneum* Herbst.) Everyone who has sifted wheat flour for making food, be it butter cake or pol-roti have seen these little reddish 2-3mm long creatures remaining on the sieve. The present treatment for these pests uses synthetics which have reported adverse effects in experimental animals. It is heartening to note that reports are available where essential oils are used in controlling these pests. Again in olden days aromatic leaves such as lime or orange were placed into bins where food grains were stored, but how effective these treatments were have never been evaluated. Among the publications, basil oil (*Ocimum basilicum* L.) is reported as being highly toxic and repellent against *T. castaneum* adults. Similar activities have been reported for *Artemisia annua*, *Nigella sativa* (black cumin) *Anethum graveolens* (Dill seed) and others. An interesting report in the journal *Molecules* 2010, presents data for oil of *Murraya exotica* (syn. *M. paniculata*) leaves which had insecticidal activity against *T. castaneum* and also against *Sitophilus zeamais* which is the corn weevil.

One concern which the author has in treating food products with essential oils or compounds extracted from them is the residual flavor of the oil retained in the food.

This matter has not been addressed in any study simply because it is not significant or it is assumed that because the oils are volatile there will no residues retained by the food products to taint the food flavor.

As we all know the mosquito menace has both health and economic impact on people



*Murraya exotica*



*Ocimum basilicum*

and country wide all over the world. The most deadly mosquito problems are those in sub-Saharan Africa connected with the malaria epidemics.

It is estimated that children in some of these countries get infected at least once a week, so common are bites from malaria carrying mosquitoes. One of the most effective preventions is to provide each bed or sleeping mat with a mosquito net impregnated with repellent and or insecticidal chemicals like pyrethrins. The most effective mosquito repellent known is the synthetic aromatic compound called NN-diethyl toluamide (DEET). Isolongifolinone is a natural substance found in an Amazonian plant *Humiria balsamifera* St(Aubl.) Hill, and researchers have shown that this odourless compound is as good at deterring the biting by mosquitoes including malaria vectors, as DEET. This molecule can be easily synthesized from turpentine based compound called longifolene. Since it is a sesquiterpene ketone (C15) it would have low volatility, thus be a good candidate for treating mosquito netting.

The indiscriminate use of antibiotics in medical treatment has resulted in the emergence of drug resistance in bacteria, fungi and viruses. In order to fight these resistant pathogens more powerful antibiotic agents and more effective agents with novel actions must be developed. This race has been in progress for over a century between medicinal chemists and physicians on one side and the pathogens on the other. Many essential oils derived from spices and aromatic plants such as fennel (*Feniculum vulgare*), peppermint (*Mentha piperita*), thyme (*Thymus vulgaris*), tea-tree (*Melaleuca alternifolia*), lavender (*Lavendula angustifolia*) and others have been reported to be active against Gram-positive and Gram-negative bacteria and also fungi, yeast and viruses.

### Tea-Tree Oil (TTO)

Tea tree oil has been scientifically investigated only relatively recently. It had been well known among the indigenous Bundjalung people of eastern Australia who use "tea trees" as a traditional medicine by inhaling the oils from the crushed leaves to treat coughs and colds. They also sprinkle leaves on wounds, after which a poultice is applied. In addition, tea tree leaves are soaked to make an infusion to treat sore throats or skin ailments. Some sources suggest beneficial medical properties when applied topically, including antiviral antibacterial, anti-fungal, and antiseptic qualities. It also has beneficial cosmetic properties.

Tea tree oil is active against *Staphylococcus aureus*, including MRSA. Tea tree oil is less successful for application in the nose. Also, there is clinical evidence that topical der-



matological preparations containing tea tree oil may be more effective than conventional antibiotics in preventing transmission of CA-MRSA.

Recent studies support a role for the topical application of tea tree oil in skin care and for the treatment of various diseases and conditions. Tea tree oil appears to be effective against bacteria, viruses, fungal infections, mites such as scabies, and lice such as head lice. A 2008 study of in vitro toxicity showed a tea tree oil preparation was more effective against head lice than permethrin, a popular pharmaceutical remedy.

In the treatment of moderate common acne, topical application of 5% tea tree oil has shown an effect comparable to 5% benzoyl peroxide, albeit with slower onset of action

There is considerable evidence obtained through in vitro studies that many essential oils clearly showed antiviral activity for enveloped DNA and RNA viruses

Some of these oils that were effective in denaturing herpes simplex virus 1(HSV-1) and 2(HSV-2) have been found by in vitro experiments and the authors have listed oil of anise (*Pimpinella anisum*), oil of thyme (*T. vulgaris*), oil of dwarf pine (*Pinus mugo*), citrus oil (*Citrus limon*), ginger oil (*Zingiber officinale*), chamomile (*Matricaria recutita*) oil and sandalwood oil from *Santalum album* among others. A table of results indicate that ginger and sandalwood oils are active even at 1 and 5ppm respectively against HSV. Further experiments on the use of essential oils in topical applications and the attendant cytotoxicity have been evaluated by the same authors. While essential oils exert cytotoxic activity at very low concentrations on experimental cell lines, it is believed that these data are over estimates of the actual in vivo toxic effects. In other words the use of the better known or traditional essential oils by human beings is safe at recommended levels, in fact in many situations such as aromatherapy and vapour inhalation, lower concentrations have shown efficacy and safety at the same time.

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# PROCUREMENT & MANAGEMENT OF RAW MATERIALS FOR THE HERBAL INDUSTRY

by Dilmani Warnasuriya, T. M. S. G. Tennakoon\* and Yamuna Dissanayake\*\*

## Introduction

The herbal pharmaceutical market worldwide is today a billion dollar one. So effective and spectacular has this been, that there is an unprecedented surge towards the popular use of natural medicaments derived from plants during the recent years. That being the trend, there has also been a simultaneous interest in the traditional systems of medicine which mostly utilize such plant-derived medicaments. Modern research has thus been directed to the revisit of these traditional pharmacopoeias as scientists of the world go in search of new chemical entities that will serve to limit the diseases for which modern medicine has no answers. New approaches to medical treatment based on those used in the Ayurvedic and the Traditional Chinese Medical systems are also entering the treatment methodologies of modern times as answers are being sought to counter seemingly intractable ailments such as diabetes, cancer, Alzheimer's disease, and AIDS. Accordingly, the pressure on the supplies of medicinal plants to centres where there is factory scale production in particular, is considerable. The acute shortage of medicinal plants is felt throughout the globe and in particular the tropical belt wherefrom the plant supply mostly comes. Plant species which were comparatively abundant a decade ago are now endangered or even extinct. Sustainable procurement is sometimes and in the context of some species, even a distant ideal. Methodologies are available of sustainable harvesting from those vital and abundant sources namely the rain forests { Bojor. 1991} but these methods and attendant precautionary measures are often jettisoned by persons with rapacious interests for quick gain, and the treasures of these forests become only a tale of history. (IUCN Report). The Sinharaja Forest Reserve in the south of Sri Lanka is an example.

It is in this milieu that a company with genuine needs for sustainable raw material pro-

curement for its supplies, has to operate, mindful of the fact that many plant species needed are scarce within the country, the region, and even worldwide. The question is how well we can continue to process and supply quality herbal products in the burgeoning quantities that they are being sought today.

## The Complicating Factors

Medicinal plant raw materials are a commodity which is anything but simple. The material can present itself in any of the natural forms that constitute plant material namely: leaves, twigs, bark, hardwood, berries, pods, fruits, flowers, whole plant, seeds, roots, even gum exudates, and so there is a wide and varied nature to the raw material.

Some materials are used in the dry state and thereby could be stored satisfactorily, while others have to be used in the fresh state and this constitutes a problem, as the materials have to be acquired fresh and used almost immediately. This means that a fine tuning and planning of the production process is necessary in order to minimize waste and optimize resources. Besides this, the sources from whence the material is procured also vary, and so the ensuring of quality raw materials is an issue that merits considerable attention.

It is interesting to note, (in the instance of the company Link Natural), that over 200 raw materials are used in the manufacture of herbal products, and each of these require special consideration with regard to storage, quality assessment etc.

One of the biggest issues then in raw material procurement is the scarcity of authentic raw material. Authentic, being taken here to mean, the exact species, and variety of the plant, which has been used in the traditional systems of medicine. Several plants, such as

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*Coscinium fenestratum* (Venivel), *Aegle marmelos* (Beli), *Munronia pinnata* (Karanda) which were in abundance several years ago, are now in danger of becoming extinct. This problem is further exacerbated by the following factors.

- Such plants have no organized cultivation commercially
- There is little information on the national requirements for such crops, and hence farmers are loath to commence cultivation
- The cultivation technology is not well known
- The cost of production, income and profits are not known, and hence there is low competition with other crops.
- The most suitable varieties have yet to be established, and there is a shortage of genuine planting material.
- There is no organized marketing for such crops.

Companies such as Link Natural have taken these facts into cognizance and initiated out grower's programmes for these depleting crops, whereby they could be assured of the authentic varieties of the required plants in the quantities needed. For this to be effective, it was necessary to educate the farmers on

- correct cultivation practices,
- good postharvest treatment methods,
- proper storage conditions

The farmers have also to be supplied with authentic raw materials and also be assured of reasonable prices for their produce in order to encourage them to embark on such plantations. Sometimes even cash advances may have to be granted them, given the fact that Banks are reluctant to indulge in granting such advances to what are thought of as high risk crops that do not come within the well-known categories.

### Sources of Raw Materials

For relatively small processing facilities of herbal materials, such as that at Link Natural, raw materials could be obtained through the following sources.

1. Out growers programmes
2. Domestic cultivations
3. Local collectors/Suppliers,
4. Wholesalers supplying imported materials



*An Outgrowers' cultivation*

The degree of variability in terms of quality and post-harvest treatment is accordingly quite wide. The reliability is most in the out growers programmes, and at the company's own cultivation site, both of which are monitored by the company's extension crew. The company's cultivation site consists of around 14 acres in extent, and this caters mainly to raw (green) herb cultivations. This operation is being further developed. In the case of the out-growers' programmes, since even the planting material is supplied to the outgrowers, this ensures the authenticity of the raw materials. At Link Natural, this involves small scale farmers who deal with the cultivation and primary processing of herbs such as Katuwelbatu, (*Solanum dioica*), Elabatu (*Solanum melongena*) and Vishnuranthi (*Evolvulu salsinoides*). Domestic cultivations too could in similar fashion be inspected and evaluated although there would be less control over the conditions applied by the growers. No assurance could be given that safe environmental practices are used for such cultivation. Even the local suppliers who supply materials could to some extent be assessed. At Link Natural, local collectors supply raw materials based on orders, and these include dry fruits, barks, flowers and roots collected mostly from perennial trees, which are not specifically cultivated. But the material that comes in from wholesalers is quite another dimension. The age of the material is unknown. This can be assessed sometimes by microscopic or pharmacognosic tests, but this too would not give a fully satisfactory idea of age or freshness or even authenticity. To a great extent therefore there is dependency on the word and experience of the suppliers and the task force of the R&D that monitor the quality of incoming raw materials.

## Criteria for Choice of materials

The choice of when and how much of raw materials should be purchased is a complicated process with several interrelated factors coming into play. In a company such as Link Natural, the raw material requirements are planned for three months. This will be influenced by the production and preparation plans which are made at the end of every month. Minimum reorder levels are maintained accordingly with stock levels being assessed monthly. This data is maintained in stock databases in most companies. Raw material consumption is assessed according to three categories: heavily used, moderately used and little used; and this information is made use of in annual forecasting of raw material requirements.

Seasonal availability is another factor which has to be taken into account when selecting raw materials and here judicious purchasing is necessary. A case in point is the price of products such as ginger (*Zingiber officinale*) which could vary from Rs. 200 - 700, and since it is not a very perishable product, purchasing should be made when the prices are at a minimum. Plants like Asafotoeda/Perunkayam (*Ferula asafetida*), Gugul (*Commifora mukul*), Suwandakottan (*Saussurea lappa*) and Sandalwood (*Santulum album*) are also very costly, the prices ranging from Rs. 10,000 / k to 12,000 /k and purchasing of such products should be done purely according to the estimated needs only. The same is true for crops such as Polpala (*Aerva lanata*) and Venivel (*Coscinium fenestratum*).

Lead time in the supply of raw materials is yet another issue. In the case of imported raw materials, this could vary from one and a half to three months, whereas local supplies would have a lead time of about a week. The problem comes in when considering materials which have to be purchased in the fresh state before further processing. Gotukola (*Centella asiatica*) and Lunuwila (*Bacopa moniera*) which are widely used are such examples. In such instances, an ever present hazard is the presence of pesticides and other foreign matter in the produce. The Ayurvedic texts gives nineteen stipulations for collection of fresh produce, but in practice this is not really feasible, and much attention is instead paid to having in-house plantations for such crops. It is interesting to know that over 40 materials could be used in the manufacture

of just one product, and the planning that goes into such manufacture, is truly astounding.

## Methods of Storage

Proper storage is a vital factor in the management of raw materials used in the manufacture of herbal products. Raw materials should be available according to requirement, they should be in a fit state, and they should be easily accessible and identifiable. The storage area or locality of storage will depend on whether the commodity is slow moving or fast moving. Fast moving materials have to be stored in an easily accessible area. The other factor is whether the product is used in the fresh or dried state. Fresh materials have to be examined in the laboratory and preprocessed in the fastest possible time to avoid spoilage. This has necessitated the allocation of different storage areas to be set up for different raw materials such as spices, essential oils, raw herbal materials, and also solvents and finished products. In the case of the same raw material, the policy used is first in, first out. Perishable are stored in special packaging materials. Minimum reorder levels are maintained for all materials, this varying according to the production and preparation plans which are set out at the end of every month.

## Quality Control



*Authentic samples of herbs*

To go through the procedures followed in a typical herbal products processing facility such as that at Link Natural, when a raw material is received to the processing facility, it is tagged with a label, and the laboratory is informed through a Materials Receipt Advice. It is then sent to the quarantine stores and sampling done according to established WHO methods. Laboratory testing follows to ascertain the

authenticity of the plant. This is done not according to visual examination methods but using special chromatographic techniques such as TLC, GLC and HPLC. Here the secondary metabolites of the plants to be examined are compared with standard patterns or profiles of such metabolites, such as polyphenols, volatiles, sugars or amino acids. Through these signature compounds the authenticity of the plants can be verified. This procedure, which is also referred to as fingerprinting methods, are of vital importance in establishing the purity of such plants. Such sophisticated procedures to test the authenticity of its raw materials, is by no means the norm in this country or perhaps even in many other herbal products processing institutions worldwide. But given the company's commitment to quality and authenticity of their products, Link Natural steadfastly maintains these procedures, even when dealing with fresh produce, where, time is an essential factor.

Finger printing methods are essential for most plants. Eg *Rauwolfia serpentine* could be distinguished easily by the presence of alkaloids. There are some other species of *Rauwolfia* which are sometimes supplied such as *R. tetraphylla* which is native to South America and introduced to Sri Lanka as an ornamental species, and it is difficult to distinguish it from the real species when only the tubers are available. Use of the fingerprinting techniques can easily determine which the authentic sample is. Similarly in the case of Gotukola, although several varieties are known as *Centella asiatica*, though it would seem that the variety with the smaller leaves could be easily identified and the identity confirmed through physical and microscopic means, the use of finger printing methods nevertheless are crucial in enabling the procurement of the authentic species for processing. It is a fact that domestication of ornamental plants often morphologically similar to the medicinal plants used, has added a new dimension to the complexity of identification. . Therefore it is necessary that judicious testing procedures be established in the case of individual plant materials. Protocols for such testing should be maintained in each laboratory.

Laboratory procedures also include the testing for the purity of the material with regard to foreign matter and total extractives of the material. Once the laboratory has established the raw material as being acceptable according to the Laboratory Specification manu-



*Sorting of Raw Materials*

al, the stores is informed with the required instructions as to storage , packaging etc, and a certificate of analysis is attached to the raw material. The raw material tag is changed as to either reject or accept and then sent to stores. If it is labeled as 'reject' , the stores are informed and necessary action is taken with the supplier.

### **Pre-processing Methodologies**

Pre-processing methodologies depend on whether the raw material is in the fresh or dry state as explained above. In the case of fresh material, once the laboratory has pronounced the material as being acceptable, cleaning is carried out through washing and sorting. Some materials have seeds enclosed. Some have fine sand particles enclosed within the flowers. Although flotation methods using stainless steel mesh is used, fine sand particles still remain in the finished product such as in " Paspanguwa"- which is a multiple herbal composition in dry comminuted form based on Ayurvedic formulae. The company, being ever mindful of providing a quality product, has embarked on a new procedure for Pathpadagam, Polpala, Vishrukantha and Katuwelbatu used in this preparation, to dry the whole plant after washing to get rid of the sand in such material. The drying methods used in most factories are sun drying, spray drying and fluid bed drying. These have to be innovatively employed sometimes consecutively to enable the best result to be obtained.

### **Conclusion**

The image and success of a company manufacturing herbal products depends to a great extent on the quality and efficacy of the product it manufactures. This in turn will be

subservient to the quality and authenticity of the raw material used. In herbal prescriptions if one is to make the fullest use of the Ayurvedic system and engage scientific methodology in the processing, then attention should necessarily, and in the very first instance, be focused on providing high quality raw material in the purest form and containing the effective ingredient in sufficient quantities. Thus an interactive relationship between the procurement team, the R&D laboratory and the processing and production facility is a crucial prerequisite in the product development process. Success in the marketing of products and the company name for assured quality is dependent on these factors. This has been the hallmark of the processing ethic at Link Natural.

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### Some ways to use

#### Essential Oils

For 'scent - sensational' wash, lace a few drops of your favourite EO onto a small piece of terry cloth and toss into the clothes dryer while drying. Alternatively , add 5 drops of EO to ¼ cup of fabric softener or water and place in the centre cup of the wash.

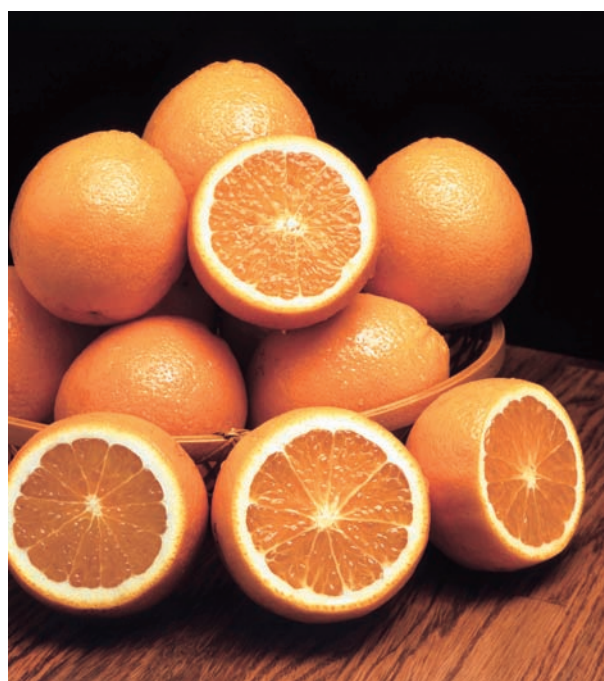
Freshen air by adding a few drops of EO to water in a spray bottle and spray.

For a scented candle, place a drop or two of EO into the hot wax as the candle burns.

For fresher smelling carpets, add 10 drops of EO to a box of cornstarch or baking soda, mix well, let set for a day or two and then sprinkle over the carpets in your home. Let set for an hour or more and then vacuum.

Smelly feet or shoes can be remedied by either dropping a few drops of Geranium EO directly into the shoes or by placing a cotton dabbed with a few drops of Lemon oil into the shoes. Athletes ? Tea tree oil is great.

To fragrance your kitchen cabinets and drawers place a food scent EO dabbed on a cotton ball in an inconspicuous corner.



## CLINICAL TRIALS USING LINK SUDANTHA SHOWS SIGNIFICANT BENEFITS ON ORAL AND GINGIVAL HEALTH

by Colvin Gunaratne,\* Chamari Wickramatilleke\*\* and Chandani Rupasinghe\*\*\*

Good oral health is an indication of good general health. Oral hygiene is much valued in Ayurvedic health care. The Link Sudantha toothpaste has been formulated with the objective of giving the benefits of a mixture of efficacious medicinal plants which have been used in Ayurveda for several centuries for keeping teeth and gums healthy. It uses a total extract of nine specially selected plant species to formulate modern herbal toothpaste. Link Sudantha has healing effects on many conditions of gums and teeth, and prevents anaerobic bacterial infection, tartar build-up, sensitive teeth and bad breath. In short, daily use of Link Sudantha provides the total oral care that an ideal toothpaste can give.

Plant derived medicinal preparations such as poultices, infusions and simple extracts or powders of dried seeds and roots, have been used in indigenous systems of medicine since ancient times for treatment of oral diseases. There is ample evidence for the efficacy of Karanda (*Pongamia pinnata* L), Moonamal (*Mimusops elengi*) Aralu (*Terminalia chebula*) and Masakka (*Quercus infectoria Olivier.*), in oral cleansing. Herbal ingredients such as clove (*Syzygium aromaticum* L.), Adhatoda (*Adhatoda vasica* Nees), black pepper (*Piper nigrum* L), and ginger (*Zingiber officinale* Rosce) have been used for many teeth, gingival and other oral diseases. Link Sudantha is a toothpaste that combines the holistic traditional Ayurvedic knowledge regarding oral and gingival health, with modern concepts of efficacy, quality and convenience of use, and the technology of formulation.

A randomised double blind placebo controlled clinical trial, carried out by the

Faculty of Dental Sciences, University of Peradeniya, Sri Lanka, (Sri Lanka Clinical Trials Registry SLCTR / 2010 / 002), with ethical approval from the Research and Ethical Review Committee, Faculty of Dental Sciences, has shown unequivocal and highly significant benefits of Link Sudantha herbal toothpaste, as early as 4 weeks' of use for brushing teeth. These benefits persisted when tested at 8 and 12 weeks of regular use.

The study sample consisted of 60 healthy male and female dental students and graduates, aged between 18 and 35 years. Brushing instructions were given for all participants two weeks before the baseline examination. Participants were randomly assigned to placebo and treatment groups. Baseline plaque index (PI), salivary aerobic (SAB) and anaerobic bacterial counts (SANB), bleeding on probing (BOP), probing pocket depth (PD) were recorded at six sites in each participant.

Participants were given a coded toothpaste tube (either the herbal or placebo), and advised to brush teeth twice daily for the duration of the 12 week trial. Link Sudantha and placebo toothpaste were packed in identical coded tubes, and all investigators and participants were unaware of the identity of the tubes given. All measurements were repeated at 4, 8, and 12 weeks.

Results of this trial showed that, at baseline there were no significant differences ( $p > 0.05$ ) between means for test and control groups regarding PI (1.73 vs 1.77), BOP (19.6 vs 20.7), PD (2.22 vs 2.22 mm), and SANB (207 vs 192 per 106 ml). By the end of 12 weeks there was a highly significant reduction of PI, BOP

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\*\*\* Chandani Rupasinghe is a R & D Scientist at Link Natural Products



and SANB in the Link Sudantha group. These findings were statistically highly significant at 4, 8 and 12 weeks when compared with the baseline measurements. In the placebo toothpaste group the means of all of the above variables at 4, 8 and 12 weeks were not significantly different when compared with that of the baseline measurements.

*Findings of this clinical trial are published in Ceylon Medical Journal 2011; 56: 5-9. Full details of the trial can be found on <http://www.sljol.info/index.php/CMJ/article/view/2887>*

## More ways to use

### Essential Oils

Are mice a problem ? Place several drops of peppermint oil on cotton balls on place them in problem locations.

Scent the bathroom by placing oil scented cotton balls in inconspicuous places or sprinkle oils directly onto silk or dried flower arrangements or wreaths.

To promote healing apply 1 Or 2 drops true lavender oil and tea tree oil directly to cuts , scrapes or scratches.

For 'scentual' hand washable, use a few drops of your favourite EO or blend in the final rinse water

Create your own personal essence! EOS and blends make wonderful perfumes. Add 25 drops to 1z perfume alcohol . Let age two weeks before using.

To dispel mosquitoes and other picnic or Bar -B -Q pests, drop a few drops of Citronella or Eucalyptus citriodora oil in the melted wax of a candle or place a few drops on the Bar-B- Qs hot coals.

Infuse bookmarks and stationery with EOs. Use a few drops on paper, place in a sealed plastic bag and leave overnight to infuse the aroma. Send only good news on the perfumed letter.

To make gifts such as pillows or padded decorative hangers, more memorable put a couple of drops of EO on them before giving them a gifts.

For restful sleep, place 1or 2 drops of sleep enhancing oils such as Chamomile, Lavender, Neroli, Marjoram or Hops on your pillow before retiring.

When washing out the fridge , freezer or oven, add 1 drop of Lemon, Lime, Grapefruit, Bergamot mandarin or orange EO to the final rinse of water.

## UNDERSTANDING SOME ASPECTS OF THE BASIS OF AYURVEDA

by Vikrama

### Introduction

Ayurveda is believed to be both a system of combating disease, as well as a manner of living, which is healthy and enjoyable. It encompasses the concept of : “Mensano in corpore sano” - a healthy mind in a healthy body. Ayurveda strives to create a clear and contented mind, free from anxiety , weariness as well as idleness, within a healthy disease free body. With energy and a stable mind, life will be full and the body will be healthy. That is the purpose and embodiment of Ayurveda. As its name implies Ayurveda - the science of life is applicable to every living being.

The “vedic sciences” from which Ayurveda is derived, attributes life to five main natural elements. - the Pancha Mahabhutha, - Air, Space, Water, Fire Earth . Planets and the Universe; and these are all considered to be part of a vast “Unit” .Everything within this one vast “Unit” or (macrocosm) is believed to be analogous to those things that constitute the internal cosmos of the human body (or microcosm) . For instance, the human body is composed of an estimated 50-100 million cells - which are, - when the body is in a state of good health - in absolute harmony.This means that the cells are self perpetuating , and self - remedying , analogous to the systems of the Universe.

The ancient Ayurvedic text Charaka Susrutha states that : “the human system is the epitome of the Universe. Within it there is diversity as in the outside world. The outside world too is as diverse as human beings themselves” .

### The Five Great Elements - Pancha Mahabhutha

Thus, it is one of the principle tenets of Ayurvedic philosophy that the macrocosm , that is the framework of the Universe comprises five great elements “structural units” and they are:- Earth , Water, Fire, Air and Ether ( Space). Earth

is the embodiment of the solid state of matter. In the microcosm, that is the human body, it manifests stability and fixedness; and particularly refers to the skeletal structure , cells and tissues.

Water represents characteristically the fluid state and conditions. Water is an intrinsic requirement for survival of all living things. A large part of the human body is water. This includes blood, lymph and all fluids that circulate through the body system, bringing energy, nutrients and oxygen and syphoning away waste material. The fluids regulate body temperature, bring in materials that help re stabilise the microcosm thus combating any diseased state. Fluids also carry growth factors as well as hormonal information . “Water” is regarded as devoid of stability. - A substance without stability.

Fire (or heat) is the element that has the power to alter the physical state of materials, converting solids to liquids and liquids to gases. Within the body system, Fire or Heat ( sometimes co associated in Ayurvedic parlance with Energy) is functional in the combining of atoms to form molecular species. It is functional in absorbing foods and converting them to stored energy in the form of fats and muscle. “Fire” or Heat converts food into energy form. “Fire” is responsible for such things as the impulses of nervous reactions, and is a determinant in the body’s reactions and thought processes . “Fire” is regarded as a form without substance.

Air is the gaseous form of matter which possesses the property of mobility. Within the body microcosm it is the factor that is responsible for transfer of energy. It is a key element in combustion and is required for “Fire to burn. Air is existence without form in Ayurvedic philosophical parlance.

“Ether” is the space in which all actions and reactions of the macrocosm occur. It is the playing field, which bears the sources of all

matter and the arena of activity. Ether lies in between all matter. The chief characteristic of ether is :“Sound” – the entire spectrum of wavelengths.

Within the philosophy of Ayurveda the entire macrocosm is made up of these five great elements.;

### **Historical development of the Ayurvedic system.**

Indian philosophical thinking was the fundamental basis of Ayurvedic theory.

The philosophies that substantially contributed were :-

Vaisheshika of Kanada  
Nyaya of Akshapada  
Sankhya of Kapila  
Yoga of Patanjali

The Ayurvedic concepts of Physiology or Kriya Sharira and Pathology or Vikriti – Vignana in relation to living organisms are believed to owe their origin to the Vaisheshika and Sankhya philosophies.

The concepts of drug action or Druvaguvegnana owe their origin to the Vasishieskae and Nyaya Philosophies.

### **The Philosophical Basis of Ayurveda - Harmony with Nature and Universal Laws**

The fundamental law that governs Ayurvedic philosophy is that human lives have to be lived in harmony with nature and the universal natural laws and rhythms of the Universe.

In practical terms this can be interpreted as follows:

- Ayurveda stipulates guidelines for a systematically regulated food intake
- Daily routines and exercises and rest
- Medication and fitness regimens

All these are centred around the goal of perfect health. For the individual, it implies the creation of a healthy society and a supportive environment in which all beings are inwardly in balance and externally in harmony with the

environment itself and the natural laws of the universe.

### **The Concept of the Human body**

According to Ayurveda every individual is a unique unrepeatable entity. The modern scientific theory of DNA and its uniqueness within an individual is in accord with the concept. Every individual is considered to have uniqueness in :

Constitution of mind cum body  
Set of life circumstances

Accordingly, the prescriptions for health must be specific to each individual. This applies to the foods, that are beneficial for a healthy life, the programme for exercise, rest and fitness.

Hence one of the primary factors in Ayurveda healthcare is understanding the individual constitution.,personality,habits, idiosyncracies, and personal relationships.

This must be a primary consideration in the diagnosis and treatment of disease.

### **The Concept of Self**

The self is conceived as the central core, or inner dimension of an individual's nature. It is the central terminal that governs the individuals thought processes, feelings, emotions, speech, actions, reactions and interrelationships with other individuals.

The individual “self” is always regulated by the process of self-referral or looking within to the self. The functioning of the individual can be enhanced by referral to the self

The self is the source that can deliver creativity peace of mind, intelligence, happiness and such feelings that can nourish life,.

### **Disease and Disharmony**

In the state of normal health the human body is like a smooth working machine. In addition it has the capability to continue to maintain itself as such ie in a state of good health. In fact it possesses an inbuilt capability for self regulation as it strives to rectify any deviation that may occur from the normal healthy state. It

is constantly striving to maintain this state of homeostatic equilibrium, which is indeed its natural state. Ill health is a disturbance of this state of equilibrium. It is caused by the body's exposure to organisms such as bacteria, viruses and allergens even carcinogens and toxic material. The body's natural immune system usually has the capability to adjust any imbalance or disturbance in the state of harmony and bring it towards the natural state of equilibrium or harmony - that is good health.

However, conditions of stress, malnutrition, over tiredness or fatigue, can weaken the capacity of the immune system resulting in illness and disease. The immune system can get over worked and overcome.

However, all the time the body is in a state of adjusting its condition to meet the vicissitudes of the several factors that tend to bring about disharmony within it. The body is the best judge of its base condition of homeostatic balance or harmony, which relate to such factors as: body temperature, the biochemistry of the body and its various dynamic organs and systems. Good health is dependent on the body's inherent capability to counter the factors likely to disturb its homeostatic balance.

### The Concept of Like and Unlike

External factors that interact with the body or microcosm, can effect in one, two or all of three possible ways.

1. It can enhance or nourish the body
2. It can be corrective and curative and restore imbalance in the body
3. It can be toxic and cause disturbances of the body's equilibrium

The five elements viz Air, Ether, (ie Space) Fire, (heat) Water and Earth may exert one, two or three of these effects.

The rule that governs interaction between the environment and the body or microcosm is known to Ayurveda as "the Law of Like and Unlike". Like tends to increase like, and Unlike to decrease like. Some examples will illustrate this concept.

For example, when the body is exposed to strong sunlight there is a detectable rise in the

body temperature. Likewise if one steps into a refrigeration chamber for a while, there will occur a distinct lowering of body temperature.

The same goes if one has a cold shower or a swim in cold water.

It is believed in Ayurvedic philosophy that all of the body's experiences tend to be guided by the law of Like and Unlike. Intake of Food, Drink, Medicaments, and anything toxic tends to increase the relative "alike" constituents of the body - microcosm, and decrease the "unlike" constituents.

Thought too can affect the body microcosm in accordance with the same law. Good or positive thoughts induce good feelings and bad thoughts have the effect of decreasing the feeling of well being. Thus good thoughts will be beneficial and evil thoughts detrimental to the microcosm. Thus it is important to identify the good and the bad for the well being and health of the body microcosm.

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Yesterday is but today's  
memory and tomorrow is today's  
dream.

*Kablik Gibran (1883 -1931)*

## FINN SANDBERG - THE LEGENDARY "FLYING FINN" OF SWEDEN. 1920-2011

A memorial tribute to a global authority on medicinal plants.

by R.O.B. Wijesekera

In the quiet dignified Swedish village of Skokloster, a unique scientist, a Professor from the University of Uppsala, and a man who developed a tenacious rapport with the scientific researchers of four continents, made his beautiful home. This home had all the symbols of elitist modern European living style in a country which though socialist nevertheless boasted one of the highest living standards in the world. This unique man had a burning passion based on his scientific upbringing as a medical man and his venturesome style that derived from a Viking inspired exploratory urge. This was his abiding interest in nature, traditional medicine, and the prospects it opened up to enrich the medicine of modern times. This urge enticed him to travel widely in the so-called underdeveloped regions of the world, in Africa, Asia, Latin America, and in between. He linked up with small groups of scientists in every continent who were researching on medicinal plants of the regions, and collaborated with them in surroundings far removed from the luxury of his home conditions in his native Sweden. In his familiar khaki safari suit he battled the heat and dust of the tropics and the life in areas far remote from his native Scandinavia. Many of the third world scientists he associated with became his lifelong colleagues and some of the younger ones even became his students; and he large-heartedly entertained them in his Skokloster home whenever they were in the University of Uppsala, as researchers.

All of them, and many more were to become his close friends and he was warmly received by them at all times. He even enjoyed the hospitality of many of them in their own humble homes in the widely spread three continents which spanned his world of scientific interest. Living and working in the rough and tumble of a site in a tropical rain forest or in a rough abode in a scarcely inhabited zone came to him easy, as he demanded little in luxury



*Finn with wife Ilse in his Gard in Skokloster  
(Note his AIRLANKA cap given by the author)*

although used to so much. He enjoyed the company of colleagues, food of all types, and the roughness and variety of primitive nature with a relish that was equal to his liking for the sophisticated pleasures of Europe. He enjoyed life to the fullest extent. Yet he was hard working towards his goals and demanded such from collaborators as well. His boundless energy and forceful style paved the way for his success and he became in time, a scientific legend, who was referred to by Rachel Carsen in her award winning book as: "The Flying Finn of Sweden". He has been bestowed with almost every Scandinavian accolade and was knighted by the King of Sweden.

The author first met him in 1960. He broke journey in Colombo on his way to Australia to attend the first post-war Symposium on Natural Products organized by the International Union of Pure and Applied Chemistry (IUPAC) and held in Australia. It was a time when ships were the mode of travel and Colombo was a last port of call on the sea voyage from Europe to Freemantle in Australia. The author together with Professor Sultambawa, had applied to participate at the IUPAC Symposium, but had unfortunately, no sponsor-

ship to meet the costs. So it was our great satisfaction to meet the celebrated participants who were on route to Australia. Finn had read my name in the provisional list of Participants and wrote to me and that is how I went to the Colombo jetty to meet him for the first time. I took him around the University campus in Colombo along with Sultanbawa, and to the Faculty of Medicine at Kynsey Road to meet with Professor Senaka Bibile, and to deliver a lecture to my colleagues at the Medical Research Institute. He was researching then on arrow poisons from South America as he knew that primitive people used poisonous plants to augment the potency of their arrows and these plants had substances that would have effects on the central nervous system. Such substances he then noted would be potential medicaments. The author kept in contact with him even when in 1966 he moved over from the MRI to the then CISIR. As a result Finn Sandberg became a visitor to our laboratories whenever he passed through Colombo, (which became frequent with Air Travel), on his way to other lands.

There was once a Laboratory at the CISIR, Colombo, named as the Finn Sandberg Laboratory in recognition of his services in human resource development to the Institute. My colleagues came to know him well and we discussed our scientific work with him. In time my colleagues at the CISIR, A.L.Jayewardene, Lakshmi Arambawela nee Rajapakse, Kanthi Hetttiaratchi nee Fonseka, Milton Geevaratne, Nissanka de Silva and Donald Wijekoon, had visited the University of Uppsala, for research studies and been trained by him and his staff. The Sri Lanka-Swedish scientific rapport had commenced then, (and so many Sri Lankan researchers were to benefit from that initiative). We had with him also developed the concept of a two part Ph.D. with work done at both laboratories- at CISIR and Uppsala.

In 1964 Sri Lanka had staged the 2nd UNESCO Symposium on Medicinal Plants in Kandy and the author had the opportunity to work with Finn Sandberg again. During one of his several visits in later years we bemoaned the fact the since that time in 1964 UNESCO had forgotten Medicinal Plants. Finn who had played a leading part at the first symposium in Peshawar, and the second in Kandy, took the initiative which resulted in the third symposium held again in Sri Lanka in 1977, and now designated as ASOMPS III. One of the participants at that

symposium was his then pupil and eventual successor at Uppsala, Lars Bohlin who was the Chief Guest at the SLAAS sessions a few years ago.

Finn was looking forward to the ASOMPS XII next year when death called at his door on July 20th 2011.

The author had a special affection for Finn as it was he who recommended the author to take his own place as a Special Technical Adviser to UNIDO, to be in charge of all UNIDO programmes in the area of Essential Oils and Medicinal Plants. After Finn handed over his mantle to the author in Vienna in 1980, he was one of our periodic visitors and we welcomed these visits personally as well. He was humble enough to continue to work within the programme of which the author was now the manager. He was also a gourmet and enjoyed my wife Marina's cooking while we were in Vienna during the 1980,s.. She had known him too during her days at the then National Science Council, and our joint visit to Sweden just before the staging of the ASOMPS III, in 1977.

We last met at Maastricht in 1994, at the International Symposium organized by the ISHS to commemorate the 500th Anniversary of the discovery of America by Christopher Columbus and enjoyed a meal with him and his wife Ilse. During the last few years we collaborated with him and Jack Cannon of Australia, who was writing a history of the ASOMPS series in which Sandberg was the major actor. With him now gone the scientists of the Third World and those dedicated to Phytochemistry, Pharmacology,



*Finn Sandberg - Field Demonstration*

and bioactive plant products, have lost perhaps their best friend.

Finn was very interested in the work In Sri Lanka of Link Natural Products and Samahan and other products the company had produced. He was featured as the first in our series of "Prominent Researchers" (Vide Link Natural Digest: vol 2,(2), 09. 2006).



The creation of a medal called the FINN SANDBERG MEDAL, for research in the field of plant based bioactive agents as proposed to UNESCO by the ASOMPS committee, would be a fitting tribute to a worthy scientific great who dedicated himself to augmenting the capabilities of Third world nations in Research in an important field. It is an objective we sincerely commend to a sponsor as a fully worthy one.

May one end this tribute thus:

*To : Finn Sandberg.*

*As all plants are made resplendent  
by sunshine and dew,  
Our world is made richer by  
the life of one like you;  
If you seek Finn's monument,  
then look around the world,  
For the tradition of his learning  
his wisdom and his name;  
But surely he lived for ends,  
more durable than fame.*

## SCIENCE

We are not a superior species because we can make weapons to kill, but because we are permitted the luxury of SCIENCE . It is wisdom that we lack when we use it to wage war.

*John Lenihan*

One who lets slip by the  
opportunity to save another,  
Misses one of the richest  
experiences life has to offer

Ancient Pali Text

"The art of healing comes from nature and not from the physician. Therefore, the physician must start from nature with an open mind."

*Paracelsus*

## PLANT NATURAL PRODUCTS AND DRUGS : A COMPREHENSIVE STUDY

Use of traditional medicine as an antidote and cure for a variety of ailments has been practiced by our forefathers for centuries. As the name implies, it is part of the tradition in each country and involves practices handed down from generation to generation. Its acceptance by a population is largely conditioned by cultural factors and it is not easily transferable from one culture to another. Practitioners prefer to use compound prescriptions over single substances or drugs since it is believed that some constituents are only effective in the presence of others. This means that it is much more difficult to identify and assess the efficacy of active principles as required in international standards compared with simple preparations. With this in view, a number of medicinal plants have been subjected to detailed chemical investigations and this has led to the isolation of pure bioactive molecules which have been pharmacologically evaluated. As a result new drugs have been discovered along with new applications. These bioactive molecules are used as therapeutic agents, novel starting materials and new reagents for molecular biology research. At present there are 125 clinically useful drugs of known constitution which have been isolated from about 100 species of higher plants. It has been estimated that about 5000 plant species have been studied in detail, as possible sources of new drugs. The production of plant based drugs in bulk is now an important challenge for the pharmaceutical industry. based on the age old practices based on beliefs and local traditions. With time, studies have shown that the herbs and plants used clearly showed pharmacological activities some even showing poisonous effects.

Tantry, A Mudasir - *Asian Journal of Traditional Medicines*, 2009,4 (6)

## TOTAL PHENOLIC COMPOUNDS, FLAVONOIDS, AND RADICAL SCAVENGING ACTIVITY OF 21 SELECTED TROPICAL PLANTS

Free radical scavenging activity of 21 tropical plant extracts was evaluated using 1,1-diphenyl-2-picrylhydrazyl assay (DPPH). Total phenolic compounds and flavonoids were determined using Folin-Ciocalteu and HPLC, respectively. Results of the study revealed that all the plants tested exhibited excellent antioxidant activity with IC<sub>50</sub> in the range of 21.3 to 89.6 µg/mL. The most potent activity was demonstrated by *Cosmos caudatus* (21.3 µg/mL) and *Piper betle* (23.0 µg/mL) that are not significantly different than that of  $\alpha$ -tocopherol or BHA. *L. inermis* extract was found to consist of the highest concentration of phenolics, catechin, epicatechin, and naringenin. High content of quercetin, myricetin, and kaempferol were identified in *Vitex negundo*, *Centella asiatica*, and *Sesbania grandiflora* extracts, respectively. Luteolin and apigenin, on the other hand, were found in *Premna cordifolia* and *Kaempferia galanga* extracts. Strong correlation ( $R=0.8613$ ) between total phenolic compounds and total flavonoids ( $R = 0.8430$ ) and that of antioxidant activity of the extracts were observed. The study revealed that phenolic, in particular flavonoids, may be the main contributors to the antioxidant activity exhibited by the plants.

Practical Application: Potent antioxidant from natural sources is of great interest to replace the use of synthetic antioxidants. In addition, some of the plants have great potential to be used in the development of functional ingredients/foods that are currently in demand for the health benefits associated with their use.

Mustafa, R.A., Abdul Hamid, A., Mohamed, S. and Abu Bakar, F. in *Journal of Food Science*, 2010, Vol.75, No 1



# "LINKING" WITH PEOPLE AND SOCIETY

## LINK NATURAL WINS EXPORT AWARD FOR FIFTH CONSECUTIVE YEAR

For the 5th consecutive year, Sri Lanka's iconic natural products manufacturer, Link Natural Products was awarded the Presidential Award 2009 for its Outstanding Export Performance in Non-traditional Products & Services Category- Herbal, Ayurvedic and Health/ Personal Care Products Sector, creating history in the herbal healthcare products industry in the country..

The Presidential Export Award 2009 under the Special Awards Category - 'The Largest Contributor for Rural Development' was also granted to Link Natural, in recognition of its efforts in uplifting the life of the rural community.



*Tharanga Perera, Factory Manager, Link Natural Products receiving the award*

In order to promote the product with the salon owners and barbers which are the key focus segments, several workshops were conducted across the island, namely Negombo, Piliyandala, Colombo, Galle, Kandy, Kiribathgoda and Ratnapura. This gave a wide coverage to the product.

The participants were given detailed information on the product, highlighting the key benefits of HCC over the other competitor products in the market currently. The highlight of the workshops were demonstrations of the proper method of performing an Ayurvedic head massage.

The demonstration was conducted by Mr. Thushara Hettiarachchi, who is the head therapist at a leading Ayurvedic resort in Sri Lanka, whilst the full programme was conducted by Mr. Amiththa Weerasinghe, a well known personality in the film industry in Sri Lanka.



*Demonstration session*

## INTRODUCTION OF LINK NATURAL HAIR CARE COOL

Link Natural introduced one of its new products, Link Natural Hair Care Cool to the market in December 2010. With the introduction of 'Cool' under the brand name of 'Link Natural Hair Care' the company aims to develop and expand the hair oil market to include different categories of consumers..

## LINK NATURAL SALES CONVENTION 2011

Link Natural Products (Pvt) Ltd., held its annual sales convention on the 1st of August 2011 during an elegant event held at the Waters Edge Grand Ballroom. The event was graced by the LNP sales team, distributors and other distinguished guests.

The key point of the event was where all the distributors were recognized for their efforts in elevating LNP to a leading position in the herbal products industry. Seven long standing distributors were awarded with special gold coins for their loyal service towards the company.

Three special gold coins were also presented to the most senior sales officers in the company.

Bangkok tours along with cash prizes were awarded to the best Area Sales Manager and four sales officers for their great achievement during the past year.



*Dr. Devapriya Nugawela, Mr Titus Peter with the award winning sales officers*

## LINK SUDANTHA RE LAUNCH EVENT

Link Natural Products (Pvt) Ltd., re-launched its oral care specialist 'Link Sudantha' toothpaste during an elegant event held on the 1st of August 2011 at the Waters Edge Grand Ballroom, graced by the LNP sales team, distributors and other distinguished guests.

An AV clip was presented to the audience, revealing the findings of the latest National Oral Health Survey 2002/03 conducted by the Ministry of Health, and the clinical trial conducted by the Faculty of Dental Sciences, University of Peradeniya, proving the beneficial effects and the efficacy of the product. This was followed by the new Link Sudantha pack revelation.

Thereafter, the Brand Manager for Link Sudantha Mr. Gotabaya Attanayake shared a few words with the audience on the product benefits and elaborated on the product highlights and how the fading smile of the nation can be bought back to life by using Link Sudantha. The evening continued well into the night, where the guests were entertained by elegant dance acts and a comedy act performed by well known teledrama artists in Sri Lanka.



*Mr. Gotabaya Attanayake, Brand Manager for Sudantha addressing the gathering*

## LINK PARTNERS SLIDA IN TRAINING PROGRAMME

Link Natural Products recently joined hands with Sri Lanka Institute of Development Administration to train administration personnel in the country, by providing opportunities for exposure visits to its state of the art facility in Dompe. Two batches of SLIDA trainees visited the company in May 2011. In his address, Mr. M. Tilakasiri, Senior Consultant SLIDA, said that these visits would help the participants to receive first hand information on R & D, Quality Assurance and contemporary Sri Lankan management practices. In turn, Dr. Devapriya Nugawela, Chairman of Link Natural Products enunciated that it was their social responsibility to assist in developing the administrators of the country, whose actions will benefit the masses. He said that the company had been assisting many school, universities and other organizations in this manner and that he was happy to extend the same services to SLIDA as well.

## 'HERBAL DRUGS - A MODERN APPROACH TO UNDERSTAND THEM BETTER, 2011

*Edited by Subhash C Mandal*  
Department of Pharmaceutical Technology  
Jadavpur University, Kolkata 700 032, India  
ISBN: 978-81-7381-653-6

**Published by NCBA , (UK)**

Categories: Pharmacy, Botany, Ayurveda,  
Research

This book is a robust attempt to furnish the latest scientific information for any multidisciplinary research team engaged in plant drug research. It focuses on the roots of research in medicinal plants, highlights some of the striking features of commonly known metabolites, and presents a few of the newer aspects of herbal research. The utility of the book lies in its versatility through which it has covered a wide spectrum of research activities in the field of herbal drugs.

## EXOTIC MEDICINAL PLANTS IN SRI LANKA AND THEIR USES, 2010

*By Ranil Senanayake*

Published by Neo Printers, Sri Lanka  
ISBN: 978-955-8505-04-5

Categories: Pharmacy, Botany, Ayurveda

Featuring 49 medicinal herbs this book is a part of global movement to share and synthesize traditional healing knowledge. It seeks to reveal the medicinal value of plants that inhabit Sri Lanka's landscapes, but originate from other countries. Although these plants have often been seen as weeds, their special properties add strength to our system of indigenous medicine.

The book contains the nomenclature, morphology, medicinal and other uses and culture and harvesting of these 49 exotic medicinal herbs with detailed recipes for herb preparation, and a wide variety of ideas on how to use each herb. This book will guide you on using Sri Lanka's exotic plants for healing.

Theories are always being tested. This is how SCIENCE works. All the more reason for citizens to become as scientifically literate as possible – to figure out where the centre of gravity is, in any given debate. Because at some point, a scientific civilization has to take action, uncertainties withstanding.

*Joel Achenbach written for  
Washington Post in National  
Geographic May 2006*

Just as this edition was going to the press we learnt with great sadness about the death of Norman R. Farnsworth, another eponyme of medicinal plant research. The Digest has previously featured him under 'Celebrated Researchers No.4' in Vol. 4, Issue 1, 2008. An appreciation of Prof Farnsworth and his work will be featured in our next issue. We offer our condolences to his family.

## Extracts from Letter 1

I forward herewith a brief comment on the excellent article written by Dr. Nirmala Pieris which appeared in Vol. 7 Issue 1, which may perhaps be of interest to your reader. The incident in question was encountered by me, when I was Government Analyst, so the facts stated therein are true and accurate.

Tailpiece - with apologies to Dr. Nirmala Pieris - Pomegranate Abused.

I enjoyed reading this highly informative article and appreciated very much, both its historical and scientific contents, including its legendary medicinal properties. It was also noted that every part of the fruit had its proven uses, including its skin, which, with its high percentage of tannic acid was used in the process of tanning leather. But a more modern use or perhaps abuse of the fruits, with its rich colour and natural beauty has been discovered. - a pity alas!

It was as follows - A circular incision had been made at the "stem end" of the fruit thereby facilitating the removal of a cap like portion of the fruit. The contents of the fruit including seeds and all fibrous material had been scooped out and the cap duly replaced resulting in the formation of a beautiful deep pink or red receptacle which could sit majestically alongside a selection of fruits (apples, bananas grapes etc) which are usually served on a tray, in an aircraft cabin.

A group of tourists visiting Sri Lanka filled some pomegranate receptacles so prepared, with high quality heroin and placing them amongst other fresh fruits on trays used for serving such fruits duly disembarked with two such fruit trays in hand. They passed through the Customs uneventfully and perhaps gleefully with their task accomplished and millions of rupees in prospect - at least so they thought.

It was indeed their misfortune that having checked into a star class hotel in Negombo, their desire for a smoke of heroin seemed irresistible and soon its effects took its toll. Their unruly behavior consequent to the euphoria caused by the drug soon brought in the Police and the tourists were soon in police custody with legal proceedings to follow after the Government Analyst's report confirmed the presence of heroin in the beautiful pomegranate.

So while Nature's blessings both aesthetically and its wide range of medicinal uses have been showered on this "super fruit", it has only taken a single drugged mind to discover an abuse though fortunately with no success and hopefully no repetition by any others.

Dr A R L Wijesekera

## Extracts from Letter 2

Many thanks for my copy of the latest edition.

Let me briefly introduce myself. I am the ICATS Director of Studies. I spent 2 years at BBA (now part of IFF) starting in Aroma materials R & D and then into various roles including Product safety, Regulatory Affairs and QA Management. My PhD from UCL London is in Perfume chemistry. I have been teaching at the University of Plymouth for 20 years and have been associated with the IFEAT distance learning programme for over 20 years.

Our programme is taken by students around the world and tutorial support and submissions are effected by e-mail. IFEEAT International Federation of Essential Oils and Aroma Trades award the diploma on successful completion. We have around 25 active students.

The purpose of this email is to say I found the article on Vanilla production interesting and it would be of value to our 25 active students. Would it be acceptable to photocopy this article to this restricted list of IFEAT diploma students? It would be much appreciated.

Dr. Tony Curtis  
ICATS Director of Studies

## Response

Many thanks for your letter acknowledging receipt of our Publication, the Link digest.

We are glad that you found some of the contents useful, and have no objection at all in your using the article on Vanilla for the benefit of your students. The author, Dr R O B Wijesekera is always happy to impart his expert knowledge in the field to interested persons who would gain from it. We trust you will make due reference to the source of the article.

We also invite you to contribute to our publication with an article on any topic in the areas given in the publication. The next issue is scheduled for October 2011 and we would be grateful if you could give it to us by the end of August.

We note that one of our young officers is following the diploma course coordinated by you, and happy to see that she has displayed a creditable performance in her work.

Dilmani Warnasuriya  
Editor

# 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.

## VALUE

Try not to become a man of success but rather try to become a man of value.

*Albert Einstein, 1879 -1955*