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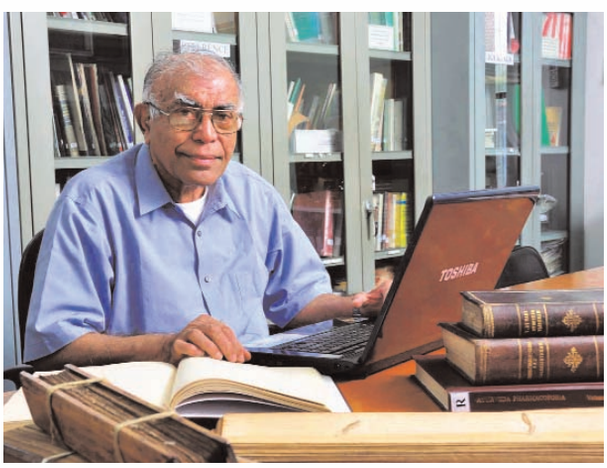
IN THE PAGES THAT FOLLOW.....

EDITORIAL

SCIENTIFIC INITIATIVES AND THE AGEING PROCESS.



From the very beginning of time people have endeavored to understand ageing. However scientific interest in the process of ageing is of very recent origin. The reason is that age was regarded as being logically of the order of three score years and ten, the biblical time frame, that is, seventy years.

Now modern medicine and living styles, determine that people live to ages beyond this limit and are able to make contributions that are valuable to society. Thus scientific interest in the process of ageing came to be heightened around the 1960 period.

In the ancient systems of medicine, such as the Traditional Chinese medicine (TCM) and Ayurveda system, certain herbs are believed to have profound effects on the degenerative diseases that bring about the features characteristic of ageing, such as deficiencies in hearing, sight, amnesia, atherosclerosis, rheumatoid arthritis, Alzheimer's disease, various forms of cancer etc., and many others. Studies on the effect of these herbs and the progress of gerontology will bring new dimensions in addressing age-related syndromes. Age is part of life and it is not realistic to think that the process can be reversed. But the experiences of the old systems of medicine together with modern concepts such as the role of anti-oxidants in disease control opens new doors in addressing the symptoms related to ageing. Life in old age can be made to be more comfortable and productive if research on these lines comes to be intensified.

R O B Wijesekera

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ECOPHARMACOGNOSY, QSEC, AND TQM FOR TMS

*By Geoffrey A. Cordell**

Introduction

The use of plant-derived traditional medicines (TMs) dominates primary health care for the majority of the global population. Although essentially unchanged over thousands of years in some areas of the world, the application of scientific principles and techniques to traditional medicines is fostering revolutionary change. Three aspects of those changes which pertain to the impact of TMs in various healthcare systems will be discussed; namely, quality control, sustainability, and continuous product improvement.

Laozi has written in the "Tao Te Ching" that a long journey begins with a single step. The famous management expert W. Edwards Deming made the point in his management book "Out of the Crisis" that "Quality begins with intent", and that "We have lived in a world….. of defective products. It is time to adopt a new philosophy".

That was at a time when Japanese goods were regarded as not of good quality. Now it is the basis of the revolution in TMs that is currently underway; for TMs, dietary supplements, and phytotherapeuticals are frequently classed as being defective products which may lack safety, efficacy, and authenticity. The contemporary intent is to enhance their quality in order to change that perspective radically.

Medicinal Plant Seller, Marrakech, Morocco

Crude, dried plant materials are available for sale in medicinal plant markets all over the world.

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These practices have continued unabated from the earliest recorded times of human medical history, when humankind made the strategic decision to seek medicines through the application of natural materials.

Elsewhere in the world, the latest scientific techniques are being applied to examine the purported effects of TMs to improve their health care outcomes. The "journey" towards significantly improved TMs is underway, several small steps have been taken, and the clear intent is towards safe, effective and reliable products. It is not, and will not be, an easy journey. It will take time and patience, and a lot of money, and there will be both success and failure on the way, as some TMs are deemed to be effective, and others not. Hopefully the latter will be eliminated from the marketplace and clinical practice.

For it is in the best ethical interests of the manufacturer, the practitioner and the patient that in the long term only safe and effective products are placed in the hands of patients. How is this revolution being conducted ? Unexpectedly, the globalization of coffee provides some interesting answers.

There is a cartoon in which a man goes into a coffee shop early in the morning. He orders a cup of coffee, and after sipping it, the waitress asks "How does the coffee taste this morning, Fred?". "The first cup doesn't have to taste" the man quickly replies, "It just has to work." Almost all of the key aspects of TM development are characterized in that one cartoon. Let's explore some of them. First of all, it is patient-centred, the provider of the coffee is concerned about how the customer (patient) is being affected by the coffee. The quality of the brew, and therefore the taste of the coffee, is reflected by the source of the green beans, the roasting time and temperature, and the percolation process of the coffee. These are processing parameters, and when different processes are applied to a TM they will afford products with different chemical profiles and therefore different outcomes. In a manner similar to taking a TM preparation (which typically tastes horrible unless taken with honey, or is in a capsule), Fred is not concerned about the taste, he just wants to make sure that the biological effects of the caffeine in the coffee "work" for him. Although there are known side effects from overdosing on caffeine, including dependency, vasoconstriction, and diuresis, coffee is regarded as a safe beverage in reasonable quantities. Coffee is also effective; it "works". The caffeine (ca. 100-200 mg/8 oz. cup) content is adequate to have the desired biological effect at about 1.75-2.0 mg/kg. For most TMs there is almost nothing known about the relationship between safety and efficacy, the nature and mechanism of the active principles, and thus what constitutes a "dose". (It is recognized that establishing a "dose" of a TM may not be as important as once imagined!) Finally, when Fred goes back tomorrow and the day after, and tries the coffee, it will probably taste very similar; in the same way that a M&M candy tastes the same all over the world! Those are the same four elements that any patient is anticipating to receive by taking a TM, Quality, Safety, Efficacy, and Consistency, summarized[1-7] as QSEC, in order to heal or to effect disease prevention.

Coffee is a global commodity; its value traded on a daily basis. As such, it is cultivated as a crop, on both large farms and in small holdings in many countries of the world. It is being produced in a sustainable manner. (It is acknowledged that actually producing coffee beans takes a large amount of water, and thus is not particularly environmentally friendly.) Unfortunately, very few of the thousands of TMs that are provided to patients on a daily basis are being cultivated, i.e. placed in the market in a sustainable manner. Instead they are harvested from their natural habitat, "wild-crafted". This method of sourcing is becoming a significant health care issue, especially as the sales of processed TMs increase annually, and already many plants used in TMs are declining in range or even disappearing from their native habitat. Another important aspect, as more and more TMs are brought to market as a refined product (ointment, tincture, pill, capsule, tea bag, etc.), is

that these products must remain accessible to the patient. Accessible in this context indicates that the constituent plants are being sourced sustainably (i.e. the product will not disappear because the constituent plants are no longer available), and that the products can still be acquired at reasonable cost by the patients who need them. Bringing all these factors together should be the goal of natural product scientists, regulators, producers, manufacturers, and practitioners, so that finally, one step at a time, patient care can be improved globally through the use of TMs[8]. If it is acknowledged that a TM has to "work" to be effective to treat the patient, either as a curative, or as a preventive, then what makes that happen, and how can the patient be assured that the product is (relatively) safe within a reasonable, recommended dose range?

Traditional Medicines for Sale, Santiago, Chile

Multicomponent Traditional Chinese Medicine prescription ready for processing

Plants are factories for the production of compounds of many different chemical classes (steroids, coumarins, flavonoids, lignans, alkaloids, etc.) based on their genome and on which metabolite biosynthetic pathways are turned on or off at any particular time. The genes which encode for the enzymes which produce the compounds that characterize a plant are different in different parts of the plant. Therefore, the compounds present in the roots of a particular plant will be different from those in the leaves, the flowers, the fruits, the bark, etc., although transportation form of metabolites within plants is also widely appreciated. Closely related plants (i.e. the same genus) may produce a similar range of compounds, however, in completely different proportions. The age of a plant typically has a significant effect on the range of metabolites, as enzyme systems evolve in the plant with time, and more compounds are produced. The same plant grown in different locations (soil pH, rainfall, temperature, altitude, etc.) will also produce metabolites in quite different ratios. In addition, there may be various "chemotypes", where even within a particular population of plants, grown under identical conditions, different plants will show different metabolite ratios. One commonly appreciated example is Capsicum annuum, the chili pepper, where disparate levels of "hotness", due to varying levels of the capsaicin alkaloids, are readily observable[9]. What does this mean for a TM?

It means that the "C", the consistency, in "QSEC" is extremely challenging to achieve. Batches of the same plant will show different chemical profiles, and thus, if turned into a product, will show different biological (i.e. clinical) effects in patients. This is why establishing standards for TM constituents, particularly when the material is a complex mixture of fourteen or more plants, is critical. In addition, these standards need to be established at an early stage in the biological and clinical investigation of both safety and efficacy. For only in this way will the biological effects be reproducible. How can this be achieved?

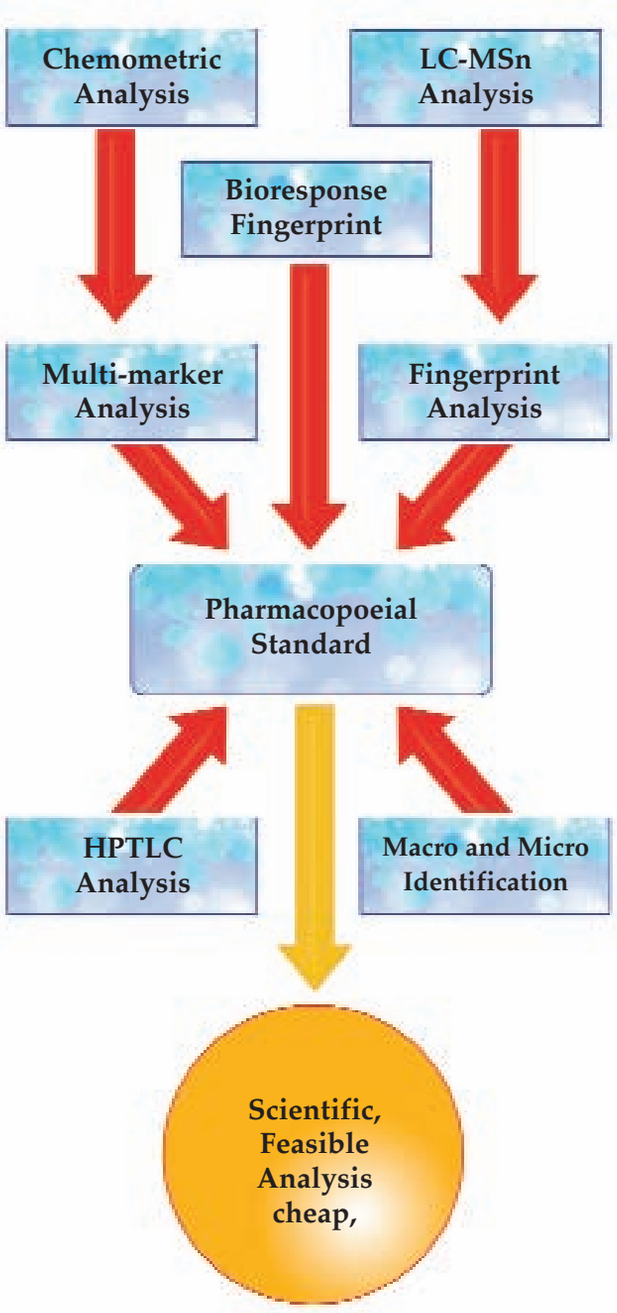
In the past few years, the science of metabolomics has had a powerful impact on the analysis of plant extracts. High pressure liquid chromatography (HPLC) or nuclear magnetic resonance (NMR) spectroscopy is used to examine the whole range of metabolites in a complex plant extract (possibly several hundred compounds) at the same time. This information can then be compared statistically with samples from other growing regions, or with plants growing in the same area over time, and specified, acceptable ranges of key metabolites defined for important metabolites, sometimes called a "fingerprint". Any extraneous plant or synthetic chemical found in the extract showing a different HPLC or NMR profile will be spotted immediately as a contaminant or adulterant. Hence, this is a very effective way in which to assess the initial purity of the acquired plant material. Application of metabolomic techniques may identify plants of different species, those grown under different conditions, those originating from different regions, how a particular plant has been processed, or whether the correct plants have been combined in a complex mixture. Taking all these factors into consideration, this approach aids enormously in the goal of achieving a consistent standard for biological testing, and subsequently for product standardization. Which brings us to the package of medicine the patient purchases with healthcare expectations.

It is important to answer the question, "what's in a name?" After all, according to Shakespeare in "The Tragedie of Romeo and Juliet", a rose by any other name, such as an "esor", would smell as sweet. In TM terms, this indicates that no matter the name on the product, it is the content of the product that determines the efficacy, and thus the sweet smell of a successful health outcome. Therefore, regulations which focus on indicating the name of the plant on the product label are appropriate. However, they bear almost no relationship to an assured, consistent, and beneficent patient outcome, since the most important aspect is authentic, standardized content; that's the patient expectation for a product that "works".

Salvia miltiorrhiza

The level of scientific technology being applied to investigate TMs is impressive and is leading to comprehensive approaches to standardization beyond the previous pharmacopoeial methodologies. Recently, in collaboration with a group in China, a holistic approach to the development of a pharmacopoeial standard of a TM, *Salvia miltiorrhiza* Bunge (Lamiaceae), was described3. This evolving strategy involves the macro - and microscopic identification of the plant (and also DNA barcoding identification when established), metabolomic analysis of numerous samples which leads to a comprehensive fingerprint analysis through a HPLC/mass spectrometric approach and which allows for multiple chemical markers. Linking this chromatographic separation with a relevant bioassay then permits the identification of the most important active constituents. Once established, this reductionist approach can reach back to a simpler analytical process, as it is recognized that the level of sophisticated instrumentation required to meet those analytical standards is not attainable for manufacturers. Consequently, a more holistic, cheaper, less time-consuming assay, such as simple TLC (possibly bioautographic) or HPLC assay is developed, based on the key compounds disclosed as critical for bioactivity by the advanced technology. This simpler bioanalytical approach can be utilized for the starting plant material, during the manufacturing process, and

for verification that the final product meets an established standard. For this particular plant, this methodology was accepted by the US and Chinese Pharmacopoeias. As such, it may be another step in the development of strategies towards a holistic and integrated approach of information systems, botany, chemistry, and biology for the standardization of many other TMs.



Holistic Approach to the Standardization of a Traditional Medicine Leading to a Feasible Analytical Standard

The development of quality control standards for TMs is a long and steep pathway. It intimately involves the concept of total quality management (TQM); considering routinely how processes can be improved, given the availability of new scientific knowledge and new technologies[10,11]. The late Ajahn Chah in "A Still Forest Pool" indicates that "If you are on the fifth step and think that you are too high, you will never make it to the sixth step". In that regard, there are a number of new technologies which might be applied to the quality control of TMs before they are harvested. These include the use of hand-held Raman spectrometers and the use of drones and hyperspectral imaging cameras to look for characteristic chemical signatures for when is the best time to harvest a TM. The quality of a TM, like that of an essential oil, begins in the field, and cannot be enhanced during the production process. Thus optimizing the time for collection becomes a critical initial element in establishing the highest level for the overall quality control of a finished product. Which raises the issue of maintaining the supply of quality plant material.

Pharmacognosy may be defined as "the study of biologically active natural resources". Those resources may be plants, microorganisms, marine organisms, animals, insects, etc. The nature of the study is typically focused on examining TM use, searching for new, single agent molecules for drug development, or for preparations which may serve as natural herbicides, insecticides, etc. With a rapidly growing global population and the globalization of TM usage in diverse populations, the continuous supply of quality plant material becomes an important factor in maintaining accessibility. It was in this light that the term "ecopharmacognosy" was introduced[12,13]. The addition of the prefix "eco" to "pharmacognosy" was specifically intended to raise consciousness regarding the sustainability of the philosophies and practices being applied to investigate natural resources, including those found in TMs. This topic has been developed further in various formats[2,4-7], and only select examples will be given here.

When developing a TM-based product for an expanded or global market it is important, at a very early stage in the process, to consider the element of long-term sustainability of the constituent plant(s). If several tonnes of plant material were to be required for a product over a year, how would that be resourced? If the TM plant part being studied is either the bark or the roots, can that resource be sustained, or should a resource such as the leaves or the fruits be nvestigated for potential substitution? If a TM preparation requires fifteen plants, can all of these be sustainably resourced over time? Indeed, is there a biological and clinical justification for including all those plants in the product? If plants can be eliminated from the product without loss of biological effectiveness, those materials can be used for other preparations, thereby conserving precious plant resources, or not acquired.

The World Health Organization, since at least 2000, has encouraged the development of traditional medicine to be based in science, as a responsible health resource[14-16]. As described above, such improvements require a complex process of scientific study which embraces information systems, botany, chemistry, and biology. As more sciences are integrated into the quality control process, the realistic expectation is that this will lead to a significant improvement in the quality and consistency of the products in the marketplace, and consequently a higher level of effectiveness for the patient. Finally, it is critical to note that there is a very important element of trust between the manufacturer, the practitioner, and the patient, which should be maintained and enhanced through investment in the continuous improvement of QSEC systems for TMs, in order to achieve the long-term improvement of global healthcare outcomes.

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"And because the Breath of Flowers is farre Sweeter in the Aire (where it comes and Gose, like the Warbling of Musick) than in the hand, therefore nothing is more fit for delight, than to know what be the Flowers and the Plants that doe best perfume the Aire." ~ Francis Bacon, 1625.

Give fools their gold, and knaves their power; let fortune's bubbles rise and fall; who sows a field, or trains a flower, or plants a tree, is more than all.

John Greenleaf Whittier

Manta and Mobula ray numbers are falling as they're hunted for Asian remedies

In the ocean manta and mobula rays move with exceptional grace, gliding and twirling with mouths agape to feed near the surface. Now an appetite for their gill rakers – filaments that filter out plankton, krill and other food – has put their populations at risk says a new study. Demand in China for dried gill rakers as purported medicine for chicken pox and other ailments means a large manta can fetch several hundred dollars, versus $20 to $40 for its meat alone. In 2011, around 100,000 of the rays landed in global fish markets the study estimates, boding ill for nearly a dozen mobuild species, many listed by the IUCN as vulnerable or near threatened.

"As quickly as rays started appearing in markets we fear they could disappear from the sea just as quickly" says Shawn Herinrichs, lead author of the report released by conservation groups WildAid and Shark Savers. Mobuild catches rose sharply about a decade ago, Despite increased fishing efforts fewer and smaller rays are being caught, indicating populations in peril, says Heinrichs. On the flip side, the sublime creatures have proved a lucrative tourist draw – a ray of hope for the slow-to-reproduce sea dwellers.

Luna Shyr,
National Geographic, Sugust 2012.

GERANIUM OILS IN PERFUMERY AND AROMATHERAPY

*By A.L Jayawardene**

Name : *Pelargonium graveolens*
Family : Geranaiaceae (Geranium family)_
Common names: Rose scented pelargonium, Scented leaves Pelargonium, Wildemalva

Description

Pelargonium graveolens is an erect, much-branched shrub, with attractive, strongly rose-scented leaves and pinkish white flowers which adds texture, fragrance and colour to any mixed flower border. It can reach a height of up to 1.3m and a spread of 1 m. The hairy stems are herbaceous when young, becoming woody with age. The deeply incised leaves are velvety and soft to the touch due to the presence of numerous glandular hairs. The leaves are strongly rose-scented. The showy white to pinkish flowers are borne in an umbel-like inflorescence and are present from late winter to summer (August - January) peaking in spring (September - October).

Distribution

This plant is confined to two separate areas in southern Africa, one in Limpopo Province, where it receives summer rain, and the other in the south-eastern part of the Western Cape, where it receives rain throughout the year. In both these regions, the summer is hot and the winter is mild, and *Pelargonium graveolens* is found growing on the mountains, in sheltered positions such as kloofs, usually in relatively moist habitats. *Pelargonium graveolens* has also been recorded in Zimbabwe and Mozambique.

Cultivation

Pelargonium graveolens grows very well in moist, semi-shaded positions in the garden where it can be used as filler. Its velvety leaves add texture to the planting. This species also makes a good container or hanging basket subject, provided it is kept in a semi shade position. *Pelargonium graveolens* responds well to feeding with liquid organic fertilizers. A suitable systemic insecticide can be used if whiteflies are observed feeding on the plants.

This plant can be propagated by means of stem and tip cuttings, or seed. Cuttings root well

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when dipped into a suitable rooting hormone and then placed in trays filled with coarse river sand. The trays should be kept in cold frames. Optimum rooting time is autumn (March-May) and spring (September-November). Seed can be sown in spring, summer or autumn.

Derivation of the name

The genus Pelargonium gets its name from the resemblance of the shape of the fruit to the beak of a stork, pelargos in Greek. The species name graveolens refers to the strong fragrance of the leaves, graveolens meaning strong-smelling in Latin.

The genus belongs to the family Geraniaceae, which also comprises four other genera, Geranium, Erodium, Monsonia and Sarcocaulon. There are ± 220 species within the genus Pelargonium, and 80% of them are confined to southern Africa and about 80% of these are confined to the south-western corner of the country.

Why Geranium is so valued

Rose-scented geraniums (Pelargonium species) belong to the family Geraniaceae. They are high-value, perennial aromatic shrubs, originating from South Africa, Reunion Madagascar, Egypt, and Morocco. These species are commercially cultivated in Reunion, China, Egypt, Morocco, and India for the production of "geranium oil" . The commercial geranium oil is obtained by steam-distillation of fresh aerial parts of rose-scented Pelargonium species and their cultivars and hybrids . Geranium oil is one of the most widely used fragrance materials and is an indispensable component of most rose-scented perfumes and soaps. The natural geranium oil is itself a perfume and blends well with other perfumes. It possesses green herbal, fresh, and earthy characteristics and is often used in masculine fragrances. It is nontoxic, a non irritant, and possesses energy-boosting and soothing properties, thus its value in aromatherapy applications.

Natural geranium oil is a very complex mixture of monoterpenes, sesquiterpenes, and some other low-molecular-weight aromatic compounds. The chemical composition of geranium oil varies due to intrinsic and extrinsic factors. So far, more than 240 compounds have been identified in geranium oils of diverse origins. Nevertheless, the major components of geranium oil (about 60–70%) are three monoterpene alcohols: citronellol, geraniol, and linalool.

Some marker constituents such as isomenthone, menthone, nerol, cis-rose oxide, trans-rose oxide, α-terpineol, α-pinene, myrcene, and β-phellandrene can be found in geranium oils from all localities (Lawrence, 1984). The structures of the marker constituents of geranium oil are shown in Figure 1.

The major types of geranium oil available on a commercial basis include Bourbon, Chinese, Algerian, Egyptian, and Moroccan types (Table 1). The rose-scented geranium is a highly adaptable crop and can be cultivated in varied climates, such as tropical, subtropical, temperate, and Mediterranean climates, at altitudes ranging from 120 to >2400 m . In India, mainly two types of geranium have been identified: Algerian/ Tunisian and Bourbon/Reunion types. The former cultivar is inferior in comparison to the latter in terms of commercial essential oil quality.

These shrubby evergreen perennials grown chiefly for their fragrance, may be species or cultivars but all must have a clear and distinct scented foliage. Scent is emitted when the leaves are touched or bruised with some scents aromatic, others pungent and in a few cases, quite unpleasant. The scent of some species growing in their natural habitat, acts as a deterrent to grazing animals who appear to dislike the emitted scent. Conversely, it also attracts other insect life to visit the bloom and pollinate the plant. The scented leaves can be used for potpourri and they also have a use as flavourings in cooking. Occasionally scented types can be found in some of the other groups mentioned; for example, the Angels, having *P. crispum* in their

genetic makeup, can often have a strong citrus scent. Leaves are lobed, toothed, incised or variegated. Growth habit is very variable, but the flowers are less prominent than other groups, and most closely resemble the species they originated from.

The leaves of the various species of Pelargonium contain the specified odour, for eg. *P. graveolens* is rose scented, *P. tomentosum* is peppermint scented, *P. betulinum* is camphor scented, *P. cordifolium* is apple scented, and *Pelargonium x citriodorum* is orange scented etc.

These include:
Pelargonium quercifolium'
Fair Ellen (Scented leaf)

- Almond - *Pelargonium quercifolium*
- Apple - *Pelargonium cordifolium*
- Apricot/Lemon - *Pelargonium scabrum*
- Camphor - *Pelargonium betulinum*
- Cinnamon - *Pelargonium 'Ardwyck* Cinnamon'
- Nutmeg - *Pelargonium x fragrans*
- Orange - *Pelargonium x citriodorum* (Synonym - *Pelargonium* 'Prince of Orange)
- Peach - Pelargonium 'Peaches and Cream'
- Pine - *Pelargonium denticulatum*
- Raspberry - *Pelargonium* 'Red Raspberry'
- Rose - *Pelargonium graveolens* (Synonym - *Pelargonium roseum*)
- Rose - *Pelargonium capitatum*
- Southernwood - *Pelargonium abrotanifolium*

Pelargonium ionidiflorum (Scented leaf)

- Apple - *Pelargonium odoratissimum*
- Apple/Mint - *Pelargonium album*
- Balsam - *Pelargonium panduriforme*
- Celery - *Pelargonium ionidiflorum*
- Coconut - *Pelargonium grossalarioides* (*Pelargonium parriflorum*)
- Old Spice - Variety of *Pelargonium x fragrans*
- Peppermint - *Pelargonium tomentosum*
- Pineapple - *Pelargonium 'Brilliant'*
- Strawberry - *Pelargonium x scarboroviae*
- Rose - *Pelargonium radens*
- Spicy - *Pelargonium exstipulatum*

Cultivars

- 'Attar of Roses' - a cultivar of *P. capitatum*
- 'Crowfoot Rose' - a cultivar of *P. radens*
- 'Dr. Livingston' - a cultivar of *P. radens* Scented Geranium

- *'Grey Lady Plymouth' - a cultivar of *P. graveolens*
- 'Prince Rupert' - a cultivar of *P. crispum*
- Fiery-flowered stork's bill *Pelargonium ignescens* Scarlet Unique

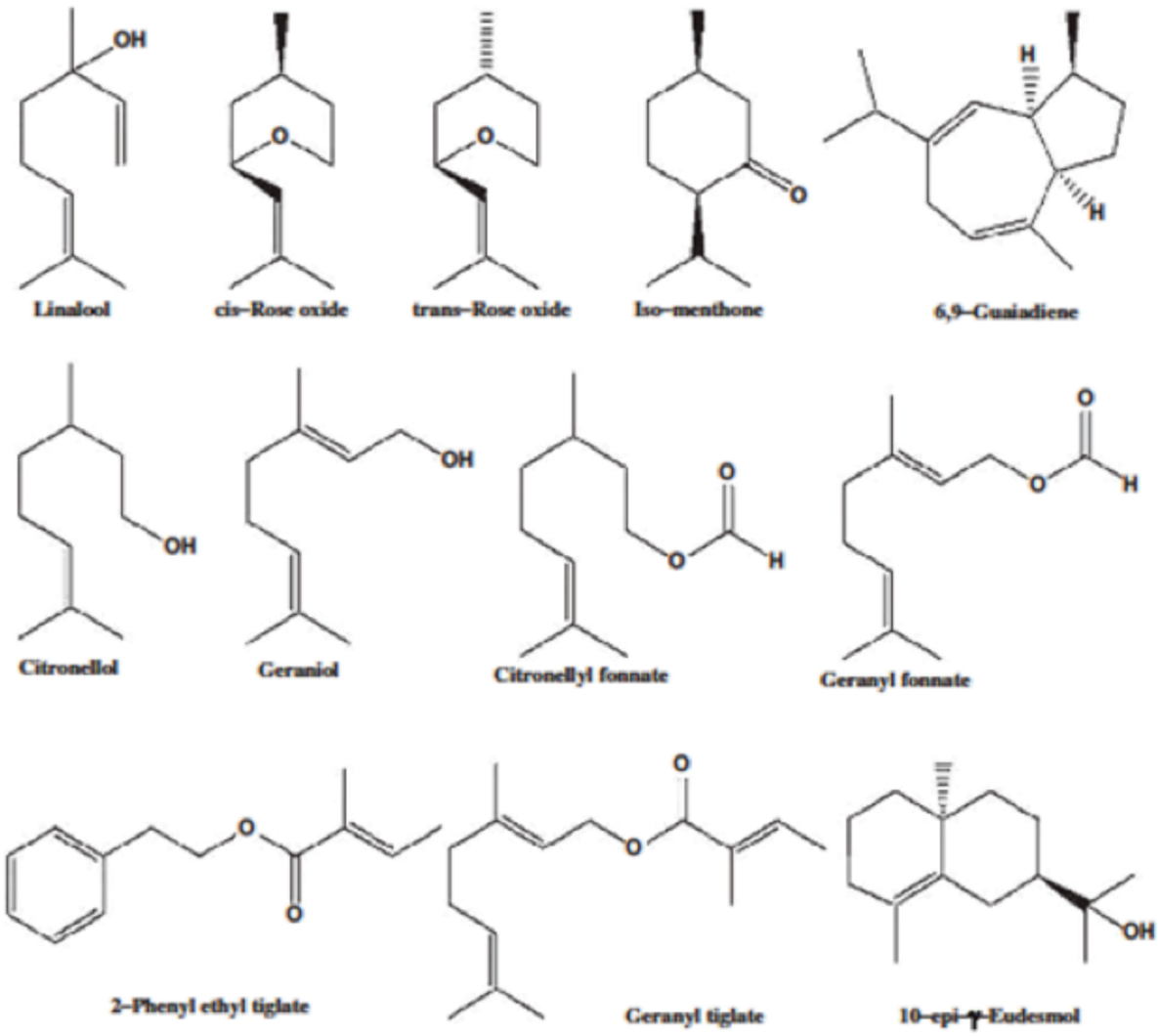

FIGURE 1 Structures of the major constituents of geranium oil.

TABLE 1 Major Constituents of Rose-Scented Geranlum Oil of Different Origins

	Lawrence (1984)						Verma et al (2013)
Comppound (%)	**Algeria**	**Egypt**	**Morocco**	**Bourbon**	**China**	**USA**	**India**
Cis-rose oxide	0.69	1.04	1.31	0.52	2.25	1.09	0.5 - 1.6
Trans-rose oxide	0.31	0.40	0.56	0.28	1.04	0.74	0.0 - 1.0
Bomenthome	5.33	6.05	5.63	8.12	4.51	6.30	4.5 - 6.6
Liralod	6.25	9.90	5.62	13.79	3.79	1.89	2.9 - 9.2
Citronellyl formate	9.40	7.43	7.64	12.39	17.45	24.40	4.4 - 9.2
Geranyl formate	6.49	3.89	4.33	5.92	2.20	4.97	3.8 - 6.2
Citronellol	27.87	32.10	18.59	23.24	44.39	29.23	15.2 - 31.3
Geraniol	24.97	19.70	18.59	20.67	6.40	7.41	14.1 - 34.6
10 epi.y.eudcsmol	5.41	4.62	5.20	1.04	2.03	2.77	4.7 - 6.7
Geranyl tiglate	1.56	1.44	1.54	0.45	1.64	1.40	2.0 - 2.5

Why is Pelargonium Sometimes Used As a Remedy?

Pelargonium (*Pelargonium sidoides*) is an herb long used in South African traditional medicine. In alternative medicine, pelargonium is thought to fight upper respiratory tract infections (including the common cold) and a few clinical trials have even examined the cold-fighting effects of pelargonium. It is also said to be effective in dysentery-related diarrhea. Also known as black geranium, "umckaloabo" or "umcka," pelargonium is sometimes used as an ingredient in herbal cough and cold syrups.

Some proponents suggest that pelargonium can also help treat bronchitis and inflammation of the sinuses.

In test-tube research, pelargonium has been found to fight bacteria and viruses, as well as stimulate the immune system. Here's a look at some key study findings:

1) Colds

Pelargonium may help relieve the common cold, suggests a 2007 study published in Explore. For a period of up to 10 days, 103 adults experiencing cold symptoms received either a liquid preparation of pelargonium or a placebo treatment. Results revealed that pelargonium helped reduce the severity of cold symptoms, as well as shorten the duration of sickness.

2) Bronchitis

Pelargonium may help soothe acute bronchitis, according to a 2008 report published in Phytomedicine.

In their analysis of six clinical trials testing pelargonium's efficacy as an acute bronchitis treatment, the report's authors found that pelargonium significantly improved symptoms of acute bronchitis without causing any serious side effects.

3) Strep Throat

In a 2003 study from Alternative Therapies in Health and Medicine, researchers found that pelargonium may help treat a strain of strep throat called "non-group A beta hemolytic strep" (or "non-GABHS").

Unlike group A beta-hemolytic strep throat, non-GABHS is typically treated without the use of antibiotics.

For the study, 143 children with non-GABHS were given either pelargonium or a placebo for six days. In addition to easing strep throat symptoms more effectively than the placebo, pelargonium was found to shorten the duration of illness by at least two days.

Possible Side Effects

Use of pelargonium may trigger a number of adverse effects, such as stomach upset, nausea, heartburn, allergic reactions, or worsening respiratory symptoms. A couple of case reports have suggested that pelargonium products may have more serious side effects, such as liver damage. There's also some concern that use of pelargonium may increase the risk of bleeding. Therefore, people with bleeding disorders and those using blood-thinning medications should consult their physician before using pelargonium.

It's important to keep in mind that supplements haven't been tested for safety and dietary supplements are largely unregulated.

In some cases, the product may deliver doses that differ from the specified amount for each herb. In other cases, the product may be contaminated with other substances. Also, the safety of supplements in pregnant women, nursing mothers, children, and those with medical conditions or who are taking medications has not been established.

Where to Find It

It is widely available for purchase online, syrups containing pelargonium are also sold in many natural-food stores and in stores specializing in dietary supplements.

Using Pelargonium for Health

Due to the limited research, it's too soon to recommend pelargonium as a treatment for any health condition.

If you're experiencing symptoms of chronic bronchitis (such as a cough that persists, disrupts your sleep, and/or produces blood) or any symptoms that concern you, it's important to consult your physician. Self-treating any condition with pelargonium and avoiding standard care may have serious consequences.

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It's been proven by quite a few studies that plants are good for our psychological development. If you green an area, the rate of crime goes down. Torture victims begin to recover when they spend time outside in a garden with flowers. So we need them, in some deep psychological sense, which I don't suppose anybody really understands yet.

Jane Goodall

From plants that wake when others sleep, from timid jasmine buds that keep their odour to themselves all day, but when the sunlight dies away let the delicious secret out to every breeze that roams about.

Thomas Moore

THE SAGA OF QUININE.- A BARK, THAT MADE HISTORY, CHEMISTRY AND THERAPY

By R.O.B.Wijesekera

Introduction

In the entire colourful history of human health and medicine, there is one thing that seems to have been recurrent. Whether it was ancient medicine, Arabian, Greek, Indian, or Chinese, from time to time leaping developments have occurred. And all the more frequent have been the discovery from forest plants and traditional practices, of spectacular and epoch making new cures.

The battle against Malaria is one such case, - where the discovery of the curative effects of the bark of an African tree (Cinchona), in the Middle Ages seems to have paralleled the role of a Chinese weed viz worm wood, Qingha su (*Artemisia annua*) over almost the same time period. It was ironical that the latter came to be noted by the Western world only during the conflict in Vietnam, though known for thousands of years before that. The former was the saviour of the Western armies during World War II, as it was too during the original conquest of Africa by colonial European powers. The event in focus then was the discovery of Quinine from what came to be called the Peruvian Bark. However, it was only in 1982 that the world outside of China came to know of the virtues of the weed Qing ha su in the triumphant conquest of Malaria. The scientific discovery and development of the drug from this plant by Madame Tu You earned her the Nobel Prize in 2015. (vide Link Natural Digest 2015)

Stripping the bark

The Cinchona Tree in the forest

When the Spanish Conquistadores commenced their exploration of the New World in the 17th Century they found that it was afflicted with fevers which they called agues.

Jesuit monks working in the region at the time had acquired the counter to the dreaded fever from the native Quecha Indian healers. They were able to use the water extract of the bark of the so-called fever tree to stem and control the effects of the fever which was debilitating and often life threatening.

There are many tales associated with the fever and the cures, all of them are indeed apocryphal though they have been recorded in the chronicles of the time. It would appear that the tree and its curative powers were well known during the time of the Inca civilization but it is not known what the tree was called by the Incas. In the Chronicle of St Augustine published in 1633 a monk, Antonio de la Calaucha, describes the miraculous curative properties of the bark of the tree from Quito,- that is in present day Ecuador,- as: " a tree grows which they call the fever tree in the country of Loxa and the powdered bark when given as a beverage cures the fevers"

While it is not clear what the Incas called this tree, the Peruvian word for bark is Kina and this when rendered into Spanish as Quina quina, came to be the name then associated with the fever tree.

Another legend has it that the quina bark then the local remedy for the dreaded fever was first used by the Spanish when the physician Juan del Vega administered it to the Countess of Chinchon, Dona Francisca Henriquez de Rivera. The husband of the countess was the Viceroy in Peru from 1629-39 and she had contracted fever there. The treatment made the countess recover fully and the efficacy of the bark treatment was thus secured. It has been recorded that the Swedish legendary botanist Carl Linneus placed the tree in a new genus which he called Cinchona, widely assumed to be after the Countess of Chinchon. However the similarity of the Peruvian word makes this version of the derivation ambiguous.

Countess Chinon

Ouecha indians teaching jesutis about Cinchona

Painting of Emperor Shenung

Although this story had been widely repeated, and even cited in historical records, a historian of medicine, Haggis has reported in 1941 that it could not be true. The first Countess of Chinon, he discovered, had died in Spain, three years before the Count had been appointed as the Viceroy of Peru. The second countess, according to her diary discovered in 1930, had enjoyed a healthy life and had died in Colombia without returning to Spain. But apocryphal tales endure.

The tendency among physicians was to regard Malaria as a tropical disease. However historical facts belie this. Malaria parasites had been with mankind ever since the beginnings of time and may conceivably have originated in Africa together with mankind. Fossils of mosquitoes up to 30 million years old have revealed that the malaria vector, the mosquito,

was present then too. Perhaps the oldest reference to malaria like fevers is found in a text on Chinese Medicinal Plants written by the Emperor Shen Nung, in circa 2700 BCE.

In the eighteenth century Horace Walpole has written of a "thing called mal- aria or foul air, which comes to Rome each summer and kills one". It seems to have kept coming for over a hundred years to the entire Europe. But in those ancient days there clearly was no remedy. The Roman Physician Dioscorides had prescribed a tonic of St John's wort, taken with wine and there were other more weird remedies too. Physicians had no clues as to the cause of the disease and attributed it to mal odors and hence seemingly evolved the name malaria.

David Livingstone was one of the most intrepid missionary explorers of the Victorian age and he fell prey to the disease time and again, and was eventually to be rescued by the efficacy of the bark which came to be known as the Jesuit bark or the Jesuit powder. Even as later as the nineteenth century, malaria was rife throughout Europe and North America, and was known as "marsh ague" in London. It is interesting to note that on evidence, the history of malaria began long before recorded time. Even in our own land of Sri Lanka it is now believed, that the civilizations prior to the Christian era, were wiped out by recurrent spells of malaria epidemics.

An interesting story of the efficacy of the cinchona bark is quoted as follows:
A native of the region where the cinchona tree grows, and this ranges from the eastern slopes of the Andes Mountains from Venezuela to Bolivia, was suffering from the disease and his thirst drove him to a pool of stagnant water. He drank amply from it and noticed the water was extremely bitter and worried that he had been poisoned by the quina-quina trees that surrounded the pool. As it finally turned out his fever disappeared and he was cured.

But the natives of neither the region nor the colonists knew anything about the nature of the disease but the cinchona bark through the Jesuit connection reached Europe. There are records that indicate that it was being used for treatment of fevers in Jesuit colleges in Genoa, Lyon, Louvain, and Ratisbon from 1650.

From bark powder to quinine

Powdered bark of Cinchona administered in various forms and in various vehicles remained as the treatment for malaria and fevers until at least the 1820's in which year the alkaloids of the cinchona bark were extracted and isolated by the French chemists Pierre Pelletier and Joseph Caventou.

Cinchona had been popularized in Europe by the Jesuit Cardinal Juan De Lugo and came to be referred to as "Jesuit bark" or "Peruvian bark" and even "Contessa bark". The Cardinal had been provoked by the obstreperous attitude of the medical professionals, that he ordered the physician of the Pope Innocent the Xth, to report on the Cinchona Bark. This report stated the bark was the most effective remedy against the rampant dreaded fever. Cardinal De Lugo had then ordered the bark to be packed as a prescription called "Schedula Romana" to be used under medical supervision. But though the medical profession had been less than enthusiastic, patients in Europe had treated themselves with the bark and it had become very popular on ccount of its efficacy. It is reported that the Cardinal even went to Paris to administer the bark to the young dauphin of France, the prince who would in time become King Louis XIV, who had been stricken with the fever.

In this scenario must be viewed the triumph of the chemists Pelletier and Caventou in isolating from the bark the effective ingredient Quinine in a semi- crystalline form. This meant the bark could be replaced with a pure more effective ingredient with the possibility of effective dosage control, - a huge advantage. The two research chemists were rewarded by scientific academies, and their national achievement commemorated with a monument .

There also developed a counter movement based on the concepts of Greek Galen Medicine, and this even took on a religious dimension. The story goes that when the Archduke Leopold of Austria was laid down with the disease in 1652 he was treated with the bark but failed to recover. He succumbed because of the failure of his physician Juan Jacob Chiffler, who then wrote a book on the failure of the bark for the treatment of Malaria. Local physicians welcomed the book as they were already not enthusiastic about the efficacy of the bark. Rumor then spread that the Jesuits were attempting to destroy the protestant population of Europe by recommending to them an ineffective remedy for the life-threatening fever.

In 1655 the Holy City had recorded no deaths from Malaria for the first time in its recent history, while the disease took its toll in other protestant countries. England also had its share of deaths, the victims including Cromwell.

The isolation of the crystalline substance Quinine then by the French chemists, Joseph Bienaime Caventou, and Pierre Joseph Pelletier, in 1820 was the landmark chemical intervention and represented a phenomenal advancement in the treatment of the disease. For research chemists it was to signal the dawn of decades of research endeavour, into antimalarials and synthesis of model structures based on quinine.

Pelletier & Caventou who isolated Quinine

Cardinal Juan de Lugo

Monument: Pelletier and Caventou

Cultivation of cinchona

By 1825 this quinine had become the standard treatment for malaria and fevers in Europe. It represented an advance in the combat against Malaria, particularly after the British Monarch Charles himself, and King Louis XIV of France, had been successfully treated with what was then still termed Jesuit bark.

It was also reported from Kew Gardens Bulletins that the "Cinchona alkaloids were taking an increasingly important role in the occupation and safe administration of tropical colonies." It had also been revealed, that as early as 1768, cinchona bark was being used as a prophylactic. James Lind, a British naval surgeon

had recommended that "as long as a ship lay in anchor in a tropical port every man receives a daily dose of cinchona powder." The practice was continued, and soon quinine alkaloid powder replaced the cinchona bark powder through the orders of the Director-General of the British Naval Medical Service. The increase of demand brought forth the inevitable supply problems which in time gave rise to felling of forest trees and consequent endangerment of the sources of supply. The British and Dutch dispatched expeditions to procure seeds of the several cinchona species to commence large scale cultivations of the species in suitable habitats spread over a wide area. Countries within the British Empire as well as the Dutch territories were investigated as prospective locations for cultivation. The British crown colony Ceylon, too was one such. It was the Dutch who triumphed in this race being able to discover a species of cinchona richer in its content of quinine. This was named *Cinchona ledgeriana,* which they developed and propagated throughout the island of Java. Several species of Cinchona were cultivated in the countries of the British Empire and the Dutch colonial territories.

The Dutchman F.W. Junghun pioneered the cultivations of cinchona in Java.

The reports from the Kew gardens from the 17th century onwards till the 1940's stated that cinchona bark and its derived alkaloids were the most effective treatment for malaria. At first the bark which had been stripped from the tree, was cut into small pieces and dried and powdered so that the material could be made into tinctures. Finally it was only towards the end of the seventeenth century the British Pharmacopoeia was to include "Peruvian Bark" as a treatment for malaria.

At the same time it had also reached popularity in Germany and in England, a man by the name of Robert Talbor, from a prominent Cambridge family, had been credited with the spread of an efficacious therapy for malaria. Talbor, an apprentice pharmacist, and not a qualified medical man, had gained a reputation as the one who treated Charles II, Louis XIV, and the Queen of Spain, and his "secret" was the surreptitious use of the bark of cinchona, coupled with other ingredients such as wines. He was knighted in England for his services. He was even admitted as a Member of the prestigious Royal College of Physicians. To ensure his continued popularity he had written a manuscript himself, on how to cure malaria. And now a rich man he had contrived to secretly buy up the available stocks of the bark. But he was never able to continue with his "secret remedy", as he died in his prime.

After his death his secret was discovered to be Rose leaves, lemon juice, a strong decoction of cinchona bark , and adequate wine to solubilize the cinchona alkaloids.

The large-scale cultivation of cinchona had by this time taken on an international dimension with the Dutch, the British, and the Spanish, competing in plantations in their colonial territories. The search for seeds of the varieties that yielded a good content of the quinine alkaloids became a target issue. Though experiments were conducted to determine the best methods for cultivation cinchona was to present many difficulties. There were as many as 65 species of Cinchona but in the many seed beds there was to be much hybridization. In 1865 cinchona plants were smuggled out of South America, by Charles Ledger, which contained a large percentage of quinine alkaloids (8-13 %). This species was named *Cinchona calisaya*, or *C. ledgeriana,* and the wide propagation of this variety effectively destroyed the South American monopoly. It has also been recorded that the

native who was the accomplice of Ledger in the smuggling of the plants had been tortured to death.

Cinchona plantations became a Dutch monopoly and then British colonies like India and Ceylon too became a supply source. During the WW II, when the Japanese overran plantations the western world's supplies again faced a crisis. For a long time the Netherlands East India Co had been the major supply source.(97%).This marked the beginning of the search for synthetic substitutes for quinine.

The molecular structure of quinine had been elucidated by that doyen of British chemists Sir Robert Robinson and it was a structure that was unique and complicated. It defied the attempts of generations of scientists to synthesize it . Only recently did Robert B. Woodward, the celebrated genius of synthetic chemistry managed a synthesis -Woodward and Doering synthesis,- and later there was a more complete one by Gilbert Stork, but these were of considerable academic interest only, and economically not suitable as a method of production of quinine. So the supply of quinine still remains plant dependent.

Quinine therapy for malaria

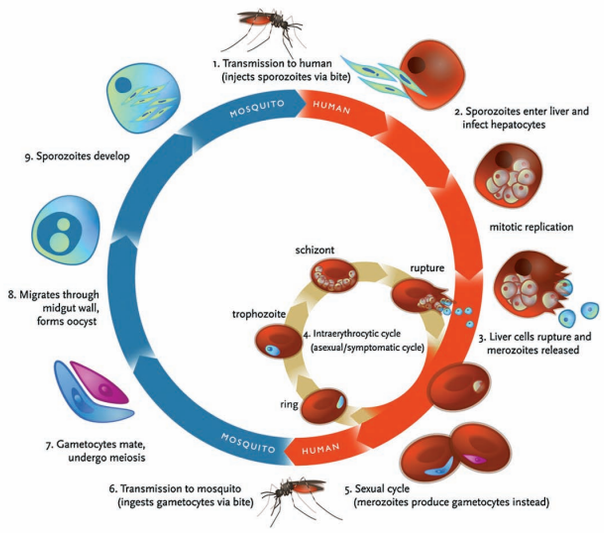
Three scientists are now credited with the discovery that the transmission of malaria is via the mosquito vector. They are Patrick Manson, regarded as the "Father of Tropical Medicine", Giovanni Batista Grassi, an Italian scientific and medical celebrity, and Ronald Ross an Englishman who researched in India and won the Nobel prize for Medicine in 1902. The mosquito vector theory was a landmark in the history of medicine, and went a long way in understanding the disease, the therapy, and the preventive measures required to contain propagation. Prior to this time there was no concept of how the disease came about. Livingstone it is reported, had sensed a link with mosquitoes, as the malaria fever had been referred to as swamp fever, and the swamps were known to breed mosquitoes. But it was some years later that a French army physician Alphonso Laveran in Algiers had found the protozoan Plasmodium parasite in malaria infected red blood cells. Several years later following the work of Grassi in Italy and Manson, and Ronald Ross working in India, scientists were able to conclude that the parasite is transmitted by mosquitoes as they suck blood from their prey.

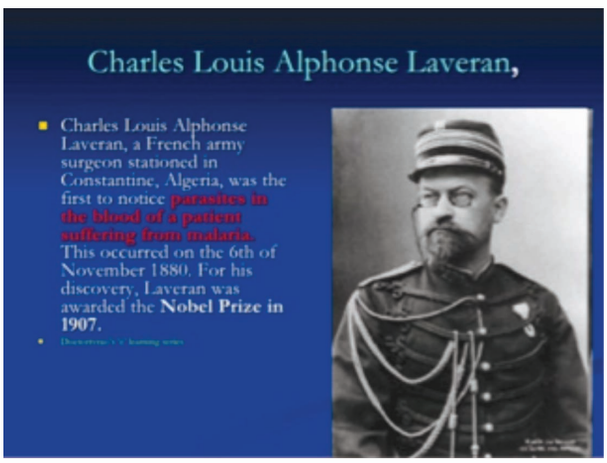
Manson

Ross

Grassi

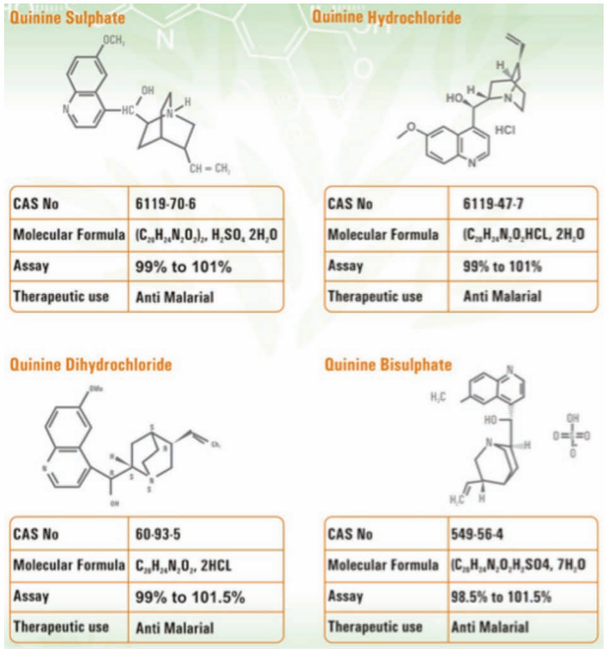
In the history of Malaria it should be recorded that it was the French Physician Laveran who In 1880, for the first time, identified the parasite in the red blood cells of malaria patients.



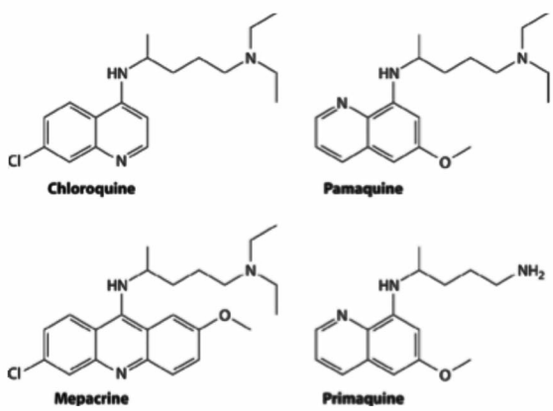


Chemical constituents & synthetics

Following the determination by Robinson of the complex structure of quinine and the compelling demand for the chemical to combat malaria, with the Japanese capture of the colonial plantations there emerged many synthetic substitutes. They were all attempts to synthetically imitate the structural features of the molecule of quinine. The following were the main derivatives of quinine used in therapy and the bark contained besides, many other cinchona alkaloids.



The synthetics that were put into the market, such as those structures below, had a limited effect only since, the parasite became immune to them soon, but they were indeed to serve a purpose, during the stressful wartime years.



These synthetics served to substitute for quinine during the time of the wars until other methods such as the mass use of DDT and then finally the Chinese drug based on Artemisinin derivatives were to take on the dominant role. Yet quinine is still in use as malaria is not yet globally under control. Meanwhile quinine has now been required for several other important clinical purposes.

STEPS IN QUININE EXTRACTION ON A LARGE SCALE

The first industrial process for isolation of quinine from cinchona bark, by Friedrich Koch, 823

Determinaion of the quinine content of the delivered bark

↓

Grinding and milling of the bark

↓

Stirring the powder with time slurry and sodium hydroxide solution
Release of the alkaloids during serveraldays of "maturaion"

↓

Mixing of the lime slurry pulp with oil -> solution of free a lkolids in the oil

↓

Removal by vacuum fitration of the reddish oil layer, and decoloration with boneblack

↓

Addition of hydrochloric or sulfuric acid to the oil phase, alkaloids are transported into the acidic aqueous phase

↓

Crystalization of the alkaloids

↓

Multiple recrystalizations from alcohol and water

Recycling of the oilfor exraction

The current industrial process for isolation of quinine from cinchona bark, from Buchler & Co.

Determination of the quinine content of the delivered bark

↓

Grinding and milling of the bark

↓

Stirring the powder with quicklime and sodium hydroxide solution
-> Release of the alkaloids from ester compounds

↓

Addition of toluene to the alkaline pulp -> Ext raction of the free alkaloids with toluene

↓

Adion of 25% sulfuric acid, the alkaloid sulfates are transported into the acidic aqueous phase

↓

Crystalization of the alkaloids

↓

Multistep purification and separation processes

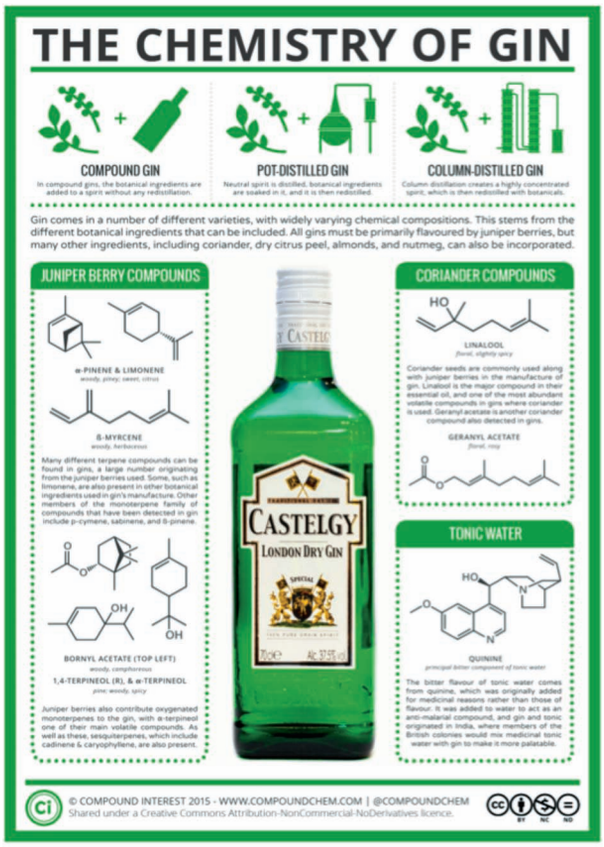
Recycling of the toluene for ext act ion

The Classic tonic

Much as quinine was appreciated by the pharmaceutical industry it was to become a much greater favourite of the beverage industry. The drink gin was first a medicament coming as an essential oil distilled from juniper berries, and also from the seeds of coriander. Its association with a small dose of quinine gave it a reputation as ''a cure for all' and defined a new flavour trail that this day consumes 60% of the global quinine market. Thence ommenced the gin and tonic saga and the 'cocktail' trail.

G&T

This is the Grand Old Man of the summer drinks world, and as the category grows in popularity, so do the options of gin, of tonic, and of garnish. Just add your choice of gin over ice. Add tonic water and garnish of your choice.



Though gin and quinine water (TONIC WATER) was the pioneer summer drink almost all of the tonics that followed did have quinine content in the mixtures so that the flavour of quinine had left its mark on the summer drinks.

The recent history of the cinchona bark is now more than a century and a half old, if we do not count the centuries of the time of the Quechan Indians, and the inca civilization. In the modern times malaria and quinine and indeed in recent times, artemisinin and its derivatives have drawn the attention of the best of scientific talent of the world.

Indirectly in the attempts at synthesis it has brought astounding developments in chemistry, and also a chemical based industry.

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One of the biggest tragedies of human civilization is the precedents of chemical therapy over nutrition. It's a substitution of artificial therapy over nature, of poisons over food, in which we are feeding people poisons trying to correct the reactions of starvation.

Dr. Royal Lee

Learn from the mistakes of others. You wont live long enough to make them all yourself.

Chanakya

WOULD BE THE COSTUS SPECIOSUS (THEBU) LEAF EXTRACTS BECOME REMEDY AGAINST NON COMMUNICABLE DISEASES?

*By Kalpa W. Samarakoon**

Background

Cancer is the leading threat for the world population and first-leading cause of death in economically developed countries and the second in the developing countries. Global cancer statistics showed that about 12.7 million cancer cases were reported with an estimated mortality of 7.6 million in 2008. In addition, breast cancer in females and lung/bronchus cancer in males are the most frequently diagnosed type of cancers reported in the world. Apoptosis is considered as a programmed cell death and characterized cell changes including blebbing, cell shrinkage, nuclear fragmentation, chromatin condensation and chromosomal DNA fragmentation. Apoptosis provides a conceptual framework to understand the cancer genetics and cancer therapy.

Inflammation is also one of the physiological processes and is initiated by the pathogenic invasion or cell and tissue injury and can be influenced by the activation of various immune cells such as macrophages, neutrophils and lymphocytes. Pro-inflammatory cytokines including interleukin (IL) and tumor necrosis factor (TNF-α) can be generated in macrophages as per the inflammatory disease. In addition, inflammation has long been associated with the development of cancers. It has been conceived that the development of cancers from inflammation can be driven by inflammatory cells through varieties of mediators, like cytokines, chemokines and enzymes as well as establishing

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an inflammatory microenvironment. The cause of inflammations and cancers are associated with the physiological conditions and always impacts on the well-being. Most of these chronic situations so called non communicable diseases (NCDs) are initiated by reactive oxygen species (ROS), which are evolved in certain conditions. Basically, ROS are unstable free radicals such as hydroxyl (•OH), nitric oxide (NO•), peroxyl (ROO•) and superoxide (O2•-). Mostly these reactive molecules are formed during the physiological process and commonly generated with the excessive metabolic oxygen.

Under the normal physiological conditions, ROS are effectively eliminated by natural endogenous antioxidant enzymes such as superoxide dismutase (SOD), catalase (CAT) and glutathione peroxidase (GPx). Non-enzymatic antioxidants such as vitamin C, α-tocopherol and selenium are also involved to protect internal organs and tissues from ROS. However, under certain conditions, imbalances between the antioxidant system and ROS can result in damage to the biological tissues and macro bio-molecules such as proteins, lipids and nucleic acids. This phenomenon is known as oxidative stress and can be caused to associate with many degenerative diseases such as aging, cancers, coronary heart diseases and atherosclerosis.

These disorders are increasing due to certain conditions such as environment pollution, chemicals of smoke, alcohol and high-fat diets. Therefore, researchers are continually seeking a good source with potent antioxidant, anti-inflammatory and anticancer ability as an alternative for the dietary supplements. Medicinal plants are considered as a rich source of natural antioxidants. Medicinal plants have been used to treat chronic diseases from many centuries ago. In particular, South Asian and Asian Pacific countries have long utilized medicinal plant materials for expected health benefits and long life. Therefore, many researchers are attempting to evaluate the therapeutic potential of medicinal plants, since they are a rich source of phytochemicals. They are also prolific sources of secondary metabolites. There is a great demand for screening plant products which contain chemical and therapeutic medicinal properties. It is a current trend to explore and evaluate the bio-functional effects of medicinal plant parts in order to find out novel therapeutic agents for mankind.

Tropical herbaceous plants from the family Costaceae under the order, Zingiberales are ornamental plants and also grown for medicinal purpose. Among the available species, *Costus speciosus* (Koen.) Sm. is widely distributed in Sri Lankan home gardens and is better known as Thebu (Sinhala), Spiral flag or wild ginger (English), Keu or Keukand (Hindi), Kembu (Sanskrit) and Kostam (Tamil). In fact, *C. speciosus* is used as a food plant; tender young shoot leaves are traditionally consumed as a green leaf salad and expected to prevent scabies and stomach ailments. In addition, the rhizomes extract is used as a tonic and herbal remedy for fever, constipation, leprosy, asthma, bronchitis and skin ailments. Moreover, it is an alternative source for diosgenin and generally used to control diabetes. A prominent diagnostic characterization on pharmacognostical and phytochemical analysis has been reported recently. However, pharmacological effects of *C. speciosus* leaf have not been studied and reported so far. Therefore, in the present work the antioxidant, anti-inflammatory and anticancer activities of *C. speciosus* plant leaves derived in organic solvent extracts in vitro assays is shown.

Antioxidant effects of C. speciosus leaf extracts

To check the antioxidant activity of the extracts, 2,2-diphenyl-1-picrylhydrazyl (DPPH), hydroxyl and alkyl radicals scavenging potentiality were measured using electron spin resonance (ESR) spectroscopy compared to the standard antioxidant as ascorbic acid. In this study, the most sensitive, direct and accurate method to detect free radical scavenging activity was used. Hence, the ESR technique based spectroscopy was used to monitor reactive species, including DPPH, hydroxyl and alkyl radicals scavenging activity compared to the commercial antioxidant ascorbic acid at the room temperature. DPPH chemicals generate stable free radicals and is widely used to test the antioxidant activity of compounds or extracts of food materials for their free radical scavenging properties or hydrogen donor capacity. Hydroxyl radicals are highly reactive oxygen species, and capable of causing damage to DNA and other biological tissues. Moreover, they can initiate the lipid peroxidation process by abstracting hydrogen atoms from unsaturated fatty acids. Among the extracts, ethyl acetate fraction (T-EA) indicated the strongest scavenging activity against hydroxyl and alkyl radicals with the IC50 values 0.046 ± 0.002 and 0.055 ± 0.004 mg mL-1, respectively. Whereas the commercial antioxidant (ascorbic acid) showed the strongest scavenging activity on hydroxyl radicals (IC50 value 0.0033 ± 0.005 mg mL-1) and alkyl radicals (IC50 value 0.0123 ± 0.006 mg mL-1). Though, the aqueous fraction (T-WE) indicated the highest DPPH radical scavenging activity (IC50 value 0.110 ± 0.01 mgmL-1), ascorbic acid which is used as a commercial antioxidant in this study reported an IC50 value of 0.0035±0.003 mg mL-1.

Table 1.
Radical scavenging activities of different solvent extractions from thebu (*Costus speciosus*) plant leaves [a]

Samples	T-ME	T-HE	T-CE	T-EA	T-WE	AA
IC_{50} values (mg mL-1) [b]						
DPPH	0.320 ± 0.01	0.607 ± 0.02	0.639 ± 0.05	0.403 ± 0.02	0.110 ± 0.01	0.0035 ± 0.003
Hydroxyl	0.258 ± 0.02	0.273 ± 0.01	0.138 ± 0.03	0.046 ± 0.002	0.986 ± 0.04	0.0033 ± 0.005
Alkyl	0.141 ± 0.01	0.082 ± 0.001	0.134 ± 0.03	0.055 ± 0.004	0.203 ± 0.04	0.0123 ± 0.006

[a] The values of IC_{50} were determined by at triplicate individual experiments. Values are mean ± SD of three determinations

[b] The concentration of sample required to scavenge 50% of the radical scavenging activity.

Methanol extract (T-ME); n-hexane extract (T-HE); chloroform extract (T-CE); ethyl acetate extract (T-EA); aqueous extract (T-WE) and AA; Ascorbic acid

Anti-inflammatory activity of *C. speciosus* leaf extracts

Nitric oxide (NO) productions as the inflammatory mediators by iNOS, with the effects of different Thebu leaf extracts were determined in LPS-induced RAW 264.7 cells in vitro. LPS act as endotoxins for mammals and stimulation of the RAW cells in terms of enhancing the NO concentration in the medium. With the pretreatment of Thebu leaf extracts, decreasing effect of the NO production level (%) was measured at all the concentrations. However, among the active extracts, a significant suppressing of NO production level (%) showed by T-ME, T-HE, T-CE and T-EA compared to the control. T-HE and T-CE extracts showed the significant highest and similar results as inhibitory effect of NO production (%) on LPS-induced RAW macrophages dose dependently. The calculated IC50 values on T-HE and T-CE fractions were 23.18 ± 0.02 and 21.84 ± 0.06 μg/mL, respectively (Figure 1). Whereas T-EA extract showed the strongest suppression of NO production level (%) but the determined cytotoxicity effects on RAW 264.7 cells were very high and could not assess as the effective anti-inflammatory activity.

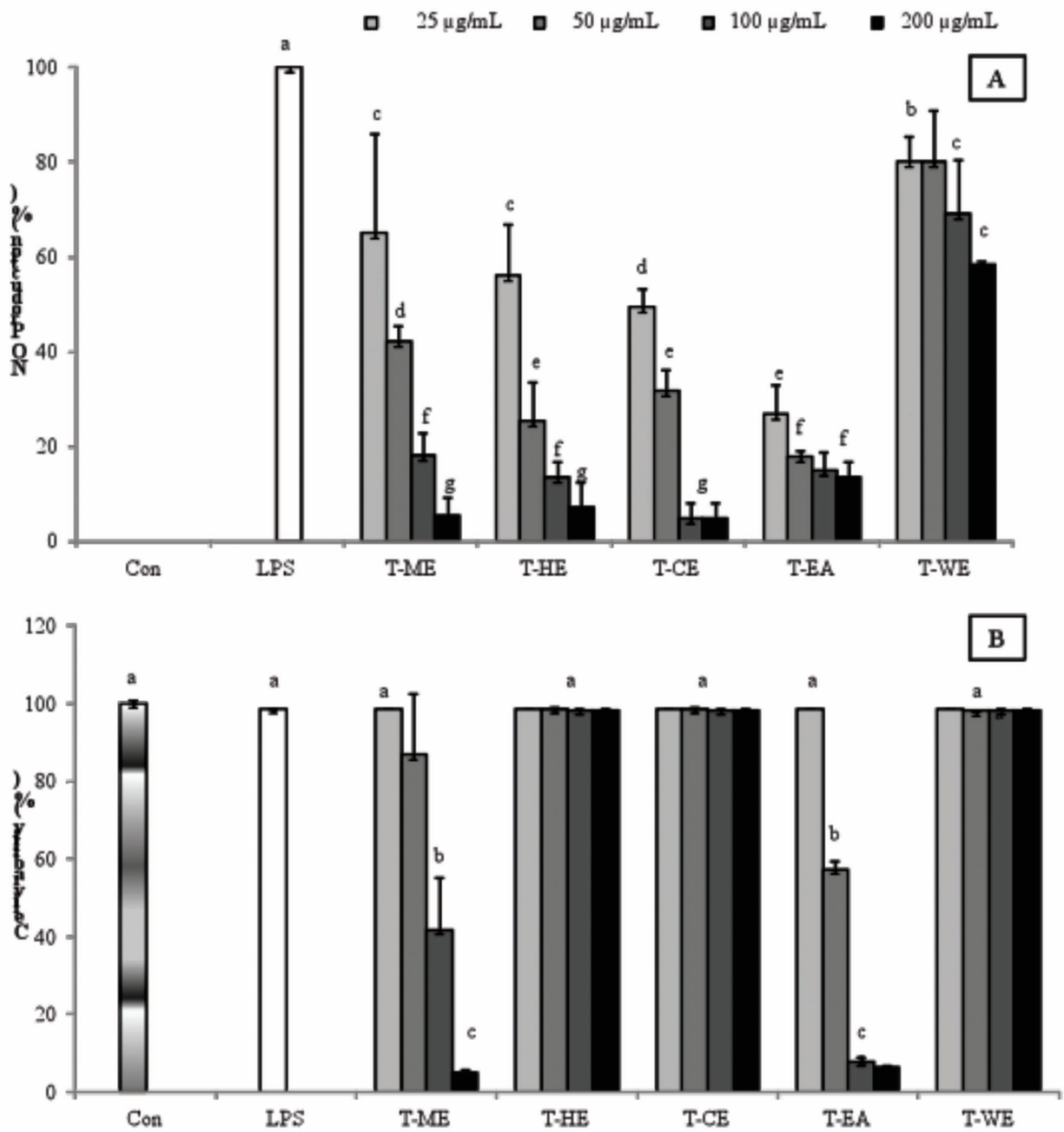

Fig 1. Inhibitory effect of *Costus speciosus* extracts by solvent-solvent partition chromatography on (A): LPS-induced NO production (%) and (B) cell viability (%) in RAW 264.7 macrophages. The Incubation of extracts, T-ME: *C. speciosus* methanol extract; T-HE: *C. speciosus* hexane extract; T-CE *C. speciosus* chloroform extract; T-EA: *C. speciosus* ethyl acetate extract and T-WE: *C. speciosus* aqueous extract with cells in response to LPS (1 μg/mL) for 24 h, the nitric oxide (NO) levels in the medium was measured.

Cancer cell growth inhibitory effect by *C. speciosus* leaf extracts

Anticancer activity was screened against the three different cell lines including a human promyelocytic leukemia cell line (HL-60), a mouse melanoma cell line (B16F10) and a human lung carcinoma cell line (A549). Different polar extracts derived from Thebu leaf were assessed for the inhibitory effect of growth of cancer cell lines. The highest growth inhibitory activity was observed as 94 % on HL-60, 97 % on A549 and 95% on B16F10 cells at 200 μg/mL treated concentration from T-EA extracts compared to the control. The determined IC50 values of T-EA extract for the anticancer effects were 26.06, 31.02 and 30.58 μg/mL against HL-60, A549 and B16F10, respectively. Hence, in order to evaluate the cellular regulatory effects and inducing apoptotic effects on HL-60 cancer cells with the different T-EA concentrations were examined. Flow cytometry analysis confirmed the apoptosis elicited by T-EA and dose-dependently increased after treated with the T-EA on HL-60 cells ompared to the untreated control cells. Moreover, the apoptosis was increased about 46%, when HL-60 cells treated with the T-EA at 100 μg/mL for 24 h, compared to the control group.

To further investigate whether the viability decrease in leukemia cells was due to the induction of apoptosis, cell morphology of T-EA treated cells was analyzed with phase contrast microscopy. The morphology of HL-60 cells were exposed to T-EA, but not control cells, exhibited blebbing, cell shrinkage and apoptotic bodies were observed and the effects were dose-dependent. These data reveal that T-EA induces apoptosis in HL-60 cells in dose dependently.

From the cancer cell growth inhibitory effects, HL-60 cell line was identified as the most susceptible for determining the apoptosis regulatory dependent pathway. Thus, the results indicated that the significant cancer cell growth suppressing effect with the treated T-EA extracts dose-dependently.

Collectively, our results suggest that C. speciosus leaf extracts can be used as a promising agent for medicinal and therapeutic uses. Going by the adage, that the prevention is better than the cure, leafy material of thebu plant could be used as a functional food or food supplement thus taking advantage of the health promoting properties of the plant. This could thereby be considered as one of the future remedies for non communicable diseases.

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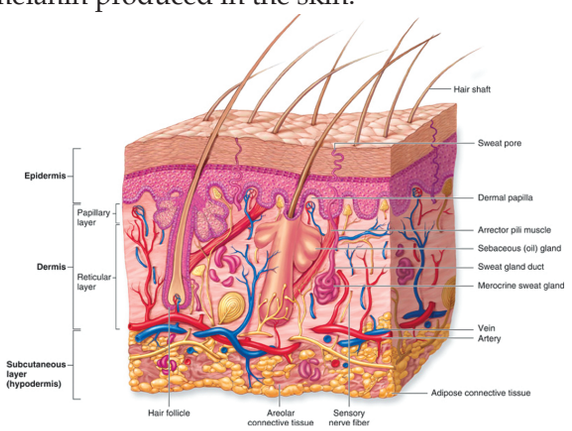
DEVELOPMENT OF A PLANT BASED FAIRNESS CREAM AND ITS TYROSINASE INHIBITION ACTIVITY

*By K.A. Nissansala Kulasooriya *, Lakshmi Arambewela **

Introduction

Human skin exists in a wide range of color and gradations ranging from white to brown to black. This is due to the presence of chemically inert pigmentory agent known as melanin produced in the skin.



Human skin is categorized in to three main regions. They are sub-cutaneous layer, Dermis layer, Epidermis layer. Melanin is produced in specialized cells called melanocytes and they are present in the dermis. Following upon this, melanin is transferred to keratinocytes, which is present in epidermis and gives dark color to the skin. Many factors affect the increase of melanin synthesis. Among them DNA damages caused by UVB radiation is the major cause.

Melanin synthesis pathway

In melanogenesis pathway the precursor molecule is L-tyrosine. Tyrosinase is the rate limiting, key enzyme in the biosynthesis pathway of melanin. The rate limiting steps in melanogenesis are oxidation of L-tyrosine and DOPA. The quantity of melanin synthesis is proportional to the amount of tyrosinase activity present in the cell. Tyrosinase enzyme can be isolated from different sources such as fungus *N.crassa,* hamster melanomas or plant tissues using simple techniques.

Tyrosinase Inhibitors.

Tyrosinase inhibitors may be chemically used for the treatment of some skin disorders associated with melanin hyper pigmentation and are also important in cosmetics for skin whitening effects. Therefore there is a need to identify the compounds which can inhibit the tyrosinase enzyme. A number of tyrosinase inhibitors from natural and synthetic sources inhibit the enzyme. [9-11]

Table1: Some Tyrosinase inhibitors from natural sources

Inhibitor	Source	Ref
Kaempferol	*Crocus sativus*	2
Queracetin	*Hetarothecainuloides*	2
ECG	Green tea	3
GCG	Green tea	3
EGCG	Green tea	3
p-Coumaric acid	*Panax ginseng*	4
Alosin	*Aloe Vera*	5
Cuminaldehyde	Cumin seed	6
Cumic acid	Cumin seed	6
Trans-cinnamaldehyde	*Cinnamomum casia*	7
Anisic acid	Anise oil	8

Some synthetic tyrosinase inhibitors are Kojic acid, Benzoic acid, Benzaldehyde, Captopril Methimazole etc.

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Adverse effects of fairness creams

Most fairness creams contain strong bleaching agents that whiten the skin tone. Many creams also contain strong skin lightening steroids that prevent the skin from secreting the skin coloring pigment, melanin. As a result the skin becomes fairer. There are many other harmful ingredients in the creams that can cause a number of side effects like rashes, skin irritation and blemishes. Long term use of these creams can cause cancer, kidney problems and the skin can become photo sensitive. Skin that has become photo-sensitive could also have problems if subjected to any kind of packs or massage treatments as those oils or packs could further react on the skin. Daily use of these bleaching creams causes the skin to lose its tightness and in turn become thinner. The fairness effects of some creams are temporary. Once the cream is stopped the skin will return to its original color. Hence people resort to regular use of these chemicals which in turn makes the skin weak.

Due to adverse effects of the fairness creams in the market the development of a plant based skin whitening cream was undertaken.

Materials and Methods

The herbal ingredients of the cream are *Alpinia calcarata*[13] yams, *Curcuma zedoriya*[14] yams, Cumin seeds[15], *Psidium guajava* (Guava leaves)[16] and Aloe vera[17]. These were purchased from the market.

Aloe vera

Alpinia calcarata

Curcuma zedoriya yams

Cumin Seeds

Psidium guajava (Guava leaves)

Preparation of ethanol extracts.

The plant materials were weighed and blended with 96% ethanol water mixture. The mixture was kept for about 24 hrs and filtered. After filtration the residue was blended again with of ethanol and water, kept for a 3 hours & filtered. The filtrate was concentrated using a rotary evaporator.

Preparation of Aloe juice

Aloe vera leaves were taken and the lower edge of the leaves was cut. Then the leaves were kept vertically for the yellow colored juice to come out. After 2 hours all the epidermis of the leaves were removed. The Gel was taken and blended well for 15 minutes. Juice was filtered through a white cloth and the juice was collected.

Extraction of tyrosinase enzyme from potatoes[18]

Potatoes (140g) were washed and cut into pieces of about 1 inch squares. Potatoes were put to a cold blender, along with 140 ml of cold 0.1 M sodium fluoride and homogenized using the laboratory blender for 1 minute bursts at high speed.

The mixture was poured through several layers of cheesecloth into a beaker. The volume of the homogenate was measured and an equal volume of saturated ammonium sulfate (saturated ammonium sulfate is 4.1 M at 25 ^{0}C) was added. This caused a flocculent to appear as many of the previously soluble potato proteins become insoluble.

The enzyme tyrosinase is one of these proteins, and was found in the precipitate. The ammonium sulfate-treated homogenate was placed in chilled centrifuge tubes and centrifuged at the highest speed for 5 minutes. The centrifuge tubes were collected and the supernatant fluid was discarded. To the pellets, 10.5 cm^3 of 0.1 M citrate buffer was added. A glass rod was used to break up and each pellet in the buffer was resuspended, keeping the preparation ice cold.

The solution was poured into centrifuge tubes and recentrifuged for 5 minutes. The supernatant (enzyme) in a test tube was poured off and saved. The enzyme solution was kept around 0 ^{0}C.

Preparation of cream using plant extacts

Extracts of *Alpinia calcarata* (1.00g), *Curcuma zedoria* (1.00g), Cumin seed (1.00g), Guava leaves (1.00g) and 10cm^3 of *Aloe vera* juice were taken in to a beaker and mixed with distilled water, 12.0 g of propylene glycol, 8.0 g of triethanol amine and 14.0 g of glycerine. The above mixture was kept in 70 ^{0}C water bath and stirred continuously until a homogenous mixture was formed. Stearic acid (12.0g), Glyceryl monostearate (4.0g), mineral oil (20.0g), lanoline (6.0g) and methylparaban (0.4g) were taken in to a separate beaker and stirred continuously at 70 ^{0}C. The two mixtures were combined to obtain a homogeneous mixture.

Tyrosinase inhibition assay

Tyrosinase inhibition assay was performed for individual plant extracts as well as the cream according to the procedure of Yoshimura [1] with some modifications. 3.60ml of phosphate buffer (pH=6.8), 2.00ml of water with or without L-tyrosine (2mM) and 0.4ml of 50%

DMSO with or without sample were added to the test tubes. The test tubes were pre incubated at 37 ^{0}C for 5minutes, 2.00ml of tyrosinase, which is extracted from potatoes, were added. After incubating at 37 ^{0}C for 15 minutes, the amount of DOPA chrome was determined at 405nm. The percentage inhibition of tyrosinase activity was calculated as the inhibition (%) = [(A-B) / A] * 100, where A represent the difference in absorbance of the control sample between the samples with and without L-tyrosine, and B represent the difference in test sample with and without L-tyrosine. Percentage tyrosinase inhibition was calculated by using UV absorption results.

Results

The percentage yields of *Alpinia calcarata Curcuma zedoriya*, Cumin seed and Guava extracts were 4.7,5.7,3.1 and 5.6 respectively.

Table 2
The Tyrosinase inhibitions of plant extracts and cream

Test sample	% Tyrosinase inhibition
Alpinia calcarata extract	60
Curcuma zedoriya extract	33.33
Cumin seed extract	37.14
Guava extract	50
Aloe vera juice	0
Cream	36.36

Discussion

Tyrosinase enzyme, which was used for tyrosinase enzyme assay was extracted from potatoes as pure enzyme was not available. The percentage tyrosinase inhibition of the prepared fairness cream was 36. It is lower than that of individual plant extracts due to the presence of the cream base. In the tyrosinase inhibition assay of individual plant extracts 0.01% of pure plant extract was used while 0.01% of the cream contains plant extracts (0.0007%) and cream base.

Conclusion

A fairness cream having 36% throsinase inhibition was developed using five common plant extracts. However the performance of this gel has to be assessed through an in vivo method performed on human volunteers. Also a cream containing higher content of plant extracts should be prepared and evaluated.

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"Until man duplicates a blade of grass, nature can laugh at his so-called scientific knowledge. Remedies from chemicals will never stand in favour compared with the products of nature, the living cell of the plant, the final result of the rays of the sun, the mother of all life."

- T. A. Edison

Humans make thousands of units of vitamin D within minutes of whole body exposure to sunlight. From what we know of nature, it is unlikely such a system evolved by chance.

~ Dr. John Cannell,
Executive Director, Vitamin D Council.

We estimate that vitamin D deficiency is the most common medical condition in the world.

Dr. Michael F. Holick,
Vitamin D expert.

"If people let the government decide what foods they eat and what medicines they take, their bodies will soon be in as sorry a state as are the souls who live under tyranny."

Thomas Jefferson

K. HOSNU CAN BASER, A VERSATILE TURKISH SCIENTIST, WITH A DESERVED INTERNATIONAL REPUTATION.

By R.O.B.Wijesekera

Hosnu Baser was a young ebullient researcher when the author first met him and he had then just completed his doctorate at the Chelsea College of the University of London. He was a Pharmacognosist, and he was introduced as a most promising researcher by his mentor Professor Norman Bisset, my old friend.

Dr. Baser had by then returned to Eskisehir where he held a position as a University Don and had been appointed to Head the newly formed University of Anadolu's "Medicinal Plants Research Centre".(TBAM). This is where our interests at first, met as UNIDO, - for which organization I had responsibility as a Technical Adviser,- had then been requested by the Turkish government via the UNDP to assist in building up the capability of the Centre.

Given the dynamic nature of the leadership that the young Baser was to provide, this task came to be a most fruitful and productive one. It was successfully accomplished and over the years came to be regarded as a landmark initiative of UNIDO within its Programs for the "Industrial Utilization of Medicinal Plants and Essential Oils".

By the end of a couple of years the TBAM Centre had not only developed its capability to serve the country, but was also able to undertake a role in serving other developing countries. The singular leadership of young Baser had been the key factor in making this possible.

UNIDO had by then developed a unique "In Plant Group Training Program" which was aimed at helping developing country scientists to enhance their expertise and this had been carried out with the assistance of Rumanian scientists by the Joint UNIDO-Rumania Centre.

UNIDO now looked to staging the program in another developing country, and Baser with the TBAM now well established, readily undertook the task Thus commenced what came to be called the TRUMAP Program (Training in the Utilization of Medicinal & Aromatic Plants), and it was open through the

agency of UNIDO to all developing country scientists. Sri Lanka gained from it through the participation of Yamuna Dasanayake, of LINK NATURAL PRODUCTS, in the TRUMAP program in Eskisehir. The TRUMAP program was to go on for over a decade and about a hundred developing country scientists, from 40 countries, were trained in that time and Baser continued to provide the leadership in developing it to a level of international acceptability.

Another instance was when Baser stepped in to assist the Government with the resurrection of an abandoned process facility for essential oils fractionation in Silifke, on the Mediterranean coast. It was an abandoned unit of pre-war Italian design, and there were no firms that would undertake the repair. Baser and his TBAM colleagues with the assistance of an irrepressible UNIDO expert, Marala B. Narasimha, undertook the task and successfully accomplished it under difficult climatic conditions of a severe winter.

One recalls a pleasant journey through Turkey from Eskisehir to the Mediterranean coast accompanied by Baser and several UNIDO colleagues when the task just described was in operation.

It is no surprise to the present author that Baser subsequently has reached the highest echelons of scientific endeavor through his researches at TBAM on medicinal plants and essential oils. It is no surprise too, that he has been called upon to serve as a consultant to several international organizations including UNIDO, WHO, and has been duly recognized for his work by them. The accolades that he has received are too many to mention here but most significant are:

- His services to the International Council of Medicinal & Aromatic Plants (ICMAP) As Secretary General and as President.
- His services as Founder Member & Later President of the Turkish Society of Cosmetic Scientists.
- His contributions in the organization of the International Symposium on Essential Oils 1997
- Services to the WHO Expert Panel on Traditional Medicine.
- Services to several other International Organizations, such as IFEAT, WOCMAP, and ISHS.

Baser now a world recognized scientist and expert in medicinal plants and essential oils, has retired from his Professorship at the Anadolu University in 2011, and is now with the Near East University in Nicosia , Cyprus. He remains an active international scientific Expert and is a widely regarded colleague in the natural products scientific scenario.

Yet another facet of his versatile character can be mentioned in lighter vein. When the author and his wife were being entertained in Eskisehir by Mrs. Yasmine Baser and Professor Hosnu Baser at a restaurant, Hosnu was irritated by the nature of the entertainment and particularly the vocalist. He then grabbed the microphone and sang in a rich baritone voice with the aplomb and class of a truly professional singer. He was a truly worthy talent in the entertainment direction as well a feature not too many of his wide circle of global scientific colleagues will know.

Photo of Baser with Yamuna Dasanayake of Link Natural, in 1988

Also vide, Link Natural Digest for the article on Turkish Rose Oil authored by Baser.
Ref: Link Natural Digest (2008).vol 4, no 1.21-24

SARVAVISADEE OIL

By Nadeesha Gunasekera and
Dr Ranjit Gamage

Ayurvdic oils have been an indispensable item in the home medicinal chest of Sri Lankan households for the last several hundred years. Their proven efficacy in the relief of common ailments and minor day to day injuries have led to this practice. Unlike some medicines, both adults and children have recourse to these remedies having implicit faith in their effectiveness.

Link Sarvavisadee oil is an effective time tested Ayurvedic oil for skin boils, inflammatory swelling of lymph nodes, itchy skin rashes, inflamed insect bites, and caterpillar contact induced inflammations. It can also be used for the treatment of tonsillitis. It is prepared by using forty-eight herbs described in the Ayurvedic Pharmacopeia.

Directions for use:

Apply externally on the affected area 2 -3 times a day or keep an oil soaked piece of cotton on the affected area. For tonsillitis apply externally on the throat area.

GLEANINGS FROM THE LITERATURE

AUSTRALIA ADAPTS NEW METHOD TO CONTROL INVASIVE FISH

In Australia, native fish populations in some rivers, are being gradually wiped out by carp, which now accounts for 80% of all fish. Carp was introduced to Australia from Europe in 1859, and have now become the most invasive fish pest in the country. Scientists have been tackling this problem during the last several years, and have come up with a carp specific herpes strain – cyprinid herpesvirus 3, which kills between 70 – 80 % of the carp population but does not harm other native fish, or even other species such as frogs and turtles. The Government has now announced a plan to release this virus into rivers which are over populated with carp, by the end of 2018. Consequently, considering the thousands of tonnes of dead carp envisaged, a clean up programme is also being planned.

This is probably the first bio control strategy that uses a herpes virus, but the scientists, have given the assurance that the potential risk to humans is very small.

SUGAR AND HEALTH

A much talked of topic these days the world over, is the effect of sugar sweetened beverages on the health and nutritive status of children. While free sugars contribute to weight gain in both adults and children, childhood obesity has been shown to be significantly increased by the intake of such beverages. While it is also true that many foods such as milk and fruits contain sugars in the natural state, the addition of sugars increases the total energy content of the products and thus increases the total calorie value. Thus a 330 ml of sweetened carbonated drink contains sugars such as sucrose or high fructose corn syrup, and typically has some 35g of sugars and gives approx. 140 calories of energy usually with little other nutritional value.

Consumption of sweetened beverages is shown to be particularly prevalent in low and middle income countries, and consumption is also influenced by the socio economic status of consumers, within each country.

These facts have been brought to the attention of many policy making bodies and organizations by medical experts and nutritionists , and some action has been taken to limit the intake or manufacture of such beverages through policies and guidelines.

Some headway in this direction have been made by US FDA who recently introduced changes on the Nutrition Facts Panel and the American Beverage Association has announced that it will offer more low and no calories beverage options. As part of the change, added sugars in grams and as percent Daily Value will be included in the label. "Scientific data shows that it is difficult to meet nutrient needs while staying within calorie limits if you consume more than 10% of your total daily calories from added sugar and this is consistent with the 2015-2010 Dietary Guidelines for Americans." according to FDA.

In addition, the World Health Organization , during its Sixty third World Health Assembly in May 2010, adopted resolution WHA63.14, which supports a set of recommendations to limit children's exposure to the marketing of sugar sweetened beverages, along with other food products high in saturated fats, sugars and salt. These measures have however not being entirely successful, and stronger governmental intervention may be needed to ensures that dietary recommendations are not undermined by commercial interest.

The Sri Lanka Ministry of Health has taken due cognisance of this international scenario and are soon to take action to restrict the content of sugar and salt in processed and instant foods. Apart from stated effects on child obesity, medical tests carried out locally, has revealed that this has contributed to an increase in non communicable diseases such as diabetes, coronary vascular diseases, strokes and blood pressure among Sri Lankans. The Food Consultative Committee of the Ministry after much discussion recommended that food outlets, restaurants, hotels and tea shops strictly abide by the standard set by Consumer Affairs Authority (CAA) for instant foods and drinks." The over consumption of salt and sugar are the main cause of all these diseases that come from instant or take-away foods which are extremely popular among the urban population," Mr. Wanninayaka said.

He added that the salt and sugar consumption among Sri Lankans was much higher than the international and WHO approved limits. For instance, the internationally approved intake of sugar per day per person was 5 tea spoons but in Sri Lanka it was 9 tea spoons. The sugar intake per person per day was one tea spoon but in Sri Lanka it was 4 tea spoons which was highly detrimental to a healthy life, he stressed quoting the report.

As a result there was a steady increase in the number of persons who fall ill with non-communicable diseases and added,' easily vailable and much popular instant foods and short-eat varieties such as biscuits, cakes, fried rice, kottu, rolls and similar instant foods and almost all soft drinks contain excessive salt or sugar or both," he said.

With regard to sweetened drinks, the Ministry of Health and Indigenous Medicine has taken prompt action and issued a Gazette notification in connection with introducing a special red label on excessive sugar content for bottled drinks 01st August 2016 under 32nd article of the Food Act No 26 of 1980. The manufacturer/importer should display the red label if the sugar content of the drink is over 11g /100 ml. Green label should be displayed for drinks which contain 2g or less. A middle sugar level should be indicated by a yellow label.

In summary, current evidence suggests that reducing sugar intake, especially in the form of sugar-sweetened beverages, may help maintain a healthy body weight. A range of interventions may be effective at achieving this goal.

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"LINKING" WITH PEOPLE AND SOCIETY

LINK NATURAL WINS MORE EXPORT AWARDS

The Presidential Export Awards initiated by the Export Development Board in 1981, is the highest form of recognition given to exporters for their contribution to the country's economy. Link Natural Products has been the recipient of such awards for many years previously. At the 20th Presidential Awards ceremony held on 9th August 2016 , for the period 2014 and 2015, Link Natural Products (Pvt) Ltd. received awards for the category Highest Value Added Exporter of the Herbal and Spa Product Sector for the years 2014 and 2015. This is indeed a significant achievement and it endorses the high quality maintained by the company in all their products.

Mr Fazal Mushin receiving the Presidential award for 2014 from Hon. Sujeewa Senasinghe, State Minister of Internal Trade

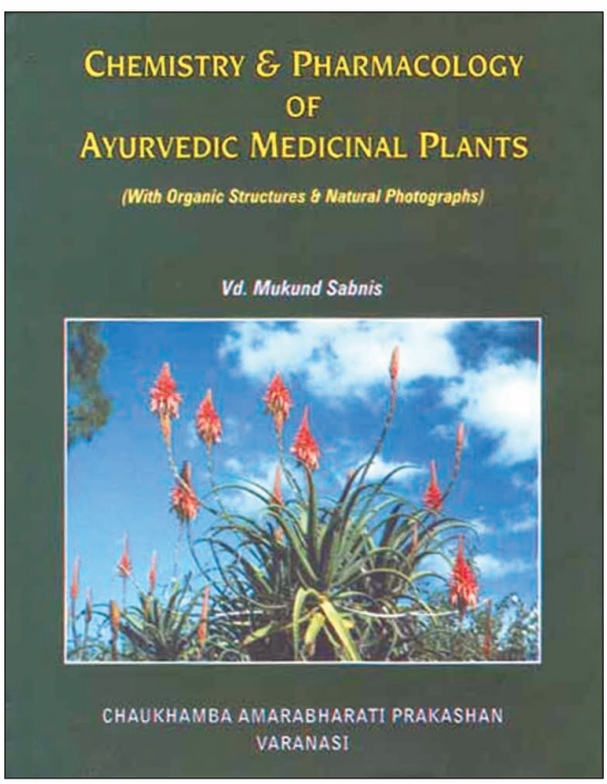
Ms Chamari Wickremetilleke receiving the Presidential Award for 2015 from Hon. Sujeewa Senasinghe, State Minister of Internal Trade

CNCI ACHIEVER AWARD 2016 FOR INDUSTRIAL EXCELLENCE – EXTRA- LARGE CATEGORY NATIONAL LEVEL GOLD AWARD

Link Natural Products became the Extra- large category National level gold award winner at the CNCI Achiever Awards 2016" organized by the Ceylon National Chamber of Industries. This award was presented recognizing the company's outstanding performance in the areas of quality standards, productivity, employee benefits, labour relations and social and environmental obligations.

BOOK REVIEWS

CHEMISTRY & PHARMACOLOGY OF AYURVEDIC MEDICINAL PLANTS



Author : *Vd. Mukund Sabnis*

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Year : *2006*

Medicinal plants act a major role in the medical sciences like Ayurveda and Chinese systems of medicine.

A number of pharmacological activities are attributed to these herbs. People living in rural areas use these valuable medicinal plants for different kind of disorders which are still not documented. So it is really important to do a proper study of these medicinal plants and their properties. The book elaborates the contraindication, drug interactions, metabolism of many of the herbs with their detail chemical constitution and pharmacology. This will help in the development and propagation of Ayurveda through interdisciplinary approach.

This book also deals with fifty-five medicinal plants and eight poisonous plants which are used in medicine. To give more Credibility a number of research journals are scanned and attached to the book. This book is studded with latest information regarding medicinal plants and their uses, which makes it useful to readers including Ayurvedic consultants and research workers.

DIGEST MAIL BOX

Letter 1

Dear Sir/ Madam,

I acknowledge with thanks receipt of the publication you so kindly donated to the National Library and Documentation Services Board of Sri Lanka.

This publication is indeed a very valuable addition to the National Library Collection. Thank you once again and may I take this opportunity to express our gratitude for your interest in our Institution. We expect your cooperation in the future as well.

Thank you

G W G Amitha Gallanawatta
Head/ Acquisitions Division

Letter 1

Dear SIr

I am a retired Professor who was involved in natural product research for some time. I have read some volumes of the Link Digest and found them to be very interesting. I will be extremely grateful if you would send me a copy of the Link Digest magazine to the following address.

Prof C Pathirana
Dear Prof. Pathirana,

Response

Thank you for your interest in our Magazine.
We have added your name and address to our Digest Readers' database.

We have just issued the Link Digest Vol.11 Issue 2. and your copy will be mailed to you ASAP.

Thank You and Best Regards.

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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