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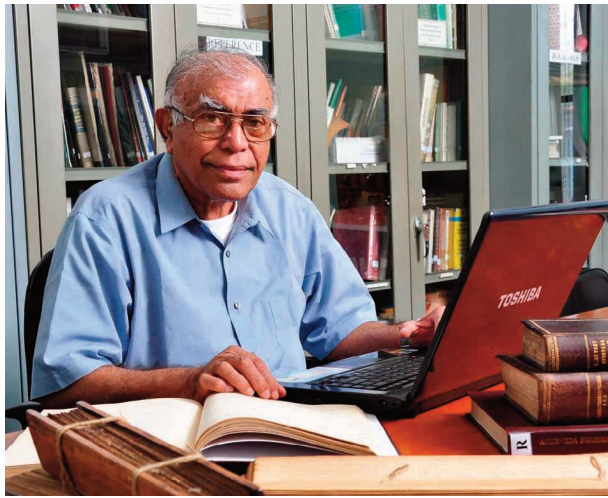
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EDITORIAL

RECOURSE TO THE NATURALS.



In December of 1945 Sir Alexander Flemming is reported to have clearly stated that: "It is not difficult to make microbes resistant to penicillin". Now in 2015, seven decades later, the WHO in Geneva is to present a Global Action Plan on Antimicrobial Resistance (AMR). The goal is to ensure that we can continue to safely and effectively treat infectious diseases. There is an ever increasing threat posed by anti-biotic resistance and more broadly stated as : AMR to Health, Food production and economic progress. The over dependence on antibiotics in the treatment of disease has been seen as the cause of AMR. This is evident not only in the USA and in Europe, and indeed among opulent societies globally, but also in the countries of the world where the compulsive pharmaceutical industry pushes sales of antibiotics with massive thrust

among societies that have had recourse to alternative therapies such as Ayurveda, and Traditional Chinese Medicine. Concurrent with this new emergence of AMR there has developed an understandable movement towards what is termed Green Medicine, which is traditional Medicine mainly confined to herbal medicines or Phytotherapy. In countries such as Sri Lanka, Phytotherapy in the form of Ayurvedic therapy already prevails but has been neglected over the decades and even pushed down in the social ladder to an unjustifiably lower scale. This is sad. A more positive reaction which boosted the traditional therapies to be served with a high quantum of research funding, and better understanding of the theories of disease as they describe them would have benefitted humanity. One would imagine that the new WHO initiative would include the positive aspect of substantially harnessing the established virtues of the traditional systems of the world and through enhanced scientific research making their obvious benefits impact on a large scale to the global population.

R O B Wijesekera

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DURIAN: A TASTE OF HEAVEN AND A SMELL LIKE HELL

By Dilmani Warnasuriya

Durian is a fruit which invokes either love or hate. There is rarely a passive emotion associated with it. It is considered a delicacy by some, while others shun it and avoid being anywhere near its vicinity. It has even created marital discord, when husbands refuse to transport it in their vehicles, despite the fact that wives crave for it. An apt description of it is "it smells like hell and tastes like heaven".



History

Durian has been known in Southeast Asia since prehistoric times. It is said to be indigenous to Borneo and Sumatra, and according to some,

in Malaya and Lower Burma, as well. It is commonly cultivated along roads or in orchards from Southeastern India and Sri Lanka to New Guinea. The earliest reference to it are the several bas relief panels of 9th-century Borobudur depicting durian as a fruit offering for Javanese kings. Being much valued in the Royal palace in Burma, there was an active trade from Lower Burma to Upper Burma.

In the Western region, Durian fruit, was known only for around 600 years. The earliest reference is that made by Nicollo da Conti who travelled to Southeast Asia in the 15th century and his description was recorded thus .

"They (people of Sumatra) have a green fruit which they call durian, as big as a watermelon. Inside there are five things like elongated oranges, and resembling thick butter, with a combination of flavours."

In Asia, many consider this to be the King of Fruits because of its distinctive size, odour, and husk, and its unique odoriferous character which has no equal in the world of fruits. In some parts of Southeast Asia, it is even banned in hotels and locations of mass transit . That should say it all.

The name *Durio* also means thorny, which indicates the origin of the name. In some countries it is called the “civet cat tree” or civet tree, not in acknowledgement of its foul odour as one would naturally suppose, but because the fruit was used as bait to catch the civet cat.

There are many legends and myths associated with the consumption of the fruit. An 18th century theory is that eating this fruit will cause indigestion and bad breath. Another legend or belief, is that the fruit should not be taken when consuming alcoholic beverages or coffee as it can be poisonous to your health. The Japanese believe that the Durian fruit is actually an aphrodisiac and even gone to the extent to create rules as to when Durian may be consumed and when it may not. However, none of these have been either proven or disproven.

The species cultivated in Sri Lanka, *Durio Zibethinus*, was first introduced to the country by the Portuguese during the 16th century. In Southeast Asia the fruit was cultivated at a village level since the 18th century, but assumed commercial cultivation from around the early 20th century. In the West, the first seedlings to arrive in England came in 1884 to the Botanic Gardens. The demand, both at a national and international level for the fruit arose around the 1990s. Durian is sought and savoured with passion by durian lovers in the South east Asian region, and now there is a strong demand for quality durian in Hong Kong, China and Taiwan. It is also much sought after in the USA, Canada and Europe. Thailand and South Vietnam are important producers of durians. The Association of Durian Growers and Sellers was formed in 1959 to standardize quality and marketing practices.

Taxonomy

The taxonomic classification of Durian has been attributed to G. E. Rumphius, who created the genus *Durio*, meaning thorny while it was Carl Linnaeus who affixed the Latin name *zibethinus* to it.

Throughout the years, the classification has provoked many controversies. There has been some confusion between soursop, (*Annona muricata*) and also horse chestnut of the family Castaneae, during various times. Some taxonomists place the genus *Durio* under the family Bombaceae, or others broadly under Malvaceae, which is also said to include Bombaceae, while still others place it in a smaller family Durionaceae. Nevertheless, the broadly accepted classification is the Family Malvaceae and Genus *Durio*. This family includes plants such as Hibiscus, Okra and Cotton. There are about 30 known species of Durian in Southeast Asia, of which 9 are known to produce edible fruit.

Description of Plant



The durian tree grows to a height ranging from 90 to 130 ft in tropical forests, and is usually erect with a short and rough peeling trunk of about 4 ft in diameter. It has an irregular dense or open crown of rough branches and thin branchlets coated with greyish scales when young. The leaves are rounded at the base and are more or less oblong or elliptical and tapering abruptly to a point at the apex. They are leathery, dark green and glossy on the top side, and silvery or pale-yellow, and densely covered

with gray or reddish-brown, hairy scales on the underside. The flowers are three petalled and 2-3 inches in width, whitish to golden brown and are malodorous. They are borne in pendant clusters of 3-30 from the old thick branches or trunk from a 5-lobed, bell-shaped calyx.

The infamous fruit



The fruits are 6-12 long, and 5-6 wide and are ovoid to nearly round. The weight of the fruit can go up to 18 lbs in weight. The rind is yellow or yellowish-green and is thick and tough and densely set with stout, sharply pointed spines, 3 to 7-sided at the base. Handling without gloves can be painful. Inside there are 5 compartments containing the creamy white, pinkish or orange flesh and 1 to 7 chestnut-like seeds, 3/4 to 2 1/4 in long with glossy, red-brown seed coats. In the best fruits, most seeds are abortive. It is the flesh of the fruit which exudes the much talked of odour, which was described by the renowned explorer Otis B Barret as "combined cheese, decayed onion and turpentine, or garlic, Limburger cheese and some spicy sort of resin". However he further says that after eating the pulp the odour is scarcely noticed as the flavour has a three fold effect, first a "strong aromatic taste, followed by a delicious

sweet flavour, then a strange resinous or balsam-like taste of exquisite but persistent savour. It is neither acid, nor sweet, nor juicy; yet it wants none of these qualities, for it is in itself perfect." The fruit does not produce nausea or other bad effects, but it is more or less addictive, as the more you eat of it the less you feel inclined to stop. .

Cultivation and Propagation

Durian is a tropical crop and cannot be grown at high altitudes. It needs plenty of rain and flourishes on river banks, with roots having easy access to water. Deep alluvial or loamy soils are best for growth. It is believed that the fruits are pollinated through bats and bees. Cross pollination is also said to be essential for obtaining good crops of fruits. Durian seeds soon loses its viability particularly if exposed to sunlight, but even in cool storage can be only kept for 7 days. Special measures should be taken if required for longer storage, such as for shipping purposes. Ideally, they should be planted fresh, flat-side down, and they will then germinate in 3 to 8 days. Seeds washed, dried for 1 or 2 days and planted have shown 77-80% germination. Grafting of cultivars have become popular in commercial cultivations, but the grafted trees never grow tall as seedlings.

In Sri Lanka, the durian generally blooms in March and April and the fruits mature in July and August, but these periods may shift considerably, with the weather. Nearly all cultivars mature within the very short season during which the fruits are present in great numbers in local markets, particularly at roadsides.

In rural areas, villagers construct huts and live in them for weeks on end during harvesting, in order to be ready to collect each fruit as soon as it falls. Caution is necessary when approaching a durian tree during the ripening season, for the falling fruits can cause serious injury due to its hard shell. Hunters place traps in the surrounding area because the fallen fruits

attract game animals and all kinds of birds. The fruit is also placed as bait for game in the forests.



Durians mature in 3 1/2 to 4 1/2 months from the time of fruit-set. Well-grown, high-yielding cultivars should bear 6,000 lbs of fruit per acre (6,720 kg/ha).

Durians are highly perishable. They are fully ripe 2 to 4 days after falling and lose eating quality in 5 or 6 days.

Food Uses

The flesh or pulp of the fruit can be consumed at various stages of ripeness. While some like it slightly ripened and tart flavoured, others may prefer soft and over ripened fruits. When selecting durian fruits, the ones with a firm stalk should be selected. The seeds of the fruit although can be safely eaten, are discarded as they have a bland taste. Durians are sold whole



or cut open and divided into segments which are then wrapped in plastic. The flesh is most often eaten fresh, but is best well chilled.

Sometimes it is simply boiled with sugar or cooked in coconut water, and it is a popular flavoring for ice cream, milkshakes, sweets, cappuccinos, rice, and other Asian dishes and other sweet preparations in the Southeast Asian cuisine. In Indonesia, the flesh is prepared as a sauce to be eaten with rice, and also as a relish when mixed with onion, salt and vinegar. Sometimes the flesh is fermented in earthen pots,



often smoked, and eaten as a special side dish. In Malaysia, the flesh is preserved with salt and kept to eat the year round. The unripe fruit can also be boiled whole and eaten as a vegetable. The seeds are eaten after boiling, drying, and frying, or sliced thin and cooked with sugar as a sweetmeat.

For export purposes, the flesh is canned with syrup or sold as a paste.

Young leaves and shoots are occasionally cooked as greens. Sometimes the ash of the burned rind is added to special cakes.

Nutritive Value of the fruit

Nutrition value per 100 g

Principle	Nutrient Value	Percentage of RDA
Energy	147.0 Kcal	7.0%
Carbohydrates	27.09 g	21.0%
Protein	1.47 g	2.5%
Total Fat	5.33 g	20.0%
Cholesterol	10.0 mg	0%
Dietary Fibre	3.8 g	10.0%
Vitamins		
Folates	36.0 mcg	9.0%
Niacin	1.074 mg	7.0%
Pantothenic acid	0.230 mg	4.5%
Pyridoxine	0.316 mg	24.0%
Riboflavin	0.200 mg	15.0%
Thiamin	0.374 mg	31.0%V
Vitamin A	44.0 IU	1.5
Vitamin C	19.7 mg	33.0%

Electrolytes

Sodium	2.0 mg	0%
Potassium	436.0 mg	9.5%

Minerals

Calcium	6.0 mg	0.6%
Copper	0.207 mg	23.0%
Iron	0.43 mg	5.0%
Magnesium	30.0 mg	7.5%
Manganese	0.325 mg	14.0%
Phosphorus	39.0 mg	6.0%
Zinc	0.28 mg	2.5%

Phyto-nutrients

Carotene-a	6.0 mcg	-
Carotene-β	23.0 mcg	-
Lutein-zeaxanthin		

(Source: USDA National Nutrient data base)

Durian is a good source of energy, specially for those athletes who need extra energy. 100g of fresh fruit contains 147 calories, and five servings of Durian is said to cover the entire daily requirement of carbohydrates. However those suffering from diabetes need to be cautious when consuming the fruit, as it is rich in simple sugars, glucose, fructose and sucrose.

The abundance of dietary fibre makes it a good bulk laxative and also helps protect the colon mucous membrane by decreasing exposure time to toxins, and helps to bind and eliminate cancer causing chemicals from the gut.

The beneficial effects of Vitamin C is undisputed. The durian fruit is a rich source of antioxidant vitamin C and consumption of such foods helps the body to develop resistance

against infection, thus fighting off illness, aids in wound healing, lowers cholesterol and improves blood flow and scavenges harmful free radicals.

The presence of health giving B-Complex groups of vitamins, niacin (vitamin B3), riboflavin (vitamin B2), pantothenic acid (vitamin B5) pyridoxine (vitamin B6) and thiamine (vitamin B1) adds to the nutritive value of this fruit. Vitamin B is associated with preventing aging and heart disease . It also increases the HDL levels, which is the good cholesterol.

Copper and iron are also seen in the fruit, and their presence enhances the formation of red blood cells. The high Potassium content helps to reduce fatigue and relieve mental stress. Potassium is an important electrolyte inside cells and body fluids that help in controlling heart rate and blood pressure.

Tryptophan is an important amino acid which is present in significant amounts in Durian fruit. Tryptophan has a great impact on the sleep patterns of humans. It metabolises into serotonin and melatonin which are two neurochemicals that play an important role in sleep inducement and controlling epileptic fits.

Folate is another vitamin which aids in preventing heart disease and fetal development, and also helps in brain functioning.

There are several myths or beliefs associated with the ingestion of Durian. One is that a rapid rise in the cholesterol levels will be seen. This is now disproved as the fruit has good monounsaturated fats that can actually lower harmful cholesterol levels and moderate high blood pressure. Another such belief is that durian can act as an aphrodisiac, but other than causing the temperature to rise there is no validity in this assertion. Again, it is said that caution should be exercised when eating durian and intaking alcohol, particularly beer, as it could cause death. A scientific explanation for this could be that durian extract strongly inhibits the enzyme

aldehyde dehydrogenase (ALDH) which is used by the liver to break down alcohol and alcohol could thereby accumulate causing problems.

But what is essential to note is that durian can become addictive, and excess of anything could give rise to various problems, but when eaten in moderation it will provide the body with much needed minerals, vitamins and good fats, in addition to a generous amount of carbohydrates.

The flesh of the fruit is said to serve as a vermifuge, the decoction of the leaves and roots as a febrifuge. The latter is also applied to swellings and skin ailments. The ash of the burned rind is taken after child birth.

Even in Western countries, Durian is believed to be a health giving fruit, and is sold as a "health-food accessory" in tablet form, with the tablets reputedly containing durian and a species of Allium from India, as well as a considerable amount of vitamin E. They were claimed to provide "more concentrated healthful energy in food form than any other product the world affords" to keep the body vigorous and tireless; the mind alert with faculties undimmed; the spirit youthful."

While the seeds could be consumed without harm, it is also believed to possess a toxic property that causes shortness of breath. The Durian fruit itself is considered to have warming properties and cause sweating. Those who have high blood pressure or are pregnant are not supposed to have the Durian fruit as it is supposed to be hazardous to their health due to these warming effects.

A toothpaste flavored with durian is currently marketed for durian fanciers.

And Finally – What causes the Stink?

Chemicals account for the taste, smell and nutritive value of every food and drink

consumed by man. The smell whether fragrant or nauseating is due to chemicals which are said to be volatile as they readily vaporise and are detected by the scent receptors of the nose. While odours are caused by one or two chemical compounds, and known as single or double note smells, the odour of durian has been found to be a combination of several volatile compounds. The elucidation of the nature of the smell has challenged many a scientist, but no concerted opinion as to how many and what these compounds has been obtained by them, and studies are still going on.

Initial studies done around 20 years ago were able to confirm the presence of over 100 volatiles in the fruit, but they were not able to identify the compounds contributing to the unique flavour of durian. Later studies revealed the presence of over 40 highly odorous compounds, some of which had not been identified before in a natural product. What has captured the interests of chemists is that none of the compounds identified seem to match with the characteristic durian smell individually. The individual odours have been aptly described as fruity, skunky, metallic, rubbery, buttery, burnt, roasted onion, garlic, cheese, onion and soup seasoning and caramel. It is the combination of these many odours that the powerful and unique odour of durian is produced. Subsequent research uncovered the identity of the chemical given by these tags to some degree, and for the benefit of chemists interested in the specific compounds, the odour and the responsible chemical is given below. However, the contribution of each odorant to the overall odour has still to be studied. Overall, esters, ketones and sulfur compounds were the major compounds identified, with Acetoin, ethyl 2-methylbutanoate and diethyl disulfide being the predominant compounds present. The esters and sulfur compounds are obviously responsible for durian's strong fruity and sulfury odors while ketones, especially acetoin, is most likely contribute to its creamy flavour.

Durian signature odours

fruity

(ethyl (2S)-2-methylbutanoate),
(ethyl 2-methylpropanoate)
(ethyl butanoate ,

honey

(ethyl cinnamate),

roasted onion

(1-(ethylsulfanyl) ethanethiol),
(1-(methylsulfanyl)ethanethiol)
(1-(ethylsulfanyl) propane-1-thiol)

sulfury, onion

(1-(ethyldisulfanyl)-1-
(ethylsulfanyl)ethane),

caramel

(2(5)-ethyl-4-hydroxy-
5(2)-methylfuran-3(2H)-one),
(4-hydroxy-2,5-dimethylfuran-3(2H)-one)

soup seasoning

(3-hydroxy-4,5-dimethylfuran-
2(5H)-one),

skunky

(3-methylbut-2-ene-1-thiol),

sulfury durian

(ethane-1,1-dithiol)y,

The more simple and generally accepted flavours detected are:

rotten egg - hydrogen sulfide

fresh fruity - acetaldehyde

rotten cabbage - methanethiol

rotten onion - ethanethiol

rotten durian - propane-1-thiol

Conclusion

Getting to the bottom of what causes the unique flavour of Durian will continue to interest scientists for many more years. With the latest detection techniques becoming more and more accessible in laboratories, there is no doubt, that the stink will no longer be a mystery in the near future. With more light being shed on the nutritional benefits of the fruit, even durian haters may brace themselves to consume the fruit in some form or another.

Reference Sources

1. Morton, J.(1987). Durian. p. 287–291. In: Fruits of warm climates. Julia F. Morton, Miami, FL.
2. Wong, K C and Tie D Y. (1995) Volatile constituents of durian (*Durio zibethinus* Murr.), Flavour and Fragrance Journal, Volume 10, Issue 2, pages 79–83, March/ April
3. Hugo Weenen , Wim E. Koolhaas , and Anton Apriyantono (1996) Sulfur - Containing Volatiles of Durian Fruits (*Durio zibethinus* Murr.) J. Agric. Food Chem., Vol. 44 (10), pp 3291–3293
4. Jiang J. Et al (1998) GC-MS analysis of volatile compounds in durian (*Durio zibethinus* Murr.) Developments in Food Science, Vol.40 pg 345-352
5. Chin, S.T. (2007) Analysis of volatile compounds from Malaysian durians (*Durio zibethinus*) using headspace SPME coupled to fast GC-MS, Journal of Food composition and Analysis Vol.20 Issue 1 pg 31-44
6. Jia-Xiao Li , Peter Schieberle, and Martin Steinhaus (2012) Characterization of the Major Odor-Active Compounds in Thai Durian (*Durio zibethinus* L. ‘Monthong’) by Aroma Extract Dilution Analysis and Headspace Gas Chromatography–Olfactometry, J. Agric. Food Chem., Vol. 60 (45), pp 11253–11262
7. Moore, Thomas (2012) The Treasury of Botany, Vol. 1, p. 435 RareBooksClub.com
8. <http://earthsky.org/earth/worlds-stinkiestfruit-durian-is-a-chemical-cacophony>
9. <http://www.smithsonianmag.com/science-nature/why-does-the-durian-fruit-smell-so-terrible->
10. <http://www.theguardian.com/lifeandstyle/australia-food-blog/2014/oct/01/durian-the-worlds-most-divisive-fruit>
11. <https://en.wikipedia.org/wiki/Durian>
12. www.nutrition-and-you.com/durian-fruit.html
13. <http://www.asianscientist.com/2012/11/in-the-lab/odor-active-compounds-in-the-durian-fruit-2012/>



Durian Mousse Cake

YLANG YLANG - FLOWER OF FLOWERS: QUEEN OF THE FRAGRANCE WORLD

By R.O.B.Wijesekera

Introduction



Walking through a field of Ylang ylang one gets the feeling of an air of Paradise. Such is the captivating scent of this wonderful creation of nature. The trees themselves that are adorned with a profusion of blooms are deformed and are and even grotesque, and ugly. This is not nature's way. In the natural habitat in the forest the tree grows symmetrical, erect and straight. In the plantations that one sees, man has distorted the trees and bent its branches so as to enable easy picking of the blossoms which being tender have to be hand-picked, to avoid bruising. Further the blossoms grow off the stem and the bending causes more exposure to sunlight, enhancing the yield.



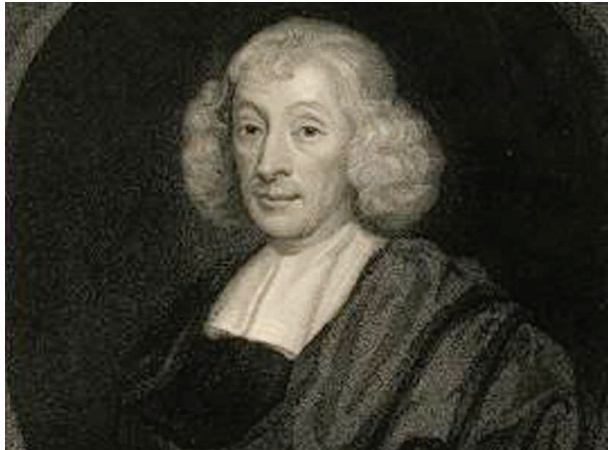
A plantation and the grotesque appearance of the trees



The blossoms before harvesting

The Ylang ylang tree which delivers the flowers that bear this exquisite and much valued fragrance is botanically identified as: *Cananga odorata* variety genuina, Family : Annonaceae. There is also a dwarf variety and another variety, *Cananga odorata* var. *macrophylla*, the latter providing an oil that is lesser in quality and is mainly used for making soaps.

It is believed that the name ylang-ylang originates from the Philipino slang, *alang-alang* meaning flower of flowers, a description of the manner in which the flowers are suspended from the branches of the tree and flutter in the breeze. The tree is native to the south-east Asian region, particularly the Philippines and Indonesia, and naturalised as far as Papua New Guinea and the Pacific Islands. Varying records report that it was first discovered in 1740, in Malaysia by the French botanist Pierre Poivre. Other reports say that it was first discovered by the English explorer and botanist John Ray (1628-1705), who described it as *Arborsaguisen*. Later it was named as *Borga cananga*, and *Unona odorata*.



John Ray English Botanist

The French introduced Ylang ylang to Reunion in 1770 as an ornamental crop and by 1892 had undertaken large scale planting in Reunion, the Comoros islands, and the islands near Madagascar, like Nosy Be, where it still grows well and is regularly harvested and distilled for its essential oil which is a much valued component in the modern perfumery industry.



Harvesting ylangylang flowers in a plantation in the island of Nosy Be



Off to the Distillery

The ylangylang tree in a plantation undergoes a systematic pruning procedure to make it yield more essential oil and this is coupled with the bending of the branches which is responsible for its misshapen form. The flowers are believed to be pollinated by night moths, so the build-up of the essential oil content is high towards early morning and hence the harvesting is done then.

Distillation of the Essential Oil of Ylang ylang

It is recorded that the first person to obtain the essential oil by steam- distillation of the flowers was Albert Schwinger in 1860, when he was stranded in Manila with his mobile distillation still. In the islands surrounding Madagascar and the Comoros, the oil is steam-distilled, and the technology varies much from the bare traditional to the most sophisticated stainless steel stills with multi - tubular condensers seen nowadays.

In the year 2014 the estimated global production of ylang ylang oil stood at 70-75 tonnes per year. The production was largely restricted to the four geographical regions which produce 80% of the worlds supply of oil, as follows:

- COMOROS Islands - (La Grande Comore, Anjuan, and Mohli)
- AMBANJA (North east of Madagascar)
- NOSY BE Island facing Ambanja) and
- MAYAOTTE (Island, part of the Comoros under French Administration)





content has been reached and the flower is ready for harvesting. The flowers after hand-picking are placed in baskets during the early hours of the morning (before 10 am), and delivered to the distillation centre.



Picture showing flowers at a distillery in one of the islands.



The plant parts used for distillation are the flowers, umbellate in appearance consisting of six petals per flower. When the flower is in its infancy it bears a greenish tinge, has developed little or no fragrance and the petals are largely coiled. Across a 14-20 day period the flower matures developing a progressively strong and captivating fragrance and an attractive vibrant yellow colour. When soon after the flower develops a reddish spotty tinge at its base, it is the indication that the maximum essential oil

The precautions for distillation should be strictly observed as it impacts on the quality of the oil and therefore its acceptability in commerce. In general the following should be observed:

- The flowers should be distilled within two hours or less of picking to avoid fermentation
- Complete distillation generally takes about 14 hours and should be continuous
- About 50 kg of flowers are needed to yield 1kg of oil.
- The grades of oil will depend on the distillation time used by the distiller



A modern distillery in Nosy Be showing state-of-the-art equipment

Whereas till the end of the century traditional stills were used by distillers with little progressive improvements, recently the advent of large fragrance companies have caused a technological surge upgrading the methodology. Distillers are now utilising state-of-the-art equipment due to the investment and competitive interest of these Flavour Companies. This means that distilleries are now using stainless steel equipment of modern design with heat sources that are environmentally friendly. This results in a product of consistently acceptable quality and in good yield. The product storage too has reached high standards.

Grading of the Oil

Those in the trade today view the grading of ylang ylang as an art as much as a strict procedure. This is due to the fact that some of the early methods of grading were dependent on quality assessment by organoleptic sensory

evaluation, and were experience dependent to a very large extent. Many of these experienced personnel are not involved in the present day methodology of grading. The grades are now identified as follows:

- Ylang ylang Extra. The fraction of the distillate oil that comes over following the very first initial lot which is discarded.
- Ylang ylang Grade I - The fraction that distils over after 2-2.5 hrs. This fraction is characterised by less of the volatile material found in ylang ylang extra and more of geraniol geranyl acetate and beta-caryophyllene
- Ylang ylang Grade II - The fraction that distils over after another 2-3 hours..
- Ylang ylang Grade III - The fraction that distils after another six hours..
- Ylang ylang Grade III - super, that distils over to completion.
- Ylang ylang complete - This is a complete distillation (about 14 hours)

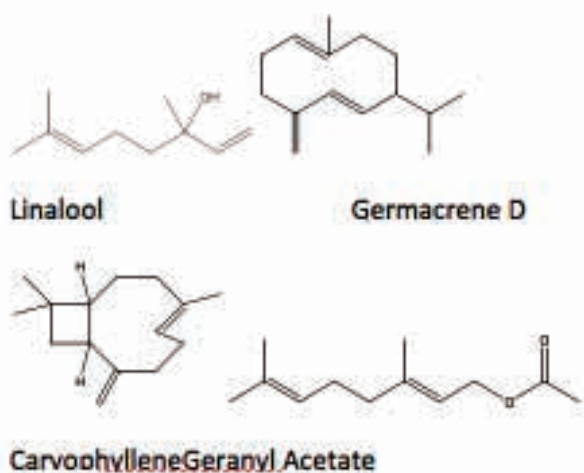
The distillers obviously distil to the demands of the trade and their respective contractual arrangements.

There is also ylang ylang absolute which is the solvent extract of the flowers and when the solvent has been completely stripped it is a green liquid with a viscosity that makes it pourable.

Chemical Constituents

The chemistry of the ylang ylang oil is very complex and has a large number of individual constituents which combine to make up its coveted fragrance. The major constituents are as follows:

Chemical Compound	Sample 1	Sample 2	Sample 3
Linalool	19.0 %	20.8 %	20.7 %
Caryophyllene	10.7 %	7.4 %	3.1 %
Germacrene D	10.3 %	7.3 %	10.1 %
p-Methylanisole	8.4 %	6.3 %	6.8 %
Geranyl Acetate	7.6 %	8.2 %	2.9 %
Benzyl Benzoate	7.6 %	8.6 %	14.1 %
Benzyl Acetate	4.6 %	5.5 %	9.6 %
Cadinene	4.6 %	4.1 %	0.5 %
Humulene	2.8 %	2.5 %	2.4 %
Benzyl Salicylate	1.9 %	1.3 %	2.3 %
Methyl Salicylate	0.2 %	6.4 %	0.0 %
Cinnamyl Acetate	1.1 %	1.1 %	4.1 %



However the composition will vary from sample to sample depending on such factors as distillation methods, geographical location, and seasonal, as well as climatic variations. Recent

research using state-of-the-art methods have revealed the presence of a very large number of constituents as in almost every essential oil, a factor that makes artificial duplication an impossibility.

Uses in Perfumery.

Two persons are credited with the initiation of ylang ylang oil as a highly popular modern perfume. They are Gabrielle “Coco” Chanel who initiated the Chanel series of perfumes, and her perfumer, Ernest Beaux (Bo), who was a descendent of the owner of a renowned perfumery company Raillet, who delivered perfumes to the Imperial court in Russia. Bo migrated after the revolution of 1917 and was working for Chanel when she asked him to compose “an ideal smell for a woman”.

In 1921 he delivered several samples from which Chanel selected the No. 5,-which became the celebrated Chanel No 5, and this contained besides the dominant perfume of ylang ylang, those of rose and jasmine as well. In the 1950’s a quip by Marylyn Munroe gave it instant fame. Asked by journalists what she wore at night in bed Munroe quipped:“ Channel No 5”.

Ylang ylang oil is now a component of many of the modern feminine perfumes and is a commodity much in demand in the fragrance world. Its supply security is vital to the global fragrance industry and as a result several flavour companies are working with the agencies in the growing areas to jointly ensure its sustenance. This is indeed a welcome initiative as it will assist the growing regions.

Therapeutic Properties.

Traditionally, the flower and fragrance was noted for an upliftment of a person’s mood. Traditional women were accustomed to wear flowers in their hair to enable them to benefit from the mood enhancing properties of the fragrance. In documents of a general nature the oil is credited with a multiplicity of properties.

It is reputed to act as a relaxant of the central nervous system. It regulates the adrenaline flow which is useful when experiencing extremes of negative emotion such as anger, shock, fear or pain. It is also deemed to be helpful in instances of low self-esteem, and conditions such as insomnia, hypertension and stress. Ylang ylang has a soothing effect and can be used to help with nervousness, depression, shock, and insecurity. In Ayurveda it is believed to be a relaxant to the central nervous system and promoting feelings of joy and euphoria.

It has been reported that a team from the Queen Elizabeth Hospital in Birmingham In England, has displayed the use of essential oils - and in particular the oil of Yang ylang - in the treatment of Epilepsy. Ylang ylang oil is used extensively in Aromatherapy for the treatment of many conditions caused by conditions of stress. It has displayed beneficial effects on both mind and body.

References.

1. Battaglia, S. (2004) The Complete Guide to Aromatherapy. Perfect Potion. (Amazon.co.uk)
2. Michael A. & Barcenilla M. <http://www.hermitageoils.com/ylang-ylang-article>
3. <http://www.givaudan.com/fragrances/explore-ingredients/innovative-naturals/ylang-ylang>
4. <http://www.treatt.com-news/9-news/102-ylang-ylang-so-good-they-named-it-twice>
5. Gaydou, E.M. et al. (1986) J. Agric. & Food Chem. 34(3), 481-487
6. Mojay G. <http://materiaaromatica.com/Default.aspx?go=Article&ArticleID=221>
7. <http://toptropicals.com/html/toptropicals/articles/trees/cananga.htm>

The argument that the chemical and drug companies often make, to counter the growing movement of natural or alternative medicine is similar to my warning about kissing cobras. They will say things like, "Not all things natural are good for you" and "Even walking to the bathroom in the morning carries risks!" They then trot out extreme, obvious examples like drinking hemlock, or kissing cobras, people falling down stairs in their house, and the like. Okay Mr. Chemical man, some natural things can kill you, like CEOs of chemical companies who poison almost everything they touch with their products? That's assuming of course that CEOs are natural."

— Steve Bivans, *Be a Hobbit, Save the Earth: the Guide to Sustainable Shire Living*

NATURE HEALS

"According to Ayurvedic principles, by understanding oneself, by identifying one's own constitution, and by recognizing sources of *doshic* aggravation, one can not only follow the proper guidelines to cleanse, purify, and prevent disease, but also uplift oneself into a realm of awareness previously unknown."

~Vasant Lad, M.A.Sc., Ayurvedic physician and Director of the Ayurvedic Institute in Albuquerque, New Mexico

DEVELOPMENT OF HERBAL HEALTHCARE PRODUCTS: CONSTRAINTS AND STRATEGIES

By Geoffrey A. Cordell *

A synopsis of a lecture by Dilmani Warnasuriya



The 27th of February saw a gathering of natural products chemists from around Sri Lanka, at the auditorium of Link Natural, in Dompe, to listen to the renowned scientist, Emeritus Professor Geoffrey Cordell on the above topic.

The presentation commenced with the premise that access to health care is a human right, and that healthy people need a healthy earth. This naturally led to the importance of sustainability, sustainable medicines, and the responsibility of the scientific community to limit the contemporary depletion of the earth's resources for the benefit of future generations. In his view, the quality of traditional medicines available to patients has not changed significantly over the last 4000 years, and this was demonstrated pictorially.



The acceptance of Traditional medicines as effective medicinal agents on a global basis was well illustrated by the Beijing Declaration of 2008, at the WHO Congress on Traditional Medicine, which calls to:

- **Respect, preserve, and promote knowledge and practices of TM**
- **Formulate national policies, regulations and standards, as part of integrated health systems to ensure appropriate, safe and effective use of TMs**
- **Promote TM research and innovation**
- **Enhance communication and training of practitioners and researchers**

The importance of Traditional medicine in global health care is further augmented by the fundamental philosophy set out by WPRO Regional Strategy for Traditional Medicine

* Geoffrey A. Cordell, Ph.D. Professor Emeritus, Univ Illinois
Adjunct Professor, Univ Florida, and President, Natural Products Inc.

2011-2020 which, having been accepted by 27 countries, emphasizes the need to have sustainable strategies for drug discovery and synthesis, while assuring patients of the continuous availability of safe and effective traditional medicine products, through proven research.

A brief explanation was also presented on the term pharmacognosy, which is the study of biologically active natural resources, which was then extended to the new term "Ecopharmacognosy" which is defined as the study of sustainable, biologically active natural resources. The use of green strategies in natural product development in order to conserve energy and preserve the environment was given significant emphasis.

Another area afforded much attention was the globalisation of traditional medicine. Although many traditional medicines have entered global commerce, the practices relating to TM are not receiving adequate attention globally. This is where quality control and the need for the standardization of natural medicinal products entered the scene. Presently, very little has been done by way of setting standards and quality control measures for traditional medicinal products. Reproducibility, in both the biological and clinical studies of TM products, is the path towards establishing credible, acceptable products for use of the population. Patients need to be assured of quality, safety, efficacy, consistency (QSEC), shelf-life, and accessibility of the traditional medicinal products they take for a health-beneficent purpose. The four pillars of traditional medicine quality control regulation were given as Information, Chemistry, Botany, and Biology. This covers, DNA analysis, identification of active principles, genetic studies, safety and efficacy studies on humans and also GAP, GLP, GMP, and GCP certifications. Integrating of technologies such as DNA bar coding analysis, introduction of remote sensing, hyphenated spectroscopy and other techniques

for identification and setting standards for TM products was briefly described as was the emerging field of metabolomics and the discrimination of plant samples through plant species, growth conditions, processing and the consistency of plant mixtures. Through several NMR spectral analyses, Prof Cordell demonstrated the effect of processing on changing the chemical constituents of *Euphorbia kansui* root.

Prof Cordell also dwelt at length on the myths relating to traditional medicine, while putting the question as to whether such myths had any scientific basis, and whether they inhibited or discouraged scientific research in the area. The most discouraging myth in modern medicine was that "Traditional medicines are not effective, and therefore are not worth considering as part of a contemporary health care system". He was also able to dispel the beliefs that complex mixtures of plants cannot be standardized, that the constituents are always the same irrespective of origin, plant part or mode of preparation, that the sources of medicinal plants are inexhaustible and the knowledge of TMs will be ever present in time to come. The use of E-commerce as a tool for the marketing of TM products was also discussed.

The interesting concept of network pharmacology as applied to Traditional medicines was also discussed, where the following ideas are being developed:

- Changing "one target, one drug" to "network target, multiple components"
- A TM may therefore be predicted to treat more than one disease

The prospect of using vegetables as chemical reagents was given some attention, together with the concept of using plants for green chemistry, as a potential replacement for non-renewable reagents for organic chemical reactions.

Another interesting area covered was the application of new detection technologies in traditional medicine. The questions posed were:

- Where are the medicinal plants and how are the plant populations being monitored and conserved?
- Can global herbaria records map former medicinal plant collection locations?
 - Can Raman and FT-IR techniques be used for TM quality control in the field?
- Can multisensor remote aerial imagery be used to establish medicinal plant locations?

Finally Prof Cordell voiced his views on the way forward for TM globalization and concluded with the thought that:

- Conservation analysis and maintenance of existing global biodiversity is critical for a healthy people and a healthy Earth
- Collaborative natural products research must pursue SUSTAINABLE resources and practices, incorporate contemporary and innovative technologies, and stay relevant to societal needs for new medicinal and agricultural agents

Prof Cordell's presentation evoked much discussion and questions, and was unequivocally a very useful and productive discourse.

"For every drug that benefits a patient, there is a natural substance that can achieve the same effect."

– Pfeiffer's Law, Dr. Carl C. Pfeiffer, M.D., PhD.

NATURE HEALS

"The scope of herbal medicine ranges from mild-acting plant medicines such as chamomile and peppermint, to very potent ones such as foxglove (from which the drug digitalis is derived). In between these two poles lies a wide spectrum of plant medicine with significant medical applications. One need only go to the United States Pharmacopoeia to see the central role that plant medicine has played in American medicine."

~Donald Brown, N.D., of Bastyr College, in Seattle, Washington

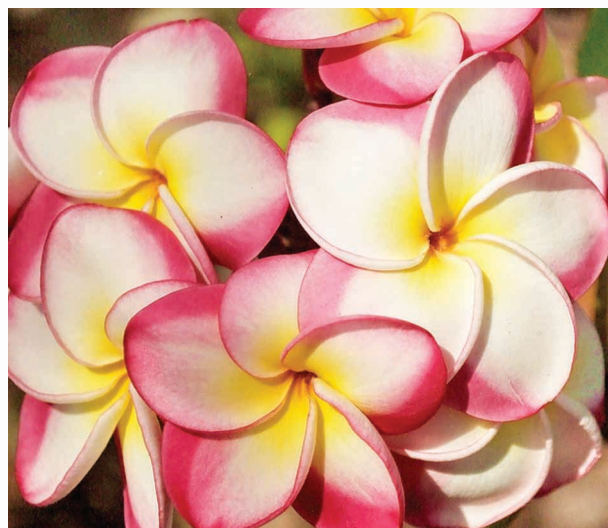
"This illustrates the need for modern medicine and science to turn its attention to the plant world once again to find new medicine that might cure cancer, AIDS, diabetes, and many other diseases and conditions." *Alternative Medicine Quotes* ~ Norman R. Farnsworth, Ph.D., Professor of Pharmacology at the University of Illinois at Chicago

"The first question an Ayurvedic physician asks is not 'What disease does my patient have?' but 'Who is my patient?' By 'who,' the physician does not mean your name, but how you are constituted." *Alternative Medicine Quotes* ~ Deepak Chopra, M.D.

INVESTIGATION OF VOLATILE CONSTITUENTS OF FLOWERS OF GENUS PLUMERIA

By Udeshika I. Ranatunge and Lakshmi Arambewela

INTRODUCTION



Genus *Plumeria* belongs to family Apocynaceae which is a large family of about 300 genera with more than 1400 species. *Plumeria* is an introduced plant grown as an ornamental and commonly known as 'Araliya' or temple tree in Sri Lanka. *Plumeria* is generally a small tree growing to as much as 30 ft. The flowers are tubular, expanding into a "pinwheel" of five petals that averages 2–3 inches diameter and may be white, red, yellow, pink, or multiple colors. Flowers are highly fragrant and bloom from March to October.¹ The aromatic flowers retain

* Institute of Chemistry Ceylon, 341/22, Kotte Road, Welikada, Rajagiriya, Sri Lanka

their original colour and fragrance for several days in a plastic bag at 48–55 °F temperatures. Many parts of the plant are considered to be useful in a variety of diseases and used as a purgative, emmenagogue, febrifuge, antitumor, antibacterial, antimicrobial and antioxidant.

Plumeria essential oils are used as ingredients in soap industry, cosmetic industry and are excellent for aromatherapy uses. They are used in scent candles, freshen potpourri, massage oils and as perfumes. The chemical compositions of Plumeria flower essential oils from Hawaii, India, Egypt and Malaysia are reported ^{2,3} but the chemical composition of Plumeria growing in Sri Lanka have not been investigated. In the present study three types of Plumeria flowers were investigated for their volatile compositions.

MATERIALS & METHODS

Plant Material

The fresh flowers of three Plumeria species were collected from Colombo district. Plumeria white was collected in July-August 2010. Plumeria pink and Plumeria yellow were collected from May – July 2011.

Preparation of essential oil by hydrodistillation

The essential oil of three types of Plumeria was prepared by hydrodistillation. Separated flower petals were weighed and hydrodistillation was carried out for 6 hrs by using a Dean - Stark apparatus. Diethyl ether was used to trap the essential oil from the water phase. The diethyl ether layer was dried using anhydrous sodium sulfate and diethyl ether was

removed by using a water bath. The essential oil yield was calculated based on the fresh flower weight.

GC/MS analysis

GC/MS analysis was performed on a Agilent 6890 GC gas chromatograph with Agilent B 5973 MS mass spectrometer. HP – 5 (5% phenyl methyl)capillary column was used for separation. Sample (0.1µl, auto inject) was injected in to the injector with inlet temperature 250°C, pressure 6.84 psi and total flow rate 25.4 ml / min. Initial temperature was kept at 40°C for 1 min, increasing to 200°C at a rate of 4°C/ min, then increasing to 300°C at a rate of 5°C/ min. Total duration is 54.42 minutes.

RESULTS AND DISCUSSION

Identification of volatile compounds in essential oils

The Gas chromatograms of the essential oils of white, Pink and yellow are given below

Figure 1
Gas chromatogram of the essential oil of Plumeria white

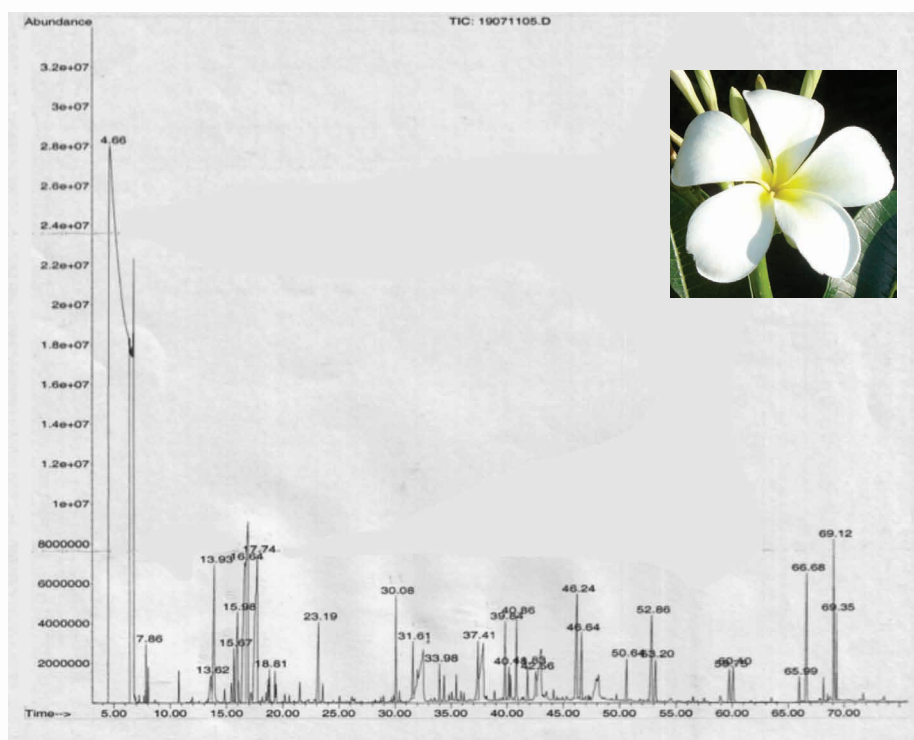


Figure 2
Gas chromatogram of the essential oil of Plumeria pink

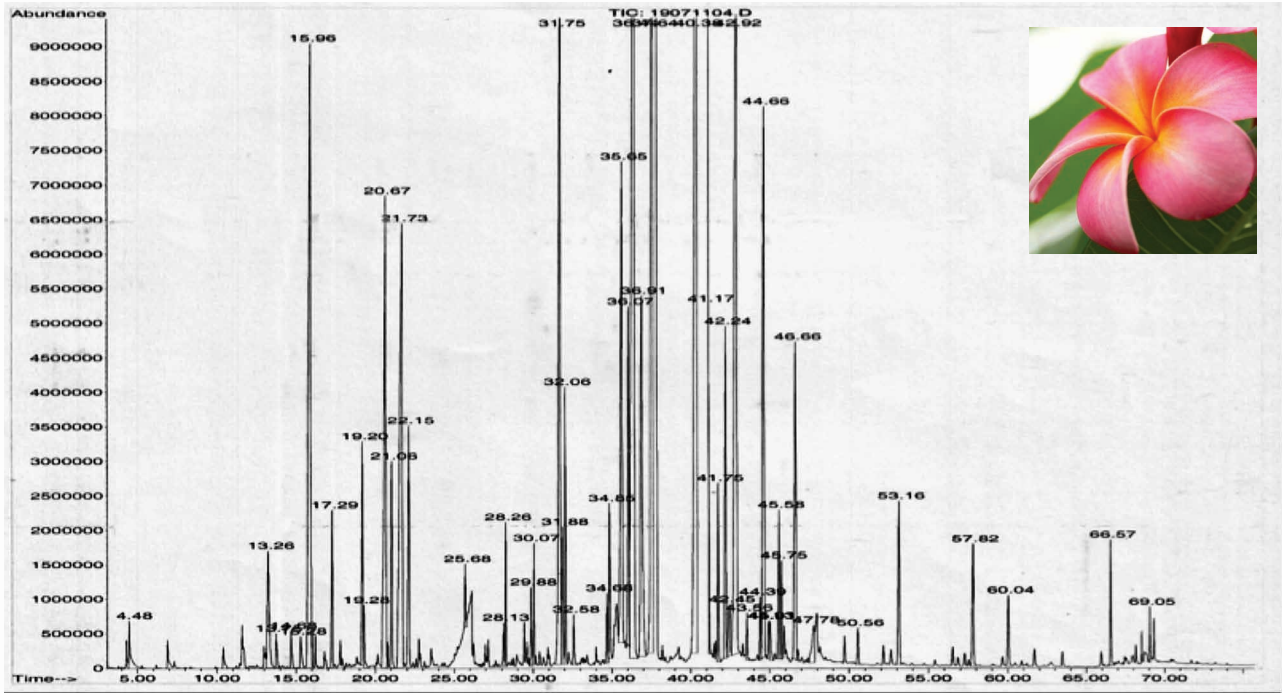


Figure 3
Gas chromatogram of the essential oil of Plumeria yellow

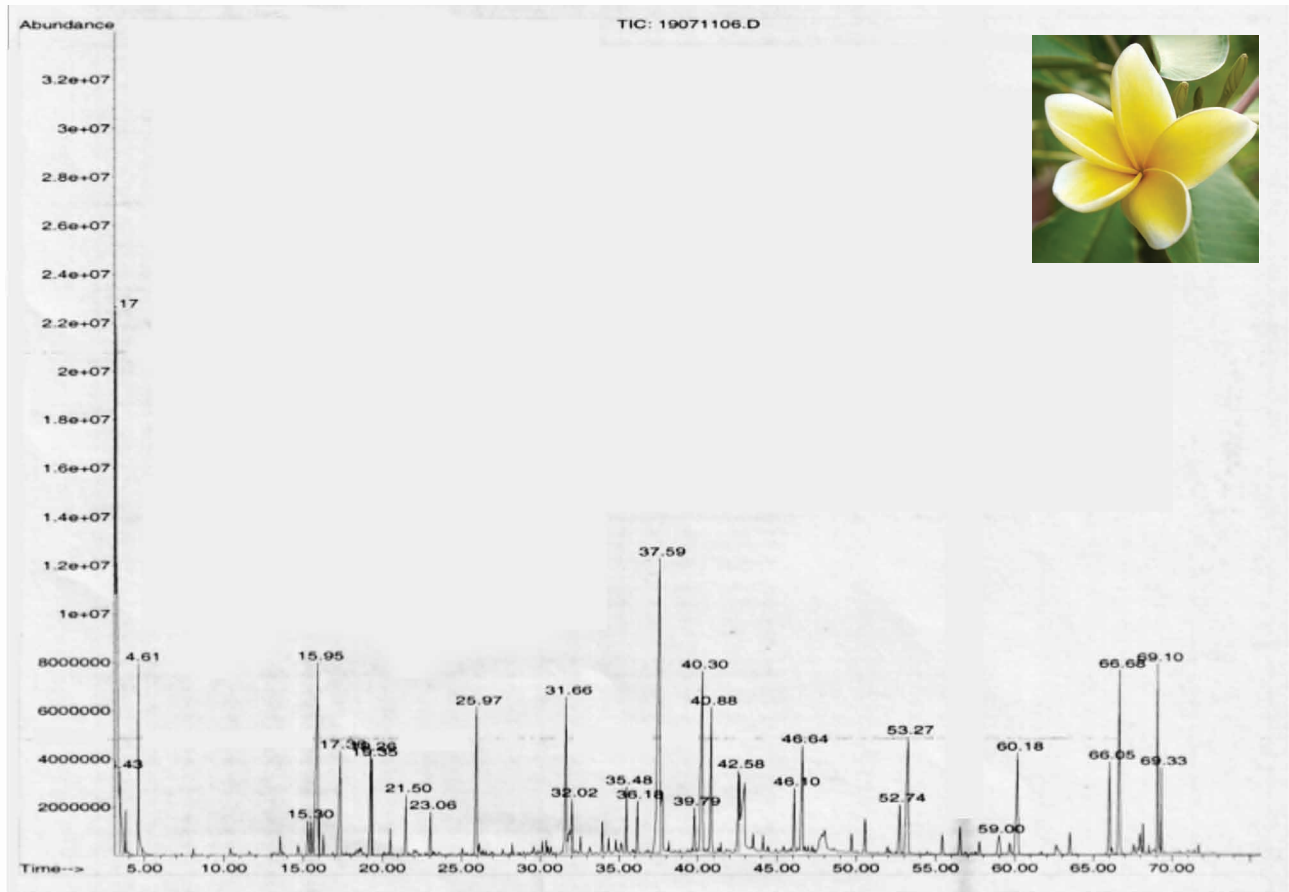


Table 1 Comparison of the constituents of three Plumeria essential oils

Compounds	Plumeria white %	Plumeria yellow%	Plumeria pink%
Benzyl alcohol	1.97	-	1.11
Benzoic acid, methyl ester	1.33	-	-
Benzyl salicylate	1.04	7.28	11.08
Methyl salicylate	-	1.65	0.27
Phenyl ethyl alcohol	14.17	-	-
Benzene acetonitrile	14.46	-	-
Benzyl benzoate	2.60	14.67	9.24
Citronellol	-	-	4.00
Neral	-	-	1.09
Cyclohexene 1-methyl-3-(methylethyl)	-	3.62	-
1-Docosene	1.45	3.34	-
Docosane	1.51	-	-
Eicosane	-	-	1.07
α -Farnesene	-	-	0.37
trans-Farnesol	-	-	3.59
β -Farnesol	-	-	11.49
Geraniol	-	1.60	5.46
Geranial	-	-	1.06
Geranyl propionate	-	-	8.33
Heneicosane	-	3.45	2.32
Heptacosane	5.40	5.84	-
Linalool	4.39	8.40	6.52
Linalyl benzoate	-	-	1.87
4-Methyl-2,6-di-tert-butylphenol	3.08	-	-
Methyl cinnamate	-	4.25	-
Nerolidol	1.76	4.25	6.16
N-Nonadecane	-	4.06	-
1-Octadecanol	5.67	-	-
1-Octadecene	4.50	1.65	-
Phenylacetaldehyde	7.95	-	=
Tricosane	1.77	5.22	-
α -Terpineol	-	2.63	1.18

The table indicates the chemical constituents which were analysed and identified by GC/MS from the essential oil of Plumeria white, Plumeria pink and Plumeria yellow. Over thirty volatile compounds, including terpene hydrocarbons, alcohols, aldehydes, esters and carboxylic acids were detected in the essential oils of Plumeria. Benzeneacetonitrile was the major compound in Plumeria white. Other main compounds are phenylethylalcohol and phenyl acetaldehyde β - farnesol was the major volatile compound in Plumeria pink followed by Benzyl salicylate. The most abundant volatile compound was benzylbenzoate in Plumeria yellow

CONCLUSION

The GC/MS analysis of Plumeria species, Plumeria white, Plumeria pink, and Plumeria yellow revealed that their essential oils are different. The essential oils comprised of alcohols, aldehydes, esters and hydrocarbons. Ester compounds that were present in all three types of Plumeria were benzyl benzoate and benzyl salicylate. Hydrocarbon compounds were present at relatively low amount. Aldehyde group was represented by phenylacetaldehyde, geranial, and neral. The terpene alcohol such as Nerolidol, linalool, geraniol and farnesol give a pleasant floral odor. The above mentioned major compounds of local Plumeria flowers have wide applications in perfume industry. The local Plumeria floral oils might be potential sources of raw materials to be incorporated into perfumes.

REFERENCES

1. T. P. Weeraratne and N. K. B. Adikaram (2006) J. Sci.(Bio. Sci.) 35 (2):157-162,.
2. NTohar, K.Awang, M. A. Mohd. and I. (2006) Jantan, Journal of Essential Oil Research 18,(6) 613-617
3. O. A. Lawal, I.A. Ogunwande, A.R. Opoku. (2014) Nat Prod Commun.9(11):1613-4,

PROMINENT RESEARCHERS NO.13

CARL DJERASSI, 1924 - 2015

By Dr Rosh Chandraratne



The death of a great person of substantial accomplishment often robs a specific area of human endeavor of a giant in that field. Seldom though does one person's passing simultaneously create large voids in multiple disciplines. The recent demise of Carl Djerassi did just that because he was a man of many interests who had significant impact on the myriad areas to which he applied his deep intellect and indefatigable energy. In his long and continuously productive career, Djerassi at various times excelled in synthetic organic chemistry, medicinal chemistry and pharmacology, analytical methodology, and also as a writer of well-regarded scientific treatises, works of fiction, and several autobiographies (for his life did not fit easily into one).

Armed, at the age of 22, with a Ph.D. in synthetic organic chemistry from the University of Wisconsin, Djerassi gave early notice of his scientific prowess when, working in Mexico, he beat Harvard's R.B Woodward (the consensus 'King' of organic synthesis) in the race to synthesize cortisone. A few years later, he achieved the defining discovery of his scientific career when he led his Mexican team to the completion of the synthesis of norethindrone, the active ingredient in the first commercially successful oral contraceptive. Norethindrone also became the template for the design of nearly all subsequently synthesized oral contraceptives. These achievements earned Djerassi the sobriquet, "The Father of the Pill". The discovery of the pill led to convenient contraception under the control of the woman and consequently led amongst other things to efficient population control methods and also to the sexual revolution of the '60s. For the enormous impact that the pill had on human medicine and society, Djerassi clearly deserved a Nobel Prize in Chemistry and Physiology or Medicine or both. Tragically, petty jealousies and politics intervened and Djerrasi who would have been one of the most deserving Nobel recipients has gone to the grave sans the one honor that would have confirmed his status as scientific royalty. As would be expected from a prototypical renaissance man, Djerrasi explored

avenues opened by the contraceptive pill to explore and make lasting contributions in the fields of population control, women's rights and the role of women in society.

Djerassi parlayed his experiences at Syntex in Mexico into another career as a pharmaceutical entrepreneur. In addition to his pioneering role at Syntex, Djerassi founded two other successful companies, SYVA and Zeecon. These successful companies made Djerassi a very rich man and, typically, he used his new-found wealth to facilitate subsequent phases of his life. Psychiatric diseases including depression, impinged on Djerassi's life and led to life changing events. His mother who was given to depression, threatened Djerassi that she would commit suicide on numerous occasions. This placed an unbearable psychological burden on him and led to his permanent estrangement from his mother. Worse was to follow; his daughter Pamela, a talented artist, after struggling desperately with depression committed suicide on his ranch on the San Francisco peninsula. Her body was found by Djerassi himself after four days of intensive search and her ashes were scattered on the ranch. Typically, Djerassi sought to generate something positive from the tragedy. He became a patron of the arts. In honor of his deceased daughter, he established an artist's colony on his San Francisco Peninsula Ranch where artists of all types could apply for work residencies which offered them a living while they developed their art. He also became an avid art collector and built up the premier collection of the works of Paul Klee.

During the late 1970's and early 1980's Djerassi experienced a series of momentous, mostly tragic personal events. First, there was the loss of his daughter Pamela. Soon after, Diane Middlebrook, who he referred to as the 'great love of his life', left him for another man. They were soon reconciled and married in June, 1985. Within two months of the happiest event of his life, he was diagnosed with advanced metastatic colon cancer which ultimately took his life. Most others would have responded to this series of

body blows by withdrawing completely from society and career. Djerassi at almost 70 years of age, responded by embarking on the completely new intellectual pursuit of writing. Although he started so late in life, he gained considerable critical acclaim as a playwright, novelist, and poet. In his best known book, *Cantor's Dilemma*, he delved into the petty politics that often sullied the highest levels of science; an appropriate choice since he himself was denied the highest scientific accolade of a Nobel by similar chicanery. Given his intellect and fierce determination, I have little doubt that, given a longer innings, Djerassi would have become one of the finest writers of the English language.

Given his history of barely evading the clutches of Nazi Germany and having to struggle against odds to make his way in the U.S., Djerassi had a special commitment to leveling the 'scientific playing field'. He did this by bringing world class science to Third World Countries by establishing internationally renowned centers of scientific excellence. One such is the reputed International Centre for Insect Physiology and Ecology (ICIPE) established in Nairobi, Kenya. Djerassi established this Institute as a model in collaboration with Thomas Odiambo a renowned insect physiologist of African birth who himself was awarded the Guinness Award for Scientific Achievement. The ICIPE Centre drew world class scientists to research in Kenya along with local personnel thus enriching not only the scientific stature of the locals but also helping to develop a scientific research culture in the Nairobi Centre. During a visit to Sri Lanka in 1975, as the leader of a high powered team from the National Academy of Sciences, Djerassi attempted a similar model to enhance the level of natural product chemistry in the island. Unfortunately due to considerations of a political nature, (perhaps misinterpreted) the initiative never took off.

Our correspondent Dr Rosh Chandraratne is an eminent synthetic chemist, who is well known in the pharmaceutical industry having worked in the field for several years. He has to his credit several drugs which are in the market.

ANOTHER TRIBUTE TO CARL DJERASSI 1924 - 2015

By R.O.B.Wijesekera



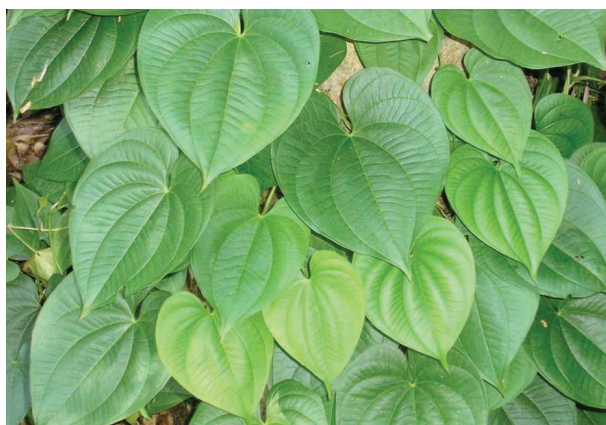
Carl Djerassi who departed this life early this year aged 91 was a man so complex that even he was unable to explain himself except to say that he was a multifaceted personality, and a “professional and intellectual polygamist”.

Djerassi’s accomplishments were so many. He was awarded the Priestley Medal and the initial Wolf Prize for his attainments in chemistry. His researches covered the areas of natural products, physical methods in organic chemistry, spectroscopy, and science policy. He was the only scientist to receive the US National medals for both Science, as well as for Technology. His published research papers are considerable, and his work alone could be equated to that of possibly three persons of the highest class, yet the Nobel Prize for some unaccountable reason has evaded him. That is a queer scientific conundrum which the Nobel authorities only may be able to explain.

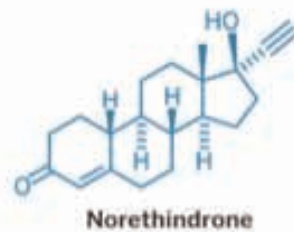
Djerassi is popularly regarded as the Father of the Birth control Pill when his synthesis made possible the availability of the pill for dispensing to people as a fertility control agent. Equally significant was the synthesis that he

performed which made Cortisone at that time a rare and expensive wonder cure, available as a regular treatment for Arthritis. He was indeed concerned with the rate of increase of the global population and the lack of choice regarding child bearing of women kind in the poorer regions of the world.

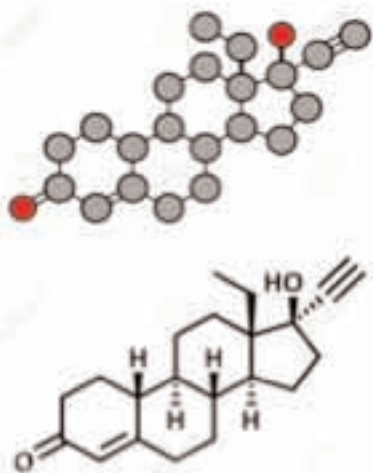
Early in his career Djerassi who was a Viennese immigrant in the US, decided to leave the US, to go to Mexico and join a small research group led by Rosencrantz, so that he could swiftly process his ideas of synthesis. He began with the synthesis of Cortisone commencing with a Natural Product, Diosgenin, derived from a Mexican yam of the *Dioscorea* species.



Dioscorea spp



His small Mexican company was able to synthesise Cortisone even before the redoubtable teams led by Robert B. Woodward, and Louis Fieser, at Harvard. He followed it up by his historic synthesis of the birth control pill which was chemically identified as Norethindrone.



This author first met Carl Djerassi when he arrived in 1975 in Colombo, as leader of a team of the National Academy of Sciences of the US to interact with a Sri Lankan team on the development of research on Natural products. The author was the leader of the Sri Lankan contingent to a NAS-Sri Lanka Workshop on Natural Products held in Colombo. The US-NAS team included several illustrious scientists namely: Richard Schultes of Harvard the legendary botanist; Norman Farnsworth, the Pharmacognosist of the University of Chicago, who pioneered the NAPRALERT database on Natural products; Ernst Theimer, the chief chemist of the company IFF; William Dauben of the University of California, winner of the Guenther Award for his researchers on Terpenoids and essential oils; and Paul Scheur of the University of Hawaii, a pioneer of the chemistry of marine substances. Prior to the commencement of the Workshop itself Djerassi asked this author, the question "assuming this workshop went completely satisfactorily what would be your expectation?". As I recall, my response was as follows: "I would expect a massive exchange of ideas and enrichment of the

knowledge of our scientists; and some mechanism for continued funding for research and knowledge enhancement for them, in the years to come."



*Djerassi and the author in 1975
At the Colombo Workshop*



Austrian stamp in honour of Djerassi

Djerassi thought for a while and added "You and I may work on the latter idea during the workshop". This we did and we evolved a programme which we called SLICHEM Programme - standing for Sri Lanka International Chemistry Programme. Djerassi proposed that he would approach the Chemical Societies of a selection of European nations, where he had some connections, and felt that he would be able to persuade them to jointly help Sri Lanka with the initiatives in assistance which we had identified. Djerassi himself presented our SLICHEM proposal to the final session of the

workshop and it was accepted avidly. However, sadly, some parties later viewed that the inclusion of Israel in the cartel of nations may draw objections from the Government at the time. I was certain this was not so, but failed to persuade those who held this view, and understandably, Djerassi did not wish to push matters further, and the project failed to materialise. Djerassi, was disappointed as were all of us but that was the sad outcome. This story has not been recorded before.

The author and his wife Marina were to become friends of Djerassi, and briefly corresponded until we were to meet again in Geneva, when the author was appointed to the WHO as the Task Force Manager of their programme on Plants for Fertility Regulation in 1978. Without doubt Carl Djerassi had a hand in this as he was a friend and adviser to the Director of the Programme, a brilliant American Medical Doctor but very Europeanised, in Alexander Kessler. We met then on several occasions during my two year stint with the WHO at our home in Chambesy, as well as at the WHO Secretariat, and during this period Djerassi presented his book on the "Politics of Contraception". Djerassi had during this period gone through a cataclysmic turbulent personal life having been divorced from his wife Norma and then having to bear the loss of his daughter Pamela with her tragic suicide. He had become a prolific author having written two autobiographies and reflections on the social aspects of the birth control pill. It has been said that the global social impact of the pill turned him from being a straight forward scientist to a philosopher as well. He spent the latter years of his life exploring the consequences of the epoch making scientific achievement of his which came when he was only 28 years of age. His Book the POLITICS OF CONTRACEPTION was his initial effort to evaluate the consequences of the Pill from a social angle. Since then he has become a multi-faceted author writing besides scientific topics, on social topics for the Pugwash Movement of which he is a renowned member, novels, plays, poems, and a couple of more

memoirs. He was indeed a true scientist who worked hard for his achievements. At Stanford he was a great teacher. His teaching methods were revolutionary. - as a teacher he derided the memory-aspects of learning, preferring the open book style of examinations.

He was justifiably rich, mostly because he had faith in his little Mexican company whose shares he purchased, and they subsequently escalated in value. Any others too could have done the same if they had similar faith. He used his wealth to enhance his interests such as Art Collections. (He was an avid collector of the paintings of the Swiss artist Paul Klee, and he sponsored young artists in the name of his daughter Pamela after her demise.)

We never met him in the decade we were in Vienna, but occasionally he was to send us copies of his books through some of the Sri Lankans he met at the Pugwash Conferences.

It had been our good fortune, my wife Marina and I often recall, to have met many great men of science, but of all of them he indeed was the most remarkable and one whom even our children who were young at the time mostly recall with deep affection. His life was one of turbulence in personal affairs that only one with a steely mental structure could have endured, working and busy to the last. Yet from all accounts and there are so many written of him, through all the vicissitudes of fate his charm endured. One is richer for having known him. And mostly, he was one who left behind a unique legacy to the world.

In some mysterious way woods have never seemed to me to be static things. In physical terms, I move through them; yet in metaphysical ones, they seem to move through me.

~ John Fowles

MAHANARAYANA OIL : AN ESTEEMED OIL IN AYURVEDA

Dr. R. Gamage and Achala Liyanage

"The body of one who uses oil massages regularly does not become affected much even if subjected to accidental injuries, or strenuous work. By having an oil massage daily, a person is endowed with a pleasant touch, trimmed body parts and becomes strong, charming and least affected by old age". Charaka Samhita Vol. 1, V: 88-89.

Medicated oils or Thailas are a main dosage form in Ayurveda medicines. Ayurveda prescribes the usage of different medicated oils for application on the body, with or without massage for providing health benefits and to treat specific indications. These oils are mainly used externally but some are used for inhalation, as enemas and some are taken internally. Medicated oils are prepared by prolonged cooking of vegetable oil with a pasty mass of herbs (kalka) and decoction of herbs. Most of the time sesame oil is recommended as the oil. Medicated oils possess the properties of the herbs used to prepare that oil. Medicated Ayurveda oils are examples of trans-dermal drug delivery systems.

Mahanarayana oil is an esteemed and one of the most popular oils in Ayurveda. Ayurveda Pharmacopoeias (Sri Lankan and Indian) show variations in the number of ingredients in different formulations of thailas. Mahanarayana oil is well known for external

massage in vata disease. Formula contains more than thirty herbal ingredients and Shatavari (*Asparagus racemosus*) is the major ingredient in the composition. Therapeutic components of these ingredients are extracted into sesame oil. Mahanarayana oil is a powerful therapy for muscles and joints and it rejuvenates the nerves. It is used to soothe sore muscles and tendons, supporting an active lifestyle and preventing over-use damage. In Ayurvedic terms, Mahanarayan Oil is particularly good for rehabilitating those suffering from disorders due to high *vata*, such as in paralysis, facial paralysis muscle wasting disorders and in sciatica.

In daily life, people encounter varying degree of aches and pains specially in joints and muscles. Mahanarayan oil is very effective in relieving these maladies to a great extent.



The oil can be applied locally to areas where there is physical discomfort on a daily basis as it can rejuvenate tired muscles and nerves giving some measure of relief. It also strengthens the muscles and joints paving the way for an active life style.

SYSTEMATIC REVIEW OF ASHWAGANDHA FOR THE TREATMENT OF ANXIETY

Ashwagandha (*Withania somnifera*) is a plant upon which several medicinal properties have been bestowed and for good reason. It has been shown to have anti-inflammatory, anti-oxidant and anxiolytic properties. A review to evaluate human studies of *Withania somnifera* as a treatment for anxiety was carried out. The searches were carried out on several of the recognized databases such as PubMed, Scopus, Google scholar, CINAHI and others. The searches were limited to randomised control trials evaluating *Withania somnifera* as a treatment for anxiety. Studies where a combination of plants used were excluded, as well as review articles. Of a total of over 200 articles which were found, five articles met the criteria in toto. The authors concluded that while evidence showed that ashwagandha preparations significantly improved measures of anxiety when compared to controls, there were several flaws in most of the studies which could dilute the final observations. Some studies were flawed in their methodology, and none attained a low risk-of-bias rating. In addition, the primary outcomes in all these studies were patient reported measures. The authors opine that objective data from blinded diagnostic interviews and the assessment of biomarkers would undoubtedly add more strength to their conclusions. Future studies should employ larger

samples, moreover in a more clinical context in order to validate their findings on the therapeutic use of this plant. Other factors to be worked out include the optimal WS preparation form, chemical composition, dose and dosage form.

HERBALGRAM, No 106, May-July 2015, page 41
"See also Link Digest Vol. 8, No.1 pp 17-21"

Whenever the immune system successfully deals with an infection it emerges from the experience stronger and better able to confront similar threats in the future. Our immune system develops in combat.

If at the first sign of infection, you always jump in with antibiotics, you do not give a chance for the immune system to grow stronger

Andrew Weil.

"LINKING" WITH PEOPLE AND SOCIETY

LINK NATURAL PRODUCTS JAFFNA AT THE INTERNATIONAL TRADE FAIR FOR THE SECOND CONSECUTIVE YEAR

By Madhari Watson and Chanaka Alagoda,
Marketing Department

Link Natural Products (LNP) participated in the Jaffna International Trade Fair (JITF) 2015 for the 2nd consecutive year, creating a memorable interaction with the visitors to the fair. The event was held for three days, from 23rd to 25th January



2015 at Jaffna Municipal grounds attracting over 60,000 people from Jaffna and surrounding areas.

The North as a whole and Jaffna in particular is currently undergoing rapid development, with the post war freedom that has been witnessed. Northern Province estimated to have a population of around 900,000 mostly Tamils, conversing in the language Tamil, is experiencing multi dimensional changes in economic, social and cultural aspects.

JITF 2015 was organized for the 6th consecutive year and has already become popular among the residents and is a regular event on the annual calendar. During the event over 150 companies who are considering the province as important for their business, try to exhibit and connect with the participating potential consumers.





In addition to creating exposure for the specific ranges on offer, activity is lined up to keep the participants actively engaged. The final outcome is to successfully interact with the potential consumer and communicate the brand messages effectively, leaving a memorable interaction in their minds.

Link Natural Products exploited this opportunity effectively and created a presence at the event which resulted in extensive interaction with the visitors, generating awareness about the strong range of product on offer, its benefits and relevance to the day to day life of the participants. Most products were on offer at very special prices to generate trial.

The lead brand for this event was Link Sudantha, and the team offered a free dental screening to people who purchased a pack of the toothpaste. The screening was conducted by a Dental Surgeon practicing in the region, which allowed the participant an opportunity to get to know him for future interactions.

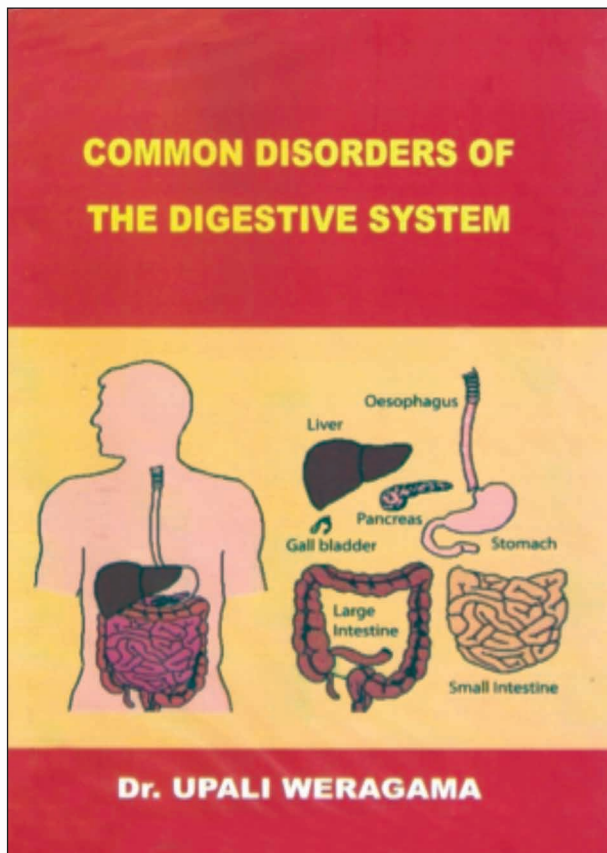
The visitors who purchased Link Natural's products were entitled to a lucky dip, to win many branded memorabilia. The highlight of the draw was 200 vouchers worth Rs 1500/- for a pro-bono dental scaling. Winners were able to redeem these vouchers with 7 dental surgeons in Jaffna and surrounding areas.

In the regional papers, Link Swastha Thriphala was featured, which resulted in many wanting to find out more about the product at the event generating trail. Link Gotukola tea was another fast moving product at the stall, the benefits of Gotukola, especially in the area of boosting memory was seen attractive to the participants.

Jaffna International Trade Fair created a suitable forum for us to meet and interact with the consumers in the Northern Province, resulting in very high levels of awareness and generating trial. We consider this an ideal event to be a part of in the years to come.



COMMON DISORDERS OF THE DIGESTIVE SYSTEM



The function of the Digestive system is to break down food into smaller molecules which could be processed easily in the body, and provide the necessary energy for bodily functions. Digestive disorders are a common malady which affects a large number of people. They are a source of irritation and discomfort which drastically limits the lifestyles of people. Ayurvedic remedies considers the relationships between energy and matter, and provides remedies which treats the individual as a whole. This book is most useful for Ayurvedic practitioners, and also for doctors in Western medicine, in addition to being most informative to people in general. The book is a compilation of articles previously published by the Author in newspapers, and comprises of common digestive disorders. Descriptions are provided in a simple and non technical manner, easily understood by the reader.

Author : Dr. Upali Weragama
ISBN : 978-81-926243-0-3
Publisher : S. Godage & Bros (Pvt) Ltd.
Colombo 10, Sri Lanka
Language : English
Date : 2014

A fact is a simple statement that everyone believes. It is innocent, unless found guilty. A hypothesis is a novel suggestion that no one wants to believe. It is guilty, until found effective.

~Edward Teller

FIGHTING MULTIDRUG RESISTANCE WITH HERBAL EXTRACTS, ESSENTIAL OILS AND THEIR COMPONENTS.

Editor : Mahendra Rai and Katerina Kong

ISBN : 978-0123985392

Publisher : Academic Press, Londonka

Language : English

Date : 2013

More than 2 million people in the United States become infected with antibiotic resistant bacteria each year, and it is estimated that more than 25,000 die as a direct effect of resistant infections. Multidrug resistant microbial strains are rapidly becoming a global threat, and at present, the discovery and development of novel antimicrobials to thwart this menace does not appear to be a priority for most pharmacological companies. Most conventional antimicrobial compounds have their origin in natural products, and one category - botanicals offers a plethora of unique chemical entities with which to combat emergent multidrug resistant microbial strains. The authors have compiled a series of reviews from leading researchers that discuss phytochemicals as a potential means of treating multidrug resistant microbial infections. This book is an invaluable resource for researchers interested in the current status of phytochemicals for treating multidrug resistant microorganisms.

My love affair with nature is so deep that I am not satisfied with being a mere onlooker, or nature tourist. I crave a more real and meaningful relationship. The spicy teas and tasty delicacies I prepare from wild ingredients are the bread and wine in which I have communion and fellowship with nature, and with the Author of that nature."

— Euell Gibbons

"Most over-the-counter and almost all prescribed drug treatments merely mask symptoms or control health problems or in some way alter the way organs or systems such as the circulatory system work. Drugs almost never deal with the reasons why these problems exist, while they frequently create new health problems as side effects of their activities."

- John R. Lee, M.D.

"The introduction of homeopathy forced the old school doctor to stir around and learn something of a rational nature about his business. You may honestly feel grateful that homeopathy survived the attempts of allopaths (the orthodox physicians to destroy it."

- Mark Twain

DIGEST MAIL BOX

Letter 1

Dear Editors

During the past few years I have received the Link Natural Digest edited by you. I wish to congratulate you on this beautiful production. It contains many interesting articles , most of which should concern medical men. Needless to say I would like to receive future copies too

Dr C G Uragoda

Letter 2

I have just received the Digest's Volume 10. Issue 2 and find, as usual, many research articles of great interest. Since I do not wish to miss any future copies, I would appreciate it if new Issues are sent to me at 27, Deal Place Colombo 3, as we are relocating home from Bethesda, MD, USA in December 2015. Thanking you to change my address in your records, and kindly confirm receipt of this notification.

C. R. de Silva.

Letter 3

Dear ROB

It was a pleasant surprise to read your generous write up about me in the recent issue of your excellently produced Journal LINK Digest which reached me yesterday.

Whatever little I could achieve was due to dedicated support and co-operation I was privileged to receive from my colleagues at CDRI.

It would be useful if you also include the E-mail address of the person in your future write-ups.

PS; You had sometime back published an excellent article on Bacopa, which I have misplaced unfortunately.

I would appreciate if you could send it as a PDF file.

Bhola Nath Dhawan <dhawanbn@gmail.com>

NOTE TO POTENTIAL CONTRIBUTORS

Link Natural 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 email to :

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By post to:

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

All manuscripts must include the following :

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

**The Digest Mail Bag
Welcomes Reader's
Views & Ideas.**