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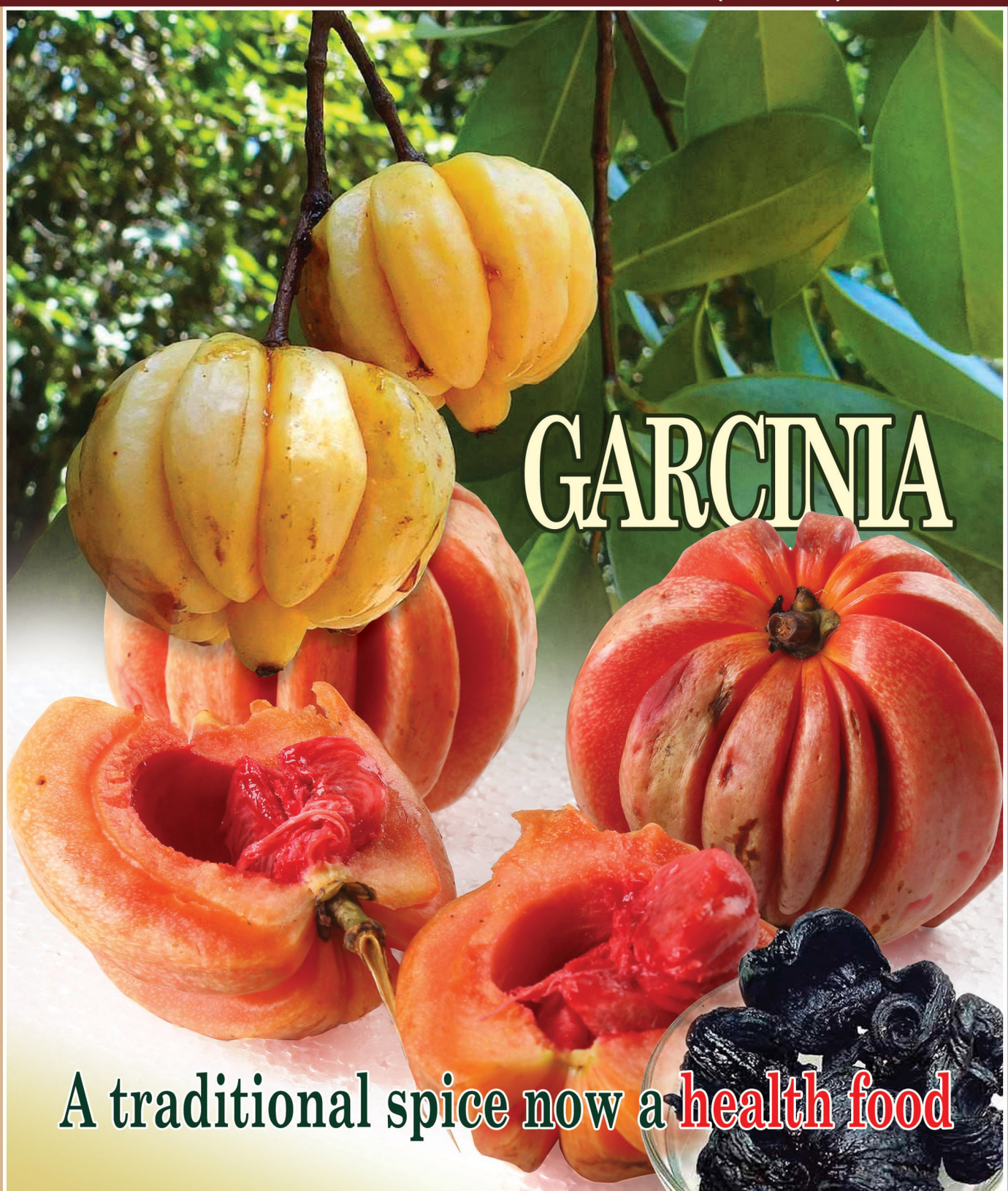

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IN THE PAGES THAT FOLLOW.....

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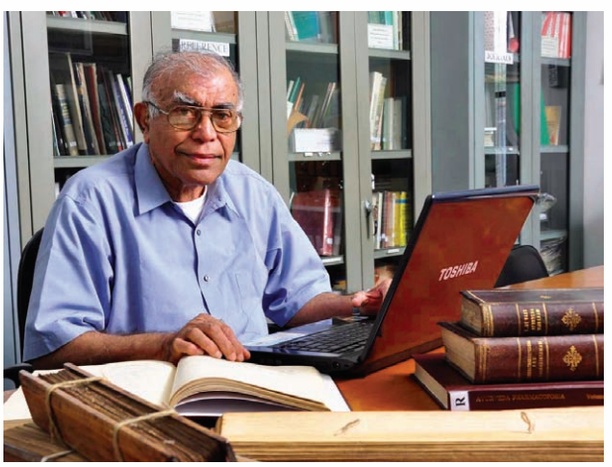
EDITORIAL



It has been estimated that 18 billion pounds of plastic ends up in the ocean each year, including a trillion plastic bags used globally. Rivers are the main route by which plastic trash reaches the ocean, and 15 of the world's twenty most polluting rivers are in Asia. Plastics have been found inside the stomachs of small sea animals who die after eating plastics, making the ocean a veritable minefield. Many people consider plastics as being a necessary evil, as no effective alternative has been found to replace boxes, bags and other utilities. Biodegradable plastics have been around since the 1980s, but they do not seem to have fulfilled the implied promise. Regulations although being in place, are not strictly implemented with the result that we are still drowning in plastics. Plants may give the answers to the search for alternative packaging materials. Asian cultures which still adhere to traditional practices could well provide disposable materials which were used in bygone days, and which could be used in modern living as well. Some might still remember the time when leafy materials were used for wrapping of different types of commodities. This practice was most common in rural households where food was distributed lavishly to neighbours and friends. Surely, with the rapid advances in science and technology, innovations using the natural resources of nature to provide safe wrapping and packaging materials is well within the realms of possibility?

R O B Wijesekera

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PLANTS POWERED HEALTHCARE THROUGH THE AGES

By R.O.B.Wijesekera

Introduction

Through the ages of recorded time, plants have been the source of therapeutic agents used by mankind. Indeed paleontological research has revealed that this had been the case even much before the time where records were available. It is suspected that even Neanderthal man had recourse to the plant kingdom for his health needs. This relationship has maintained itself throughout the millennia until the present time. If we consider the scenario of the present time we find the dependency of mankind on the plant kingdom for healthcare needs is even more intense and wide.

The dominant methods of health care that come through the ages are the Chinese system of Traditional medicine, the Ayurveda system of medicine, and the systems that derive from those which prevailed in ancient Arabia, and thence to Greek and Roman times, and all of these are mostly dependent on the plant kingdom for the therapeutic agents.

When we consider the health issues that dominate the scenario of the day we find the following:

- Acute need of new medicines to combat the variety of diseases now identified – by new diagnostic methods
- Need of new agents to counter the overuse or misuse of antibiotics
- Counters to toxic manifestations and allergies
- Inexpensive and facile delivery forms for medicines for those in the countries of the third world.
- Readily available and easily prepared medicines for the poorest of the world.

Once again mankind seeks answers from the plant kingdom for new approaches to healthcare therapy. Modern scientific research is again tending towards nature.

The global scenario of the day is characterized by the following facts:

- Almost half of the bestselling pharmaceuticals of today are those derived from Natural products. (NIH- US)
- There is a wide diversity of chemical types among natural products, which have established bioactive properties, and sourcing these present formidable supply

problems. The supply sources are generally in remote regions.

- The concept of ownership now arises from the UN Convention on Biodiversity 1992, which rightly dictates that the biodiversity property belongs to the country of origin.
- The conservation of global genetic resources and indigenous knowledge is paramount in the context.

Plant power may have contributed towards medicine throughout the ages but the modern view of conservation is certainly in the right direction. "Modernization" of our life styles in all its forms has unfortunately and inevitably resulted in the destruction of rain forests and such sources that has spelled the consequent loss sometimes for all time, of genetic biodiversity as well as indigenous knowledge that would have been a treasure trove invaluable to humankind.

Contributions from Plants to Modern Medicine

The contributions of the plant kingdom to modern medicine is in a respect parallel to the development of modern medicine itself. It was when modern chemistry channelled itself into the synthetic era that the vast array of new man-made medicines emerged, and these again were models of chemical structures mostly based on attempts to copy the models of nature. The new relationships between the chemical structures and the physiological activity of the molecules, became a subject of intense interest. It became the main theme of the subject of natural product research and new drug development.

In the scenario of the modern day the following facts are deemed noteworthy;

- An estimated 75-80% of the global population depend on plants for their therapeutic needs, mainly used as aqueous extracts of the plant material. (WHO).
- Around 13,000 plant species are known to be in use globally for drug formulation.
- 60% of the anticancer research drugs are derived from plants, or are based on model structures derived from natural products.
- 75% of the anti-infective drugs approved during the period 1982-2002, are traceable to origins of plant natural products.
- 50% of all drugs approved since 1994 are traceable to natural product origins.(NIH)
- Over one hundred new leads based on plant natural products are presently undergoing clinical development.(NIH)
- Despite the burgeoning growth in the area of chemical synthesis of drug molecules, almost 25% of prescribed drugs still contain molecules that derive from vegetable origins.

Researchers are still confident that studies on the chemical metabolites within plant species that have sustained humanity over the millennia would still provide clues for the treatments of health problems that arise today.

Some Historical Glimpses

Let us take a brief peep into some relevant historical facts. The use of plant materials for medicines is as old as human history itself. Paleo-anthropological studies at the cave site at Shamidar in the Zagras Mountains in Iraq, suggest that more than 60,000 years ago Neanderthal Man was aware of the medicinal properties of plants. Over the ensuing multi-millennia, human-kind has made use of Plants to the fullest extent. They have used a wide array of plants as therapies for every ailment they suffered from. We have historical records of the various eras such as the following:

Arabian medicine

Greek and Roman Medicine

Ayurveda and Indo-Asian Medicine

Chinese Traditional Medicine

During the last century we have seen the development of the main sciences related to plants, such as Botany and Pharmacognosy, Natural product chemistry and Organic synthetic

chemistry, Chemical structural studies, Pharmacology, Pharmacy, and parallel with the development of these and other related sciences the development of the now dominant massive Pharmaceutical Industry itself. Every civilization in every geographical region has accumulated a vast amount of knowledge and experience in the use of plants in health related therapy.

During the early history of mankind there is recorded evidence of the use of medicinal plants as a source of therapeutic agents for all kinds of human ailments. We have records available of the medicines of ancient Arabia, then Greece and Rome, and along with these the recorded medicinal treatises of the Indian sub-continent mostly the recorded methods of Ayurveda- the Charaka and Susruta Samhitas.

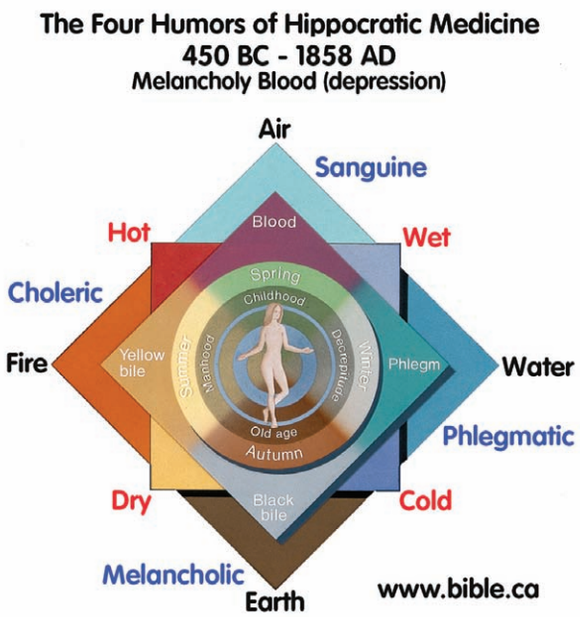
Then we are told that some two thousand years or more before this present time the Sheng Nong Ben Cao in China, had been produced, and this materia medica, was an exhaustive one that classified the plant therapies into three categories as superior, medium, and inferior. The superior category identified the drugs as non-toxic and to be used for sustenance of general health. This was during the Han Dynasty. Later in ca 650 AD the first National Pharmacopoeia Tan Ben Cao was published and in ca 1587 AD the historic Publication by Li Shi Zhen was Ben Cao Gang Mu - a Compendium of medicinal plant-derived materials.

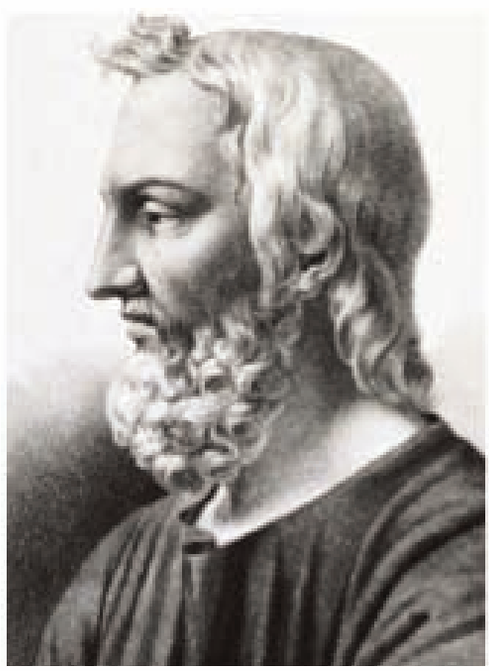
In Southern Africa, and the remote parts of the world such as the Amazonian region, there are no comparable records but there is evidence of the existence of various indigenous medical systems and practitioners called Guerrier's and Samans, and the knowledge of these practitioners have led to many leads as regards cures. While also in Southern America the records of the Inca and Maya civilizations are available.

The common feature in all these systems in the various geographical regions is that the plants were the major therapeutic agents.

In the earliest European scenario at the time in Mesopotamia circa 2600 BCE medicinal plants and their efficacy in combatting disease were written into clay tablets which remain to this day.

In Egypt the Ebers Papyrus ca 1550 BCE is evidence of the part played by plants in health care. In Greece in 460-377 BCE we find the Corpus Hippocraticus, which describes the plant- derived medicines used by Hippocrates at the time, the man now recognized as the Father of modern medicine.





In the periods that followed in Rome we find the Die materia medica, of Dioscorides 40-90- AD and again in Greece the compendium of Galen 120-200AD all of which gives massive evidence of the role of the plant kingdom in human health through the ages.

Some interesting similarities

Systems seemed to have developed independent of each other in the various geographical regions except where there is evidence of contact through trade and travel .However some similarities deserve mention. For example in Greece Hippocrates had used the plant species *Veratrum album* as an anti-tussive agent, when at the same period of time the Chinese were using the species *Veratrum nigrum* in similar fashion. The plant species both have similar constituents and their physiological impact would have been similar. There are many such instances in the use of plants with similar action in the different regions of the world.

The Beginnings of single compound therapy, and some classic stories

In 1805 the German chemist Serturner isolated Morphine from the seeds of the Opium poppy and so Morphine is recorded as the first pure compound that was used as a therapeutic agent. Before this time plant extracts were used and most of the time these were mixtures of the metabolites of the plant. The company Merck commercialized the usage in 1826. Thenceforth it appears that the now powerful pharmaceutical industry was born and with it the trend of research into plant components was determined. The priority was to isolate the constituents in a pure form with a view to its use as such and further to determine the structure to enable chemists to attempt to synthesize. This trend continued to direct research to this day. So in the wake of this, a series of pure compounds came to be loaded into the armory of modern medicine.

Some of the more significant of these may be recalled here.

Silicin was the compound within the bark of the white willow tree, *Salix alba,* that was used to cure fevers and the chemical intervention gave rise to the historic drug aspirin, acetyl salicylic acid.(vide Link Natural Digest Vol.13,No.1)

Emetine was isolated from *Cephaelis ipecacuanha,* and used thereafter in place of the extract of the plant.

Strychnine and Brucine isolated from *Strichnos nux vomica* followed the same sequence.

Quinine, isolated from the cinchona bark forms one of the classic tales of medical history which has a romantic side as well as the profound impact in the battle against malaria.(Vide Link Natural Digest Vol.12,No 1). In the country then known as Laxa. In the 17th century, Jesuit priests came across a tree the native doctors or caciques had identified as the Fever Tree. It was renowned for its efficacious cures of fevers. In 1652, the bark had been set to Rome by Juan de Vaga a doctor, who claimed the extract of the bark had cured the wife of the viceroy. Thus the compound strychnine came to be isolated and used as such for the cure of Malaria.

The cure for Hypertension came from the Ayurveda plant drug *Rauwolfia serpentina* and a chemist in Pakistan then pre-independence India, Salimuzzaman Sidiqui, found its effectiveness in its use in Ayurvedic medicine, then brought it to the notice of the Swiss Pharmaceutical firm Ciba-Geigy,who through the efforts of Emil Schittler, an eminent Swiss chemist, finally marketed the drug Reserpene. The Story of Reserpene too is one of the epics of modern times, the immediate post world war II period.

The story of *Catharantus roseus*, a flowering plant that grows in Asia and Africa is a somewhat different one. There was only hearsay evidence of its use as an anti-tumor drug in Africa when a global screening programmer in 1958 by Gordon H. Svoboda, included it in the programmer pioneered by Eli Research Laboratories. This was a wide spectrum screening programme

The end result was that Vincristine one of the alkaloid constituents came to be marketed in the US in in 1963, five years after the extract had proven to possess anti-tumor activity. It was the choice for the treatment of childhood leukemia

Another alkaloid in the extract Vinblastin was found to be successful against Hodgkin's disease and According to Svoboda the net profit for the company exceeded 100 million USD in 1985 which meant 88% profit for Eli Lilly.

There is much more to the part played by Plants in enriching modern medicine and much is adding to this vivid story while in the interim as it were, the Story of anti-biotics demands mention as it was another approach to therapeutics that came to the fore.

The Antibiotic Explosion,–
and now a Paradigm change

The unique chapter of antibiotics comes alongside the discoveries of other modern drugs. The discovery of Penicillin by Alexander Flemming, Brian Chain and Howard Florey, and their work with Penicillin the scenario of an antibiotic driven drug therapy, which ends with decades of overdosing with antibiotic, is the next phase. This is another phase of the history of human medical therapy.

In the interim the technique of chemical isolation of several bioactive principles from plants survives and even flourishes even as the huge synthetic pharmaceutical industry becomes even more formidable, there comes the beginnings of a new approach to drug development.

The new paradigm shift is based on exploiting synergistic effect heralding a new generation of phytopharmaceuticals. (Wagner et al 2009)

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NATURAL PRODUCTS – A CONTINUING SOURCE FOR NEW DRUGS

*By Dr (Mrs) Chayanika Padumadasa**

The term "natural products" is often used synonymously with secondary metabolites. They are chemical substances produced by living organisms found in nature. Unlike primary metabolites, secondary metabolites are not directly involved in growth, development and reproduction of an organism. Further, their distribution is restricted to a particular species or family. However, secondary metabolites aid organisms in which they are found, in order to carry out important functions that include protection, defence, sexual attraction, social communication and identification. Most mportantly, they possess interesting biological or pharmacological properties that could be exploited in the process of drug discovery.

Natural products can be obtained from different sources. The plant kingdom is a rich source of natural products. Not only the plant kingdom, but also microorganisms such as bacteria and fungi, coral, sponges and fish of the marine world, animals and also venoms and toxins from snakes, spiders, scorpions and insects possess a myriad of interesting natural products.

The very first natural product to be isolated was the analgesic and sleep-inducing agent from opium produced by cut seedpods of the poppy, *Papaver somniferum* in the beginning of the 19th century by a pharmacist's apprentice named Friedrich Sertürner. He named this morphium (morphine) after the Greek god of dreams, Morpheus as it has a tendency to cause sleep. Since the discovery of morphine, it has held its stature as one of the most potent analgesics to date.

Serturner's work proved that plants contain active substances that, in isolation, carry out the therapeutic properties of the plant. The discovery of morphine also led to the emergence of natural products chemistry as an independent discipline. Further, this triggered the examination of other medicinal plants and natural sources, and throughout the 19th and 20th centuries many natural products were isolated from their natural sources as therapeutic agents.

Two remarkable discoveries made in the 20th century were penicillin and taxol. These have made a huge impact in therapeutics and continue to do so even today. Antibiotics are compounds produced by bacteria and fungi, which are capable of killing, or inhibiting, competing microbial species. Although this phenomenon has long been known; it was only in 1928 that Alexander Fleming, Professor of Bacteriology at St. Mary's Hospital in London, discovered penicillin, the first true antibiotic.

It was Howard Florey, Ernst Chain and their colleagues at the Sir William Dunn School of Pathology at the University of Oxford who turned penicillin from a laboratory curiosity into a life-saving drug. Penicillin heralded the dawn of the antibiotic age. Before its introduction there was no effective treatment for infectious diseases such as pneumonia, gonorrhea or rheumatic fever. Hospitals were full of patients who were habouring infections and doctors could do very little except to hope for the best. Dawn of penicillin turned tables. The introduction of antibiotics led to a shift in mortality patterns. By

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the 1950s deaths from infectious diseases began to decline and heart disease and cancer became major killers. This spurred interest in cancer research and US National Cancer Institute initiated an extensive program to screen plant sources for potential anti-cancer drugs. This led to the isolation and structure elucidation of the anticancer agent taxol from the bark of the North American yew tree *Taxus brevifolia* in the late 1960s by Wani and Wall. Although obtaining commercial quantities of taxol slowed its advancement, it became a blockbuster drug once it reached the market.

In natural products related drug discovery and development, initially crude extracts are obtained from medicinal plants. Crude extracts are subjected to bioassays and in the presence of activity, the extract is fractionated and active compounds are isolated and identified. Every step of fractionation and isolation is usually guided by bioassays, or else crude extracts are fractionated and compounds are isolated and identified, which are then subjected for bioassays. 'HIT' compounds that results from initial screening work are subjected to further screening and suitable lead compounds are selected for the drug development process. Lead compound is a compound with some interesting biological or pharmacological activity, but not yet good enough to be the drug itself. It will undergo the following steps before a new drug emerges from it.

- Synthesize analogs of the lead compound
- Carry out structure-activity-relationship studies to identify the "pharmacophore"
- Optimize the structure of the lead compound (pharmacophore) to improve interactions with the target
- Determine toxicity and efficacy in animal models
- Determine pharmacodynamics and pharmacokinetics of the compound
- Patent the drug
- Continue to study drug metabolism and toxicity
- Design a manufacturing process
- Carry out clinical trials
- Market the drug

The process can be slow, inefficient, labour intensive and very expensive. There is also no guarantee that a lead compound would be chemically workable, patentable or even result in a new drug. Further, difficulty in isolating active compounds from extracts, lack of reproducible results, slow growth and sparsely distribution of species from which natural products are obtained, long resupply time for active extracts and problems with large scale supply if a drug emerges from natural sources were challenges that declined interest in natural products related drug discovery and development towards the end of the 20th century.

However, today there is renewed interest in natural products drug discovery and development. Research in to natural products drug discovery and development is coupled with modern methods involving novel technologies. It is utilizing smart screening methods and robotic separation with structural analysis. Natural products drug discovery and development has also become a multidisciplinary science by embracing diverse fields. One such field is computational chemistry. There is an ever-growing interest in applying computational power to combined chemical and biological space in order to streamline natural products drug discovery and development. Commonly used computational approaches include ligand-based drug design (pharmacophore, a 3-D spatial arrangement of chemical features essential for biological activity), structure-based drug design (drug-target docking) and quantitative structure-activity and quantitative structure-property relationships. These computer-aided approaches expedite and facilitate hit identification, hit-to-lead selection along with absorption, distribution, metabolism, excretion and toxicity studies of the drug. It is expected that computational tools for natural products drug

discovery and development will grow as the technology continues to evolve. All these coupled with untapped biological resources will enable new drugs to come to clinical trials and the market place more rapidly and with a higher rate of success.

Natural products have been an extremely productive source for new drugs in the past and will continue to do so in years to come.

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Indigenous Knowledge

Indigenous people are often the neglected wealth of the world. They collectively possess an abundant wealth of know-how and information gathered over a period of time that scans several generations and is the collective contribution of innumerable people from so many sources and generations. The indigenous people are the world's vulnerable as their knowledge is often at the mercy of the world's biopirates. These come in the form of wealthy organizations, private or as companies who rob the knowledge of indigenous people for a petty price. Exploitation is just a mild word to describe this crime. The knowledge includes that of plants their medicinal value, the cultivation methodologies the utilization practices and a whole bundle of knowledge that has been painstakingly gathered by the people over times that include the times of their forefathers and before. The knowledge that indigenous people pass down the generations is never documented, never acknowledged and rarely if ever recognized as such. A most noteworthy initiative from the United Nations Convention on Intellectual property Rights some years ago called on all member states to insist that any companies that acquire benefits from indigenous resources, to show that they had gained prior informed consent from indigenous communities before exploiting plants or crops for industrial purposes.

A UK government's former secretary for International Development Hilary Benn has indicated that his government helped to negotiated a satisfactory mandate for an international regime on access and benefit sharing. This is said to cover traditional knowledge and recognize the need for a balance between facilitating g access to a genetic resources and sharing benefits.

We wonder what other countries have done with regard to this.

GARCINIA – A TRADITIONAL SPICE, NOW A HEALTH FOOD

By Nadeesha Gunasekera, Dilmani Warnasuriya & R O B Wijesekera

Introduction

Garcinia – or, *Garcinia cambogia* to refer to it in its botanical name is a large or medium sized tree growing in the forests of southern India and Sri Lanka. In Sri Lanka it is known as a popular spice by the name of GORAKA, and it is used in everyday cooking to give a sharp astringent taste. In particular it is used to preserve small fish which generally accounts for what is termed the "bycatch" in the fisher nets, and the fish thus preserved with sea salt and segments of *garcinia* fruit dried and seasoned, forms a traditional favorite termed "Jaadi". Also a most favored delicacy in Sri Lanka, called *"ambul thiyal"* features a fish preparation with goraka. Besides these traditional fish delicacies not much has been known of the versatility of this tree until, in recent times, research has unfolded a multiplicity of benefits. Most significant among these is the recently observed capacity of an extract of the fruit to combat obesity. This fact alone has pushed the plant extracts into a premier position as a significant contributor as an aid to health. The spectacular effects as an anti-obesity factor are now scientifically attributed to the positive results obtained through animal studies. However, although capsulated products for weight control incorporating garcinia are available commercially, no credible human trials have been reported.

Fresh fruit

Ripe fresh fruit

Dried fruit

Botany & Distribution

Garcinia is the largest genus of the Clusiaceae - Guttiferae juss family comprising of 390 species. These polygamous trees or shrubs are mainly distributed in tropical Asia, Polynesia and Africa.

Other common names of Garcinia are, Goraka, Brindle berry, Malabar tamarind, gamboge, gorikapuli, uppagi, garcinia kola, among others.

Garcinia Tree showing leaves and fruit

Garcinia tree

Garcinia cambogia is a large or medium sized slender tree and when fully grown has a rounded crown and horizontal or drooping branches. The tree has a limited native global distribution, being restricted to India, Nepal, and Sri Lanka, but it has been introduced elsewhere where it is distributed in the subtropical region of Asia including China, Malaysia and the Philipines. These trees are found mainly in the semi-evergreen to evergreen forests of Southwest India, predominantly in the Western Ghats (Maharashtra, Karnataka, Kerala and Tamil Nadu), upto an altitude of 6000ft. This tree can grow on both hilltops and plain lands but grows best in dry or occasionally waterlogged or flooded soils in riverbanks and valleys. It is tolerant to fluctuating water tables and drought and does not need elaborate irrigation or use of fertilizers, pesticides or herbicides.

The fruits are round, oblong or oval with pointed tips and, are crowned by the four-parted stalkless stigma. When raw they are dark to light green in color and crimson red with a yellow tinge to dark violet or purple when fully ripe. The fruits are initially small and grow up to the size of a lemon. An average Garcinia tree bears hundreds of fruits and each fruit weighs around 21-85 g. The fruit contains three to eight large seeds covered with a whitish sweet pulp or aril. The seeds are placed in a pattern similar to that in orange. It flowers during the hot season and fruits ripen during the rainy season. The fruits are manually harvested, deseeded and the rinds sun dried and ground into powder. The rinds appear black in color, are shrunken and hard. Drying decreases the water activity required for the growth of microbes and concomitantly increases the shelf life of the rind. This helps in making the rinds available throughout the year for human consumption. *Garcinia cambogia* extract is the calcium salt of hydroxycitric acid (Both 50% and 60% hydroxycitric acids are available), which is obtained from the water extract of *Garcinia cambogia* fruit.

Geographical distribution of *Garcinia cambogia* indicating the native and exotic ranges. [1]

Chemical constituents

Garcinia cambogia has a formidable array of chemical compounds, many of which contribute to the beneficial health effects attributed to it. Phytochemical studies revealed the presence of alkaloids, flavanoids, phenolic compounds, saponins, tannins, carbohydrates and proteins . A few xanthones, benzophenones and organic and amino acids have been isolated from various parts of the plant.

Proximate composition of Garcinia rind

The rind contains the following

Moisture	80g/100gm
Proteins	1%
Tannin	1.7%
Pectin	0.9%
Total sugars	4.1%
Fat	1.4%

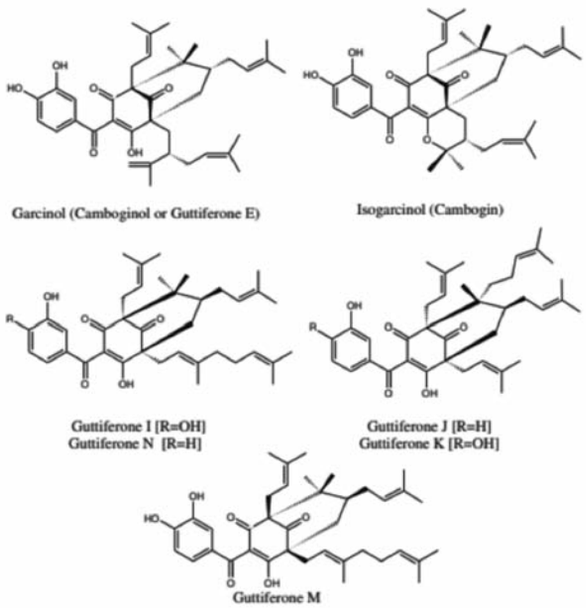

Fig.1 Benzophenones isolated from Garcinia

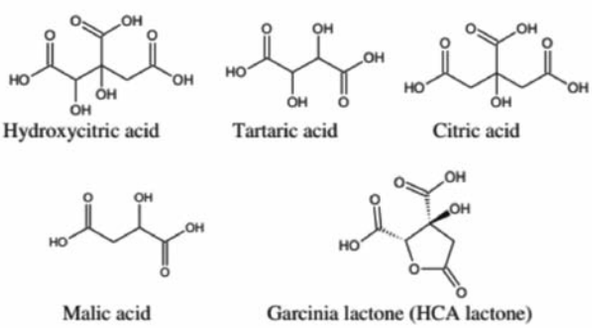

Fig.2 Organic Acids isolated from Garcinia

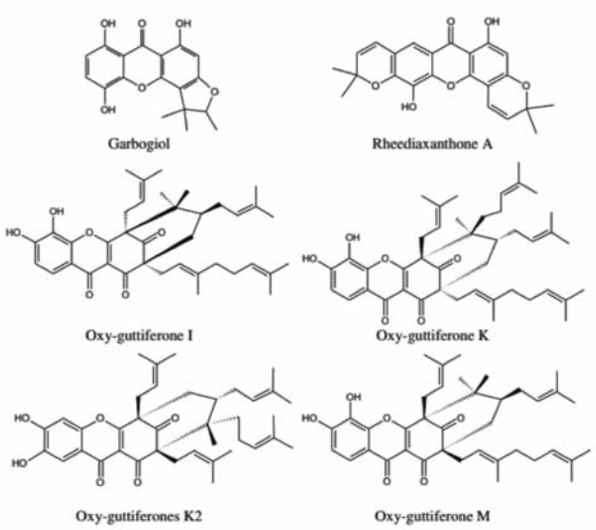

Fig.3 Xanthones isolated from Garcinia

Xanthones are a group of chemical compounds which have anti-oxidant properties and prevent a metabolic breakdown, helping the body to be rid of harmful free radicals. Flavanoids are usually found in most fruits, and are beneficial to the immune system and have anti-inflammatory and Anti-oxidant properties

But the most predominant compound present in Garcinia is HCA, an α-, β-dihydroxy tricarboxylic acid. and the active ingredient present in the fruit rind. This compound is said to be accountable for the weight-loss property for which the fruit is now renowned. The fruit contains approximately 10% to 30% HCA which can be isolated in the free form, as a mineral salt or as a lactone. The acid itself is soluble in water and alcohol and the free acid is relatively unstable and is converted into its lactone form. Chemically HCA is similar to the citric acid found in orange and other citrus fruits, and which provides the characteristic acidic taste. For consumer products, the free acid is stabilized by conversion to salts. Garcinia lactone was also isolated from salts of hydroxycitric acid. The chemical structures of organic acids reported from *G. cambogia* are given in Fig. 2

Reputed Health Benefits

The traditional health benefits attributed to Garcinia are recorded in the ancient texts of Ayurveda, and the plant is such an integral part of the Ayurveda system that it is recognized as being beneficial to several ailments of the human system. In particular it is used traditionally in the treatment of rheumatism, inflammatory ailments, bowel complaints, diarrhoea, dermatitis and a host of other disorders. However, in the Western world, its fame and popularity and possibly exploitation of the plant, came about with the realization that it could have spectacular effects on weight reduction. In other words, to prevent obesity. Obesity is said to be the cause of many health problems such as cardiovascular diseases, diabetes, digestive diseases and cancer. Tackling obesity may therefore be indirectly related to curbing other health problems as well. The active ingredient in Garcinia having anti-obesity effects is hydrocitric acid present in the rind. Owing to its significance and assigned importance, emphasis will be placed on the anti-obesity action of the fruit .

Mechanism of anti-obesity action

What is obesity and how is it caused? The main cause of obesity is that a person consumes more calories from food than he burns. What usually occurs in the body is that the body converts carbohydrates taken through meals into energy (ATP) and the excess carbohydrate that cannot be used at the time for energy, converts, into glycogen. Glycogen is thus a storage form of carbohydrate. This glycogen is deposited in the muscles and liver. When the glycogen stores are full, additional carbohydrates are then converted into fat and cholesterol using the enzyme ATP citrate lyase . This enzyme produces Acetyl CoA, which is required for fatty acid synthesis. What then is the role of HCA? HCA was shown to be a potent inhibitor of ATP citrate lyase. Thus, with the inhibition of this reaction, the availability of acetyl- CoA units required for fatty acid synthesis and lipogenesis during a high carbohydrate diet are limited. Hydroxycitric acid, the major component of the fruit is thus able to boost the body's metabolism and enhance the capability of burning fat. Furthermore, it raises the body's serotonin level suppressing the urge to feed. This added glycogen load in the liver also stimulates a longer lasting neurosignal from the liver to the brain indicating a fullness or satisfaction, thus helping to suppress appetite longer. HCA unlike caffeine is not a stimulant, nor is it an appetite suppressant both of which work directly on the nerve centres of the brain. Both stimulants and suppressants can have undesirable side effects. Instead HCA satisfies the body's need for energy and improves the signaling system that the body uses to send a message to the brain that it has eaten enough. In overweight persons, the relaying of this message is delayed, thus inducing them to eat more than is required.

Other Health related Effects

- **Hypolipidaemic Effect**

A significant lipid lowering effect has been observed with the intake of a garcinia extract and this could also be explained by the mechanism outlined above. Recent research has shown that *Garcinia cambogia* results on triglycerides, LDL and HDL levels could indicate that the extract lowers the bad cholesterol (LDL) and enhances the good cholesterol (HDL).

- **Anti-diabetic Effects**

Studies on rats shows a lowering of blood glucose levels and also lowered serum insulin level, leptin level and leptin/WAT ratio, while increasing glucose metabolism. This could be a positive prospect in the treatment of Type 2 Diabetes.

- **Anti-inflammatory effect**

Garcinia contains several compounds such as flavonoids showing anti-inflammatory effects and studies showed positive results.

- **Stress reduction and Mood regulation**

It has been observed that HCA used for anti obesity treatment worked best for those who overeat due to anxiety or stress. The hormone cortisol is known for being a stress hormone, and it has been postulated that garcinia might have the ability to regulate and reduce this hormone. It is also said to be effective for depression treatment, serotonin being the crucial component, with HCA supposed to raise the body's serotonin level

- **Treatment of Gastric Ulcers**

From ancient times, Garcinia has been used for the treatment of gastric ulcers . Studies have shown that this is probably due to garcinol , one of the plants constituents. Garcinoal lowers acidity in the stomach and protects the gastric mucosa.

Other sundry Health effects

Although convincing experimental evidence is not available, Garcinia has been long used in traditional medicine for treatment of rheumatic pains, bowel complaints, intestinal parasites and inflammatory ailments. It is employed as a purgative, hydragogue, anthelmintic and emetic. It is also used in veterinary medicine where a rinse is used to treat mouth diseases in cattle .

However, what must be borne in mind is that although much convincing evidence has been presented as to the rationality of the attributed health effects, most of the results obtained are through animal studies. More credence will be given to these claims once human experiments are conducted.

Toxicity of Garcinia Extracts

The use of garcinia as a condiment in flavoring in curries and as a food preservative is only too well known in the Asian region, including Sri Lanka . There have been some doubts as to its toxicity during regular use, but most of these complaints have been for multicomponent formulations and there is no reported toxicity of Garcinia itself, either as a food or as dietary supplement. This is only too obvious considering this long history of traditional use, where no adverse side effects, or acute nor chronic toxicity have been observed with *Garcinia cambogia* making it safe for human consumption. It has been shown that HCA is safer than citric acid.

However, with commercial supplements, in the case of pregnancy, breast feeding or infants, caution must be exercised and medical recommendations are needed before consumption.

Commercial Products

Several commercial products of *Garcinia cambogia*/(HCA) as a nutraceutical, to serve as a weight loss supplement are being sold, particularly in the West. They are sold as OTC

products. The major, markets are US, followed by Japan and Europe. Garcinia supplements are usually combined with chromium. Chromium is a mineral that is often lacking in diets during aging, and a chromium deficiency has been identified as a factor that can contribute to weight gain and possibly diabetes. The two seem to work synergistically to regulate the body's sugar levels

Supplements are available in tablet or capsule form, powders, biscuits , extracts and even snack bars. These supplements are usually standardized to contain fixed amounts of HCA. The usual dosage for garcinia is 300-500 mg tablets taken three times daily before meals. To achieve best results from the supplements, a preparation that has minimum 50% HCA and not composed solely of Ca salts, should be selected, making sure that K and or Mg are present. Low lactone content is also preferable.

Other Uses

The culinary uses of Garcinia have been described in a preceding section. Other than such traditional uses, ripe rinds are ground in blender with sugar and cardamom and consumed as a cooling drink . They are usually prepared as concentrates which require dilution. In Goa, garcininia is used to prepare wines.

The juice or sherbet made from the rind is used as a treatment for piles, colic problems, sores and dermatitis, diarrhoea, and also to prevent over perspiration.

It is also used as a substitute of Kokum butter (from *Garcinia indica*) and as a common additive to make meals more filling. HCA is available on the market in the form of its various salts such as calcium, magnesium and potassium as well as their mixtures.

Quite apart from its health related use and its employment as a food additive the rind is used to polish gold and silver ornaments, and as a substitute for acetic acid for the coagulation of rubber latex . The gum is used as a varnish and the resin used as a pigment in water colours.

It is also used as a cosmetic ingredient since, Garcinia fat is rich in oleic acid and this exhibits a good emollient feeling.

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STORY OF MINT

Many of the plant materials used for traditional medicines, cosmetics and other purposes from time immemorial, are associated with quaint folklore, and make interesting reading. Mint, is no exception, and the story behind the origin of Mint is a Greek myth. Minthe, was supposed to be a nymph of the rivers, streams and lakes and her youthful looks and beauty had bewitched the God of the underworld Hades. Persephone, his wife, and a powerful Goddess herself, riddled with jealousy turned the nymph into a herb and Hades who had no power to reverse the spell, added the fragrance. Minthe's presence and scent were then widespread and used in many Greek rituals including funeral rites to counter the scent of decay. Today, mint is used extensively in both culinary, medicinal and cosmetic preparations, and in flavoured and fragranced products. Its cooling properties accounts for much of its popularity. The most widely known use of mint, particularly in America and Europe, is in oral care products, where it has an effect on tartar / plaque control, sensitivity and whitening. Despite its universal use today, it is surprising that it was recognized as a valuable commodity only in the late 17th century.

Perfumer & Flavourist, Vol.43, June 2018

CANNABIS SATIVA – A VICTIM OF PREJUDICE

*By Dr Upatissa Pethiyagoda.**

There are two species of the Genus Cannabis :- *C. sativa,* and *C. indica.* It belongs to the Family Cannabaceae (Order Rosales). It is an annual, dioecious herb. It has twin uses - as fibre and for its psychotropic properties. All parts of the plant have neuro-stimulants, with the flowers being the most potent.

I know of no other plant that has so many synonyms (recorded to be 220!) – Marijuana, Ganja, Hashish, Weed, Pot, Hemp, Grass, Bhaang, The Sacred Plant being among the commoner ones. The last is the most intriguing and possibly a tribute to its many reported beneficial properties.

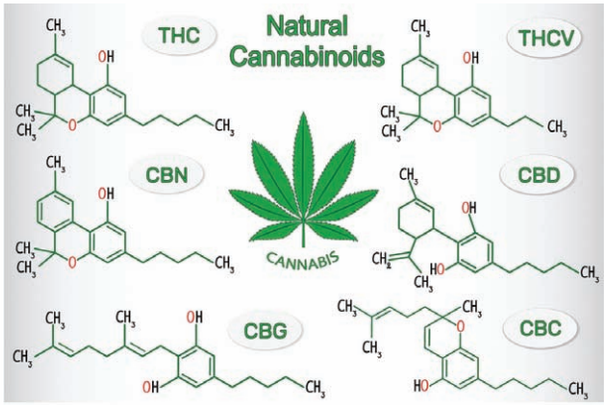
The use of Cannabis is believed to have preceded recorded history. Its use as Hemp fibre dates back to about 8,000 B.C when it was discovered as fibre used as a binder in pottery in China. By around 2,700 B.C, it is believed to have been used in Medicine, while by 2,000 B.C. it was used in ancient Hindu rituals in India and acquired the name of "The Sacred Plant". Galen the Greek Physician (130-200 A,D) included it in his Pharmacopeia. In more recent times, it has been recognized in Ayurvedic Medicine and has been used as a meat tenderizer and as a stimulant in beverages and smokes. A hundred years ago, Cannabis preparations, from the most prestigious Pharmaceutical firms, were available. With the Prohibition Law in the US 1937, a change came about with Marijuana being declared a "prohibited substance". From about the mid-nineties, its medical values were "re-discovered".

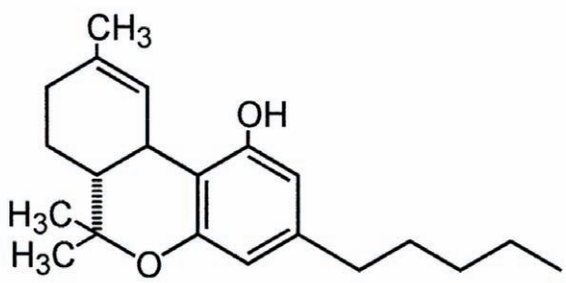
However many, including myself, have been biased in our opinion of this plant largely because of its association with narcotics, believed to cause addiction. Sri Lanka is particularly sensitive in view of its unsavoury reputation as a major transit point for World traffic of such substances as Heroin and other opiates. This is further aggravated by involvement in the past role of narcotics in the smuggling operations of the LTTE.

An important distinction, often overlooked is that while derivatives of Opium (Opiates or Opioids) such as Heroin, Morphine and Codeine are recognized as narcotics with serious side effects and addictive properties. Those derived from Cannabis (Cannabinoids) are without serious side-effects and claimed to be non-addictive except when used in large amounts and over a long period. More seriously, its use is feared as possibly leading to indulgence in the more harmful opioids, as a "Gateway Drug". In reality, Marijuana has use as an "Exit Drug" – useful in weaning away persons addicted to more harmful narcotics.

A massive change in attitudes occurred in the discovery, in the mid-nineties, of an endogenous Endocarbinoid system with receptors, principally in the brain as well as in the peripheral nervous system, and being widely

*Note by Editor. Our correspondent is an eminent and active researcher, who retired from a career at the state sector as Director of the Coconut Research Institute.





Δ-9-tetrahydrocannabinol (THC)

considered to be involved in intercellular communication. The major role of exogenous Cannabinoids is believed to act as supplements to this system, thus restoring a balance, which exerts multiple effects including mood enhancement and pain relief.

The confusion surrounding marijuana has unfortunately led to ambiguities (even absurdities) in Law enforcement. It is more than likely that the stigma attached to Marijuana products, which have already been legalized in several US States and several other countries including France, Italy, Germany, The Netherlands, Mexico etc , for medicinal as well as "recreational" use, may soon result in universal liberalization. Cannabis is deemed to be far safer than tobacco and alcohol. Ambiguity in respect of addiction (or dependence) and progression to "harder" and more dangerous intoxicants, manifests as inconsistencies and even absurdities in law enforcement. A striking example is the US, where some States have legalized Cannabis for medical and even recreational use, while it is totally or partially banned in others. Naturally, this has led to some curious absurdities such as interstate smuggling, prescription or even re-location of residences by those desperately seeking medical use. It does not figure in Federal Law and is limited to State Legislatures. More seriously, it has impacted on clinical studies involving humans, resulting in heavy reliance on animal trials and anecdotal evidence. Locally, the Law enforcement bodies display great enthusiasm in raiding and destroying Ganja plantations. Judging from the clearly luscious growth of the seizures, we may well be denying ourselves of a possibly lucrative export crop! Relating to this, I may anecdotally relate the story of a schoolmate who had just been recruited by the Police as a Sub-Inspector, said he: "Some think that my aspiration would be to end up some day as the IGP. Not so, my ambition are much higher – to some- day be the OIC, Hambegamuwa !". I have never ceased to wonder, why?

Perhaps as a result of recently re-acquired respectability, there has been a remarkable explosion of scientific interest. Dozens of books, scores of peer-reviewed articles in accredited journals and many popular presentations have appeared. There is hardly any plant in dietary or therapeutic use, that has been more comprehensively studied.

There are several features that will ensure that research interests will continue interminably. Some of them can be listed. The main bio-active compounds are hundreds of Cannabinoid derivatives, dozens of Terpenoids, Flavonoids and some vitamins. Compositions and ratios vary among several sub-species, strains and cultivars (eg "Kerala" Ganja). The bewildering range of Cannabinoids are identified by acronyms. The main ones are THC and CBD, often with markedly different actions and acting synergistically or as antagonists. While THC has psychoactive properties, CBD is predominantly medical. THC and its derivatives can produce "Highs", while those of CBD do not. While all parts of the plant contain Cannabinoids, the Hemp cultivars have the lower Cannabinoid contents. There is a range of Cannabis

presentations for medical use – fresh pastes (of which the local preparation "Madhana Modaka" is probably one), juices, food additives, as dried powders, tablets, capsules, oils, tinctures, aerosols and as sprays (dispersed in a range of solvents including ethanol, butanol, Olive and Coconut oil). Administration is by oral, sublingual, dermal (salves), as suppositories, smokes and mouth or nasal sprays. The most effective method depends on the condition being treated and individual preference.

As would be expected for a herbal cure, only recently relieved of its image as a narcotic and thus an unsavoury substance of abuse, there is a paucity of formal trial results. There is however a torrent of anecdotal evidence from experiences of those who have obtained spectacular relief from Cannabis or its preparations. There is supportive, formal evidence from controlled animal studies, especially in relation to cancerous tumour growth. The list of ailments for which Cannabis has provided relief is astonishing and justifies the name "Miracle Plant". From its initial use for pain relief, subsequent experiences have shown value in treatment of Cancer, Epilepsy, Convulsions, Cardiac ailments, Auto-immune diseases, HIV, Multiple Sclerosis, Parkinsonism, Glaucoma, Migraine, Rheumatism, Insomnia, Depression, Diabetes, as a Bone Stimulant and with anti-bacterial, anti-virus and anti-fungal activity. It is however not a "Cure All" Drug and precise formulations, dosages and treatment durations are claimed to be patient specific. Interestingly, some treatments are even supported by information from DNA sequencing. Several branded chemical products are available in legally permitted countries and States. They cover a broad range of derivatives and mixtures tailored for different uses.

The entry of Institutes in Israel to supplement research in respected US Universities, has yielded an enormous amount of information, making *Cannabis sativa* one of the best researched plants.

Perhaps because of our antiquated conservatism, by destroying Ganja plantations, we may be robbing ourselves of a virtual treasure. It also thrives in regions such as Moneragala and Bibile where other crops would find conditions inhospitable. It would also be timely for a global research programme to be launched on Cannabis, using the vast amount of literature available.

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"Let thy food be thy medicine and thy medicine be thy food."

- Hippocrates (460-377 B.C.)

ASIAN SYMPOSIUM IN MEDICINAL PLANTS, SPICES AND OTHER NATURAL PRODUCTS

By Veranja Karunaratne, Chair, ASOMPS XVI

The Sixteenth Asian Symposium in Medicinal Plants, Spices and Other Natural Products (ASOMPS XVI) held its sixteenth meeting in Colombo, Sri Lanka from 12-14th Dec. 2018 at the BMICH and Galadari hotel under the overall theme: "Importance of endemic and lower plants for discovery of natural medicines in times of climate change".

ASOMPS, is a 57-year-old organization, and it was a privilege to host this conference after 41 years. ASOMPS XVI was the third such conference held in Sri Lanka. Natural Products Chemistry research became a pioneering scientific activity in the past considering the island's rich biodiversity, nearly 25% of its flowering plants being endemic. Therefore, the conference galvanized the excitement and interest of Sri Lanka's chemistry/medical and biology research community.

This international symposium was a multidisciplinary event covering all the major areas of natural product chemistry. It highlighted current trends, successes and challenges, and covered overarching societally-critical topics in the field of natural products. Main objectives of this international symposium was to provide a platform for scientists from all over the world and from diverse bodies in Sri Lanka to network and engender novel research ideas and promote collaborations for the advancement of natural product sciences. Furthermore, the symposium provided a launching pad for the next generation of young natural products chemists so as to ensure that succession planning was in place.

This event was followed by the 5th National Workshop on Lichens, 2018, conducted at the Royal Botanic Gardens, Peradeniya from 17-19th of December.

Conference areas were as follows:

- Ethnomedical uses, botany, chemistry (including metabolomics), biology, clinical aspects (safety, efficacy) of plant, marine, microbial and animal based natural products.
- Biodiversity, biogeography, taxonomy and bioactivity of tropical lichens.
- Evidence-based approaches grounded in indigenous knowledge to combat diseases using natural products, important to healthcare practitioners, producers, and patients.
- Application of nano and advanced technologies to plant extracts, natural products, spices and essential oils in the production of nutraceuticals and cosmeceuticals.

The symposium embraced a total number of 278 participants including eminent academics, scientists and industrialists. Out of the total number of participants 41 were foreign delegates while 226 were local delegates. The chief guest at the inauguration was the National Research Council Chairman Prof. Janaka De Silva. At the inauguration ceremony the special guest lecture and inaugural lecture were delivered by Prof. Atta ur Rahman and Prof. Raymond Andersen, respectively. The plenary speakers Prof. S Seneweera, Prof. Iqbal Choudhary, Ms. P. Wolsely, Dr. De-an Guo, Prof. V. Rukachaisirikul, Prof. Banasri Hazra and Prof. V. Tillekeratne delivered their respective addresses at the technical sessions. In addition, there were 11 keynote addresses, 10 invited lectures, 88 oral presentations and 100 poster presentations.

* Professor, Department of Chemistry, University of Peradeniya & Vice chancellor SLINTEC ACADEMY

Asian Symposium for Medicinal Plants, Spices and Other Natural Products (ASOMPS XVI), 2018 recognized the outstanding contributions made by the following ten scientists in Natural Products Chemistry, Biotechnology and Biodiversity Conservation through Lifetime Achievement Awards.

Dr. R. O. B. Wijesekara, Former Head, Natural Products Division, ITI, Former Consultant UNIDO, Director/Consultant, Link Natural Products

Prof. Savitri Kumar, Emeritus Professor, Department of Chemistry, University of Peradeniya & Research Professor NIFS

Prof. C.V.S.Gunatilleke, Professor Emeritus, Botany Department, University of Peradeniya

Prof. Vijaya Kumar, Emeritus Professor, Department of Chemistry, University of Peradeniya, Chairman, Board of Governors / NIFS

Prof. S. Sotheeswaran, Former Professor, Department of Chemistry, University of Peradeniya, Emeritus Professor of the University of the South Pacific

Prof. I. A. U. N. Gunatilleke, Professor Emeritus, Botany Department, University of Peradeniya

Professor E. R. Jansz, Former Head, Natural Products Division, ITI, Professor Emeritus, Department of Biochemistry, University of Sri Jayawardenepura

Professor Eric Karunanayake, Founder Director, IBMBB, Former Chairman, NRC

Ms. Patricia Wolseley, Lichenologist, The British Natural History Meusem, London, Pioneering Sri Lankan Lichen Researcher

Prof. Tuley de Silva, Emeritus Professor, Department of Chemistry, University of Sri Jayawardenapurs, Former Consultant, UNIDO, Director, Link Natural Products

Prof. M. Mahendran, Former Professor Department of Chemistry, University of Colombo

The grand finale of ASOMPS XVI was the first time award of the **Finn Sandberg medal for excellence in research** awarded to Dr. R. O. B. Wijesekara (Sri Lanka) and Prof. Dr. Atta ur Rahman, F.R.S. by Dr. Barry N Noller, Chair International Advisory Committee, Asian Symposium on Medicinal Plants and Spices.

Dr. R. O. B. Wijesekara and Prof. Atta ur Rahman with Dr. Barry Noller after the receiving the Finn Sandberg medals for excellence in research

THE EFFECT OF THRIPHALA, A HERBAL AYURVEDA FORMULATION, ON SERUM LIPIDS, IN PATIENTS ON A MAINTENANCE DOSE OF ATORVASTATIN FOR HYPERLIPIDAEMIA : A RANDOMIZED CONTROLLED TRIAL

By R A I Ekanayaka[1], A D C S Rupasinha[2], M R Sooriyarachchi[3], C Goonaratna [4] Abstract

Abstract

Introduction : Thriphala, a herbal medicinal formulation, is a bedrock of Ayurveda therapeutics with many postulated benefits.

Objectives : We performed a clinical trial to test the effects of Swastha Thriphala ®, a proprietary preparation of thriphala, on serum lipid parameters in patients receiving atorvastatin.

Methods : Consenting adults receiving a maintenance dose of atorvastatin 10 mg (Atorlip®) daily from a clinic of the Institute of Cardiology, National Hospital of Sri Lanka for lipid regulation, were randomly assigned, after counselling, to receive either the proprietary herbal medicinal product Swastha Thriphala® (Treatment Group, n= 101) or a placebo (Control Group n= 97), at the stipulated dose daily, for three calendar months.

Results : In the treatment group (n=101) the addition of a proprietary preparation of thriphala formulated as caplets of Swastha Thriphala®, in the standard daily dosage for three months, as an adjunct to atorvastatin 10 mg, made a significant reduction in the mean total blood cholesterol ($p<0.0001$), mean cholesterol / HDL ratio ($p<0.0001$), and mean non - HDL- cholesterol ($p<0.0001$) when compared to the Control Group (n=97) receiving placebo caplets in the same daily dose, with atorvastatin 10mg, for the same period. In the Treatment Group mean HDL, LDL, HS-CRP, and triglyceride concentrations showed non-significant reductions, and non-significant elevations in the Control Group.

Conclusions : Swastha Thriphala® when used in the stipulated dosage as an adjunct to atorvastatin 10 mg daily, significantly enhances its cholesterol reducing action in patients. The use of Swastha Thriphala® as single therapy for lipid regulation, and the mode of its action deserve investigation.

1 - Institute of Cardiology, National Hospital of Sri Lanka, 2 - Link Natural Products (Pvt) Ltd.,
3 - Department of Statistics, University of Colombo and 4Ceylon Medical College Council, Colombo, Sri Lanka.

Correspondence: CG, E-mail: <si7np5e@gmail.com>. Received 19 November 2016 and revised version accepted 19 March 2017.

Introduction

Hyperlipidaemia is a serious problem of epidemic proportions worldwide as one of the major risk factors for cardiovascular disease [1]. Cardiovascular disease is the leading cause of morbidity and mortality in the world [2]. Combined with lifestyle modifications, lipid-regulating medication is a key component of both primary and secondary prevention of cardiovascular disease. Statins are the undisputed first-line drugs for lipid-regulation [1]. Statins provide a high level of efficacy and effectiveness with acceptable affordability. However, they have a large number of side-effects such as muscle cramps and myalgia (which are relatively frequent but mild), and others such as myositis, myopathy, rhabdomyolysis, altered liver function, jaundice and hepatitis, that are less common or rare, but problematic [1,2,3].

The primary rationale for our study derives from a major recent WHO publication that has emphasized the need for robust research and clinical trials to evaluate herbal medicinal products, noting that they have been, and are, a valuable source of potentially useful remedies [4]. We have been encouraged also by the fact that at least four successful clinical trials with Sri Lankan Ayurveda medicinal products have been recently published in prestigious journals [5,6,7,8].

Several promising Ayurveda herbs and herbal preparations such as cinnamon (*Cinnamomum verum*) and garlic have produced significant reductions in total serum cholesterol (TC) and low-density lipoproteins (LDL), with or without an increase of high density lipoproteins (HDL), in both human and experimental animal studies [9-12].

In a study in experimentally induced atherosclerosis in rabbits, formulations of three herbal products reduced not only blood cholesterol and other lipids, but also cholesterol content in the liver and plaques in the aorta and coronary arteries [13]. The three herbal components tested in this study were the dried fruits of *Terminalia chebula* (Sinhala: Aralu), *Terminalia bellerica* (Sinhala : Bulu), and *Phyllanthus emblica* (Sinhala : Nelli). These three fruits are the components of thriphala, a several centuries old herbal preparation, which is a cornerstone of Ayurveda therapeutics. Thriphala, as well as its individual components separately, have shown significant hypolipidaemic properties in human volunteers, as noted in a recent monograph [14].

Thriphala has been described in the ancient Ayurveda text Charaka Samhitha, circa BC 1500, as a thridosa rasayanaya, meaning a beneficial formulation for harmonizing the three humours (or constitutional elements) in the Ayurveda system of medicine, namely vata, pitta and kapha [15]. Its major benefits are described as harmonizing gastrointestinal and hepatic functions, retarding the ageing process, promoting longevity, and the maintenance of good health [16].

Recent scientific studies have shown that thriphala has promising free radical, scavenging, antioxidant, anti-inflammatory, antipyretic, analgesic, antibacterial, and anti-stress effects. These studies have validated many of the properties claimed by historical evidence and the more recent ethnomedical studies [17].

We chose thriphala, formulated as caplets in the proprietary preparation Swastha Thriphala ®, for our study because of its convenience in use, and because its consumption locally, both as a prescription medicine and as an over-the-counter medicine, is over 10 million caplets annually.

The primary objective of our study was to see the effects of the proprietary Ayurveda formulation Swastha Thriphala® on blood lipids

when used as an adjunct to atorvastatin in patients requiring lipid regulation. The secondary objectives were to assess compliance of participants to the said Ayurvedic formulation, and its incidence of side-effects.

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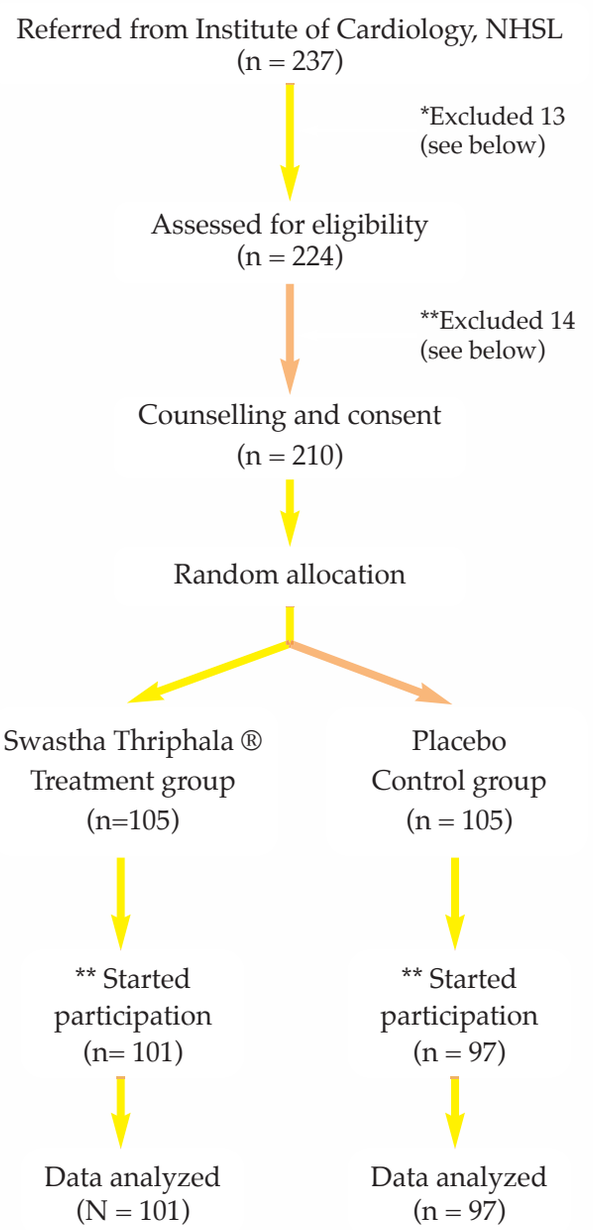
Figure 1.
Study flow diagram



* Excluded n=13 : Reasons : had exclusion criteria
**Excluded n=14, and at a later stage,
4 and 8 participants for domestic/personal reasons unconnected with the study protocol.

The year 2100 will see eugenics universally established. In past ages, the law governing the survival of the fittest roughly weeded out the less desirable strains. Then man's new sense of pity began to interfere with the ruthless workings of nature. As a result, we continue to keep alive and to breed the unfit

- Nikola Tesla

Science means constantly walking a tightrope between blind faith and curiosity; between expertise and creativity; between bias and openness; between experience and epiphany; between ambition and passion; and between arrogance and conviction - in short, between an old today and a new tomorrow.

- Heinrich Rohrer

Once you have an innovation culture, even those who are not scientists or engineers - poets, actors, journalists - they, as communities, embrace the meaning of what it is to be scientifically literate. They embrace the concept of an innovation culture. They vote in ways that promote it. They don't fight science and they don't fight technology.

- Neil de Grasse Tyson

Table1. Study population details

Variable	Treatment Group	Control Group	Significance *P* value
Male (n)	60	64	
Female (n)	41	33	
Age (years) mean ± SD	58±7.9	58±6.6	0.64
Age (years) range	35-69	42-70	
Height (cm) mean ± SD	155.5±8.6	156.4±7.9	0.41
Height (cm) range	135-175	140-177 .5	
Body Mass Index (kg/M^2)	25.3±4.2	26.4±4.2	0.06

Table 2. Relevant comorbidities in treatment and control groups

	Treatment Group	Control Group
Primary hypertension only (males)	30	32
Primary hypertension only (females)	19	16
Primary hypertension and diabetes (males)	19	20
Primary hypertension and diabetes (females)	14	12
Primary hypertension, diabetes and stable angina (male)	11	12
Primary hypertension, diabetes and stable angina (females)	8	5
Total	101	97

Table 3. Duration of atorvastatin therapy at entry to trial

Duration (Days)	Number of participants (n=198)
< 7	19
8 - 14	27
15 - 21	31
22 - 28	31
29 - 35	30
36 - 42	31
43 - 49	11
50-56	7
57-63	7
⩾ 64	4

Hope for the Obese

Obesity is a fast increasing condition seen in both male and female subjects today. Although much deprecated by the sufferers, the reduction of weight poses a severe problem, substantiating the common saying 'the spirit is willing but the flesh is weak.'

Any simple way of weight reduction other than strenuous exercise and stringent diets will thus be hailed with glee.

"The person who takes medicine must recover twice, once from the disease and once from the medicine."

- William Osler, M.D.

Table 4. Summary of laboratory data of participants: Control Group

	Variable	At recruitment		At 3 months		t value	Recruitment vs. three Months *P* value (α =0.05)
		Actual data (Mean ± SD)	Log transformed data (Mean ± SD)	Actual data (Mean ± SD)	Log transformed data (Mean ± SD)		
1	Mean total cholesterol (mg/dL)	164.4 ± 34.8		167.49 ± 34.0		1.09	0.279
2	Mean HDL (mg/dL)	47.7 ± 14.6		49.3 ± 44.5		0.35	0.72
3	Mean LDL (mg/dL)	89.6 ± 25.9		92.4 ± 27.5		1.02	0.31
4	Mean Non-HDL cholesterol (mg/dL)	116.7 ± 35.6		122.5 ± 34.9		-1.97	0.05
5	Mean triglyceride (mg/dL)	117.9 ± 61.6		122.8 ± 55.1		0.87	0.38
6	Mean total cholesterol/HDL	3.72 ± 1.54		3.88±1.24		-0.98	0.33
7	Mean HS-CRP (mg/L)	1.62±1.99		2.38 ± 4.72		-1.54	0.13
8	Mean AST (IU/L)	28.0 ± 12.7		27.0 ± 11.7		-0.96	0.34
9	Mean fasting blood glucose (mg/dL)*	116.6 ± 40.8	4.71 ± 0.28	117.1 ± 41.5	4.71 ± 0.28	-0.21	0.83
10	Mean creatinine (mg/dL) *	1.02 ± 0.29	-0.02± 0.28	1.01 ± 0.26	-0.02 ± 0.26	0.24	0.81
11	Mean ALT (IU/L)*	52.3 ± 25.1	3.88 ± 0.36	50. 6 ± 21.8	3.86 ± 0.32	0.65	0.51
12	Mean alkaline phosphatase (IU/L) *	93.6 ± 27.5	4.50 ± 0.28	89.3 ± 25.7	4.45 ± 0.28	2.31	0.02
13	Mean gamma GT (IU/L) *	44.6 ± 27.6	3.63 ± 0.56	42.5 ± 26.1	3.60 ± 0.53	1.46	0.15
14	Mean bilirubin (mg/dL) *	0.81 ± 0.40	-0.31±0.44	0.78 ± 0.40	-0.36 ±0.45	1.98	0.05

Notes: * Parameters transformed to log scale to achieve normal distribution. HS-CRP= Highly sensitive C-reactive protein; AST=Aspartate aminotransferase; ALT = Alanine aminotransferase; HDL = High density lipoprotein; LDL= Low density lipoprotein.

Table 5. Summary of laboratory data of participants. Treatment Group

	Variable	At recruitment		At 3 months		t value	Recruitment vs. three Months *P* value (α =0.05)
		Actual data (Mean ± SD)	Log transformed data (Mean ± SD)	Actual data (Mean ± SD)	Log transformed data (Mean ± SD)		
1	Mean total cholesterol (mg/dL)	175.1 ± 32.1		153.1 ± 27.5		-8.79	< 0.0001
2	Mean HDL (mg/dL)	48.3 ± 13.7		48.2 ± 14.5		-0.15	0.88
3	Mean LDL (mg/dL)	86.5 ± 24.2		84.0 ± 19.9		-1.18	0.24
4	Mean Non-HDL cholesterol (mg/dL)	126.7 ± 30.7		104.8 ± 27.0		8.85	< 0.0001
5	Mean triglyceride (mg/dL)	108.4 ± 53.3		104.8 ± 47.9		-0.81	0.42
6	Mean total cholesterol/HDL	3.801 ± 1.06		3.386 ± 0.94		-5.9	< 0.0001
7	Mean HS-CRP (mg/L)	2.34 ± 2.78		2.31 ± 2.44		-0.10	0.92
8	Mean AST (IU/L)	31.1 ± 15.0		30.4 ± 16.4		-0.63	0.53
9	Mean fasting blood glucose (mg/dL)*	112.7 ± 36.2	4.68 ± 0.27	113.3 ± 37.4	4.68 ± 0.27	-0.27	0.78
10	Mean creatinine (mg/dL) *	0.98 ± 0.27	-0.05± 0.26	0.97 ± 0.25	-0.06 ± 0.25	0.71	0.48
11	Mean ALT (IU/L)*	49.4 ± 16.6	3.85 ± 0.28	50.5 ± 15.9	3.87 ± 0.28	-0.97	0.33
12	Mean alkaline phosphatase (IU/L) *	98.7 ± 26.9	4.56 ± 0.26	93.9 ± 26.5	4.50 ± 0.27	2.93	0.004
13	Mean gamma GT (IU/L) *	41.1 ± 25.9	3.63 ± 0.59	40.2 ± 23.0	3.61 ± 0.59	1.05	0.29
14	Mean bilirubin (mg/dL) *	0.79 ± 0.37	-0.34± 0.44	0.83 ± 0.54	-0.32 ±0.40	-0.53	0.60

Note: * Parameters transformed to log scale to achieve normal distribution. HS-CRP= Highly sensitive C-reactive protein; AST=Aspartate aminotransferase; ALT = Alanine aminotransferase; HDL = High density lipoprotein; LDL= Low density lipoprotein.

Table 6. Summary of laboratory data of participants: Treatment Group vs Control Group

	Variable	Mean at 3 months-mean at recruitment	Mean at 3 months-mean at recruitment	t value	Treatment Group vs Control Group *P* value
1	Total cholesterol (mg/dL)	-22.000	3.124	6.583	<0.0001
2	HDL (mg/dL)	-0.117	1.659	0.366	0.357
3	LDL (mg/dL)	-2.521	2.742	1.527	0.063
4	Total Non-HDL cholesterol (mg/dL)	-21.881	6.061	-8.040	<0.0001
5	Triglyceride (mg/dL)	-3.574	4.814	1.180	0.119
6	Total cholesterol /HDL	-0.416	0.180	-3.330	<0.001
7	HS-CRP (mg/L)	-0.020	0.770	-1.380	0.169
8	AST (IU/L)	-0.700	-1.000	-0.129	0.551
9	Fasting blood glucose (mg/dL)*	0.000	0.000	0.000	1.000
10	Creatinine (mg/dL) *	-0.009	-0.005	0.172	0.864
11	ALT (IU/L)*	-0.024	0.0143	-1.160	0.247
12	Alkaline phosphatase (IU/L) *	0.051	0.041	0.454	0.650
13	Gamma GT (IU/L) *	0.020	0.030	-0.223	0.823
14	Bilirubin (mg/dL) *	-0.015	0.050	-1.719	0.087

Notes: * Parameters transformed to log scale to achieve normal distribution. HS-CRP= Highly sensitive C-reactive protein; AST=Aspartate aminotransferase; ALT = Alanine aminotransferase; HDL = High density lipoprotein; LDL= Low density lipoprotein.

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Agriculture is not crop production as popular belief holds - it's the production of food and fibre from the world's land and waters. Without agriculture it is not possible to have a city, stock market, banks, university, church or army. Agriculture is the foundation of civilization and any stable economy.

- Allan Savory

Great scientific discoveries have been made by men seeking to verify quite erroneous theories about the nature of things.

~ Aldous Huxley,
"Wordsworth in the Tropics"

RUELLIA TUBEROSA AND THE GASTRO PROTECTIVE ACTIVITY OF ITS ROOTS

L.S.R. Arambewela[1], R. Thambagala[1] and W.D. Ratnasooriya[2]

Introduction

Ruellia tuberosa Linn. (Family Acanthaceae S, Heen Amukkara, Wal Amukkara, Nil Puruk Wal Puruk) is an exotic plant to Sri Lanka that is native to Central America and now naturalized throughout the wet and dry zones in the country. It grows among grasses on roadside drains, grasslands etc. flowering throughout the year. It is commonly considered as a weed in Sri Lanka but, some use it as a medicine. Traditional practitioners widely used *Ruellia tuberosa* as a cheap substitute for *Withania somnifera*, the leaves of this plant are used as diaphoretic, and roots as emetic and febrifuge in W. Indies [4]. It is also used for ruminants in Trinidad and Tobago[9]. It is employed as a substitute for ipecacuanha and also used for the treatment of stones in the bladder. A decoction of the leaves is given in chronic bronchitis[5].

Ruellia tuberosa

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Roots are used as aphrodisiac[10] and to treat weakness in semen[12]. The roots are also used in tea for oliguia , heat, flu; in tisanes and infusions for venereal diseases and constipation[14]. Bronchodilatory[6] and reverse transcriptase inhibition[16] activities have been observed in the aerial parts of *R. tuberosa*. The roots are reported to possess steroids such as campesterol, β-sitosterol, stigmasterol, triterpenes such as lupeol[3] and alkaloids[15]. Several flavonoids such as apigenin, malvin, luteolin, cosmosioside, guadoside and rhoifolin are reported[11] from aerial parts of this plant. This plant is sometimes used as a substitute for *Withania somnifera* and Ayurvedic Physicians claim that the roots of this plant possess gastroprotective activity. This study was therefore carried out using rat ethanol-induced gastric lesion model to test the validity of this claim.

Materials and methods

Plant Materials

R. tuberosa plants were collected form Mirigama, Sri Lanka and the identity were authenticated by Prof. R. Wijesundara, Department of Botany, University of Colombo.

The tubers were shade dried and finely powdered. 200g of the powdered root was mixed 500ml distilled water (DW) and refluxed for about 5 hrs. The resultant extract was filtered and the filtrate was evaporated under reduced pressure until a dark brown paste was obtained (yield, 10%). This paste was dissolved in DW to obtain desired concentrations (470, 940 and 1880mg/kg CE) for oral administration.

Test animals

Adult cross-bred male albino rats (200-250g) were used. They were housed individually in raised mesh bottom cages (to prevent coprophagy) under standardised animal house conditions with free access to pelleted food and tap water.

Evaluation of gastroprotective activity

Food was withheld for 36h and water for 24h in 28 rats before the commencement of the investigation. These rats were randomly divided into 4 groups (n=7) and treated orally in the following manner : group 1, with 1ml DW; 2, with 1 ml of 470mg/kg CE; 3, with 1ml of 940mg/kg of CE; and. 4, with 1880mg/kg of CE. 30 min later, gastric ulcers were induced in these rats with absolute ethanol[13]. The animals were killed 1h later, their stomachs were excised, slit opened and length of linear haemorrhagic lesions in the glandular portion was determined and was summed per stomach[13].

Fourteen rats were orally treated with 10mg/kg of indomethacin, and randomly divided into two equal groups. One group was orally treated with 1% methyl cellulose and the other with 1ml of 1880mg/kg of CE. 30 min later, gastric lesions was induced, and length of linear haemorrhagic lesions were determined[13].

Assessment of quantity of mucus adhered to gastric mucosa

This was determined in rats treated orally either with 1ml of DW (n=7) or 1ml of 1880mg/kg of CE. Mucus content was estimated using Alcian blue technique as described by Corn et al, 19748.

Toxicological assessment

LD50 value was determined using [36] rats as described by Yamanaka et al. 1980[17].

18 rats were randomly divided into two equal groups. One group was orally treated with 1ml DW and the other with 1880mg/kg of CE daily for 30 consecutive days. During this period rats were observed for overt signs of toxicity, water and food intake and diarrohea. On day 1 post treated, blood was collected from tail under ether anaesthesia. Part of this blood was used to determine RBC, WBC counts, Hb content and PCV (using standard techniques) as an index of haemotoxicity.

Serum was separated from the rest and SGOT, SGPT, bilurubin (as in index of hepatic function), alkaline phosphate, creatine and cretaine phosphate (as in index of renal function) were determined using Randox kits.

Statistics

Results are expressed as means ± SEM. Statistical analysis was made using Mann Whitney U-test. Significance was set at $p<0.05$.

Results

Table 1 :
Effect of aqueous extract of Ruellia taberosa roots an ethanol induced gastric lesions in rats. (mean ± SE)

Extract dose (mg/kg)	Mean length of gastric lesions ±SEM (mm)
Control	73.3 ± 12.4
470	13.3 ± 3.6**
940	4.2 ± 1.8**
1880	0.6 ± 0.1**

As compared to control treatment P< 0.01

As shown in Table 1 the CE caused a significant inhibition of length of gastric lesions (low, mid and high dose by 82%, 94% and 99% respectively). This effect was dose- dependent ($r=0.90$, $p<0.05$). EC50 value for this inhibitory effect was 379 mg/kg. Further, indomethacin pre-treatment failed to significantly ($p<0.05$) alter the gastroprotective activity of the highest dose of CE (control vs extract: 62.29 ± 2.2 vs 0.41 ± 0.2 mm)

The highest dose of CE failed to significantly ($p>0.05$) increase the mucus content adhered to gastric mucosa (control vs treatment: 172.3 ± 18.7 vs 160.6 ± 28.6µg/stomach).

LD50 for acute treatment was > 2000mg/kg. In the sub chronic treatment none of the treated rats died or exhibited overt signs of toxicity and stress. Further, none of the serum or haematological parameters monitored (data not shown) except the RBC count was significantly altered (control vs treatment; 6.1 ± 0.6 vs 7.5 ± 0.6 million/mm3; 23% increase)

Discussion

This study shows potent gastroprotective activity of CE of *R. tuberosa* roots. This is an important finding as it demonstrated for the first time gastroprotective activity in a plant in Family Acanthaceae and also validated the claim of some Ayurvedic Physicians of Sri Lanka that it possesses such activity.

The plant is reported to possess steroids[3] alkaloids[15] and several flavonoids[11]. Gastroprotective activity was dose-dependent. The CE was well tolerated and the animals exhibited no signs of stress, general toxicity, hepatotoxicity, reanotoxicity or haemototoxicity. Further, the CE induced erythropoiesis as claimed for *Withania sominifera* for which *R. tuberosa* is sometimes used as a substitute. This would enhance its therapeutic value as a gastroprotectant, as bleeding is associated with gastric lesions1 LD50 of CE was 500 times higher than the effective dose indicating a wide margin of safety.

The precise mechanism/s of gastro protection of the CE is unknown. Presence of gastro protection even with indomethacin pretreatment suggests that it is not due to prostaglandins mechanisms. Alcian blue study indicates that gastro protection is also unlikely to be due to enhancement of gastric mucus secretion. On the other hand, flavonoids present in the plant could have induced the gastro protective by changing the physical and chemical integrity of gastric mucus barrier gel via free-radical scavenging mechanisms[7].

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Saving our planet, lifting people out of poverty, advancing economic growth... these are one and the same fight. We must connect the dots between climate change, water scarcity, energy shortages, global health, food security and women's empowerment. Solutions to one problem must be solutions for all

- Ban Ki-moon

Threats facing the Earth

Inequality is the global peril eg. The world's richest countries such as US, Luxenberg have incomes 100 times that of countries like Burundi and Democratic Republic of Congo. This is a tragedy for the poor and rich of the world.

Until now poor countries were no threat for the rich. Globalisation brings the imbalance impact of the difference in living standards and styles. Multiple threats that the world faces are:

1. Health – speed of disease. Diseases such as cholera, f lue AIDS Ebola get transmitted by travel diseases : cholera, flue AIDS Ebola dn

2. Terrorism - causes Religious fundamentalism and individual psychopathology

3. Inequality of living standards - Mass immigration . Political economic asylum seekers

4. Climate change- Weather variability

5. Resource depletion food cops etc

6. Only 1 billion of 7.5 bn of the world population enjoy developing country world styles.

T. R. GOVINDACHARI – A RESEARCHER ON MEDICINAL PLANTS OF THE CLASSICAL ERA

By R.O.B. Wjiesekera

Professor T. R. Govindachari was a classical era organic chemist. He commenced his career at Presidency College, Madras, and then Chennai. He spent a lifetime researching on medicinal plants during a period when organic chemists were mostly involved in isolating what was deemed to be the active principles of plants. He was engaged in elaborate degradative studies leading to elucidating their structures and thereafter attempted to synthesize the complex structures to further establish their structural identity. During the period prior to the advent of spectroscopy and chromatography this was very difficult and tedious work. After completing his doctorate in Madras he proceeded to work at post-doctoral level at the University of Illinois with the celebrated iconic American organic chemist Roger Adams. In 1963 his pioneering work on Indian medicinal plants received recognition when he was appointed to head the new CIBA research Centre in Bombay (present Mumbai). More than a dozen compounds he helped develop at the Centre were candidates for clinical trials and marketing approvals were obtained for five of them. Besides, at the Centre he was to develop an internationally recognized school of researchers in Natural Product Chemistry well versed in the state-of-the-art techniques of the day.

On his retirement from that post in 1975, he was invited to be a consultant to the Central Leather Research in Chennai for the next two years. Thereafter, he joined a pharmaceutical company, Amrutanjan Healthcare Ltd. in Chennai, where he established and headed a R & D Centre for the company. In his original research in Madras he was renowned for his work on the Tylophorine group of alkaloids isolated from Ayuvedic medicinal plants and he was to devote his life to working with these plants. His later years were devoted to studies on the constituents of *Azadirachta indica* or Neem and he was to serve the SPIC Foundation until the year 2000. He passed away two year later by which time he had been recognized with several national honours.

The author had the privilege of meeting him during several meetings connected with medicinal plants and came to know of his interests such as growing orchids and mostly of his interest in temple writings . The author sent him to visit Auradhapurs at his special request as he said he named his son Anuradha .

T.R. Govindachari was a man of extreme simplicity and modesty and spoke of his work in a most self-effacing manner. He was respected by colleagues worldwide for his contribution to chemical science and for the knowledge he had regarding plants used in Ayurveda.

Neem leaves

It's fun to think about plants not just as decorations but as functioning parts of our yard's ecosystem that attract wildlife to the garden. We have hummingbirds, tons of bees, and many monarch butterflies. The kids love it! Though we're very laissez-faire with the garden and never put chemicals on it or even water it much!

- Katherine Center

FDA APPROVES NEW DRUG FOR RECURRING MALARIA

The Food & Drug Administration (FDA) in the United States, has given approval for the drug Tafenoquine, which can be used to treat the recurring form of malaria. This type of malaria has posed a severe health problem, particularly in Africa, as it can remain dormant in the liver for years before reawakening many times.

Recurring malaria is caused by the parasite *Plasmodium vivax,* which can cause several bouts of malaria particularly in children, even after a single bite. Furthermore, infected persons can act as unwitting reservoirs of the disease as when the disease reawakens in their bodies, a mosquito carry the parasite on to someone else. This makes it the complete eradication of the disease difficult. There is already a medication, Primaquine, which is capable of flushing out the causative agent hiding in the liver. However, Primaquine needs to be taken for around 14 days, and when the patient feels better after a few doses, he may stop using the drug, allowing the parasite to awaken at a later date. Tafenoquine on the other hand is effective with a single dose. However, caution must be exercised when taking the drug, as side effects are experienced by persons suffering from other ailments. But despite these drawbacks there is hope that the drug , together with bed nets and other precautions, will help to reduce the prevalence of vivax malaria in the world.

Scientists have described Tafenoquine as a “phenomenal achievement”.

"SWASTHA - AMURTHA" NELLI - RASAKINDA HERBAL DRINK NOW IN SRI LANKAN MARKET

By Nishantha Paranagama, Director – Sales, Link Natural Products (Pvt) Ltd

In the ancient past, great Rishis have confirmed that a combination of Nelli (*Phyllanthus emblica*) and Rasakinda (*Tinospora cordifolia*) is as potent as "Amurthaya", the drink that is said to be the secret of immortality of the gods. Furthermore, "Charaka" and "Sushrutha", the fundamental texts of ayurveda mention that these two life enhancing herbs are comparable to "Amurthaya".

A combination of Nelli and Rsasakinda has remained as a trusted, safe and efficacious drink since ancient times in the Ayurveda and traditional systems of medicine as well as in common social practice. This long experience has embedded in the minds of the people that Nelli and Raskinda in combination effectively allays the numerous discomforts in the body that occurs on and off in daily life and helps to maintain a healthy life.

According to Ayurveda, the main function of the combination of Nelli and Raskinda is to purify the blood by removing toxins from the body. Modern scientific research has shown that these herbs can also effectively remove harmful "free radicals" that arise within the cells during metabolism.

"Swastha Amurtha" was developed as a herbal drink using modern technology after about four years of scientific research and development that enabled it to retain the total quality of the Nelli-Rasakinda combination. The Link Natural products "Swastha Amurtha" can be consumed very conveniently as a 'hot' or 'cold' herbal drink.

The following common bodily discomforts that occur in day to day life can be alleviated by using "Swastha Amurtha".

- Burning sensation in the soles of the feet
- Smarting sensation of the eyes and burning sensation of the body
- Discomfort associated with the urinary system
- Excessive sweating and associated body odour
- Joint pains such as knee pain and ankle pain
- Skin conditions such as heat rash, rough skin and dry skin.

Beyond the simple health issues listed above, "Swastha Amurtha" positively facilitates the internal body functions and thereby helps to achieve healthy skin, good health, and longevity. Launch of the Product "Swastha Amurtha" was held on 02nd April, 2018 at the Taj Samudra Hotel. The product is now available island wide.

AVAILABILITY OF LINK PRODUCTS

Editor's Note : A frequently asked question by Link afficionados, is "where can you buy the various products from". So for their benefit and for those who would like to sample the many superior products of Link Natural, we give below the products and their location of their availability.

	Super Market														Grocery	Phamacy	Osusal
	Sathosa	Cargills	Keels	Arpico	Laugfs	PDK	Health guard	Family super	Air Force	City Exchange	CIC	SPAR	Youmart	Odel			
Link Samahan	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Link Enriched Paspanguwa	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
Link Natural Sudantha	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
Link Kesha Hair Oil	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
Link Hair Care Cool	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
Link Akalapalitha	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
Link Swastha Thriphala	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
Link Swastha Amurtha	✓	✓	✓	✓	✓	✓	✓								✓	✓	✓
Link Five Herbs		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
Link Gotukola Tea		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
Link Osupen		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
Link Muscleguaed		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
Link SP Balm	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
Link Essentials - Siddhartha Oil		✓		✓			✓					✓	✓			✓	✓
Link Essentials - Pinda Oil		✓		✓			✓					✓	✓			✓	✓
Link Essentials - Mahanarayana Oil		✓		✓			✓					✓	✓			✓	✓
Link Essentials - Kendaperalumhara Oil		✓		✓			✓					✓	✓			✓	✓
Link Essentials - Kolaseleshma Oil		✓		✓			✓					✓	✓			✓	✓
Link Essentials - Sarvavisadee Oil		✓		✓			✓					✓	✓			✓	✓
Link Essentials - Composite Pack		✓	✓	✓			✓					✓	✓			✓	✓
Link Dekatone		✓					✓				✓		✓				✓
Link Viritone		✓					✓				✓		✓				✓
Herbal Pharmaceutical															✓		✓

"LINKING" WITH PEOPLE AND SOCIETY

LINK NATURAL BREAKS INTO VIETNAM MARKET

Through the intervention of MTI Consulting, a marketing company with international experience, Samahan and Sudantha, the flagship products of Link Natural are on the brink of entry into the Vietnamese and Myanmar markets. These markets are today's fast growing markets, and this will be a major achievement for the company, Link Natural. Link Natural has tied up with one of South Asia's leading health care companies and this will see the launch of the Samahan equivalent in both these high potential markets. This is not all! Entry into other ASEAN countries will soon follow, Philippinnes being the next target.

LINK NATURAL PRODUCTS (PVT) LTD WINS THE CRYSTAL AWARD FROM CNCI ACHIEVER AWARDS 2018

Link Natural Products (Pvt) Ltd, take pride in being honored as the winner of the "Crystal Award" under the National level, Manufacturing, Extra– Large category at the "CNCI Achiever Awards 2018" organized by the Ceylon National Chamber of Industries. The prestigious Crystal award is presented to the Company that has won the Gold award in the Extra Large category for 3 consecutive years. The company won this award for its outstanding performance in the areas of quality standards, productivity, employee benefits, labour relations and social and environmental obligations. Link Natural also won an award for being in the Top Ten companies in Sri Lanka under the same category. The ceremony concluded in glory at the Hotel Galadarion the 09th August 2018.

CSR PROJECTS OF THE COMPANY LINK CONDUCTS CREATIVE WORKSHOPS FOR YOUNG SCHOOL CHILDREN

Corporate Social Responsibility (CSR) is an integral part of the Corporate strategy of the company. The company is strongly committed to its social responsibility by executing valuable CSR initiatives such as, "Ugathamana", the students' competency development project to uplift the education of neighbourhood children, "Jana Sahanaya" to aid the victims of the disastrous situations and "Thuru athi Thuru" the tree planting project, are other projects that make significant positive impact on the society.

Several programmes were carried out under the Link Natural Educational project - "Ugathamana". A Creative Scholarship Workshop was conducted by the company under the project on 15th June, 2018 at the Vihara Maha Devi Balika Vidyalaya in Dompe. This was a novel experience for the children of the Primary Section of selected schools in the Dompe Educational division.

About 400 students participated in this workshop which was targeted at students facing the Year 5 scholarship exam in 2018, enabling them to receive a creative, practical learning experience which included the prescribed syllabi.

An Inter school arts competition was conducted on 28th November 2018 at Siyane National School, Dompe. This was a motivational project for the children of the selected schools in the Dompe Educational division, the exhibition being aimed to display and acknowledge primary and secondary school students' accomplishment in the visual arts. 54 selected artworks were on display at the exhibition.

Under the same project an Inter school quiz competition was conducted by the company The final quiz competition was held on 23rd November 2018 at Palugama, Dompe.

50 ALL NATURAL FRAGRANCE RECIPES THE ART OF PERFUME MAKING MADE EASY

On the search for easy and natural fragrance recipes? Then this book is exactly what you are looking for. You can learn and enhance perfume making skills with the range of easy-to-follow recipes in this book. The fundamental art of blending different oils to create new scents is the essence of this book. This book contains 50 all natural fragrance recipes you can try out. Experiment with different recipes and find your own signature fragrance.

All the ingredients used in recipes are natural and can be found at any local market. Pamper yourself, your friends and family with these handmade, all natural sensuous fragrances. Create blends of different essential oils and other natural ingredients to form sensual fragrances from floral and sweet scents to spicy and exotic scents. This book contains 50 all natural, simple and easy-to-follow recipes including:

- Lavender Vanilla Perfume
- Citrus Cologne
- Woodland Perfume
- Vanilla Cardamom Body Mist

Source :
https://books.google.lk/ books/about/ 50_All_ Natural_Fragrance_Recipes.

Whenever science makes a discovery, the devil grabs it while the angels are debating the best way to use it.

~ Alan Valentine

DIGEST MAIL BOX

Letter 1

Dear Team,
I would like to have a copy of Link digest magazine for institutional reference.
Thank you

Dr Chamal D Thenuwara (B.A.M.S-Uni of Colombo)
Researcher/Physician,
Institute of Ayurveda-Mount Lavinia

Letter 2

Dear Sir / Madam,

LNP DIGEST

This is to inform you that I have received today the Link Natural Digest Magazine
Volume 13 , Issue 1 for 2017. I have up to now not received any magazines for 2018.
Your publications are very informative and well presented. Well done and keep it up.

Yours faithfully,
Iqbal Jafferjee.

Response

Thank you for your letter informing us of the non receipt of the latest issue of the Digest. We have mailed you the last copy printed, which is Vol.13, No.2 2017. We regret that we are still compiling Vol.14 , No.1, 2018 and there is no print copy as yet. It will be mailed to you no sooner it is ready. We appreciate your interest in the magazine, and will endeavour to serve you continuously.

Letter 3

Thanks for your mail dated 25th July, 2018. I have received the Vol. No. 13
No. 2 2017 issue, thanks. I eagerly await for Vol. 14 No.1 2018 issue.

Please send me a list of items that I can buy at your Colombo branch. Please also let me have the address and telephone nos. of the Colombo branch.

Looking forward to hearing from you.

With best regards,

Yours faithfully,
Iqbal Jafferjee.

Response

Thanks for your mail.

Regarding your query, I was wondering what you meant by 'items'. If you mean the OTC products like Samahan , Sudantha, Musclegard etc., in the last issue of the Digest, we have indicated the sales points of

most of the Link products. Apart from these products, the Ayurvedic items are available at Ayurveda outlets. As for the Cosmetic items, they are available at Laksala down Reid Avenue. At the moment we do not have a one stop shop for all Link products, but we are considering it.

I will pass this mail to our Sales Manager for any further information.

Letter 4

I have gone thru. the Digest vol.13, issue 2 of 2017 and wish to point out a few errors and omissions I observed in the issue.

Your article on coriander was interesting and comprehensive. I am a little worried by your suggestion for replacing BHA and BHT with coriander as the antioxident. Coriander does impart a strong flavour to any food you add it to and you do need substantial amounts in the food materials, where as the two synthetics are added only in fractions of 1 percent to food products and at that concentration they are tasteless The sole purpose is to block the formation of free radical oxygen which causes fatty acid oxidation that imparts rancidity to food. May I point that a majority of young people would not care for french fries tasting of " thembun hodi" if coriander is used as a preservative. Again the final test for any replacement of a food additive is the organoleptic evaluation. On page 15 para. 1, it says that seeds also contain high dietary fibre (one needs to consume quite a bit of fibre to reap any benefit of bile salt entrapment, and coriander seed which is only a flavour adjunct could not supply fibre at the required level (unless one uses many tens of grams of the spices in each dish, you can imagine what will happen to the final flavour of the dish), to be of any value in reducing cholesterol. I hope you are quoting from authenticated research work with regard to efficacy of C.sativum as a panacea for diabetes.

Dr A L Jayawardene

Response

Your points are well taken and appreciated deeply. However, just for interest, Siebels Family Restaurant on the Colombo Chilaw Road, serves French fries with a Karapincha flavour and this is much in demand by the customers. So maybe , the same could be applicable for Coriander.

As for your query on Coriander and diabetes, yes, there are several journal articles on this but as you say, I am not sure how reliable these journals are. Two of them are Food Chemistry and Saudi Medical Journal and Dr Axe has a website on the health effects of several herbs, from which I traced some articles.

(Dr. Josh Axe, DNM, DC, CNS, is a certified doctor of natural medicine, doctor of chiropractic and clinical nutritionist who runs started a functional medicine center which is one of the most renowned clinics in the world.)

We thank for your keen perusal of the Digest, and we are thankful for your feedback.

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.

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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.