

SPICES AND CONCENTRATES

Sri Lanka is a goldmine of spices and medicinal plants with enormous industrial potential which can offer premium quality value added products. Dietary supplements, nutraceuticals, fortified food & beverages, functional foods – whatever the terminology, this sector of value added spices & medicinal plants has taken on a multitude of dimensions during the past 30 years.

In the current scenario, the industry has well specified products with controls in the active ingredient assay, limits of related molecules, residual solvent traces from the process, absence of pesticides, aflatoxins, toxic metals & minerals, specific colour, aroma, stability & shelf life validation and much more. Added to this, are the global certifications for non-GMO, Kosher fitness, Organic, etc. EOAS Organics has gone a long way during the past three decades to maintain its global commitment to produce and export such premium quality products.

While countries like India and China are almost saturated in the business of herb-food cycle, Sri Lanka remains much to be exploited. There are lucrative opportunities with products like gotu kola (*Centella asiatica*), Instant tea extract, cinnamon polyphenols, pepper products, *Garcinia cambogia*, ginger and certain essential oils. However, there is a lag in the infrastructure and operational requirements for such an industry in Sri Lanka. They are –

1. Organised RM sources,
2. Equipment and Process engineering machinery,
3. Competent human resources for project promotion, operation and research.

The following page details some potential spice products with their technical briefing.



BRIEF NOTE ON PROSPECTIVE PRODUCTS

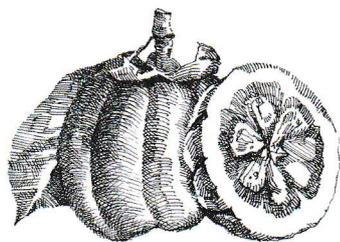


CURCUMINOIDS OF TURMERIC

This is extracted from the plant *Curcuma longa*, a member of the ginger family. Curcuminoids help to reduce inflammation. Several studies suggest that it might ease symptoms of osteoarthritis and rheumatoid arthritis, like pain and inflammation. Other compounds in turmeric might also be medicinal. In some tests, Curcumin seems to block the growth of certain kinds of tumors. One study showed that turmeric extract containing curcumin, stabilizes colorectal cancer that wasn't helped by other treatments. Other preliminary lab studies suggest that curcumin or turmeric might protect against colitis, stomach ulcers, and high cholesterol. Based on studies, turmeric and curcumin might also help treat upset stomach, diabetes, depression, uveitis, and viral infections.



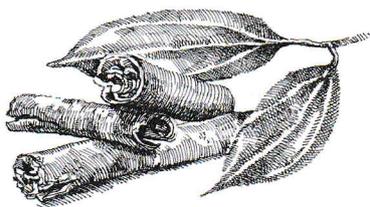
Curcuminoids in turmeric extract – HPLC profile. The three distinct molecules are Curcumin, Desmethoxy curcumin and Bis-Desmethoxy curcumin.



GARCINIA CAMBOGIA

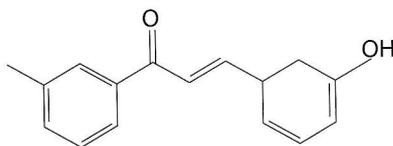
Garcinia cambogia (Goraka in Sinhala) is abundantly available in Sri Lanka, but largely exported as dried fruits. *Garcinia cambogia* on extraction, yields 20% to 30% by weight of Hydroxy Citric Acid salts of various specifications. The mechanism of action is the inhibition of an enzyme

called Citric acid lysase which is required in the synthesis of fatty acids, known as de novo lipogenesis, leading to weight loss. Though, there is not enough validation for this claim, this product has been ruling the exports for more than two decades. Hydroxycitric acid might improve weight loss by preventing fat storage and controlling appetite. It might improve exercise performance by limiting the use of stored energy in the muscles, which prevents fatigue.



CEYLON CINNAMON

Ceylon Cinnamon is unique among the various botanical species around the world. '*Cinnamomum zeylanicum*' is almost free from the toxic 'Coumarins'; a phytochemical found excessively in other species of cinnamon. In addition to the valuable bark oil, the herb can be processed to extract powders useful in diabetes management. EOAS Organics has successfully standardised cinnamon bark extract for the active ingredient MHCP (methyl hydroxyl chalcone polymer) responsible for diabetic management.



Methyl hydroxyl chalcone polymer (MHCP), shows promising data in the area of glucose control. A recent study compared the effect of MHCP in 3T3-L1 adipocytes to that of insulin. (Jarvill-Taylor et al., J. Am. College Nutr., 2001; 20:327-336). The results from that study support the theory that MHCP triggers the insulin cascade and subsequent transport of nutrients. The study also demonstrated that MHCP treatment stimulated glucose uptake and glycogen synthesis to a similar level as insulin. The study further demonstrated that treatment with endogenous insulin and MHCP resulted in a synergistic effect. Due to these conclusions it is suggested that MHCP may prove to be a very valuable tool in the fight against diabetes, where insulin is present.

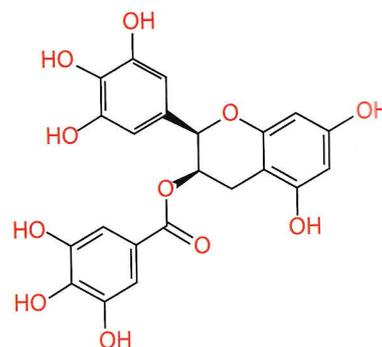
The oils found in cinnamon bark are thought to reduce spasms, reduce gas (flatulence), and stimulate appetite. Cinnamon might also increase blood flow. Cinnamon bark is used for gastrointestinal (GI) issues and diarrhea. It is also used for infections caused by bacteria and parasitic worms; and for menstrual cramps, the common cold, and the flu (influenza).

In foods, cinnamon is used as a spice and as a flavoring agent in beverages. In manufacturing, cinnamon oil is used in small amounts in toothpaste, mouth washes, lotions, liniments, soaps, detergents, and other pharmaceutical products and cosmetics.



CEYLON TEA

Ceylon tea is popular across the globe for its characteristic flavour. Apart from the traditional grades of beverages, the dried leaves can be extracted for standardised Polyphenols and Catechins. The useful parts of green tea are the leaf bud, leaf, and stem. Green tea is not fermented and is produced by steaming fresh leaves at high temperatures. During this process, it has the ability to maintain important molecules called polyphenols, which seem to be responsible for many of the benefits of green tea. The principal ingredient of tea is EGCG (epigallocatechingallate).



This polyphenol can prevent inflammation and swelling, protect cartilage between the bones, and lessen joint degeneration. They also seem to be able to fight human

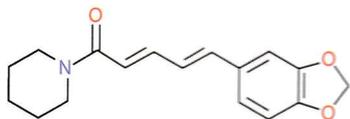
papilloma virus (HPV) infections and reduce the growth of abnormal cells in the cervix (cervical dysplasia). Green tea contains a 2% to 4% caffeine content, which affects thinking and alertness, increases urine output, and may improve the function of brain messengers important in Parkinson's disease. Caffeine is thought to stimulate the nervous system, heart, and muscles by increasing the release of certain chemicals in the brain called "neurotransmitters."

Antioxidants and other substances in green tea might help protect the heart and blood vessels. The waste tea generated in the estates can be value added for instant tea beverages as well, which contributes to major value addition of the tea industry.



BLACK PEPPER

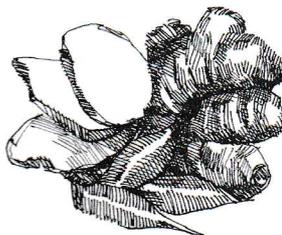
Black Pepper is one of Ceylon's specialties, with its unique aroma and pungent flavour. Among the various forms of pepper (white pepper, dehydrated green pepper, oleo resin, etc) EOAS has standardised pepper extract containing >95% of Piperine. Also, EOAS adopts super critical extraction technology, ensuring a solvent free organic product.



Piperine interacts with the surface of the gastrointestinal tract without irritating it, to quickly shuttle ingested substances to the body's uptake receptors. When there, piperine extends the time where substances are exposed to their target cells before metabolic breakdown occurs. It does this by way of slowing intestinal transit rate and inhibiting certain pancreatic enzymes responsible for metabolizing nutritional substances and excreting them through urination.

The result is that a greater amount of the nutrients ingested are used by the body. Studies show piperine can increase the absorption of vitamins, minerals, amino acids, herbal extracts, and other substances. It works so well

that it could cause higher levels of certain drugs in the blood than intended.

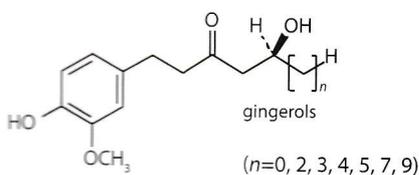


GINGER

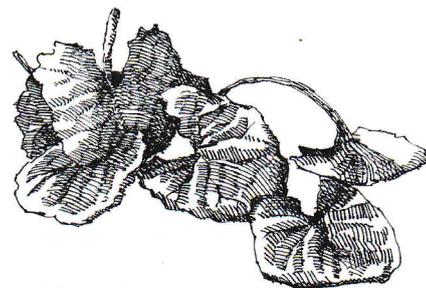
Ginger is commonly used to treat various types of "stomach problems," including motion sickness, morning sickness, colic, upset stomach, gas, diarrhea, irritable bowel syndrome (IBS), nausea, nausea caused by cancer treatment, nausea caused by HIV/AIDS treatment, nausea and vomiting after surgery, as well as loss of appetite.

Other uses include pain relief from rheumatoid arthritis (RA), osteoarthritis, menstrual pain, upper respiratory tract infections, cough, respiratory problems, migraine headache, bronchitis, and diabetes. Ginger is also sometimes used for chest pain, low back pain, and stomach pain, discontinuing use of drugs called selective serotonin reuptake inhibitors (SSRIs), anorexia, to stimulate breast milk, as a diuretic, and to increase sweating. It is also used to treat cholera, bleeding, bacterial bloody diarrhea, baldness, malaria, inflamed testicles, poisonous snake bites, and toothaches.

EOAS Organics use the supercritical extraction technology to isolate Gingerols, responsible for the therapeutic action of ginger. 'Gingerols' is a mixture of Shogaols and related molecules, useful in everyday nutritional needs. It is a fine flavour for food & beverages with proven anti-emetic effect, safe for pregnant women in resolving morning sickness without drugs.



In manufacturing, ginger is used for fragrance in soaps and cosmetics. One of the chemicals in ginger is also used as an ingredient in laxative, anti-gas, and antacid medications.



GOTUKOLA (CENTELLA ASIATICA)

Gotukola (*Centella asiatica*) is standardised for 'asiaticosides', which is responsible for activating a class of proteins known as MAPKs, which causes a release in a growth factor for neurons called Brain-derived Neurotrophic Factor (BDNF). Hence, it is a part of child nutrition helping in the memory and function of brain cells.

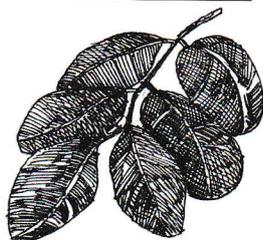
Asiaticoside, has demonstrated an increase in collagen synthesis and therefore anti-wrinkle activity. Skin ageing appears to be principally related to a decrease in the levels of type I collagen; the primary component of the skin dermis. Type I collagen is also known to impart tensile strength to skin. In vitro evaluations have demonstrated the receptorial activity of Asiaticoside on collagen synthesis. Clinical evaluations confirm its anti-wrinkle efficacy.

Also, centella is a potent wound-healer. It is used for fatigue, anxiety, depression and psychiatric disorders, Alzheimer's disease, and improving memory and intelligence. Other uses include circulation problems (venous insufficiency) including varicose veins, and blood clots in the legs.



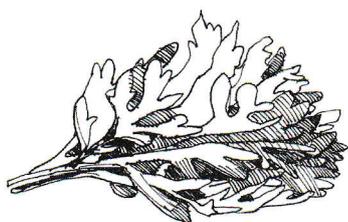
GREEN COFFEE

Green coffee extract is a major nutraceutical ingredient exported from India, which is also abundantly available in Sri Lanka. CHLOROGENIC ACID is a powerful anti-oxidant and helps in weight management. Cafestol is another ingredient in green coffee, which is used in expensive cosmetic formulations, as an anti-ageing ingredient.



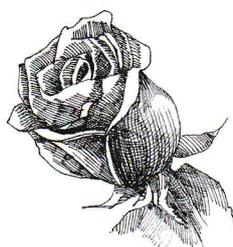
MORINGA LEAF EXTRACT

Moringa leaf extract is a total supplement used in the correction of mineral and nutritional deficiencies. This may be a good protein supplement for vegetarians, along with useful minerals like copper, magnesium, calcium, potassium and zinc.



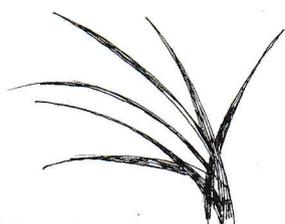
ARTIMICININ

Artemisinin is used most commonly for malaria. It is also used for bacterial infections such as dysentery and tuberculosis, illnesses caused by worms, other parasites, mites fungal infections and viral infections such as the common cold. This grows in abundance in Sri Lanka and offers great potential as a lucrative value addition.



FLORAL AROMATICS

Floral aromatics is an important sector in the value addition of Sri Lankan medicinal & aromatic products. Jasmine, Tuberose and Lotus are among the few at EOAS Organics, using modern technology and infrastructure.



VETIVER OIL

Vetiver Oil and its derivatives such as vetiveryl acetate and vetiveryl formate are of great demand in the fragrance industry.

EVOLUTION OF A NUTRACEUTICAL INGREDIENT

There are ample opportunities with the available herbal resources and demands of the day. A herbal ingredient takes a cue from various traditional medicine systems, and identifies the phytochemical responsible for the therapeutic action. For example, methyl hydroxychalcone polymer (MHCP) mimics insulin, and helps in diabetic management. The extraction process is developed focusing on the physical and chemical properties of this compound, followed by its analytical quantification and clinical validation. Amazing results were observed by administration of papaya leaf juice in the treatment of Dengue fever. The extract standardised for Carpain and Chymopapain, is a valuable product in the treatment of Dengue, by its anti-viral action, thereby controlling the depletion of platelets. A rapid depletion of platelet count is usually the critical condition of Dengue fever. The development of a herbal supplement is a chain of activities, including the process engineering design, and laboratory methods for quantification of the molecules.

MANUFACTURING INFRASTRUCTURE

The facility should ideally comprise of a multi-product manufacturing capacity enabling the general process operations in the extraction, purification and finishing of the natural ingredients. Isolation of bio-active phytochemicals vary from product to product, depending on the influencing physical & chemical properties of the active compounds and the interfering related compounds. The shopfloor should facilitate quick change-over from product to product. Finished products should be handled in a microbe free and controlled environment. Since the quality assurance certifications are almost mandatory, design aspects are planned well before building the plant. Higher capacities may be planned for utilities depending on the future short-time expansion plans. It is very important to have a fully functional laboratory for both quality monitoring and product development.

HUMAN RESOURCES

The operations of handling bulk herbal raw materials while charging and unloading batches is labour intensive. However, a suitable labour policy may be adopted, where routine un-skilled operations are managed with a contract. This industry also creates opportunities for highly qualified professionals to operate as effective value addition in institutions, in addition to providing employment to chemists, botanists and skilled personnel.

FORMULATED NUTRACEUTICAL PRODUCTS

An extraction plant can always be integrated with a formulation facility for the following reasons – Nutraceuticals ingredients manufactured in-house, better specifications control on supplies, sustainability, confidentiality management, quick access for newer ingredients, sharing of testing, R&D facilities, and consistency of production and distribution.

The increasing awareness of dietary supplements is encouraging. Flooding of harmful packed food and beverages in the consumer sector has led to chronic debilities. Some of such harmful ingredients we find in the packed food are – gluten, fructose, sucrose, soy lecithin, triglycerides, hydrogenated fats, synthetic colours & flavours, toxic agro chemicals, heavy metals, pathogens and many more. These substances hinder the healthy function of body organs, leading to chronic diabetes, heart ailments, obesity, arthritis, etc. Nutraceuticals play a responsible role in the elimination of toxins and prevention of degeneration due to environment and lifestyle.

The formulation of a nutraceutical product, comes from the time tested traditions of ayurveda and other alternative medicine. But, it is enhanced by marking a quantified ingredient which claims the therapeutic action. Other purity specifications are ensured and validated for shelf-life and exact dosages. All these factors make the modern formulation, better accepted in the global market in comparison to traditional preparations