

MANGOSTEEN: A "Royal" Fruit. Research, Clinical, and Personal Experiences and Patent

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The Mangosteen fruit above shows the distinctive raised area on the bottom of the fruit, corresponding to the number of segments inside the fruit. It then requires over one hundred days to reach full ripeness. At that time, the fruit stays on the tree until it has turned more purple and brown patches may appear as well. The fruit ends up completely brown at full ripeness.

1. INTRODUCTION

Mangosteen juice is a revolutionary development made of the **WHOLE** fruit puree of the mangosteen. Although this fruit is foreign to most people living in the temperate Western hemisphere, the mangosteen is a fruit prized above all others in the tropical countries of Southeast Asia. In fact, it is often referred to as the "Queen of Fruits" of the "Food of the Gods" in these areas of the world. So why does this mysterious fruit merit such "royal" praise and adoration?

The mangosteen has been prized for thousands of years because of the role it played in ancient Southeast Asian medicine. Traditionally, natural healers used it to help fight infection, control fever and aid in a number of health conditions.

The mature fruit has a unique and unusual appearance. It is roughly the size of a tangerine with a dark purple rind that is rather thick and tough. Encased within this protective coating is a snow-white fruit

that separates into wedges, much like an orange.

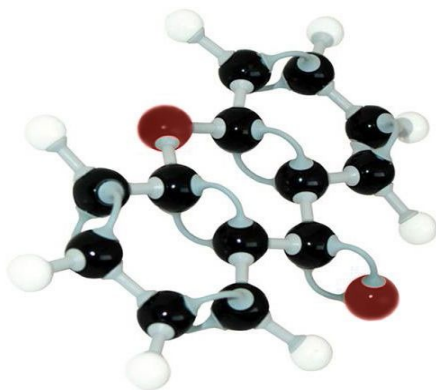
The taste of the mangosteen's flesh is exquisite and unique, with a sweet mild flavor that appeals to the masses. However the mangosteen is a very delicate fruit that does not transport well, which has prevented many people around the world from enjoying its many benefits.

Modern science has examined the mangosteen for its beneficial compounds, and those that receive the most scientific attention are the xanthenes. Xanthenes are biologically active, natural chemical substances found in only a few tropical plants. They are potent antioxidants that demonstrate a variety of health benefits. The mangosteen houses more than three dozen xanthenes, two of which (*alpha-mangostin* and *gamma-mangostin*) have been the focus of numerous recent studies.

Results from these laboratory experiments demonstrate that the xanthenes found in the mangosteen plant show activity against inflammation ^{3,4}, bacteria ⁵, fungus ⁶, histamine ⁷ (which cause allergies), and cancer ⁸, among other maladies. One of the scientific discoveries is that xanthenes inhibit the oxidation of low-density lipoprotein (LDL) ⁹. Oxidized LDL is one of the root causes of atherosclerosis and heart disease.

1.1. Xanthenes in Mangosteen

Mangosteen is the greatest known source of these powerful xanthenes and only recently has the fruit become commercially available in North America. Bottling and preserving its juice has now made it possible for anyone to partake of the medicinal power found in mangosteen. This sweet tasting juice continues to benefit thousands as it spreads around the world.



Chemically speaking, xanthenes are planar-six carbon molecules in a conjugated ring system consisting of a backbone molecule and various chemical groups attached to it. The backbone consists of two benzene rings bridged through a carbonyl group and oxygen. Each ring is connected in a fused formation not allowing free rotation about the carbon-carbon bonds. This unique backbone along with type and position of the attached chemical groups define specific functionalities (properties) of xanthenes.

Among the powerful phytonutrients found in the rind of the mangosteen, xanthenes stand alone in their impressive benefits. Scientific studies suggest xanthenes may promote healthy bodily function. The whole mangosteen fruit is packed with naturally occurring xanthenes.

Researchers have identified dozens of biologically active xanthenes in the mangosteen fruit. Today,

researchers are just beginning to uncover the powerful scientific properties behind the mangosteen fruit.

What are Xanthones? Xanthones are:

A unique class of biologically active compounds possessing numerous bioactive capabilities — such as antioxidant properties.

A restricted group of plant polyphenols, biosynthetically related to the flavonoids.

polyphenol – a group of plant chemical substances characterized by the presence of more than one phenolic group. Polyphenols are responsible for the color of some plants and are considered strong antioxidants with potential health benefits.

flavonoid – over 5,000 naturally occurring flavonoids have been characterized from various plants. The beneficial effects of plant-derived food are often attributed to flavonoid compounds — rather than known nutrients — as they show a wide range of biological effects.

1.2. Nutrition analysis of Mangosteen fruit

The table below comprises nutrition results performed at a US food testing lab that is fully certified and accredited. The fruit used were selected from the 2006 crop which was small and from young trees. The results may shift some as the trees mature but probably not much. The analysis below is from a batch of 32 fruits in total. The weight of each fruit was, on average, approximately 4 ounces or 113.4 grams. With the seeds included, the total of the edible part was 32.3% but I do not consider the seeds to be very palatable. Without the seeds, the total weight of just the edible portion of the mangosteen fruit was about 29% of the total whole fruit weight.

See the values in the table marked below with an asterisk

*pH: The mangosteen pH is quite low. On its own this would make for an intensely sour fruit were it not for the offsetting effect of the high sugar content. This is at the heart of the popularity of the mangosteen and explains why the fresh fruit is so intense in flavor.

**Brix: This number was calculated using a refractometer in the field. The value is high and reflects the significant concentration of sugars. This in combination with strong acidity makes the fresh mangosteen such a memorable tasting experience.

***Potassium: This is one of the nutrients that helps to make the fresh mangosteen fruit an excellent source of this important element. Potassium in the diet plays a vital role in energy levels and heart health.

Fructose	2.4%
Sucrose	10.0%
Glucose	2.2%
Maltose	.1%
Lactose	<0.1%
pH*	3.52
Moisture/VAC/70C/CWt	80.69%
Protein	0.50%
Brix**	18.8%
Fiber, total dietary	1.35%
Riboflavin (Vitamin B2)	<0.08% mg/100g
Thiamin Vitamin B1)	0.08 mg/100g
Vitamin A/B-carotene	<50 IU/100g
Vitamin C	7.2 mg/100g
Vitamin E	0.6 IU/100g
Nitrogen (TKN)	0.08%
Phosphorus	9.21 mg/100g
Potassium***	61.6 mg/100g
Calcium	5.49 mg/100g
Copper	0.06 mg/100g
Iron	0.17 mg/100g
Magnesium	13.9 mg/100g
Manganese	0.10 mg/100g
Sodium	6.43 mg/100g
Zinc	0.12 mg/100g

2. 'MORE THAN UNIQUE.' PROOF OF EFFICACY EVIDENT WITH PATIENTS

By Dr. Sam Walters

I am a naturopathic doctor and hold a master of science in biology with an emphasis in human nutrition. I have formulated products for companies for more than 30 years, including NASA Space Center for the astronauts, pharmaceutical companies and other nutritional companies. I am always looking for new products and new companies with something different. Mangosteen juice is more than unique. I took a long, hard look at it.

If you knew what I knew you would never leave home without your mangosteen juice. Antioxidants are the real keys to the future in treating disease. many medications today are still derived from natural components. When you look at mangosteen it has so many natural properties to it, and the proof of its efficacy isn't just anecdotal. Medical faculties all over the world have research that shows mangosteen contains elements that literally help to correct many diseases that occur today ¹⁵ .

Current projections indicate that one out of four people in North America will get cancer, and one out

of five will die of it in their lifetime. The real name of the game is prevention. We treat a lot of cancer patients in our clinic. One of the first things we do is look for heavy metals in a patient's urine. Heavy metals can destroy the immune system, and we are finding that almost all of the people with cancer are loaded with heavy metals. We try to clean these heavy metals out, and mangosteen helps to remove them. [Natural Cellular Defense - NCD - is the most efficient and safe method of removal. Nutritional support such as mangosteen juice helps replace the needed nutrients.] Mangosteen is an antioxidant. The rind itself contains xanthenes or forms of antioxidants that have been effective against cultures of breast cancer in laboratory experiments, lung cancer, stomach cancer and one type of leukemia ⁸ .

The majority of patients we treat are stage four and beyond. In some cases, they have been given six to eight weeks to live. We often witness wonderful results; the mangosteen juice has become one of the many weapons in our arsenal. It has given them their lives back. When the body is sick it needs biological material, not chemical material. In this day and age we are so polluted with chemicals, contaminants and artificial things. We must learn to do things that are preventative in nature, like using mangosteen. One of the greatest things you can do for your immune system is preventative care ² .

3. CANCER DOCTOR SEES RESULTS

By Amod S. Tootla, MD, Colorectal surgeon specializing in colon cancer.

I am an active tennis player and skier and injured my left knee twice from skiing accidents. After I was done taking my third bottle of mangosteen juice, all of my pain was gone. I had no problem playing three or four sets of tennis, when in prior months one set wore me out. I decided to research what this juice was all about. I researched materials from <http://www.ncbi.nlm.nih.gov/sites/entrez/> and studied xanthenes.

After I discovered the healthy effects that xanthenes have on the body, I decided that I would mangosteen juice on some of my patients. I saw dramatic results (Please see my recommendations for mangosteen usage in section 4 below) Many of my patients are older with color cancer, and some have other conditions like hypertension. After these patients had been on the juice a while, they were coming back and telling me what amazing results they were having. Many experienced less pain from arthritis ^{3,4} .

4. DR TOOTLA'S RECOMMENDATIONS FOR MANGOSTEEN USAGE

I use mangosteen as a first-line therapy in the following conditions:	I use mangosteen as an adjunctive therapy in the following conditions:	In my opinion, the mangosteen equals or outperforms the following US prescription and over-the-counter drugs:
Gastro-esophageal reflux disease Acid dyspepsia or gastritis Hiatal hernia Arthritis Fibromyalgia Fatigue or low energy states Mild depression or dysthymia Mild to moderate anxiety states Mild to moderate asthma Irritable bowel disease Recurrent urinary tract infection Diverticulitis Sleep disorders Allergic rhinitis Neurodermatitis Eczema Seborrhea Otitis externa Non-arthritis muscle or joint pain	Rheumatic or connective tissue diseases Degenerative disc disease Lupus erythematosis Peripheral neuropathy Migraine headache Stomach and duodenal ulcers Diabetes Cystic Fibrosis Moderate to severe depression Ulcerative Colitis and Chron's disease Cancer Cardiovascular disease and hypertension Post-menopausal mood disorder and PMS Viral infections Bacteria infections Fungal infections Hemorrhoids Psoriasis Sever allergic reactions	Nexium, Prevacid, Aciphex Xantac, Pepcid, and other H2 blockers Allegra, Zyrtec, Claritin, other antihistamines Singulair Prednisone Lotrisone, Topicort, Cutivate, other tropical corticosteroids Vallium, Xanax, other minor tranquilizers Prozac, Zoloft, Paxil, Lexapro, otaher antidepressants when used for dysthymia or anxiety Vicodin, Percocet, Duragesic patches, other narcotics Tegaretol, Neurontin, other anti-epileptic drugs when used for chronic pain Anusol, other hemorrhoid preparations Celebrex, Vioxx, Bextra, Naproxen, Arthroterc, Ibuprofen, other anti-inflammatories Ultram, Talwin, other non-opiod pain preparations Midrin, Fioricet, Imitrex. Amerge, Maxalt, Zomig, other migraine preparations Lipitor, Zocor, Pravacol, other lipid-lowering agents Valtrex Aricept, Cognex, other Alzheimer's preparations

5. PREVENTION GREATEST BENEFIT OF MANGOSTEEN

By Albert Miller, M.D., Family physician

I first started to research mangosteen in October 2004. I had not heard of mangosteen or xanthonenes before, so I was excited to begin the research. I went to Medscape (an online resource for physicians at <http://www.medscape.com/home>) and did a Medline search on both xanthonenes and mangosteen and was surprised at what I found. There were, in fact, over one thousand articles on xanthonenes and twenty some on mangosteen. I identified more than 40 xanthonenes in the mangosteen fruit, most of which are in the thick pericarp, or peel.

I narrowed down my clinical research to be more specific to my purpose. This revealed a number of articles to support: 1). potent antioxidant activity, 2). anti-inflammatory action, 3). anti-bacterial action, 4). anti-tumor action, and in some cases, even apoptosis (tumor cell death).

I decided that mangosteen juice would have a place in my practice. I began using the juice myself, and

I prescribed a select group of patients to use it as well. If the results warranted and as the science and my clinical experience directed me, I would expand my recommendation of mangosteen.

For my initial trial, five of my patients along with my wife and I began using mangosteen juice, and the results were amazing. I was most impressed with the anti-inflammatory effects; decreased joint swelling and pain reduction that we saw during our first month. Subsequently, I started recommending mangosteen for a variety of symptoms and diseases. Autoimmune diseases like rheumatoid arthritis, lupus and psoriasis showed remarkable clinical improvement. Chronic skin conditions such as eczema and dermatitis improved in many patients, totally eliminating the need for use of topical steroids in many cases. Males with benign prostate hypertrophy report reduction in nocturia -- the number of times they get up at night to urinate. Osteoarthritis pain and fibromyalgia symptoms do not completely resolve for most patients, but show a marked improvement.

I consider prevention to be the greatest benefit of using mangosteen. I fully believe the evidence clearly points to the fact that all diseases associated with aging directly or indirectly result from excessive oxidation, uncontrolled inflammation or the malfunction of our immune system. As I have stated, mangosteen has a profound effect on each of these. It is likely to be the single most powerful prevention supplement available to us today.^{2,3,4,5,6,8,12,15}

6. 25 NATURAL MANGOSTEEN MIRACLES

See how mangosteen stacks up!

6.1. Boost your energy! Mangosteen's ability to fight fatigue is one of its most sought-after benefits. "[Mangosteen] predictably and reliably provides a safe boost of energy. Users of mangosteen ... have commented on a noticeable increase in energy or sense of well-being."^{10,16}

6.2. Fight inflammation! Chronic inflammation can lead to cancer, arthritis, Alzheimer's disease, type II diabetes, heart disease and other deadly diseases. Xanthones in mangosteen naturally fight inflammation at the cellular level by inhibiting COX-2 enzymes.^{3,4,12}

6.3. Manage your weight! The xanthones in mangosteen act to make our cells soft, permeable and able to quickly convert the food we eat into energy. This makes us feel better and helps us lose weight at the same time.¹⁷

6.4. Reduce and prevent pain! Mangosteen's pain-relieving benefits are helping people everywhere. "I was able to stop using Percocet preparations and heavy doses of anti-inflammatory drugs with which I had been partially controlling the pain of degenerative disk disease in my neck for years. I am now pain-free," shares Dr. J. Frederic Templeman.³

6.5. Prevent heart disease! Heart disease and arteriosclerosis occur when the elasticity of vessels surrounding the heart is lost. Mangosteen helps to fortify this system of vessels through its antimicrobial and antioxidant effects. When these vessels are healthy and strong, the risk of heart disease decreases.⁹

6.6. Fight harmful free radicals! Mangosteen contains catechins, which have been proven to be multiple times more effective against free radicals than the antioxidants Vitamin C and Vitamin E. Dr. Templeman advises, "Use mangosteen as a daily supplement, and you will see the countless

antioxidant benefits it has to offer." ^{15,16}

6.7. Reduce hypertension! Hypertension (elevated blood pressure) is one of the leading causes of arteriosclerosis. Mangosteen has proven effective, especially in those with normal body weight, to lower blood pressure and prevent the onset of pulmonary hypertension. ⁹

6.8. Improve your stomach condition! One of the effects of aging is the natural decline in stomach acid. This leads to increased bacteria in the stomach and causes diarrhea, cramping, gas and mal-absorption of nutrients. Xanthones in mangosteen have proven to kill this overgrowth of bacteria to improve and restore balance in the stomach. ^{14,17}

6.9. Improve urinary tract health! Incontinence for women is caused by the natural decline of muscle tone in the pelvis. This decline in muscle tone reduces the bladder's ability to completely empty itself. As men age, the prostate naturally enlarges, which narrows the urethra and causes some urine to remain in the bladder after urination. Men and women with this condition often experience infection because of retained bacteria in urine that has not been eliminated. The xanthones in mangosteen have a proven, natural antibacterial effect. ¹⁶

6.10. Eliminate bad breath! An amazing "side effect" of the bacteria-killing xanthones present in mangosteen is their ability to stave off bad breath. ²

6.11. Ease asthma! Asthma is an inflammatory disease of the respiratory system. Mangosteen is an ideal alternative to undesirable asthma medications because of its ability to fight infection, inhibit inflammation and reduce allergic triggers -- naturally! ^{3,4,7,12}

6.12. Manage your diabetes! With the ability to lower and regulate blood sugar, decrease appetite, improve energy levels and decrease the need for hypoglycemic medications, mangosteen may be an answer for diabetes. ^{3,4,12}

6.13. Improve mental awareness! Oxidative damage to the brain is a significant cause of dementia. Alzheimer's, Parkinson's and other central nervous system diseases. Because mangosteen is one of the best antioxidant foods it can be effective in preventing mental degeneration. Plus, mangosteen has been shown to improve mental acuity. ¹⁵

6.14. Aid cancer prevention! Mangosteen is being continually researched for its possible prevention of cancer. Research has shown that extracts from the mangosteen fruit may inhibit the growth of human leukemia cells and also inhibit the rapid growth of cells that trigger breast cancer, liver cancer and other gastric and lung cancer cells. ^{8,18}

6.15. Alleviate allergies! Mangosteen is highly sought after for its natural antihistamine and anti-inflammatory effects without causing the undesirable drowsiness that is so characteristic of my allergy medications. ⁷

6.16. Fight infectious diseases! Scientists have exposed growing bacteria to solutions of mangosteen and have found that mangosteen actually stopped the bacteria from growing. As a result, mangosteen is being hailed as "queen of the antimicrobials." ^{2,15,18}

6.17. Increase your feeling of well-being! Tryptophan -- an essential amino acid -- may be enhanced by daily servings of mangosteen. Tryptophan is directly related to serotonin, which is responsible for sleep, moods and appetite. ¹⁰

6.18. Improve your skin! Skin disorders such as eczema, dermatitis, acne, psoriasis and rashes are commonly treated with steroids and anti-fungal creams. Applied topically, mangosteen has proven to fight these skin conditions naturally and without harmful drugs or side effects. ¹¹

6.19. Prevent eye problems! Cataracts and glaucoma are the result of radiation damage to the lens proteins in the eye. These conditions can be prevented by avoiding sun exposure and by supplementing with effective antioxidants such as those contained in mangosteen. ¹⁵

6.20. Have a healthier mouth! The astringent power and antimicrobial effects that have been demonstrated by mangosteen help promote a health mouth and gums. ^{5,6,15}

6.21. Lower cholesterol! When low-density lipoprotein (LDL or "bad" cholesterol) is oxidized in the bloodstream and arteries, fibrous plaques form. Studies have shown that xanthones reduce the oxidation of LDL, which prevents these dangerous plaques from forming. ⁹

6.22. Help prevent kidney stones! Kidney stones are common, particularly in men. When men first use mangosteen in amounts of 3 ounces or more, many urinate frequently during the following 24 hours. This diuretic effect is helpful with prevention or passing of kidney stones. ¹⁶

6.23. Reduce the effects of aging! Mangosteen may help prevent and fight many effects of aging: mental degeneration, gastrointestinal distress, arthritis, muscle and joint pain, and eye degeneration. ^{2,3,4,10,12,14,17}

6.24. Prevent or shorten viral infections! Mangosteen has shown a remarkable ability, when consumed in large amounts at the onset of a viral infection, to speed up the body's processes and heal viral infections more quickly. When taken as a daily supplement, mangosteen has also proven effective in preventing viral infections altogether. ^{5,6,15}

6.25. Improve digestion! The rind of the mangosteen is mostly made up of fiber, Fiber pushes waste through the colon more rapidly, preventing constipation and possible colon cancer. Fiber can also keep cholesterol in check by removing harmful bile acids. ¹⁴

7. THE FOLLOWING ARE A SERIES OF PERSONAL EXPERIENCES WITH MANGOSTEEN JUICE

7.1. MANGOSTEEN AT TOP OF LIST Dr. Judy Leets, Naturopathic Doctor

I am a naturopathic doctor and have been a student of natural health for more than 30 years. In those 30 years I have been introduced to hundreds of supplements but none are as impressive as the juice made from the whole mangosteen fruit. When I was first introduced to this juice I dismissed it as just another supplement that couldn't possibly live up to its expectations. After being told about it over and over I began doing my own research, after one year I embraced it wholeheartedly.

Along with changes to diet and lifestyle, supplementation is the answer to many health issues, and in my opinion, mangosteen juice should be on everyone's list of daily supplements. I have had chronic lower back pain since 1998 when I ruptured a disk in my lumbar vertebrae. When I drink my daily ounces of mangosteen juice with each meal and before bed my symptoms disappear. Our personal doctor was after my husband to take medication for his cholesterol but I convinced him to start drinking the mangosteen juice and his cholesterol came down to normal levels naturally without medication.

The pericarp of the mangosteen fruit contains biologically active molecules called xanthenes that are highly anti-fungal as well as anti-inflammatory. This is the number one reason why any mangosteen juice that is used as a supplement must contain the whole fruit, including the rind. That is what makes it so powerful and efficacious.

The father of medicine, Hippocrates, is the one who said, "Let food be your medicine." Let's help prove him right.

7.2. ARTHRITIS PAIN DIMINISHES by James Graham, M.D. Cynecologic Oncologist

I reached a point in my life where I was going to have to give up my career as a cancer surgeon. I had developed severe arthritis primarily in my knee and ankle joints. After undergoing arthroscopic surgery I was told that I had lost most of the cartilage in my knee joints. I was walking "bone on bone." I was in severe pain and began using a number of traditional western medications, including COX-2 inhibitors. After three months, I developed a gastric ulcer and my hemoglobin dropped to a level of six, thus requiring admission to the Intensive Care unit, endoscopic surgery and transfusion. One of my patients with ovarian cancer as being treated with chemotherapy and was doing extremely well. She was also drinking mangosteen juice. She told me to drink three ounces a day. After three days, I could honestly feel a difference. I was at a point that pain would wake me up as I rolled over in bed at night. Now I sleep through the night and rather than waking up in the morning with stiff joints, I get out of bed and feel great. I have since canceled my disability application and now look forward to many more years of treating cancer patients. Try it! ^{2,3,4,8,12}

7.3. IRRITABLE BOWEL RELIEVED WITH MANGOSTEEN JUICE by Harriett McCallum, Retired LPN

I have had problems with irritable bowel syndrome for almost 10 years, but in the last few years it has become a lot worse. I started drinking mangosteen juice in March and I was amazed at the difference I saw within 48 hours. I no longer had intestinal bloating, my stomach had settled down and I was beginning to have less diarrhea. I don't know what I would do without the mangosteen beverage because it has helped me so much. I was at a point that I was not able to eat anything in the morning before I went out for the day. I would sip on juice and water because I was not able to eat anything without suffering from diarrhea and cramps. This juice has made a tremendous difference in my life. It has given me a new lease on life. I have a lot more energy I don't tire as easily and I am sleeping better.

7.4. BACK PAIN RELIEF WITH MANGOSTEEN by Armando V. DeGuzman, M.D.

In 1989 I was in a very serious accident while bicycle racing. I had severe facial injuries and fractures, and I fractured my cervical spine and lower back. It is a miracle I'm not a quadriplegic today. I started

having problems with severe, traumatic arthritis ^{3,4}, and compression syndrome in my back. It had become so painful that I needed to take Celebrex and Vioxx for the pain. I also had to take some narcotics at night because the pain was so severe I couldn't sleep.

I was going to have surgery on my back to decompress it, but then a friend of mine called and told me about the launch of mangosteen juice. I began drinking three ounces twice a day. After the first week, I didn't have to take the narcotics at night. After another week, I didn't have to use any medications because I was completely pain free.

Because of my healing experience, I started researching the mangosteen fruit and sharing it with my patients as a complement to standard medication. Many patients have been able to taper their medications while on mangosteen juice.

7.5. TURN OFF THE REFLUX by Dr. Robert C. Stone Osteopathic Physician and Research Psychiatrist

After studying decades of research, I believe the antioxidant and anti-inflammatory properties of the mangosteen represent the single greatest step we can take to help prevent the five major diseases: heart disease, cancer, stroke, lung disease and diabetes.

My path to the mangosteen begins way back in my youth. After one particularly successful swimming meet, the losing team 'celebrated' by throwing everyone into the pool. One of my opponents landed directly on my head while I was standing straight up. The damage to my neck and upper back has haunted me every day since. I was 14 at the time. Aspirin was the only medication available for my pain, and I used it a lot, every day. Within a year, I had developed the 'side-effect' of stomach irritation (gastritis) and burning in my esophagus (reflux). These conditions are not known as gastroesophageal reflux disease, or GERD.

For the next decade, I could not find a medication, supplement or substance that would decrease my constant stomach pain. Over the years since, I have taken the highest dose of the strongest stomach medications available. I had some improvement on these medications, but I was a slave to them and still in misery.

Then a friend introduced me to mangosteen. After eight days of drinking 1.5 ounces of mangosteen juice each morning, I didn't have to take any pills at night before bed. Eight months have now passed without being chained to medication, and without risking the hundreds of side effects each of the drugs. Eight months with complete remission of my symptoms, for the first time in 25 years.

Two out of every three of us will die from one of the top five fatal diseases. We now know that free radical damage and chronic inflammation underlie each of these diseases. With the powerful antioxidant and anti-inflammatory properties of the xanthones in the mangosteen, I believe I am actively decreasing my chance of contracting one of these diseases. ^{3,4,10,12,13,14,16,17}

7.6. I SURVIVED CHEMO WITH QUALITY OF LIFE by Janelle Crane

In February 2004 my doctor found a tumor on my ovary the size of a honeydew melon. Surgery was scheduled to remove it. That's when they found out it was clear cell carcinoma, a very aggressive form

of ovarian cancer. The tumor was so impacted and growing around all the other organs, that when they tried to remove it, it burst! The cancer spilled back into my body and was no longer contained to the tumor. I was advised by several physicians to take chemotherapy.

During the next eight months of chemo treatments I drank a bottle of mangosteen juice each day along with a gallon of distilled water to flush the toxins. I was like no other chemo patient my oncologist had. I didn't experience the nausea like other patients did, I wasn't fatigued, I didn't have severe bone pain most suffer, and no anxiety or neuropathy in the feet. My color was good and I looked healthy! I was able to go about my daily routine at full speed. The mangosteen juice gave me quality of life during the worst time of my life.

7.7. NO MORE PIERCING HEADACHES by Ed Cohen, Retired pharmacist

For years I would awake early in the morning with headaches 13 ,sometimes as often as three times a week. I would take Fiorinal tablets and then go back to sleep so I wouldn't have to go to work with the pain. Since using mangosteen juice, I no longer have those terrible headaches, and I sleep through the night.

My wife Sandi suffers from migraine headaches so severe that she would be incapacitated for up to three days at a time. The migraine headaches came too regularly and too often. She also started using mangosteen juice and immediately the length of time between headaches increased to more than five weeks. Mangosteen works!

7.8. MANGOSTEEN CHANGED MY LIFE by Dr. Kenneth J. Finsand, Chiropractic physician

In 1981, while surfing in Hawaii, I broke my back in four areas. Over the last 20 years through chiropractic care, I have been able to lead a fairly normal life. However, the pain has increased because spurring has advanced and degeneration has occurred in certain areas of the spine.

Then I learned about mangosteen juice. I was give an ounce of the juice, and that was the beginning of my major change in my health, my life and my career. I have implemented this product in my clinic and recommended its use to my patients with incredible results. Never have I encountered a natural fruit so powerful. Because of the amazing results I have had with mangosteen, I am now drug free and virtually pain free for the first time in 21 years. The research I have performed on this product has led me to believe that it can turn around chronic conditions of inflammation^{3,4,12} in the cells of the body. It is also my finding that mangosteen is the perfect ailment preventive² . And in the chiropractic world, prevention is the key goal in health care.

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Extracted from: <http://www.patentstorm.us/patents/6730333/fulltext.html#>

10.1. ABSTRACT

Nutraceutical compositions derived from the fruit of the *Garcinia mangostana* L. or mangosteen plant are provided. The nutraceutical mangosteen compositions employ novel combinations of mangosteen fruit pulp and pericarp, and can be additionally complemented by selected juice concentrates to yield a composition for improving general health and wellness in humans.

10.2. CLAIMS (N = 81)

What is claimed is:

1. A nutraceutical beverage comprising:

pericarp from fruit of a *Garcinia mangostana* L. tree;

a first juice from fruit of a *Garcinia mangostana* L. tree; and

at least one second juice selected from the group consisting of fruit juice and vegetable juice.

2. The nutraceutical beverage of claim 1, wherein said at least one second juice comprises fruit juice.

3. The nutraceutical beverage of claim 2, wherein said fruit juice is comprised of at least one of apple juice, apricot juice, banana juice, blueberry juice, cantaloupe juice, cherry juice, cranberry juice, grape juice, grapefruit juice, kiwi fruit juice, orange juice, papaya juice, pear juice, pear puree, pineapple juice, prune juice, raspberry juice and strawberry juice.

4. The nutraceutical beverage of claim 1, wherein said at least one second juice comprises vegetable juice.

5. The nutraceutical beverage of claim 4, wherein said vegetable juice is comprised of at least one of alfalfa juice, carrot juice, celery juice, green barley juice, green lettuce juice, kale juice, parsley juice, spinach juice and tomato juice.

6. The nutraceutical beverage of claim 1, wherein said pericarp from fruit of a *Garcinia mangostana* L.

tree is processed from whole fruit pericarp.

7. The nutraceutical beverage of claim 6, wherein said pericarp comprises ground pericarp.
8. The nutraceutical beverage of claim 6, wherein said pericarp comprises powdered pericarp.
9. The nutraceutical beverage of claim 2 and claim 3, wherein said fruit juice comprises juice from concentrate.
10. The nutraceutical beverage of claim 4 and claim 5, wherein said vegetable juice comprises juice from concentrate.
11. The nutraceutical beverage of claim 1, wherein said juice comprises juice from concentrate.
12. The nutraceutical beverage of claim 11, wherein said juice from concentrate is comprised of at least one of apple juice, blueberry juice, cherry juice, cranberry juice, grape juice, pear juice, pear puree, raspberry juice and strawberry juice.
13. The nutraceutical beverage of claim 11, wherein said juice from concentrate is comprised of at least one of blueberry juice, cherry juice, cranberry juice, grape juice and pear juice.
14. The nutraceutical beverage of claim 6, claim 7 and claim 8 wherein said second juice is comprised of juice from concentrate
15. The nutraceutical beverage of claim 11, wherein a percentage by weight of said pericarp from fruit of a *Garcinia mangostana* L. tree and said juice from fruit of a *Garcinia mangostana* L. tree is approximately 3% to 50% of a total weight of said pericarp from fruit of a *Garcinia mangostana* L. tree, said juice from fruit of a *Garcinia mangostana* L. tree and said juice from concentrate.
16. The nutraceutical beverage of claim 11, wherein a percentage by weight of said pericarp from fruit of a *Garcinia mangostana* L. tree and said juice from fruit of a *Garcinia mangostana* L. tree is approximately 5% to 25% of a total weight of said pericarp from fruit of a *Garcinia mangostana* L. tree, said juice from fruit of a *Garcinia mangostana* L. tree and said juice from concentrate.
17. The nutraceutical beverage of claim 11, wherein a percentage by weight of said pericarp from fruit of a *Garcinia mangostana* L. tree and said juice from fruit of a *Garcinia mangostana* L. tree is approximately 10% to 20% of a total weight of said pericarp from fruit of a *Garcinia mangostana* L. tree, said juice from fruit of a *Garcinia mangostana* L. tree and said juice from concentrate.
18. The nutraceutical beverage of claim 11, wherein a ratio of water to said pericarp from fruit of a *Garcinia mangostana* L. tree, said juice from fruit of a *Garcinia mangostana* L. tree and said juice from concentrate is approximately 1:1.
19. The nutraceutical beverage of claim 11, wherein a ratio of water to said pericarp from fruit of a *Garcinia mangostana* L. tree, said juice from fruit of a *Garcinia mangostana* L. tree and said juice from concentrate is approximately 3:1.

20. The nutraceutical beverage of claim 11, wherein a ratio of water to said pericarp from fruit of a *Garcinia mangostana* L. tree, said juice from fruit of a *Garcinia mangostana* L. tree and said juice from concentrate is approximately 4:1.

21. A nutraceutical beverage comprising: pericarp from fruit of a *Garcinia mangostana* L. tree; a first juice from fruit of a *Garcinia mangostana* L. tree; and a second juice, comprising at least one of apple juice; blueberry juice; cherry juice; cranberry juice; grape juice; pear juice; pear puree; raspberry juice; and strawberry juice.

22. The nutraceutical beverage of claim 21, wherein said second juice comprises juice from concentrate.

23. The nutraceutical beverage of claim 22, wherein a percentage by weight of said pericarp and said first is approximately 3% to 50% of a total weight of said pericarp, said first juice and said second juice.

24. The nutraceutical beverage of claim 22, wherein a percentage by weight of said pericarp and said first is approximately 5% to 25% of a total weight of said pericarp, said first juice and said second juice.

25. The nutraceutical beverage of claim 22, wherein a percentage by weight of said pericarp and said first is approximately 10% to 20% of a total weight of said pericarp, said first juice and said second juice.

26. The nutraceutical beverage of claim 22, wherein a ratio of water to said pericarp, said first juice and said second juice is approximately 1:1.

27. The nutraceutical beverage of claim 22, wherein a ratio of water to said pericarp, said first juice and said second juice is approximately 3:1.

28. The nutraceutical beverage of claim 22, wherein a ratio of water to said pericarp, said first juice and said second juice is approximately 4:1.

29. A nutraceutical composition, comprising: pericarp from fruit of a *Garcinia mangostana* L. tree; and at least one fruit or vegetable juice other than mangosteen juice combined with said pericarp into a nutraceutical composition.

30. The nutraceutical composition of claim 29, wherein said at least one juice comprises fruit juice.

31. The nutraceutical composition of claim 30, wherein said fruit juice is comprised of at least one of apple juice, blueberry juice, cherry juice, cranberry juice, grape juice, pear juice, pear puree, raspberry juice and strawberry juice.

32. The nutraceutical composition of claim 29, wherein said at least one juice comprises vegetable juice.

33. The nutraceutical composition of claim 32, wherein said vegetable juice is comprised of at least one

of alfalfa juice, carrot juice, celery juice, green barley juice, green lettuce juice, kale juice, parsley juice, spinach juice and tomato juice.

34. The nutraceutical composition of claim 29, further comprising processed fruit pulp from fruit of a *Garcinia mangostana* L. tree.

35. The nutraceutical composition of claim 29, wherein said at least one juice comprises juice from concentrate.

36. The nutraceutical composition of claim 29, wherein said at least one juice comprises a juice powder.

37. The nutraceutical composition of claim 29, wherein said nutraceutical composition comprises a syrup.

38. The nutraceutical composition of claim 29, wherein said nutraceutical composition comprises a powdered drink mix.

39. The nutraceutical composition of claim 29, wherein said nutraceutical composition comprises a tablet.

40. The nutraceutical composition of claim 29, wherein said nutraceutical composition comprises a capsule.

41. The nutraceutical composition of claim 29, wherein the percentage by weight of said pericarp and said juice is approximately 3% to 50% of the total weight of said nutraceutical composition.

42. The nutraceutical composition of claim 29, wherein the percentage by weight of said pericarp and said juice is approximately 5% to 25% of the total weight of said nutraceutical composition.

43. The nutraceutical composition of claim 29, wherein the percentage by weight of said pericarp and said juice is approximately 10% to 20% of the total weight of said nutraceutical composition.

44. A nutraceutical beverage comprising: processing fruit of a *Garcinia mangostana* L. tree; processing pericarp from fruit of a *Garcinia mangostana* L. tree; providing at least one fruit or vegetable juice other than mangosteen juice; and combining said processed fruit pulp, said processed pericarp and said at least one fruit or vegetable juice into a mixture.

45. The method of claim 44, wherein said providing comprises providing fruit juice.

46. The method of claim 45, wherein said providing comprises providing at least one of apple juice, apricot juice, banana juice, blueberry juice, cantaloupe juice, cherry juice, cranberry juice, grape juice, grapefruit juice, kiwi fruit juice, orange juice, papaya juice, pear juice, pear puree, pineapple juice, prune juice, raspberry juice and strawberry juice.

47. The method of claim 44, wherein said providing comprises providing vegetable juice.

48. The method of claim 47, wherein said providing comprises providing at least one of alfalfa juice, carrot juice, celery juice, green barley juice, green lettuce juice, kale juice, parsley juice, spinach juice and tomato juice.
49. The method of claim 44, further comprising flash pasteurizing said mixture.
50. The method of claim 44, wherein said providing comprises providing a fruit or vegetable concentrate.
51. The method of claim 50, further comprising providing a percentage by weight of said processed fruit pulp and said processed pericarp in an amount of approximately 3% to 50% of the total weight of said processed fruit pulp, said processed pericarp and said juice concentrate.
52. The method of claim 50, further comprising providing a percentage by weight of said processed fruit pulp and said processed pericarp in an amount of approximately 5% to 25% of the total weight of said processed fruit pulp, said processed pericarp and said juice concentrate.
53. The method of claim 50, further comprising providing a percentage by weight of said processed fruit pulp and said processed pericarp in an amount of approximately 10% to 20% of the total weight of said processed fruit pulp, said processed pericarp and said juice concentrate.
54. The method of claim 50, further comprising providing a ratio of water to said processed fruit pulp, said processed pericarp and said juice concentrate of approximately 1:1.
55. The method of claim 50, further comprising providing a ratio of water to said processed fruit pulp, said processed pericarp and said juice concentrate of approximately 3:1.
56. The method of claim 50, further comprising providing a ratio of water to said processed fruit pulp, said processed pericarp and said juice concentrate of approximately 4:1.
57. The method of claim 44, further comprising forming said mixture into a syrup.
58. The method of claim 44, further comprising forming said mixture into a powdered drink mix.
59. The method of claim 44, further comprising forming said mixture into a tablet.
60. The method of claim 44, further comprising forming said mixture into a capsule.
61. The method of claim 44, further comprising forming said mixture into a beverage.
62. A method of preparing a nutraceutical composition, comprising: grinding fruit from a *Garcinia mangostana* L. tree; grinding pericarp from a *Garcinia mangostana* L. tree; providing at least one juice concentrate other than mangosteen juice concentrate; and combining said ground fruit pulp, said ground pericarp and said at least one juice concentrate other than mangosteen juice concentrate into a mixture.
63. The method of claim 62, wherein said providing comprises providing fruit juice concentrate.

64. The method of claim 63, wherein said providing comprises providing at least one of apple juice concentrate, apricot juice concentrate, banana juice concentrate, blueberry juice concentrate, cantaloupe juice concentrate, cherry juice concentrate, cranberry juice concentrate, grape juice concentrate, grapefruit juice concentrate, kiwi fruit juice concentrate, orange juice concentrate, papaya juice concentrate, pear juice concentrate, pear puree concentrate, pineapple juice concentrate, prune juice concentrate, raspberry juice concentrate and strawberry juice concentrate.

65. The method of claim 62, wherein said providing comprises providing vegetable juice concentrate.

66. The method of claim 65, wherein said providing comprises providing at least one of alfalfa juice concentrate, carrot juice concentrate, celery juice concentrate, green barley juice concentrate, green lettuce juice concentrate, kale juice concentrate, parsley juice concentrate, spinach juice concentrate and tomato juice concentrate.

67. The method of claim 62, further comprising providing a percentage by weight of said ground fruit pulp and said ground pericarp in an amount of approximately 3 to 50% of said mixture.

68. The method of claim 62, further comprising providing a percentage by weight of said ground fruit pulp and said pericarp in an amount of approximately 5 to 25% of said mixture.

69. The method of claim 62, further comprising providing a percentage by weight of said ground fruit pulp and said ground pericarp in an amount of approximately 10 to 20% of said mixture.

70. The method of claim 62, further comprising providing a ratio of water to said ground fruit pulp, said ground pericarp and said at least one juice concentrate other than mangosteen juice concentrate of approximately 1:1.

71. The method of claim 62, further comprising providing a ratio of water to said ground fruit pulp, said ground pericarp and said at least one juice concentrate other than mangosteen juice concentrate of approximately 3:1.

72. The method of claim 62, further comprising providing a ratio of water to said ground fruit pulp, said ground pericarp and said at least one juice concentrate other than mangosteen juice concentrate of approximately 4:1.

73. A method for preparing a nutraceutical beverage, comprising: grinding whole pericarp from a *Garcinia mangostana* L. tree for form ground whole pericarp; providing at least one fruit or vegetable juice other than mangosteen juice; mixing said ground whole pericarp with said at least one fruit or vegetable juice other than mangosteen juice to form a liquid pericarp mixture; and bottling said liquid pericarp mixture.

74. The method of claim 73, further comprising pasteurizing said liquid pericarp mixture before said bottling step.

75. The method of claim 73, further comprising providing a ratio of water to said liquid pericarp mixture of approximately 1:1.

76. The method of claim 73, further comprising providing a ratio of water to said liquid pericarp mixture of approximately 3:1.

77. The method of claim 73, further comprising providing a ratio of water to said liquid pericarp mixture of approximately 4:1.

78. The method of claim 73, wherein said providing comprises providing fruit juice.

79. The method of claim 78, wherein said providing comprises providing at least one of apple juice, apricot juice, banana juice, blueberry juice, cantaloupe juice, cherry juice, cranberry juice, grape juice, kiwi fruit juice, orange juice, papaya juice, pear juice, pear puree, pineapple juice, prune juice, raspberry juice and strawberry juice.

80. The method of claim 73, wherein said providing comprises providing vegetable juice.

81. The method of claim 80, wherein said providing comprises providing at least one of alfalfa juice, carrot juice, celery juice, green barley juice, green lettuce juice, kale juice, parsley juice, spinach juice and tomato juice.

10.3. DESCRIPTION

BACKGROUND OF THE INVENTION

10.3.1. Field of the Invention

The present invention relates to nutraceutical compositions derived from the fruit of the *Garcinia mangostana* L. plant, otherwise known as the mangosteen plant. More particularly, the present invention relates to nutraceutical compositions comprising a mixture of the pulp and pericarp of the mangosteen fruit.

10.3.2. Background and Related Art

The mangosteen tree (*Garcinia mangostana* L.) was named after the French explorer Laurent Garcin (1683-1751) and has been cultivated for a considerable time in tropical areas of the world. The tree is presumed to have originated in South East Asia or Indonesia and has largely remained indigenous to the Malay Peninsula, Myanmar, Thailand, Cambodia, Vietnam, the Sunda Islands, and the Moluccas. Although the mangosteen fruit is highly praised as one of the best tasting of all tropical fruits, it is considered a minor tropical fruit, and the mangosteen tree has largely piqued purely botanical interests over the years.

The mangosteen tree is a slow-growing, smooth evergreen tree that ranges from 5 to 25 meters in height with a flaking black bark that contains a yellow, resinous latex. The mangosteen tree bears fruit when 6 to 20 years old, depending on location, and can continue to yield fruit for up to 100 years. The mangosteen fruit ripens to a dark reddish-violet to black-violet color and is normally smooth or marked with brownish scars. The pericarp, or rind, of the mangosteen fruit is thick, tough, and exudes a bitter yellowish resin. Only about 25 to 30% of the mangosteen fruit consists of the edible pulp or rind, with

the remainder comprising the tough, bitter pericarp. Each mangosteen fruit usually varies in weight from 75 to 120 grams and normally contains 2 to 3 well-developed seeds.

Over the years, the mangosteen plant has been used in a number of different ways. The timber is used for cabinets, building materials, fencing and furniture. The pericarp, containing pectin, tannins, resins and a yellow latex, is used in tanning and dyeing leather black. The fruit pulp is mostly used as a dessert, but can also be canned or made into preserves. However, when removing the fruit pulp from the rind, care must be taken to prevent the tannins and resins of the cut pericarp from contacting the fruit pulp. The mangosteen rind, leaves and bark have also been used as ingredients in folk medicine in areas where the plant grows indigenously. The thick mangosteen rind is used for treating catarrh, cystitis, diarrhea, dysentery, eczema, fever, intestinal ailments, itch, and skin ailments. The mangosteen leaves are used by some natives in teas and other decoctions for diarrhea, dysentery, fever, and thrush. It is also known that concoctions of mangosteen bark can be used for genitourinary afflictions and stomatosis.

Some of the medicinal properties of the *Garcinia mangostana* L. plant have been the subject of pharmacological and clinical studies. These studies have isolated chemical constituents in the mangosteen leaves, wood, pericarp and seed aril, which were found to contain the following biologically active compounds, among others: 1,6-dihydroxy-3-methoxy-2-(3-methyl-2-butenyl) xanthone, 1,5,8-trihydroxy-3-methoxy-2-(3-methyl-2-butenyl) xanthone, maclurin, 1,3,6,7-tetrahydroxy xanthone, 1,3,6,7-tetrahydroxy xanthone-O- β -D-glucoside, chrysanthemine, cyaniding-3-O- β -D-sophoroside, 8-deoxygartanin, 1,5-dihydroxy-2-isopentenyl-3-methoxy xanthone, 1,7-dihydroxy-2-isopentenyl-3-methoxy xanthone, 5,9-dihydroxy-8-methoxy-2,2-dimethyl-7-(3-methylbut-2-enyl)²(H), 6(H)-pyrano-(3,2,6)-xanthen-6-one, fructose, garcinone A,B,C, D and E, gartanin, glucose, cis-hex-3-enyl acetate, 3-isomangostin, 3-isomangostin hydrate, 1-isomangostin, 1-isomangostin hydrate, kolanone, mangostin, β -mangostin, γ -mangostin, mangostin-3,6-di-O-galactoside, normangostin, sucrose, tannins, BR-xanthone-A, BR-xanthone-B, calabaxanthone, demethylcalabaxanthone, 2-(β , β -dimethylallyl)-1,7-dihydroxy-3-methoxyxanthone, 2,8-bis-(β , β -dimethylallyl)-1,3,7-trihydroxyxanthone, 1,3,5,8-tetrahydroxy-2,4-diprenylxanthone, and mangostanol.

Many of these chemical constituents are xanthenes, which are biologically active compounds that are receiving increasing interest in pharmacological studies for a variety of health benefits.

However, despite the pharmacological benefits of individual xanthone compounds and the native medicinal uses of the bark, leaves and rind of the mangosteen plant in Southeast Asia and Indonesia, a nutraceutical composition containing the holistic benefits of the entire mangosteen fruit, including the fruit pulp and pericarp, is not known. In fact, it is recognized that when preparing the fruit pulp for consumption, care should be taken to separate from the delicious inner fruit pulp the outer pericarp with its resins and tannins, which are traditionally used to treat and stain leathers.

There exists a need in the nutritional arts for a nutraceutical composition that offers the health benefits of the entire mangosteen fruit, including the pulp and the pericarp. There also exists a need for a nutraceutical composition rich in natural xanthenes for treating a variety of human ailments and conditions in an efficacious manner. Further, there is a need in the art for a natural xanthone product that is economical to manufacture.

10.4. SUMMARY OF THE INVENTION

The present invention relates to nutraceutical compositions derived from the fruit of the *Garcinia mangostana* L., or mangosteen plant. More particularly, the present invention relates to efficacious nutraceutical compositions rich in natural xanthenes that include the pulp and the pericarp of the mangosteen fruit. These compositions preferably comprise a mixture of mangosteen fruit pulp and pericarp with selected juice concentrates. In addition, the present invention relates to methods of preparing nutraceutical compositions of *Garcinia mangostana* L. plant that yield efficacious health supplements rich in natural xanthenes. Further, the methods of preparing the mangosteen nutraceutical compositions are economical to operate.

A primary object of the present invention is to provide a nutraceutical composition that contributes to general human wellness and good health through a novel mixture of the pericarp and pulp of the fruit of the *Garcinia mangostana* L. plant. The effectiveness of this mixture is heightened through the addition of selected juice concentrates in varying amounts.

Another object of the present invention is to provide a nutraceutical composition that offers the holistic benefits of the entire mangosteen fruit and is an efficacious source of natural xanthone compounds. An additional object of the present invention is to provide an antimicrobial and anti-inflammatory composition containing a therapeutic amount of natural xanthenes derived from the *Garcinia mangostana* L. plant.

A further object of the present invention is to provide a xanthone-rich natural product with antioxidative properties.

Another object of the present invention is to provide a nutraceutical composition of *Garcinia mangostana* L. plant with beneficial antibacterial action.

An additional object of the present invention is to provide a process for preparing nutraceutical compositions of the *Garcinia mangostana* L. plant yielding the holistic benefits of the unique combination of mangosteen fruit pulp and pericarp, either alone or with complementary and enhancing juice concentrates.

Yet another object of the present invention is to provide an economical process for manufacturing nutraceutical compositions of the entire fruit of the *Garcinia mangostana* L. plant. The foregoing and other objects, advantages and characterizing features will become apparent from the following description of certain illustrative embodiments of the invention.

While the methods and processes of the present invention have proven to be particularly useful in the area of nutritional health supplements, those skilled in the art can appreciate that the methods and processes can be used in a variety of different applications and in a variety of different areas of manufacture to satisfy a wide-ranging variety of pharmaceutical and medicinal needs.

The above-described features and advantages of the present invention, as well as additional features and advantages, will be set forth or will become more fully apparent in the description that follows and in the appended claims. The novel features which are considered characteristic of this invention are set forth in the attached claims. Furthermore, the features and advantages of the invention may be learned

by the practice of the invention, or will be obvious to one skilled in the art from the description, as set forth hereinafter.

10.5. DETAILED DESCRIPTION OF THE INVENTION

The present invention relates to nutraceutical compositions derived from the *Garcinia mangostana* L. plant, otherwise known as the mangosteen plant. In particular, the compositions of the invention described herein uniquely provide natural xanthone compounds through the combination of the pulp and pericarp of the mangosteen fruit, along with selected juice and other phytochemical ingredients. The invention also relates to processes for manufacturing the nutraceutical compositions described herein in an economical manner.

It is understood that the terminology used herein is used for the purpose of describing particular embodiments only, and is not intended to limit the scope of the present invention. It is also understood that, as used herein and in the appended claims, the singular forms "a," "an," and "the" include plural reference, unless the context clearly dictates otherwise. In the disclosure and in the claims, the term "nutraceutical" shall refer to "any compounds or chemicals that can provide dietary or health benefits when consumed by humans or animals."

Unless defined otherwise, all technical and scientific terms used herein have the same meanings as commonly understood by one of ordinary skill in the art to which this invention belongs. Preferred methods, compositions, and materials of the present invention are described herein, although any methods and materials similar or equivalent to those described herein can be used in the practice or testing of the present invention. All references cited herein are incorporated by reference in their entirety.

The *Garcinia mangostana* L. plant, or mangosteen plant, is known for a variety of uses in the areas to which it is indigenous. For example, there are a number of folk medicines in South-east Asia and Indonesia that employ various decoctions of the leaves, root, and bark of the mangosteen plant, as well as of the pericarp of the mangosteen fruit. For example, according to the literature, the thick mangosteen pericarp can be used as an astringent or in various decoctions for treating catarrh, cystitis, diarrhea, dysentery, eczema, fever, intestinal ailments, itch, and skin ailments. Other medicinal uses of the leaves, root and bark would be known to one of skill in the art. Also, the outer pericarp of the mangosteen fruit, which contains pectins, tannins, resins and a yellow latex, is used for treating and staining leather black.

In contrast to the thick outer pericarp, the edible inner pulp of the mangosteen fruit is widely regarded for its exquisite taste. The inner pulp of a single mangosteen fruit usually consists of four to eight juicy, white-colored segments. When preparing the white pulp segments for consumption, care must be taken so as to not stain the pulp segments with the resins and tannins and other matter that oozes out of the cut outer pericarp. The need to keep the delicious white pulp separate from the dark purple, staining, bitter pericarp has long been known to those familiar with the mangosteen fruit.

Xanthenes are biologically active plant phenols that naturally occur in a restricted group of plants. The general structure of a xanthone is: ##STR1##

From a biosynthetic standpoint, they are related to the flavonoids, being formed by the condensation of

a phenylpropanoid precursor with two instead of three malonyl coenzyme A units. Xanthones possess significant pharmacological properties, including antidepressant, antitubercular, antimicrobial, antiviral, anti-inflammatory, cardiostimulant, antileukemic, antitumor, antiulcer, antihepatotoxic, antiallergenic, and antirhinoviral activities and actions.

Pharmacological and botanical researchers have discovered that the medicinal properties of the mangosteen pericarp can be attributed to natural xanthones contained in the rind. The unrelated plant families Gentianaceae and Guttiferaceae are largely where naturally occurring hydroxanthones and their methyl ethers are found. The *Garcinia mangostana* L. plant, which contains a large number of naturally occurring xanthones, belongs within the Guttiferaceae family of plants.

Recent research has shown that the γ -mangostin compound, a natural xanthone found in the *Garcinia mangostana* L. plant, inhibits type A and type B monoamine oxidases as well as cyclooxygenase and prostaglandin E₂ synthesis. (Nakatani et al., 63 *Biochemical Pharmacology* 73-79 (2002)). Under normal conditions in the brain, the levels of prostaglandin E₂ (PGE₂) are very low or even undetectable. However, during episodes of tissue inflammation, multiple sclerosis, and AIDS-related dementia, PGE₂ levels rise, and can affect the activities of neurons, glial, and endothelial cells. High levels of PGE₂ also affect microglia/macrophage and lymphocyte functions. It is widely understood that the generation of prostaglandins is associated with inflammation, pain and fever.

Cyclooxygenase is the rate-limiting enzyme in prostaglandin production. There are two isoforms of cyclooxygenase (COX), constitutive (COX-1) and inducible (COX-2), which is expressed in response to inflammation stimuli. The xanthone γ -mangostin is found to directly inhibit activity of both COX isoforms as well as PGE₂ synthesis, which makes this xanthone desirable in the treatment of inflammatory conditions as well as symptoms of fever and pain. The nutraceutical compositions of the present invention offer therapeutic amounts of important xanthones, including γ -mangostin, from a natural source to provide increased health and general wellness in humans.

In the present invention, it has been discovered that a mixture of the mangosteen pericarp and fruit pulp in a single nutraceutical composition yields surprising health benefits. The efficacy of this xanthone-rich mixture of mangosteen pericarp and pulp is enhanced through the addition of selected juice and phytochemical ingredients, which are believed to synergistically react with the natural xanthone compounds. In a preferred embodiment of the invention, the mixture of mangosteen fruit pulp and pericarp is complemented by the addition of one or more juice concentrates selected from the group consisting of alfalfa juice concentrate, apple juice concentrate, apricot juice concentrate, banana juice concentrate, blueberry juice concentrate, cantaloupe juice concentrate, carrot juice concentrate, celery juice concentrate, cherry juice concentrate, cranberry juice concentrate, grape juice concentrate, grapefruit juice concentrate, green barley juice concentrate, green lettuce juice concentrate, kale juice concentrate, kiwi fruit juice concentrate, orange juice concentrate, papaya juice concentrate, parsley juice concentrate, pear juice concentrate, pear puree, pineapple juice concentrate, prune juice concentrate, raspberry juice concentrate, spinach juice concentrate, strawberry juice concentrate and tomato juice concentrate.

The nutraceutical compositions of the present invention deliver therapeutic amounts of natural xanthone compounds derived from the mangosteen fruit pulp and pericarp mixture. In one embodiment of the present invention, the mixture of mangosteen fruit pulp and pericarp is present in an amount ranging from between 3 and 50%, preferably between 5 and 25%, and most preferably between 10 and

20% of the total weight of mangosteen mixture and selected juice concentrates. In another embodiment of the invention, the nutraceutical composition comprising mangosteen fruit pulp and pericarp is formulated for oral administration. However, the present compositions can be delivered in any form known in the art, such as tablets, capsules, dispersions, solutions, suspensions, transdermal delivery systems, etc. If the mangosteen pericarp and fruit pulp mixture is complemented with selected juice concentrates, then a liquid beverage is a convenient delivery form, but other delivery forms are equally efficacious and would simply require the use of powders or other equivalent forms of the juice concentrates. Tablets or capsule forms of the present nutraceutical compositions can be prepared and coated by methods known to those of ordinary skill in the art. When the nutraceutical compositions of the present invention are presented in liquid beverage form, the ratio of water to mangosteen mixture and selected juice concentrates can be 1:1, preferably 3:1 and most preferably 4:1.

The nutraceutical compositions of the present invention can be produced through large-scale, economical operations. In one embodiment of the invented process, whole fruit from the *Garcinia mangostana* L. plant is picked and transported to a production facility. The fresh fruit can be kept at ambient air temperatures during transportation or it can be frozen, depending on need. The entire mangosteen fruit, including the fruit pulp and pericarp, is then ground into a pulp and pericarp mixture using commercial grinding or mixing equipment. The resulting mixture of mangosteen fruit pulp and pericarp can then be further processed through the addition of one or more of the selected juice concentrates listed above. In preferred embodiments of the beverage form of the invention, the selected juice concentrates and water are then added to the mixture in accordance with the amounts, ranges and ratios specified above. The liquid nutraceutical compositions can then be treated, bottled or packaged for distribution to consumers using a variety of methods known to those of ordinary skill in the art, such as pasteurization, flash pasteurization, sterilization, UHT sterilization, pressure sealing, freezing, freeze drying, irradiating, etc. Dehydrated and other forms of the nutraceutical compositions can also be prepared using standard techniques.

The effectiveness in improving general health and wellness of the nutraceutical mangosteen compositions described herein is demonstrated from the following clinical examples, which are listed for illustrative purposes only and are not meant to be limiting instances of therapeutic use. A therapeutic composition of the mangosteen fruit pulp and pericarp mixture was prepared according to the embodiments described herein. Each subject ingested 3 ounces of the beverage daily for a three week period. The following qualitative results were obtained:

EXAMPLE 1 The subject was a 62-year-old female suffering from chronic back pain, nausea and chronic vertigo. Prior to the study, the back pain was treated with oral doses of morphine three times a day. After a regimen of the mangosteen nutraceutical composition, the subject experienced improved energy, less nausea and a decrease in the vertigo symptoms.

EXAMPLE 2 The subject was a 56-year-old male suffering from chronic obstructive pulmonary disease, muscle aches, fatigue and dysthemia. After a regimen of the mangosteen nutraceutical composition, the subject experienced improvement in mood, energy and muscle aches in the shoulders and back.

EXAMPLE 3 The subject was a 55-year-old male suffering from irritable bowel syndrome. After a regimen of the mangosteen nutraceutical composition, the subject experienced regularization of bowel movements.

EXAMPLE 4 The subject was a 30-year-old male suffering from chronic neck pain, familial hyperlipidemia, fatigue and insomnia. After a regiment of the mangosteen nutraceutical composition, the subject experienced improved energy and a decrease in low-density lipoproteins.

EXAMPLE 5 The subject was a 52-year-old male suffering from hypokelema, fatigue and weight gain. After a regiment of the mangosteen nutraceutical composition, the subject experienced improved energy and a normalization of potassium levels.

EXAMPLE 6 The subject was a 63-year-old female suffering from degenerative arthritis, C-difficile colitis, fatigue, decreased appetite hypokelema, and numbness of the fingers and toes. After a regiment of the mangosteen nutraceutical composition, the subject experienced improvement in colitis, reduction of pain in wrists and hands and a normalization of potassium levels.

EXAMPLE 7 The subject was a 66-year-old male suffering from a severe allergy reaction causing desquamation of palms, fingers, soles of feet and the inside of the mouth and esophagus. After a regiment of the mangosteen nutraceutical composition, the subject was completely cured.

EXAMPLE 8 The subject was a 57-year-old male suffering from malaise, muscle aches, hepatitis, glomerionephritis, diabetes and hyperlipidemia. After a regiment of the mangosteen nutraceutical composition, the subject experienced a 30 point decrease in low-density lipoproteins, a 10 point increase in high-density lipoproteins, improved energy, a 14-pound weight loss and the malaise was eliminated.

EXAMPLE 9 The subject was a 30-year-old male suffering from a chronic dermal rash. After a regiment of the mangosteen nutraceutical composition, the rash was completely eliminated.

EXAMPLE 10 The subject was a 25-year-old female suffering from low energy levels. After a regiment of the mangosteen nutraceutical composition, the subject experienced increased energy.

EXAMPLE 11 The subject was a 28-year-old female suffering from extreme fatigue and depression. After a regiment of the mangosteen nutraceutical composition, the subject experienced a significant increase in energy.

EXAMPLE 12 The subject was a 26-year-old female suffering from irritable bowel syndrome. After a regiment of the mangosteen nutraceutical composition, the subject experienced a decrease in cramping and stool frequency and increased energy.

EXAMPLE 13 The subject was a 32-year-old male marathon runner and iron man competitor. After a regiment of the mangosteen nutraceutical composition, the subject experienced increased energy levels.

EXAMPLE 14 The subject was a 70-year-old female suffering from severe arthritis. After a regiment of the mangosteen nutraceutical composition, the subject experienced complete elimination of arthritic symptoms and increased energy.

The present invention may be embodied in other specific forms without departing from its spirit or essential characteristics. The described embodiments are to be considered in all respects only as

