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IN THE PAGES THAT FOLLOW.....

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EDITORIAL

SEALING THE HOLES IN THE THERAPEUTIC FABRIC

"The world of the clinic is a vast desert of uncertainty with oases of rational treatment."
- Christopher Booth

From the problems of an unviable foetus, right up to the problems of age such as paralysis, incontinence and countless indignities, there always seems to be a lack of therapies to address many of our complaints. It seems that there are endless opportunities to develop effective methods of treatment but there has to be more and more intensive research. Some of our urgent and crucial needs are to seek new anti-viral agents to counter the fast developing menace of viral diseases. We need new agents to counter bacteria such as *Staphylococcus,* or the parasite responsible for the scourge of malaria. We have no answer to a variety of forms of cancer now diagnosed in ever increasing numbers as the physical techniques of diagnosis improves with the moving scientific frontiers. We have no answers for the prevention of genetic conditions, crippling forms of joint disease, intestinal conditions such as Crohn's disease, or old age's dreaded Alzheimer's disease. We have not developed means to address the problems placed on families or even communities by conditions such as anxiety, depression, bipolar syndrome, and other mental health conditions. We are in the modern world faced with illnesses caused by human frailty such as alcohol and drug abuse, over eating, sexually transmitted diseases, and even accidents.

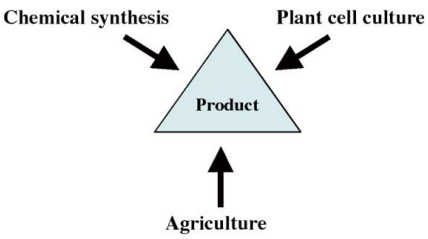
More and more research is the only answer. In this respect we face two dichotomous situations: The pharmaceutical companies that do, or sponsor most of the research, are oriented by the profit motive. So therapies are developed mostly to recover the enormous expenditure of R & D. Diseases that are prevalent mostly in the third world countries get little attention as the profits derivable from the poor nations would be minimal. However with the present movements in the tourist industry globally there needs to be interest from all parties - the affluent as well as the poor. The second situation is that little use is made globally and little research is centred around the traditional systems prevalent in the third world for so long, such as in particular the Ayurvedic system and the Traditional Chinese system. There have been very profitable results of scientific intervention into these systems so far, and a plethora of drugs have thus entered the armoury of modern medicine from studies on plants used as therapy in these systems. However the plants are fast becoming endangered or extinct, and the methodologies are being forgotten. Research in order to address our global shortcoming must indeed include deep studies of these systems as well as the philosophical basis underlying their concepts. It is the responsibility of all to mount intensive research on the ancient systems to enrich the modern, and to seal the holes in the present therapy as best as is possible for the benefit of all humankind.

Plant Tissue Culture and Bioreactors in Secondary Metabolites Production

*By Nissanka Iddagoda Ph. D. **

Introduction

Plants provide a useful source of a vast array of natural products used as foods, drugs, pesticides, flavorings, fragrances among others. These plants, whatever their origin have traditionally been obtained by harvesting field grown plants. Plant cell and tissue culture technology can be suggested as an attractive approach to supply plant-derived material especially when the plant itself is difficult to cultivate, has a low secondary metabolite yield or the chemical synthesis of the metabolites have not been achieved due to their complicated structure. When considering economic feasibility, large scale cultures of plant cells, tissues and organs through a bioreactor system is a viable solution. A bioreactor is an adaptation of the technology used for the fermentation of microorganisms , into one to produce cultures of plant materials.

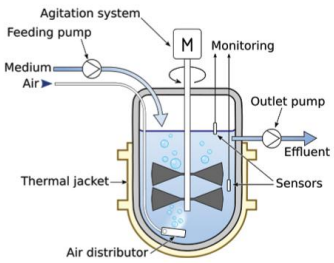


Bioreactor

A bioreactor may refer to any device or system that supports a biologically active environment. In one case, a bioreactor is a vessel in which is carried out a chemical process which involves organisms or biochemically active substances derived from such organisms. This process can either be aerobic or anaerobic. These bioreactors are commonly cylindrical, ranging in size from liters to cubic meters, and are often made of stainless steel with glass components.

A bioreactor may also refer to a device or system meant to grow cells or tissues in the context of cell culture. These devices are being developed for use in tissue engineering.

Bioreactors in operation



General structure of batch type bioreactor

Type of Bioreactors

On the basis of mode of operation, a bioreactor may be classified as batch, fed batch or continuous.

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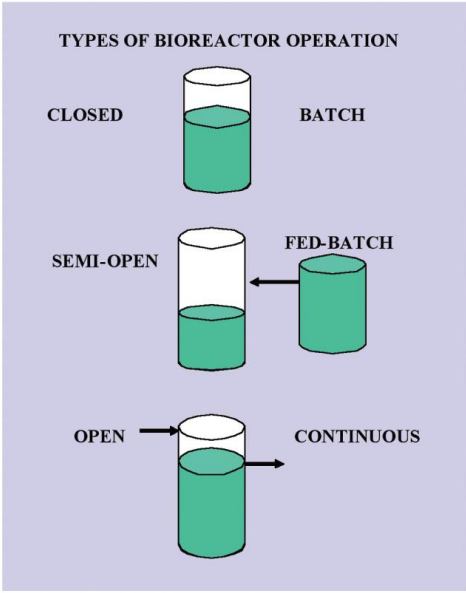
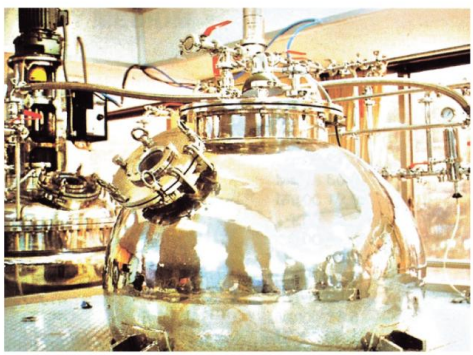


Type of Bioreacor

Organisms (e.g. bacteria, fungi, algae, cell suspension, hairy roots, whole plant) growing in bioreactors may be suspended or immobilized. The simplest, where cells are immobilized, is a Petri dish with agar gel.

Bioreactor Operation in Industry

1. Non-sterile, Non-stirred, Non-aerated (e.g. wine, beer production)
2. Non-sterile, Stirred, Aerated (e.g. sewage treatment)
3. Sterile, Stirred, Aerated (e.g. antibiotic, secondary metabolites production)



Balloon type bubble bioreactor

Balloon type air lift bioreactorwith root culture

Bioreactor Design and Operation:

The design of Bioreactors is a relatively complex engineering task, which is studied in the disciplines of cell, tissue and biochemical engineering. Under optimum conditions, the microorganisms or cells are able to perform their desired function with 100 percent rate of success. For its successful operation, the environmental conditions under which the bioreactor operates, such as gas (i.e., air, oxygen, nitrogen, carbon dioxide) flow rates, temperature, pH and dissolved oxygen levels, and agitation speed / circulation rate need to be closely monitored and controlled. Most industrial bioreactor manufacturers use vessels, sensors and a control system networked together.

Fouling can harm the overall sterility and efficiency of the bioreactor, especially the heat exchangers. To avoid it, the bioreactor must be so designed as to be easily cleaned and be as smooth as possible. A round shape is therefore usually employed.

A heat exchanger is needed to maintain the bioprocess at a constant temperature. Biological fermentation is a major source of heat, therefore in most cases bioreactors need refrigeration. They can be refrigerated with an external jacket or, for very large vessels, with internal coils.

In an aerobic process, optimal oxygen transfer is perhaps the most difficult task to accomplish. Oxygen is poorly soluble in water--even less in fermentation broths--and is relatively scarce in air (20.95%). Oxygen transfer is usually helped by agitation, which is also needed to mix nutrients and to keep the fermentation homogeneous. There are, however, limits to the speed of agitation, due both to high power consumption (which is proportional to the cube of

the speed of the electric motor) and to the damage to organisms caused by excessive tip speed. In practice, bioreactors are often pressurized; this increases the solubility of oxygen in water.

Secondary Metabolites

Secondary metabolites are organic compounds that are not directly involved in the normal growth, development, or reproduction of organisms. Unlike primary metabolites, absence of secondary metabolites does not result in immediate death, but rather in long-term impairment of the organism's survivability, fecundity, or aesthetics, or perhaps in no significant change at all. Secondary metabolites are often restricted to a narrow set of species within a phylogenetic group.

Most of the secondary metabolites of interest to humankind fit into categories which classify secondary metabolites based on their biosynthetic origin. Since secondary metabolites are often created by modified primary metabolite syntheses , or "borrow" substrates of primary metabolite origin, these categories should not be interpreted as saying that all molecules in the category are secondary metabolites (for example the steroid category), but rather that there are secondary metabolites in these categories.

Secondary Metabolites Detection Method

Direct
Visual - Coloured products (anthocyanins)
Fluorescence (serpentine)
Microspectrophotometry (rosmarinic acid)
Association with coloured products
(*Macleaya microcarpa*)

Indirect
Radioimmune assay (ajamalicine)
ELISA (quassin)
Flow cytometry (berberine)
Extraction (nicotine)
HPLC (ubiquinone)
Biological activity (berberine)

Plant Tissue Culture Approaches to Improve Yield of Secondary Metabolites

1. Cell line improvement (screening & selection)

2. Medium (composition) optimization
   - Nutrients
   - Growth regulators
   - Biologically active compounds

3. Culture conditions
   - Light
   - Temperature

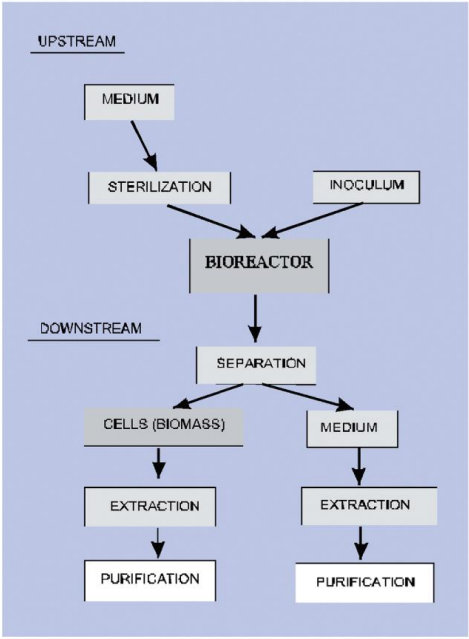
4. Cultivation strategies
   - Cell / suspension / Organ culture
   - Suspended / Immobilized

5. Specialized techniques
   - Elicitor treatment
   - Product removal

PTO

Potential Secondary Metabolic Compounds

Product	Application	Cost $/Kg	Plant source
Ajmalicine	Anti-hypertensive	37,000	*Catharanthus roseus*
Berberine	Drug	3,250	*Coptis japonica*
Codeine	Sedative	17,000	*Papaver somniferum*
Digoxin	Heart stimulant	3,000	*Digitalis lanata*
Diosgenin	Steroid	1,000	*Dioscorea deltoidea*
Morphine	Drug	340,000	*Papaver somniferum*
Quinine	Anti-malarial	500	*Cinchona ledgeriana*
Sanguinarine	Antibiotic	4,800	*Papaver somniferum*
Shikonin	Anti-bacterial	4,500	*Lithospermum erythrorhizon*
Taxol	Anti-cancer	600,000	*Taxus brevifolia*
Vincristine	Anti-leukaemic	20,000,000	*Catharanthus roseus*



Secondary Metabolites Production - PTC Productivity vs. Whole Plants

Shikonin *(Lithospermum erythrorhizon)*

Plant	0.0068 mg/l/day
Culture	5.7 mg/l/day

Ajmalicine *(Catharanthus roseus)*

Plant	0.0082 mg/l/day
Culture	0.2 mg/l/day

The Current Scenario in Application of Bioreactors

Over the past decades, biotech firms have established bioreactor systems for plant cell suspension and plant root culture. They have fully characterized reactors in terms of mixing, oxygen mass transfer, monitoring, control and scale-up. In addition to characterizing reactor performance, they have also developed strategies for improving performance such as use of growth hormones to eliminate root hairs in culture and increasing osmotic pressure to reduce tissue water content.

As a result, much progress has been achieved in the recent past on optimization of these systems for the extraction of valuable phytopharmaceutical products, such as ginsenosides in 20 tonne bioreactors producing 500 mg/L/day.

The acceptance of this process for industrial production will significantly impact on the production of pharmaceutically valuable secondary metabolites occurring in nature.

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New World

It is no longer a man's world. Nor is it a woman's nation. It's a cooperative, with by - laws under constant negotiation and expectations that profits be equally shared.

Nancy Gibbs (2009)
Time Special Report VO.174 No.16

Mushrooms - "The miraculous macro-fungi"

*By Janakie Chintha Rajapakse **

Background

Mushrooms reign in the fungal kingdom as the second most diverse group of macro-fungi having a wide array of applications and potential uses for human welfare[1]. Unfortunately their value has been often neglected due to man's superstitious fear or distrust. Despite the wide availability of rich mushroom flora in our country, relevant information is scant or not well documented. The dearth of ethno-mycological data in Sri Lanka has led many to become mycophobic whether food of fungal origin could hold any nutritional or medicinal promise. Therefore a need prevails to raise awareness about the importance of mushrooms so that myth about this class of fungi being only pathogenic is discredited.

The term 'Ksumpa' was used to identify mushrooms in ancient Sanskrit[2]. In the broad sense mushroom is defined "as a macrofungus with a distinctive fruiting body which can be either epigeous(above ground), or hypogeous (under ground), and large enough to be seen with the naked eye and to be picked by hand" [3].

Mushrooms can be divided into four categories:

* Those which are edible and possess medicinal properties- culinary-medicinal mushrooms
* Those which possess medicinal properties but no gastronomical appeal - medicinal mushrooms
* Those which are proven to be or suspected of being poisonous
* A miscellaneous category which includes a large number of mushrooms whose properties remain less well-defined.

History

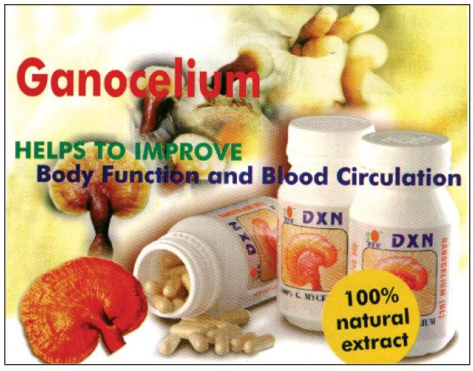
The use of mushrooms as food [3, 4, 5,] and medicine [3, 6, 7,] dates back to prehistoric era. Archeological investigations unearth ample evidence which reveal the manner the great civilizations of Greeks, Egyptians, Romans, Chinese and Mexicans acclaim mushrooms as a delicacy, therapeutic food and in some cases as a holy "herb" used in religious rites [2, 3]. The importance of the role of mushrooms in the history was emphasized by the fact that the desert truffle was described in the Bible as 'bread of heaven' [8]. In the light of these evidence it is obvious that the intentional or artificial mushroom cultivation has a long history.

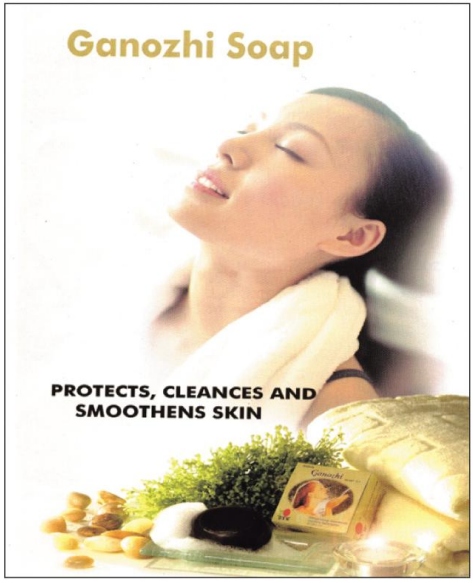
Nutritional and medicinal properties

Romans revered mushrooms as the "Food for the Gods" and the ancient Chinese called it "the elixir of life" and kept them in high esteem [9]. Mushrooms are in high demand owing to their flavour, nutritive value and unique texture [2, 3, 6, 7, 9]. Nutritionally mushrooms rank between high grade vegetables and low grade meat (10). Proteins of mushrooms contain all the essential amino acids [3, 11, and 12] and are especially rich in Lysine and leucine which are lacking in most cereal foods [3]. Mushrooms are a good source of vitamins and minerals [3, 7] and contain a good amount of dietary fiber but are low in cholesterol [2, 3].

** Ms Janaki Rajapakse, is a Research Officer (MSc-UQ / Australia) working at the Agricultural Research Station of the Department of Agriculture at Telijjawila. She is currently reading for her doctoral studies on the biochemistry of mushrooms and mushroom derived product development.*

There has been a recent upsurge of interest in mushrooms not only as health food but also as a source of biologically active compounds of medicinal value [2, 3]. Compounds such as polysaccharides, polysaccharide-peptides, nucleosides and triterpenols isolated from a large number of culinary and medicinal mushrooms have raised the interest of the mycophylic researchers as potent hypoglycemic, immunomodulatory, anti-inflammatory, antitumor, antiviral, antibacterial agents. [13, 14]. Acclaimed as "mushroom of immortality" *Ganoderma lucidum* (Fr.) Karst (commonly known as the "Reishi or Lingzhi mushroom") is one of the most important medicinal mushrooms used in the modern world.





Reishi/Lingzhi ***(Ganoderma lucidum)***

Ganoderma products

Environmental impact

Although the products of interest for human consumption are the mushrooms, the mycelia (vegetative structure of the mushroom) which give rise to mushrooms have the unique ability to secrete a wide range of extracellular enzymes into their substrates.

These enzymes degrade complex substrates into simpler substances and subsequently utilize them for the reproduction of the mushrooms.

In the biosphere a large amount of organic biomass is produced through the photosynthesis process out of which around 10-20% is directly edible to humans and animals.

This implies that an enormous amount of photosynthesized products as high as 80-90% is discarded as waste [15]. In the search for equilibrium between the social, economical and environmental factors, the reuse of agricultural waste has taken on extremely important dual purposes. Simultaneously it is a responsibility to eliminate the agricultural waste, and give it added value through the production of low cost food. In this regard, cultivation of culinary and medicinal mushrooms assumes great importance.

The biological process involved in the conversion of nutritionally valueless agricultural waste into protein rich food [3,4,5,] is both efficient and economically viable Through their ability to decompose waste, mushrooms play a vital role in maintaining the ecological balance of the environment

Socio- economical aspects:

In artificial mushroom cultivation both horizontal and vertical space is being utilized for food production. Therefore in terms of the land productivity indices, mushroom cultivation is more profitable than the cultivation of many of the conventional out door crops. If well-implemented, this agro- business based on microbial biotechnology would certainly provide not only nutritional security but most remarkably produce notable myco-pharmaceuticals, myco-nutriceuticals and myco- cosmeceuticals and provide a meaningful source of income to the people in the developing countries.

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Soursop the enchanting and exotic tropical fruit with a luscious flavor

*By Nirmala M. Pieris **

Soursop, so called due to its pleasant slightly acidic taste when ripe, is a fruit that has a most luscious flavor described as a combination of strawberry and pineapple with sour citrus flavor notes contrasting with an underlying creamy flavor reminiscent of coconut or banana. *Annona muricata* (Soursop) is a species of the genus Annona and is a member of the family of the annonaceous fruits which are sometimes collectively known as "custard apples" from the custard like flavor of many. *Annona muricata* that has the uninspiring name soursop however is rather more acid and less sweet than most other members of the group.

The plant that is indigenous to most of the warmest tropical areas in South and North America, including the Amazon, grew natively in the Caribbean and Central America and other tropical climates throughout the world and is now common right through Asia and the sub-continent, in countries such as Sri Lanka, Indonesia, Vietnam, Cambodia and Malaysia. In Sri Lanka the fruit that is commonly known as 'soursop' in English and 'katu atha' or katu anoda' in Sinhalese has recently become extremely popular due to the delicious refreshing juice that is sold in many juice outlets in the country. The fruit is sold in local markets in the tropics, where it is called guanábana in Spanish-speaking countries, graviola in Brazil and durian belanda in Malaysia.

The fruits are borne on small, upright fast growing evergreen trees, 5 to 6 meters high, with large, glossy, dark green leaves. The edible fruit is more or less oval or heart-shaped, sometimes irregular, lopsided or curved with a thin skin covered with conical nibs They are generally 15 to 20 centimeters in diameter and can grow to a large size and may weigh up to 4 kilograms. A tree can yield 50 to 100 kilograms of fruit per year over a period of about 15 years. The fruit is mature and is ready for eating when it feels slightly soft and is light green externally. The fruit is picked from the tree before it has fully ripened as it will be badly bruised if allowed to fall after ripening. Beyond its seemingly tough exterior lies a soft, sweet, lily-white interior. This edible white, pulpy juicy flesh of the fruit is peppered with a core of small shiny, black inedible seeds. There are a few seedless varieties, but they are rare, and tend to have a fibrous flesh.

** Dr. Nirmala M Pieris was formerly, the Head of the Corporate Services Division and the Analytical Chemistry Division of the Industrial Technology Institute. She has been a prolific researcher , and has several publications in both international and national journals, to her credit.*

The species is the only member of the genus Annona that is suitable for processing and preservation and soursop puree and concentrates are commonly marketed in bottles and asceptic packages. Soursop ice cream is one of Latin America's favorites. Juice, sherbets', candies, yogurts, sorbets, chutneys, jellies, jams, puddings and compotes are a few of the many other creative ways soursop can be prepared. Besides this, soursop also goes very well as a main ingredient in a healthy cuisine and has found its way into gourmet cuisine in the form of soursop charlotte in Montego Bay.

Nutritionally, the fruit is high in carbohydrates, particularly fructose. The fruit also contains significant amounts of vitamin C, B1 and B2. Calcium, magnesium, zinc, potassium, and phosphorous have also been identified.

Volatile flavor components

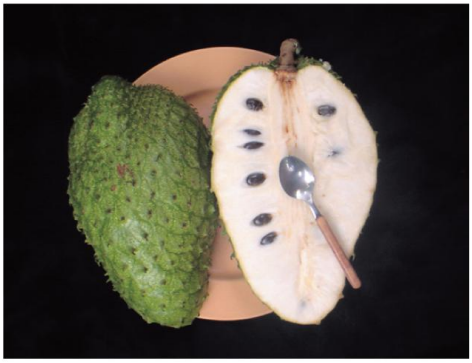
The unmistakable flavor of the soursop fruit has enchanted the most refined tastes around the world. The nature of the compounds responsible for this characteristic flavor have been reported subsequent to obtaining representative samples of the aroma volatiles by means of a modified Likens and Nickerson 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.

This study indicated that 80% of the aroma components are esters and they constituted a chemically closely related series. Methyl hexanoate (approximately 31%) and methyl hex-2-enoate (approximately 27%) were the two most abundant components and together amounted to about 0.7mg/kg of the fruit. The esters comprised an interesting series of chemically related compounds in that the methyl and ethyl esters of the C4, C6 and C8 saturated straight chain carboxylic acids were all present in the sample with the corresponding 2-enoates. The 2-enoates are relatively rare aroma constituents and generally they have only been located in tropical or subtropical fruits and products such as passion fruit, grapes and woodapple and thus supports the contention that they maybe characteristic of tropical fruits.

Herbal Medicine Uses

All parts of the soursop tree are used in natural medicine in the tropics, including the bark, leaves, roots, fruit, and seeds. Different properties and uses are attributed to the different parts of the tree. Generally, the fruit and fruit juice are taken for worms and parasites, to cool fevers, to increase mother's milk after childbirth, and as an astringent for diarrhea and dysentery. The crushed seeds are used against internal and external parasites, head lice, and worms. The bark, leaves, and roots are considered sedative, antispasmodic, hypertensive, and nervine, and a tea is made for various disorders toward these effects.

In Jamaica and Haiti, the soursop juice is recommended as a fever-stopper and parasites-killer. Besides the fruit itself, its leaves, seeds and skin are used to complement treatments of rheumatism, arthritis, diabetes, high blood pressure, asthma, flu and other ailments. As the fruit is rich in vitamin B complex, soursop is known for having many medicinal uses among the natives of the Amazon region. It specially helps the gastric-intestinal system fight various maladies such as stomach pain and indigestion.



Plant Chemicals

The principal interest in this plant is because of its strong anti-cancer effects. Although it is effective for a number of medical conditions, it is its anti tumor effect that is of most interest. Many active compounds and chemicals have been found in soursop, as scientists have been studying its properties since the 1940s. **Most of the research on soursop focuses on a novel set of natural compounds called annonaceous acetogenins produced in its leaf and stem, bark, and seeds. Three separate research groups have confirmed that these chemicals have significant antitumorous properties and selective toxicity against various types of cancer cells (without harming healthy cells).** Annonaceous acetogenins are only found in the Annonaceae family. These chemicals in general have been documented with antitumorous, antiparasitic, insecticidal, and antimicrobial activities.

Studies on the mode of action in three separate laboratories have determined that these acetogenins are excellent inhibitors of enzyme processes that are only found in the membranes of cancerous tumor cells. This is why they are toxic to cancer cells but have no toxicity to healthy cells. The National Cancer Institute performed the first scientific research in 1976. The results showed that soursop leaves and stems were found effective in attacking and destroying malignant cells.

The plant is said to have been studied by one of America's largest drug manufacturers, with over 20 laboratory tests conducted since the 1970s. These tests have also revealed that extracts from the tree effectively targets and kill malignant cells in 12 types of cancer, including colon, breast, prostate, lung and pancreatic cancer. A study published in the Journal of Natural Products, following a study conducted at Catholic University of South Korea, stated that one chemical in soursop was found to selectively kill colon cancer cells at, 10,000 times the potency of adriamycin (the commonly used chemotherapy drug). The most significant part of this report is that soursop was shown to selectively target the cancer cells, leaving healthy cells untouched, unlike chemotherapy, which indiscriminately targets all actively reproducing cells (such as stomach and hair cells), causing the often devastating side effects of nausea and hair loss in cancer patients.

Besides being a cancer remedy, soursop is a broad spectrum antimicrobial agent for both bacterial and fungal infections, is effective against internal parasites and worms, lowers high blood pressure and is used for depression, stress and nervous disorders.

The Plant that worked too well

The amazing anti-cancer properties of the soursop tree have been extensively researched-so why haven't we heard anything about it? If soursop extract is as half as promising as it appears to be, why doesn't every single oncologist at every major hospital insist on using it on all his or her patients? The simple answer is that the soursop tree is completely natural, and so, under federal law, not patentable and thus there is no way to make serious profits from it.

It is also interesting to note that one of America's biggest billion-dollar drug makers began a search for a cancer cure and their research centered on soursop. Following up on very little documented scientific evidence, the company poured money and resources into testing the tree's anti-cancerous properties-and were shocked by the results. Soursop proved itself to be a cancer-killing dynamo. However as there was no way of making serious profits from this the drug company supposedly invested nearly seven years trying to synthesize two of the soursop tree's most powerful anti-cancer ingredients.

However their efforts proved utterly futile and there was no way the company could protect its profits-or even recover the millions it poured into research. As the vision of profits faded away the testing on soursop came to a halt and the company shelved the entire project and chose not to publish the findings of its research. However, there was one scientist from the soursop research team who risked his career and contacted a company dedicated to harvesting medical plants from the Amazon Rainforest and thus a very limited supply of soursop extract, grown and harvested by indigenous people in Brazil, is finally available in America.

However, studies carried out so far have all been in the laboratory and it is only too well known that things that work in test tubes are often ineffective when digested. Similarly a study on mice had shown promise, However not all things that work well in mice works well with man. It seems that the substance to be used is from the leaves and if someone is dying from cancer it will be worthwhile to boil up the leaves and give it a try.

And in the end……

Soursop may not prove exceptional, but it certainly has an extended history of use in ancient and currently in modern herbal remedies. So, since you know all about it now, you can recommend it to a friend or just drink some soursop juice yourself as a preventive from time to time. It is completely natural and definitely has no side effects. If you have the space plant a soursop tree in your garden, it does not need much space and it does not grow too tall. The next time you have a fruit juice, ask for a soursop. It is delicious, refreshing and a powerhouse of vitamins added to the advantage of being a herbal remedy for many ills.

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King Tutenkhamen's Cause of Death

The legendary Egyptian Pharoah died at the tender age of 19. around 1324. BC. The cause of his death remained a mystery. It was considered that he was murdered. His tomb was opened in 1922. Now a new study based on DNA testing reveals that the likely cause was a severe bout of malaria and complications from a fractured leg.

Intervening in Rural Poverty

Vidarba, in Maharastri State is an arid region, and like all such regions is mostly dependant on the annual monsoon for its sources of water. A failed monsoon means disaster, as crops wilt and wither and a farmer's source of income will dwindle.

In a case like this a farmer was helped by the local government which helped construct a pond for harvesting rain water. The pond which now is a common feature of rural resource management collects water from the monsoon rains that would otherwise be wasted. By storing the water the farmer's wells are filled.

The productivity of rural agriculture is enhanced and secured by such a simple intervention.

Throughout the tropical developing world small farm agriculture remains the 'also ran' of the global economy. Hundreds of millions of farmers remain mired in poverty as agriculture stagnates in drought.

Greater support for rural agriculture means such simple innovative technological interventions.

In several areas in Sri Lanka where, like Vidarba, are termed "marginal lands" and rainfall is meagre, innovations for harvesting rainwater can mean much to farmers.

Governments and development agencies should direct efforts towards such simple measures that mean so much in terms of the production of food and other economically valuable plants.

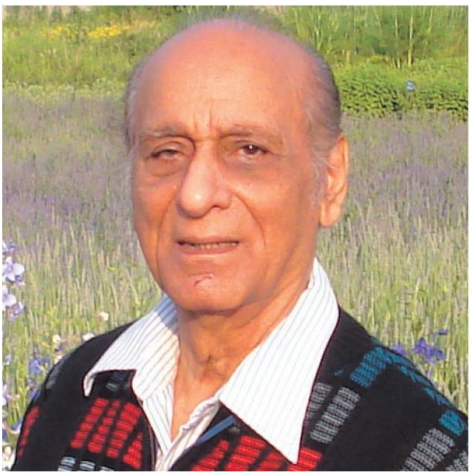
- Ayesha

Source :

Back to the Land M Schuman Time (2009) Ed. 20, p.15-19

Chand K.Atal - Monarch of Kashmiri Science

By R.O.B. Wijesekera



Picture taken from KP Link Picture Gallery

During a visit to Jammu a delegation from Europe was being directed to The Regional Research Laboratory, a landmark institution in the province. The taxi driver was unsure of the directions. The guide prompted: "Atal Saab" and all was clear. "Atal Saab" was even better known than the celebrated RRL, which he had headed for many more years than any predecessor. Atal was a dominant figure whether as Director, research leader, Adviser to the Government, or a Consultant to the International Organisations, roles that he played with distinction.

Atal originated from a Kashmri Pandit family in pre-independence India, and during the partition era he like many others, found refuge in the comparative quiet of Delhi. He specialised in Pharmacy in Chandigarh, and later with a Tata endowment Fellowship researched in Connecticut with Professor A.E.Schwarting, as a pioneer in the then new subject of Pharmacognosy. In his wide ranging research activities he covered many disciplines, including the chemistry and technology of natural products from medicinal plants, the propagation and distillation of essential oils, and the production and evaluation of herbal pharmaceuticals. Accordingly, he was also a prolific publisher of original papers, and books; and two of his review publications are inevitably found in the libraries of all laboratories engaged in research on medicinal plants and essential oils. Atal is one who had a considerable impact on Indian science, and the development of the RRL Jammu as an institution of worldwide repute. The accolades he won are far too numerous to recount, but among them was indeed the CSIR Distinguished Scientist Award. This author first met Chand Atal when he was Director of the Jammu RRL, and then later when he was chosen to serve as the Chief Technical Adviser of the UNIDO projects in Vietnam, a programme which was managed by the author. This brought us, from time to time, into close collaboration in Hanoi and in Ho Chi Minh City. Chand Atal did a colossal job during the years 1985-92 for both Vietnam and UNIDO. Those were very difficult times in a country flattened by a deadly war, and recovering into a world which seemed to have sprung open suddenly. It was difficult to obtain simple items in Hanoi and life was indeed hard. In this milieu Chand Atal with his courageous and pleasant wife Saroj, lived and worked with the scientists of the Institute of Material Medica in Hanoi and several institutions in Ho Chi Minh City. The Vietnamese loved and respected him. Often the author, when he came over to Vietnam for interaction with the UNIDO projects looked forward to meeting with Chand, and discussing the practical matters with this simple self effacing scientist. He was indeed one with multi-disciplinary knowledge and a spirit that was not dimmed by hard work or daunting tasks. He was a hands-on man, and did not shun menial tasks. He was happy to work alongside young Vietnamese scientists, joking and enjoying work together. UNIDO gave him a relatively free hand and he certainly delivered. The author enjoyed his company, valued his skill and knowledge and his hospitality in Hanoi as well as the fine cooking of Saroj.

Chand had many other interests besides science. He was an art lover and a collector. He had interests in Indian miniature paintings and had acquired a deep knowledge of ancient Indian history. Even if he had not such a great reputation as a researcher, he would still qualify to be regarded as a colossus of a human being.

Perfumes, Fragrances, and the Theory of Smell

By R.O.B.Wijesekera.

N.B. ***This article is fondly dedicated to my friend the late Govind D .Kelkar, one of the foremost perfumers of the world, and an Indian icon of the Fragrance & Flavour Industry.***

Introduction

Perfumes are complex mixtures of what those in the industry call "Raw Materials." The raw materials can be of natural origin like essential oils or their individual or collective components, in which case they will be mixtures of molecules or they may be one or more synthetic molecules made by chemical syntheses. Mixtures so made may be beautiful just as paintings made from dyes are beautiful, whether they are designed by evolution in the natural state, or designed by man, and composed from synthetic or natural raw materials or both.

Perfumes designed by nature are ostensibly to attract insects such as bees and those designed by man to attract each other.

From the ingredients or raw materials that nature has provided in plants and sometimes even animals such as the civet cat, now almost extinct, as well as from the synthetic chemicals that organic chemists have provided , two industries have emerged. One is the Perfumery or Fragrance Industry. The main players of this industry are the Perfumers. The other industry is the Flavour Industry, where the main actors are identified as Flavourists. The job of the Flavourists is to use the raw materials to compose some known and identified flavour such as the flavour of oranges or bacon. They are regarded as imitators by those in the perfumery industry. Their job is deemed a kind of olfactory still life composed by them. Their desired end product is some known odour or smell. To them the perfumers are akin to abstract painters who are not aiming to do a likeness of a natural or identifiable odour or smell. Their work is designed to obtain some abstract odour that is acceptable to some.

Both these categories are highly skilled, gifted, and trained olfactory artists. The difference is this. The objective of the Flavourists is often known. It is some natural flavour or near one. The game it would seem is to get it right. Accordingly, all the molecules used by Flavourists are generally of natural origin or synthetically made so as to be chemically identical to one that has been found in nature. By contrast most fragrance materials used today are of synthetic origin, only a few rare ones being those from natural sources. The final fragrances produced resemble nothing in particular, could be and often is, a completely novel odour. The one requirement is that it must be attractive to the human nose or at least to some of the noses.

Despite all of this ,it is totally accepted by both types of professionals, Perfumers as well as Flavourists ,that they are totally humbled by the greatest of their kind, Nature itself.

Enter the Synthetics

Perfumers lost interest in portraits that resembled Mother Nature herself with the advent of synthetic aroma chemicals. Like when synthetic dyes became available to painters, to them too the extension of the variety and range of the raw materials made abstraction possible. It is difficult to place a date on this change.

However it was in 1881 that the very first perfume incorporating a synthetic aroma chemical was formulated by Paul Perquet, for Houbigant. The formulation was called Frugere Royal. It is not available today, except in Fragrance Museums such as Osmotheque in

Versailles. This classical formulation incorporated synthetically produced Coumarin. Coumarin was initially extracted from the Tonka bean and was later synthesized by Sir William Perkin, the great English chemist, famed among other things, for the first synthesis of the dye Mauve. The Osmotheque differs from other Fragrance Museums such as the Fragonard in Grasse, which houses a magnificent collection of distillation equipment used through the ages to produce natural essential oils, together with a large variety of ornate bottles and containers in which the formulated fragrances had been marketed to customers. The Versailles Osmotheque differs from other Museums in that it houses a School of Perfume which was founded in 1990 and entrusted with the additional task of preserving old compositions of Fragrances.

Inside the Fragonard Museum in Grasse, France.

From Coumarin to the recently developed aroma chemical Javanol, synthetically produced by the company Givaudan of Zurich, is the long story of a fantastic series of Synthetic compounds that are now the "aroma-colour-analogues", which are used by the Perfumer to paint the pictures of the fragrances that are proliferated in the market by the industry. The Perfumer now has a profuse armory to use. The justification for the use of synthetic substances is twofold. Firstly, the range or odours delivered by the many synthetic products are vast. The products are in most cases easily procurable and are not subject to the vicissitudes of the many factors that impede the swift procurement of natural substances. The objective of the research chemist in industry is to find exotic odoriferous chemicals which are easy to synthesize on a large scale in good yield, and which are minimal in cost. There are a vast range of chemicals now available, giving different odour profiles. These include: compounds with straight carbon chains, nitro compounds, polycyclic compounds, such as variants of vanillin or Guaiacol, or cyanohydrins that have the odour of bitter almonds, such as mandelonitrile.

Then there are combinations of these chemical types such as hydroxycitronellyl derivatives, or derivatives of citral, which combine straight chains with aromatic moieties.
One noteworthy factor was the emergence of the ionones which were synthesized by the company Haarman and Reimer, from citral.

These methyl ionones emulated the odour of violets so well, that they were responsible for revolutionizing the perfumery practices of the times. Many new perfumes came into being as a result of utilizing the new synthetic violet instead of the expensive violet absolute. Notable among them was the perfume Violet de Toulouse.

Theories of Smell

Of all the five natural senses the most enigmatic is the sense of: smell. It had baffled scientists to explain. The theories of smell in their various forms still remain at the level of theories, none being as yet raised to the level of total acceptance, despite many years of study. Yet the interesting theories that are now current can and do explain several features to make them warrant attention and interest.

Smell is a biological function, like colour. Its perception by the nose is biological. It is not an intrinsic property of the molecule but rather one of molecular recognition. But how does this occur? There are basically two major theories of smell currently considered. They have evolved through time after contributions from many scientists. One is the Theory of Shapes.

Some researchers have likened it to the theory of enzyme synthesis which operates like locks and keys. The protein molecules which are the enzymes are seen as the locks and the small molecules of the odoriferous compounds the keys. In other words the sense of smell works like a lock and key. The shape of the chemical which is like the key fits into the odorant receptor proteins on the outside of cells (the lock) that are dedicated to the sense of smell. This would mean that the shape of the odorant molecule will determine which olfactory cells will be stimulated and thus what type of odour will be

perceived. Each receptor cell has several different types of molecular receptor sites and selection and proportion of the various sites differ from cell to cell. A variation which finds acceptance as well, assumes that the odorant molecules bind chemically to protein receptors in the membranes of the olfactory cells. The type of receptor in each olfactory cell determines the type of stimulus that will excite the cell. Binding to the receptor indirectly will create a receptor potential in the olfactory cell that generates impulses in the olfactory nerve fibres. Receptor sensitivity may explain the variations in detector thresholds exhibited by different compounds.

The other significant theory is known as the Vibration Theory and is due to an unorthodox biophysicist by the name of Luca Turin. Turin a Physiologist as well as a Perfumer elaborated on a theory first offered in the 1930's. He suggested that smell was dependent on intramolecular vibrations or the stretching of chemical bonds within an odorant molecule. He postulated that the receptors lining the nose function as a "biological spectroscope" to measure the vibration energy of odorant molecules. Turin had no experimental proof to back his theoretical concepts. His conceptual theory was based solely on observations made by him. The scientific community was therefore quick to dismiss his ideas as a single person's olfactory impressions without strict experimental proof. In the book by Burr, Turin was portrayed as a pioneering researcher, though a victim of the scientific community's reluctance to accept an unconventional idea.

Recently researchers Vosshall and Keller at the Rockefeller University have attempted to verify the Turin Theory by a series of controlled specially designed double-blind experiments. They claim to have examined three predictions based on Turin's theory with experiments designed by them for this purpose.

* Human subjects were asked to rate the vanilla character of a 1:1 mixture of guaiacol and benzaldehyde. According to Turin's theory the combined molecular vibrations of these two should approximate to the vibrations of vanillin. They noted that none of the subjects detected the smell of vanilla.
* Subjects were asked to report on whether aldehydes with an even number of carbon atoms smelled different to ones with an odd number of C-atoms as deduced by Turin. Contrary to Turin's prediction subjects did not find that aldehydes smelled more similar if they had an even number of C-atoms versus an odd number.
* Turin's theory also predicted that deuterated and non-deuterated acetophenone, which have the same shape but different vibration spectra would have distinct scents. None of the subjects were able to detect the difference between the two at a range of concentrations.

The Rockefeller researchers conclude that their work does not prove the shape theory, but that molecular vibrations alone cannot explain the perceived smell of a chemical. They did not find anything to clearly disprove the theory but instead they failed to find support for it.

There are similar controversial aspects of the Shape Theory as well. The human nose can detect many more smells than there are odorant receptors, and even if the "locks" are a trifle "loose", the shape theory is unable to explain how two chemicals, each with a unique shape can smell essentially the same. Turin himself when asked to comment on the Rockefeller study was dismissive of it. questioning the Rockefeller team's experimental design. He acknowledged that the only test would be "isotope experiments" and added that: "the jury is still out on the vibration theory."

So we are brought back to the conclusion that despite much experimentation over the years and much controversy, Olfaction, or the Sense of Smell, is the least understood of the five senses. To understand the Perfumer's Art therefore, still remains a gigantic challenge for modern science.

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Of Smoky Scents & Rituals

By R.O.B. Wijesekera

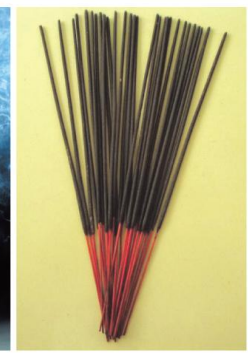
Historical Introduction.

The term incense is derived from the Latin word for burning. The origins of incense were by way of the burning of plant or animal matter which caused the smoke so generated to have within it the aroma giving substances of the original raw material. The traditions of burning incense were known even prior to recorded history. These traditions came to be incorporated within the rituals of organized religion. They bore concepts of causing well being, banishing evil influences, cleansing the atmosphere besides giving out pleasant scents.

Boswellia Tree

The historic Frankincense, known also as Olibanum, is such a material that has been used by mankind since antiquity; and is known throughout the world as a fragrance giving substance when burnt during religious ceremonies. It is a resinous exudate, obtained from a species of tree belonging to the genus known as Boswellia, of the family Burseraceae. There are several species of Boswellia yielding the incense but the main species is *Boswellia sacra.* The resin is sold in the markets in various grades and the grades depend on the species from which it had been derived, the geographical location of the trees, as well as the post-harvest practices adopted. The resin quality is also based on colour, the lighter ones being considered superior due to lesser contamination and oxidation. The trees commence to produce the gum resin exudates when they are around 8-10 years old. The mature trees are tapped about twice or three times annually. The final tappings are deemed to produce the better quality resins based on higher terpenoid content. Omani frankincense is considered superior, although high quality resin is also produced along the northern coast of Somalia. The traditions of incense are still found not only in Europe where the Christian religion adopted them, but also in India and the Far East extending to China. Early Hindu ceremonies, as well as Buddhist rituals adopted the practice. Today it is almost universal and the variations of the art of incense burning are numerous and of interest.

Frankincense has been known to mankind even during the pre-biblical times. It has been traded in the Arabian Peninsula for many centuries and had been found in the tomb of the Pharaoh Tutankhaman whose death was estimated to have been in circa 1323 BC. Incense of a similar brand, from the Indian tree *Boswellia serrata,* and commonly called Dhoop, had been in use in the ancient Hindu ceremonies within the Indian sub-continent.



There is ample evidence that mankind recognized that the aromas from burning materials like resins were able to excite the senses of smell. Imagine the scene of our ancestors gathering around a fire, breathing the fumes arising from the burning aromatic woods, exudates and herbs, and the smoke spiraling upwards to the skies giving them a rare sensory pleasure? Thus the fragrances and the burning of incense perhaps came to be dedicated to the gods, and in the image of goodwill being carried upwards, the religious ceremonies aligned to incense burning may have had their origin. Further benefits

ascribed to the process of incense burning came to be included, such as the purification of the region by the eviction of evil spirits, from which our own Sri Lankan traditional ceremonies like Bali and Thovil may have originated. The benefits extended logically to cleansing the atmosphere and disinfecting it especially after pollution caused by events such as illness or death.

This concept was also present in the Indian sub-continent and was included within Ayurvedic practices. It was a cultural practice in the subcontinent to burn incense every day so as to keep the household free from germs and other similar undesirable factors. This indeed was the origin of the practice of lighting Agarbathis today. The practice of associating this with religious practices which include the use of aromatic woods like sandalwood may have followed and gave rise to the industry which makes joss sticks or Agarbathis.

The trade in aromatic plants such as spices, and plant exudates such as incense, had surely predated the Christian era. Frankincense was used in quantity by the ancient Egyptians, Persians, Assyrians, as well as the ancient Romans who would have learnt of the use of it from contact with them; and also the people of ancient India and China. The value of these commodities often exceeded the value of Gold and Silver during those periods in history. The significance of the belief that: the three wise men brought Gold, Frankincense and Myrrh, to the infant Jesus was an acknowledgement of the nature of the gifts.

The trade in Frankincense flourished particularly in the region around what is now Oman and its use there has been traced back to the reign of the Queen of Sheba and its peak was during the height of the Roman Empire. It diminished by 300 AD due to factors of nature such as desertification of the caravan routes and the vicissitudes of history.

The burning of incense and fragrant woods such as sandalwood has prevailed as a part of the eastern religions such a Hinduism and Buddhism, as well, and the practices are there to this day. However, the burning of fragrant material is by no means the monopoly of the Eastern sector of the globe. The ancient authentic North American population also adopted the practice of burning aromatic plant substances for ceremonial healing and cleansing rituals for thousands of years. A part of the native North American tradition is the "smoke bowl blessing" known as: "smudging". Like in other ancient cultures it calls upon the odours of sacred plants to expel negative energies and restore normalcy. The combination of plants used are called; "sacred plant helpers". They constitute such plants as Cedar wood, Sage, Sweetgrass, and even tobacco. They are either tied into bundles, called smudge sticks, or braided into ropes. The smoke is ceremoniously fanned through the area to effect the cleansing operation.

Forerunner of modern Aromatherapy?

The practice of burning incense can be conceived as the forerunner of modern aromatherapy. Its use as a healing power and a means of altering the mood of a person is indeed one of the earliest uses of aroma and scent for a curative purpose. Aromatherapy utilizes essential oils extracted by steam distillation from aromatic sources to give effect to changes in the human psychological system. By stimulation of the olfactory system within the human being and by the other practices such as touch therapy, aromatherapy is able to produce physical, emotional as well as psychological effects, independent of the conscious thinking process.

Present theory accepts that when we smell a scent, our brain at its sub-conscious mode evaluates the scent, as to whether we recognize it. The information is sent to the olfactory epithelium of the limbic system via the nerves. The data is transmitted to the conscious part of the brain. The limbic system is the data base within the brain that stores all the scents ever smelt by an individual. It provides responses and reactions to various stimuli, and plays a powerful part in respect of moods. All smells are molecular and a particular molecule bearing the scent arrives at the nose which has in the mucous membrane millions of odour receptor cells and cilia to catch and identify the relevant odour molecules. Unlike the other senses the sensors of smell are directly exposed to the source of stimulation. This fact accounts for the instant reaction scent can cause and explains the effects on the nervous system which are effective sub-consciously. The sense of smell can effect a variety of bodily processes that have a bearing on mood and feelings. Therefore the use of incense in the olden times, and aromatherapy in

modern times seems to have validated the concepts of the ancients of the part played in human well being by scents, and smells. In the modern concepts of aromatherapy we may infer that the use of the fragrant smoke of incense was indeed a valid way of achieving the following:

* Cleansing the atmosphere
* Inducing calm.
* Reducing stress, and anxiety.
* Fighting fear
* Revitalizing and energizing the individual.
* Preparing mind and body for prayer and meditation.

So the burning of incense was indeed an ancient tool to employ the undisputed power of aromatherapy as we know it today. It is a valuable tool that is still effectively used.

Technical aspects of the burning of incense.

Incense is composed of aromatic plant material. They are such as gums and exudates, like frankincense and myrrh, woods like sandalwood and cedar wood, and even some spices and essential oils. These aromatic plant material contain in the main, a class of chemical compounds known as the "terpenoids". Within this class are variations depending on their molecular weight, such as: the monoterpenes of smaller molecular weight and the sesquiterpenes of larger molecular weight. There are a complex variety of these compounds and the relative compositions are often dependant on the particular species and their geographical origins. Thus one comes across the variations in the scent of each type of incense.

In the oldest form of incense burning, the incense such as: frankincense and myrrh, being resinous and brittle when dry, can be powdered, and is then self igniting. The incense is spread on burning coals and from time to time more of the fragrant incense is added. This type is now categorized as "indirect burning". This type is also referred to as "combustible incense". Another method used is the "direct Burning" method where the incense is compounded with a binder. When ignited directly by a flame and then allowed to burn slowly, the glowing ember on the incense preparation continues to smoulder and burn away. This type of incense is made by using a suitably selected binder substance into which is mixed the incense proper. The composition is so adjusted as to ensure continuous and smooth burning as well as the discharge of the fragrance in proper concentration. This type of direct burning incense takes many forms:

* Incense Coils: The incense mixed with the binder is extruded in the shape of coils without a core. This type of coil burns for a long spell when once lit. It is commonly produced in China and India. Modern mosquito coils are derived from this technique.

* Incense Cones. The incense and binder are mixed and shaped into a cone . The apex of the cone is lit while the cone is stood on a receptacle. This type is faster burning than coils.

* Incense sticks. Here too the paste of incense and binder are supported on a thin stick and are sometimes known as "Joss sticks" or in India as Agarbathi.

* Besides the above there is also Solid Incense sticks, Incense tablets, and Powders., and a variety of others.

The processing of direct burning incense requires strict conditions. Firstly the matrix or binder used should be strictly odourless, otherwise it may introduce undesirable elements into the odour frame. Ideally the incense should burn smoothly without leaving any trace of the burnt matrix. In practice it will leave a white ash. The composition of matrix to fragrant incense material has to be carefully balanced to ensure the burning as well as the release of fragrance. The burning process has to be so uniform that in certain cultures such as Chinese, this type of incense burning has been used to mark the lapse of time. This was a Buddhist tradition introduced to China and called "incense clock" or xyangyin.

Charcoal and wood powders are used as the matrix with Gum Arabic, or Gum tragacanth as binder. In India the discard materials after the distillation of sandalwood oil is employed as the matrix. This has the added advantage of residual sandalwood fragrance. An oxidizer such as sodium or potassium nitrate is incorporated to facilitate the combustion process. Natural binding substances also are popular. In Japan Makko incense powder employs the binder from the Tabu-no-ki *(Machilus thumbergii)* tree. In India

the binder called Jigit is used. Others use binders from their own national flora.

Natural Aromatics used in Incense production.

Besides the classical types of materials a wide variety of natural substances have found application throughout history in the making of incense. They do have a relationship with the geographical area where the practices occur. They are also diverse in the parts of the plant materials used. The following are some of the natural materials employed:

Woods and barks:

Agarwood, Cedar wood, Sandalwood, Cypress, Juniper, Cinnamon, Cassia.

Resins and Gum exudates:

Bdellium, Benzoin, Copal, Frankincense, Myrrh, Labdanum, Dragons Blood, Storax, Galbanum, Elemi, Sandarac, Guggul, Opoponax, Tolu Balsam.

Leafy materials:

Patchouli, Sage, Bay, Balsam, Tea, Eucalyptus, Cinnamon leaf, Clove leaf, Citronella.

Buds and Flowers:

Clove, Lavender, Saffron, Rose, Jasmine, Mewdi.

Seeds, Fruits, Pods, & Berries:

Coriander, Juniper, Harmala, Nutmeg, Star Anise, Vanilla.

Roots & Rhizomes:

Vetiver, Orris, Calamus, Spikenard, Galangal, Couch grass.

Derived materials:

Camphor, Musk, Ambergris, Operculum.

Essential Oils:

Patchouli, Cedar, Sandalwood, Jasmine, Rose, Ylang ylang,

Other materials & artificial scents.:

Cannabis, Garden Strawberry, Opium, *Cestrum nocturnum*, Lily of the valley, Watermelon

Uses in Traditional Medicine.

Psychological therapy may be easily associated with the uses of incense in religious rituals . However there were other uses as well. In Ayurvedic medicine in India, the resin of Frankincense in this instance derived from the Indian variety *Boswellia serrata,* is recorded as being edible and used in internal medicine. Edible frankincense for this purpose should be very pure and has advantageous effects on such ailments as arthritis. The use of it in Ayurveda is termed Dhoopan. In Indian culture burning of incense on a daily basis is common.

Beta-Boswellic acid is known as one of the main active compounds of Frankincense. In a recent study by the Oklahoma Health Sciences Center of the USA, it was reported that frankincense oil appeared to distinguish cancerous from normal bladder cells and suppress cancer cell viability. It is reported to induce cancer cell specific toxicity. The prospective effects of Indian Frankincense in medicine are being investigated further on the lines indicated by ancient Ayurvedic therapy.

Rain Forests :
"The pharmacy of the Planet"

The relentless slash – and – burn tactics now being employed to harvest timber and create space for agriculture in such places as the Amazon River Basin , are not only sending clouds of gas into the atmosphere but also removing trees that convert carbon dioxide into oxygen, helping mitigate greenhouse gas build up in the atmosphere. Rain forests might also be called the "Pharmacy of the Planet". They are a treasure trove of natural chemical innovation and the source of many of today's prescription drugs. Scientists fear that hundreds, even thousands of potential miracle drugs may never be identified owing to the plundering of the rain forests

Source:
Time : Global Warming (2007) Kelly Knaur Ed. Time Books NY 10070 pg 30

Health benefits of Cranberry juice

by Dilmani Warnasuriya

Cranberries are not a popular constituent in the Sri Lankan diet, either as a dessert or a drink. The main reason of course is that is not a tropically grown fruit and is not available locally. However, during the Christmas season, Cranberry sauce is widely sought after by Christians and by those in the hospitality industry, due to it being a traditional accompaniment to roast turkey, which is invariably a part of the seasonal menu.

In addition to its culinary use as a dessert and fruit, in North America, Cranberry juice has evolved as a time proven American folk remedy for several ailments, the most widely used being for urinary tract infections in women. So well known was this cure, that scientists were prompted to begin to investigate its value over seventy years ago. These studies have shown that the cranberry juice contained high levels of oligomeric proanthocyanidin minerals and a nondialyzable polymeric compound which helped to flush out the harmful E.coli bacteria from the urinary tract. The mode of action is that these acidic constituents prevent the bacteria adhering to the walls of the urinary tract and causing the infection. Clinical trials are still continuing but a recent study suggested that drinking 4 to 6 ounces of cranberry juice daily can have a preventive effect for urinary tract infections rather than a curative effect.

Several other health benefits are attributed to this wonder fruit. Besides being a prophylactic against urinary tract infections, Cranberry juice also has the ability to destroy *Helicobacteria pylori* bacteria which causes painful stomach ulcers by damaging the protective mucous coating of the stomach. This could ultimately lead to stomach cancer.

Due to its activity as an antibacterial agent, by its anti-adhesive effect, cranberry juice is also used to fight other bacteria such the influenza bacteria, which can cause painful respiratory and ear infections in children and in oral health by inhibiting the formation of plaque. Again its effectiveness is due to its ability to prevent the bacteria from attaching themselves to the cell surface.

Preliminary research also suggests that the polyphenols present in cranberry juice improves the health of the cardiovascular system by raising "good" cholesterol levels, while lowering "bad" cholesterol levels.

According to some studies, it is has also been shown that Cranberry extracts have prevented breast cancer cells from multiplying in a test tube, and therefore it is suggested that it could be effective against cancer.

Cranberries have been found to have a lot more antioxidant phenols, promoting overall health and awareness. These could account for several of the health benefits attributed to it, particularly the cancer prevention property.

Other attributed Benefits:

* Prevents the formation of kidney stones.
* Slows the aging process and breaks down breast cancer cells
* Aids in weight loss
* Prevents osteoporosis
* Improve overall skin health.
* Acts as a protection against Alzheimers' and Parkinson's disease.

The cranberry plants are evergreen dwarf shrubs scarcely a half foot tall, that grow under acidic conditions in the cooler climates of the Northern hemisphere. The plants yield

small white berries which turn red upon ripening. The commercial cranberry which has been well investigated is *Vaccinium macrocarpon*. Depending upon the locality, and how it is defined, cranberries may come from different plants. A few other plants claim the name "cranberry", including *Vaccinium vitis-idaea,* known to American botanists as Lingonberry, or mountain cranberry. Cranberry juice of commerce is a bitter liquid in its pure form. However most of the commercially available products are sweetened by adding artificial flavours. The juice is highly valued for its acknowledged health benefits in addition to it being tasty and refreshing.

Not withstanding the years of research on the health benefits of cranberries, researchers stress the importance of distinguishing between the in vitro [laboratory] and in vivo [real-world] antioxidant activities of dietary [cranberries] in relation to human health.

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Quality of Fragrance

'Naturalness' is now demanded more than ever. But it has never been in greater danger than now because of the new legislations. A danger that is very real and very close to us.

But new techniques have created better quality products that are more beautiful and more attractive than ever for the perfumery industry . In a period that is obsessed by 'naturalness', these raw materials could be the centre of the message delivered to the public. That story, that of countries and people, that of human reality must replace current marketing pitches and the stupid news briefs. ! Synthetics can also tell a story. (remember 'Hedione'….) Certain molecules have caused revolutions. It should be possible to tell the consumer that a perfume is a mixture of natural and synthetic elements. Perfume is an art, and art is artificial. …. Always remember that a perfume is purchased again , not because of a name or a bottle, but because of the quality of the perfume.

Chandler Burr "Author of "The Emperor of Scent." Arrow Books, London 2004

Quoted in New York Times

Source :
Parfums, Cosmetiquus Actualities NO 204 (2008)

We can easily forgive a child who is afraid of the dark, the real tragedy of life is when we are afraid of the light.

Plato

Sudantha becomes the first Ayurvedic toothpaste to win SLS certificate in Sri Lanka

Chairman, Link Natural Products, Dr. Devapriya Nugawela, accepting the certificate from Chairman SLSI, Dr A R L Wijesekera

Link Sudantha, the quality Ayurvedic toothpaste which has been in the market for over ten years, was recently awarded the SLS quality certificate and thus became the first in this category to obtain this quality status.

The formal event to confer this award was held on 5th May at the SLS Auditorium. The award was handed over to the Chairman Link Natural Products, Dr Devapriya Nugawela, by the Chairman of the Sri Lanka Standards Institution, Dr A R L Wijesekera.

Dr. Nugawela addressing the gathering, said that this was a historic occasion for the entire Ayurvedic industry in Sri Lanka . He also expressed the hope that the SLSI will develop more standards for Ayurvedic products so that the consumer can be assured of quality Ayurvedic products with a consistent composition. He volunteered to assist the SLSI in developing such quality standards for Ayurvedic products.

Dr. A R L Wijesekera in his address said that it was a pleasure for SLSI to award the SLS certificate for the first time to an Ayurvedic toothpaste. He further mentioned that this was done based on the quality parameters of SLSI that also considered the quality and good manufacturing practice of the Link Natural Products factory complex.

The Director General of SLSI, Dr. L N Senaweera and other senior staff members attended this event, along with staff members of Link Natural Products.

'SAMAHAN' Now in Canadian Market

The fabricated tree consists of the fourteen constituent plants of Samahan

Samahan , the flagship product of Link Natural, recently made a triumphant entry into the Canadian market, after satisfying the stringent regulatory criteria laid down by Health Products Directorate in the country . This was even more propitious for the company as Samahan also celebrates fifteen years of being in the market this year.

To celebrate these events, Link Natural held a media briefing followed by a well attended reception at the Colombo Hilton Hotel. Chairman, Link Natural Dr. Devapriya Nugawela, welcomed the participants to the briefing, and briefly outlined the formidable process which was involved in obtaining the licence from Canada. He said it took over two years to provide all the data required by the Health Directorate and satisfying these requirements was quite an achievement . Speaking of the birth of Samahan, he said that it took a team of scientists and ayurvedic physicians over five years to come up with a satisfactory formula to counteract colds, catarrh and other common upper respiratory viral infections. This special formulation was able to enhance the body's immune system and this accounted for its efficacy. Once the formula was perfected, a scientifically optimised process protocol was set in place to produce the widely used Samahan of today. Dr.Nugawela also elaborated on the manufacturing facility in Dompe and the company's commitment to maintaining quality systems throughout the entire process.

Prof Colvin Gunaratne speaking next, elaborated on his personal experience as Chairman of the State Pharmaceutical Corporation when he was called upon to investigate the allegation that western allopathic drugs was added to this product. He convincingly stated that on performing several analytical tests at the state of the art laboratories at the Corporation, he was able to confirm that there were no added western drugs, and that Samahan was totally herbal .

Prof Tuley de Silva, Director Link Natural, and a former Director Ayurveda Research Institute, next spoke of the stringent regulations that needed to be complied with for the import of herbal healthcare products in many countries. Samahan is presently exported to India, USA, Malaysia, Singapore , Middle East , and several other countries. Safety and claims for efficacy were some of the requirements in these countries and prerequisites for this were test reports from the University of Cambridge and University of Georgia. These test reports confirmed the claims made by the company that Samahan was a hundred percent pure herbal product.

Dr. Sarathchandra Wijayasinge , an eminent Ayurvedic physician wound up the proceedings by informing the audience of his personal recommendation of Samahan to his patients. He was able to provide confirmation on the safety and efficacy of the product.

Much interest was shown by the audience, and the few questions raised were ably answered by the panel . The briefing was followed by a well attended reception at the Hotel.

(Continued overleaf)

The Handbook of Essential Oils.

Science, technology and applications.
Edited by K Husni Can Baser,
Anadolu Univeristy, Turkey
And Gernhard Buchbaur Universitat Wien,
Austria
ISBN 978-1-4200-6315-8

This handbook is a compilation of essential information related to the development, use and marketing of essential oils. It covers the chemistry, biochemistry of the oils, and also the biological, regulatory and microbial aspects which will be of much value to researchers and those involved with the marketing of these oils used in pharmaceuticals, food, health and beauty products. Written by authorities in the field, coverage is also given to the sources, production, analysis, storage and transport of oils, as well as aromatherapy, pharmacology and toxicology, making it essential reading to those in the field.

Turmeric : the genus Curcuma

Edited by P N Ravindran, Centre of Plant Research, Kerala, India, K Nirmal Babu, Indian Insitutie of Spices Research, Calicut, Kerala K Sivaraman, Sugarcane Breeding Institute, Coinbatore, India
ISBN 978-0-8493-7034-2

This publication gives authoritative information on the botany, cultivation, phytochemistry, biotechnology agronomy, post harvest technology and processing of turmeric. Traditional medicine, culinary uses, production and marketing are also covered, with additional information on the major chemical, Curcumin.

Samahan in ..... (Continued)

Speakers at the Media briefing

Dr. Devapriya Nugawela

Prof. Colvin Gunaratne

Prof. Tuley de Silva

Dr. Sarathchandra Wijayasinghe

Prathiba Nisansala
(Vote of Thanks)

The Digest Mail Bag

Extract from Letter 1

In my former life, I worked in the field of natural product synthesis so I found your digest quite interesting. However, I am currently in the field of chemical education research so unfortunately I am afraid I cant help you with articles. However, there are no doubt others within DivCHEM who would be able to assist you with suitable articles.

Dr Debora Herrington
Associate Professor, Chemistry Department
Grand Valley State University Allendale MI 49401

Extract from Letter 2

Firstly let me congratulate you on producing a very informative "Link Natural Products Digest" of which you have been the Chief Editor since October 2004, when you launched the Inaugural issue.

The layout of the cover, plus all the pages therein are very well documented.

By reading your digests, I have gained a lot of information about Ayurveda , herbal and medicinal products.

Is there an outlet where I can visit and buy some of the products which your Company manufactures, if not, I suggest that you should have an outlet either at the CIC offices along D R Wijewardene Mawatha,where there is ample parking space for parking vehicles or at Kew Road.

Could you please let me know the products that you manufacture which would help in controlling diabetes, reduce cholesterol and improve general health.

Looking forward to hearing from you soon regarding the questions posed .

Iqbal Jafferjee
c/o Ansons Traders
545 1/3 Sri Sangaraja Mawatha, Colombo 10

Extract from Letter 3

"I am writing this after reading the Link Natural Products Digest, Vol.6 Issue 1, 2010. It is an excellent production. The article on the commonly used spices in our food makes interesting and informative reading. I think the article should be reprinted as a leaflet and given to visitors. ROB has done a very good job indeed. "

Chandi Chanmugam
167, Inner Flower Road, Colombo 3

NOTE TO POTENTIAL CONTRIBUTORS

Link Natural Products Digest

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

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

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

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

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Editor-in-Chief
Link Natural Products Digest
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Kapugoda

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.

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