

G³[™] TECHNICAL OVERVIEW

G³[™] AND ITS COMPOSITION

What is G³[™] Gac Superfruit Blend?

G³[™] is a nutrient-rich juice from the prized Gác “Super Fruit” of Southern Asia whose nutritional benefits have been scientifically demonstrated to protect cells. Through its antioxidant benefits, G³[™] helps to protect and rejuvenate cells. Among Gác’s potent phytonutrients are a unique and highly-bioavailable form of carotenoids called “lipocarotenes[™]” that provide powerful antioxidant protection. Gác’s restorative benefits are further enhanced by the addition of fruit juices from Chinese lycium, Siberian pineapple, and cili that have traditional use in this general region. G³ has a refreshing flavor that is deliciously sweet, slightly tart and can be enjoyed daily by everyone in the family.*

What are the health benefits?

G³[™] helps support cellular rejuvenation, strengthens the antioxidant network, fortifies antioxidant defenses against vascular and cellular free radical damage, and slows the common affects of aging by DNA protection.*

What is the recommended adult use?

As a dietary supplement, drink 1-3 fl oz (30-90 ml) with morning and evening meals.

Who should use G³[™]?

G³[™] is great for the whole family. G³[™] is perfect for adults and children who need to increase their servings of fruits and vegetables, are frequently exposed to free radical damage, and are interested in boosting their antioxidant network defense.

What makes G³[™] unique?

G³[™] is the first to offer Gác super fruit blend for the whole family to increase their dietary antioxidants. G³[™] has a unique red-orange color which signifies its carotenoid content in a unique Lipocarotene[™] form. G³[™] is formulated to improve your antioxidant defense, and is certified to increase your Skin Carotenoid Score (SCS) with the Pharmanex BioPhotonic Scanner.

INGREDIENT INFORMATION

What ingredients does G³[™] provide?

G³[™] provides Gác, along with Chinese lycium, Siberian pineapple, and cili fruit juices. G³[™] also contains a blend of other natural juices for natural flavoring and sweetening.

GÁC[™]

What is Gấc?

Gac (*Momordica cochinchinensis*) is a large, red, and palatable fruit indigenous to Southern Asia. Gac contains high concentrations of beta-carotene and lycopene, much higher than conventional fruits and vegetables. Among the indigenous plants of northern Vietnam, the Gac fruit has the highest beta-carotene content (see Figure 1). Gac also has high levels of fatty acids, which may help explain the high bioavailability of its carotenoids for human consumption, which exceeds that of highly bioavailable synthetic beta-carotene and dark-green leafy vegetables (Vuong 2004).

What is the history of use of Gấc fruit?

Gac fruit is indigenous to Vietnam and other countries in Southern Asia. This fruit is familiar to indigenous people and is easy to grow, yet the fruit is seasonal and only available for a few months each year; harvesting of the fruits begins in September and lasts until December. In Vietnam, the Gac vine is often seen growing on lattices at the entrances of rural homes.

Gac is prized in the Vietnamese culture and has multiple uses. Gac is used in a well-accepted dish in Vietnam called "Xoi Gac", or "Red Rice" (Vuong 2002). This dish is prepared by mixing the Gac seed and pulp with cooked rice to impart a red color and distinct flavor (Vo-Van-Chi 1997, Vu Dinh 1986, Do 1991). Traditionally, Xoi Gac is served at weddings, the lunar New Year, and for other important celebrations (Do 1991). During these occasions, it is essential to mask the white color of rice, since white is considered the color of death. In addition to their use in xoi gac, the seed membranes are also used to make a tonic (gac oil) for lactating or pregnant women and children, to treat "dry eyes."

What are the health benefits of Gấc?

Guichard and Bui first identified carotenoids in Gac fruit in 1941 (Guichard 1941). Gac fruit is considered a "super fruit" because of its high concentrations of beta-carotene and lycopene which is much higher than conventional fruits and vegetables (See Figure 1). Gac also has high levels of fatty acids which creates a lipocarotene™ to deliver higher bioavailable carotenoids. Compared to beta-carotene found in dark-green vegetables, beta-carotene from Gac fruit appears to be more easily absorbed, presumably because of a more efficient release of the bound molecule from the matrixes of Gac and the presence of long-chain fatty acids in the seed membrane and pulp (de Pee 1998).

According to a 2004 USDA paper, gac aril has about 40-70x the lycopene of tomatoes and 10x the beta carotene of carrots. Gac contains 2,227 mcg lycopene/g FW vs. tomato 31-50 mcg/g FW; 718 mcg beta carotene/gFW vs. carrot 76 mcg/gFW (Aoki 2002, Ishida 2004). This oil is also a rich source of vitamin E and essential fatty acids (Vuong 2003).

Gac fruit is also richer in oils than other common Vietnamese fruits and vegetables. This is important because the content and quality of fats in a meal play a key role in the absorption of beta-carotene. This was apparent in a study where subjects given Gac fruit containing 3.5 mg/day beta-carotene resulted in greater plasma levels of beta-carotene than that of another group given 5.0 mg/day pure beta-carotene powder (Vuong 2002). This is even more impressive in light of the fact that synthetic beta-carotene is more bioavailable than most natural sources.

Figure 1. *Beta-carotene contents of gac and other commonly consumed fruits and vegetables in northern Vietnam (West 1993, Vien 1995).*

What is a Lipocarotene™?

A Lipocarotene™ is a matrix of beta-carotene and fatty acids that enables efficient absorption and transport of beta-carotene and other fat-soluble vitamins. Significant concentrations of long chain fatty acids (~7-10% by weight) are found in the seed membrane and pulp of the Gac fruit. Of the total fat found in Gac, 69% is unsaturated, with 35% of that being polyunsaturated. This oil is also a rich source of vitamin E and essential fatty acids.

CHINESE LYCIUM

What is Chinese Lycium?

Chinese lycium (*Lycium barbarum L.*) is a perennial shrub with small red fruits. Chinese lycium grows throughout much of China and Tibet, and is cultivated extensively across central and northern China. Chinese lycium berries are picked in late summer or early autumn. Chinese lycium shrub has very strong roots and can thrive for several hundred years, standing up to various temperature conditions. Lycium, the name, is from the Greek name of a medicinal tree, Lycia.

What is the history of use of Chinese Lycium?

The health-promoting properties of Chinese lycium have been known for thousands of years. Chinese lycium traditionally was used for vision, tension, dizziness, kidney and liver function. One of the most famous doctors and herbologist in Chinese history, Li Shizhen, in his celebrated work "Materia Medica," mentions that the residents of Nanqu village in China have the habit of eating Chinese lycium fruits and achieving longevity.

What are the health benefits of Chinese Lycium?

Chinese lycium has been shown to potentially have immune stimulating, antioxidant, hepatoprotective, and lung stimulating action. Chinese lycium has naturally occurring flavonoids which have been found to scavenge free radicals (Huang 1998, Lee 1994, Tseng 1998). Chinese lycium has potent antioxidant protection showing increased serum levels of superoxide dismutase (SOD) and glutathione peroxidase. Chinese lycium has been shown to help support the immune system, to have blood sugar and blood lipid maintaining effects and to confer anti-aging benefits, extending the lifespan of male and female fruit flies (Gan 2004, Luo 2004, Peng 2001, Wang 2002).*

What is the chemical composition of Chinese Lycium?

Chinese lycium contains powerful antioxidants like flavonoids, more beta-carotene than carrots, and vitamin C. It is loaded with vitamin A, B1, B2, B6, and E, as well as amino acids, polysaccharides, and fatty acids. Lycium is amazingly rich in zeaxanthin, a carotenoid necessary to protect health of the eyes. Chinese Lycium has ~800 mcg/gFW zeaxanthin, which is about 40x higher than corn (18 mcg/gFW).

SIBERIAN PINEAPPLE

What is Siberian Pineapple?

Siberian pineapple (*Hippophae Rhamnoides*) or Sea Buckthorn is a small shrub native to Europe, Russia, and China with small orange or yellow berries. It is rich in vitamin C, carotenoids, and flavonoids.

What is the history of use of Siberian Pineapple?

It is believed that Siberian pineapple was used by ancient Greeks in a diet for race horses, hence its botanical name "*Hippophae*" - shiny horse. The references to health-promoting use of Siberian pineapple were found in the Ancient Greek texts attributed to Theophrastus and Dioskorid and in classic Tibetan medicinal texts, including "the Rgyud Bzi" (The Four Books of Pharmacopoeia) dated to the times of Tang Dynasty (618-907 AD). Siberian pineapple was formally listed in the "Pharmacopoeia of China" in 1977. In the Chinese Pharmacopoeia it is recognized for the following properties: promoting upper-respiratory tract health, encouraging digestion, removing food stagnancy, and promoting blood flow. Since the 1940's, ongoing Russian research has investigated active compounds in the plant's fruits, leaves, and bark. Beneficial uses include the use of the fruit in the diet of Russian cosmonauts and the oil in a cream to help protect them from solar radiation (Thomas 2004).*

What are the health benefits of Siberian Pineapple?

Siberian pineapple has been found to inhibit chromium-induced free radical production, DNA fragmentation and restore the antioxidant status. These observations suggest that Siberian pineapple extracts have marked cytoprotective properties, which could be attributed to the antioxidant activity (Geetha 2002, Geetha 2003). Siberian Pineapple has also been shown to protect the integrity of mitochondria from oxidative stress (Goel 2005).

An animal study investigated Siberian Pineapple's ability to support immune function. There was a markedly expressed immune stimulating effect which is most likely explained by the rich content of vitamins and trace elements in the oil (Ianev 1995).

What is the chemical composition of Siberian Pineapple?

The berries of Siberian Pineapple appear to be an unsurpassed natural source of carotenoids, tocopherols, vitamin C and flavonoids. They are also rich in several other vitamins, including B1, B2, and vitamin K. Furthermore, the berries have a remarkably high content of essential fatty acids and phytosterols. The total sterol contents in the seeds, the fresh pulp/peel, and the whole berries are 1200-1800, 240-400, and 340-520 mg/kg, respectively. The corresponding values in the extracted oils are 12-23, 10-29, and 13-33 g/kg. Sitosterol constituted 57-76 and 61-83%, respectively, of the seed and pulp/peel sterols (Yang 2001). Linoleic (34%), alpha-linolenic (25%), and oleic (19%) acids are the major fatty acids in the seed oil, whereas palmitic (33%), oleic (26%), and palmitoleic (25%) acids are the major fatty acids in the pulp oil (Yang 1999).

CILI

What is Cili Fruit?

Cili (*Rosa roxburghii tratt*) is a deciduous shrub that is found only in certain high mountain ranges of southwest China. It is in flower in June and the fruit ripens in August. Cili fruit is an orange-yellow fruit that smells like pineapple when the fruit is mature. Cili is a wild plant of southwest

China, and has been known to have numerous beneficial health-promoting actions on stress, aging, immunity, and heart health.*

What are the health benefits of Cili Fruit?

Cili fruit is known as the “King of Vitamin C.” Cili fruit contains 25mg/g vitamin C which is 60 times more than oranges. Cili fruit has been shown to improve antioxidant capacity and preliminary evidence suggests it may have cardiovascular, immune, and mental function benefits as well (Ma 1997, Zhang 2001).*

Cili juice has been shown to increase superoxide dismutase (SOD), and to also significantly reduce LDL oxidative susceptibility (Zhang 2001). Cili has been shown to improve cardiovascular function and microcirculation, and decrease peripheral vascular resistance (Ma 1997). Cili fruit contains the bi-phenol component protocatechuic acid, which is also found in virgin olive oil. Protocatechuic acid has potent antioxidant ability (El 1988, Kayano 2002, Kikuzaki 2001, Lin 2003, NTP 1990, Sroka 2003, Toyokuni 2002, Yanagimoto 2003). In vitro, this compound completely prevented macrophage-like-cell-mediated oxidation of LDL and exhibited several antioxidant effects in the midst of these cells (Kim 2000, Li 1994, Lodovici 2001).

What is the chemical composition of Cili Fruit?

Cili fruit is rich in vitamin C and polyphenols including protocatechuic acid, and biotin (Zhang 2001). Cili juice also contains vitamin E, polysaccharides, amino acids, zinc, and strontium (Ma 1997).

BLEND OF OTHER NATURAL FRUIT JUICES

What is in the blend of other natural fruit juices?

G³[™] also includes pure grape, pear, and apple juices for flavoring and additional phytonutrients. Grape juice is rich in vitamins, potent antioxidants called flavonoids. Apple juice and pear juice add flavor and consistency to the taste.*

BACKGROUND ON CAROTENOIDS

What are the health benefits of carotenoids?

Carotenoids are a powerful family of antioxidant nutrients responsible for most of the red, orange, and yellow colors found in nature. Carotenoid antioxidants have been shown to break the chain reactions of free radical damage. The major carotenoids are beta-carotene, lycopene, lutein, and alpha-carotene.

Carotenoids play an important role in human health. There is overwhelming epidemiological evidence that diets consisting of high intakes of fruits and vegetables naturally providing beta-carotene (~6 mg/day) with mixed carotenoids provides benefit to your overall general health. Recently, interest in the protective effects of carotenoids against free radical damage have stimulated intensive research on several specific carotenoids. Beta-carotene, alpha-carotene, lycopene, lutein, and zeaxanthin are of particular importance in human nutrition. Alpha- and beta-carotene are vitamin A pro-vitamins and act as antioxidants. Lutein and zeaxanthin are important for eye health, while lycopene, the most potent antioxidant carotenoid, may have far-reaching cell-protective benefits. Additionally, carotenoids are present in the epidermal and stratum

corneum layer of human skin and are believed to confer antioxidant and photo-protective benefits to the skin (Gerster 1993, Rao 1995, Kohlmeier 1995, Kritchevski 1999, Kritchevsky 1998, Morris 1994).

Carotenoids have been shown in countless studies to support many areas of health:

DNA Protection and Anti-aging

There is a hypothesis that a major component of aging is oxidative damage to nuclear DNA (Karanjawala 2004). Gac, Chinese lycium, Siberian pineapple, and Cili fruit all provide potent antioxidant defense against oxidative damage.

Eye Health

A number of studies support the protective role of carotenoids in eye health. For example, reduced risks of eye health concerns have been associated with high intakes of vegetables rich in the carotenoids lutein and zeaxanthin (Bernstein 2002, Bone, 2000, 2001, Brown, 1999, Chasan-Taber 1999, Elless 2000, Hammond 1997, Landrum 1996, 1997, Richer 1999, Seddon 1994).

Cardiovascular Health

The carotenoids lutein and lycopene have been shown separately to support multiple aspects of cardiovascular health. Studies have demonstrated positive health implications of lutein on cardiovascular health and other cardioprotective effects (Cardinault 2003, Dwyer 2001, Olmedilla 2001, Kouris-Blazos 2002). The cardioprotective effects of lycopene have also been shown in multiple studies including reduced risk of heart concerns reduced LDL oxidation, and the maintenance of healthy levels of LDL cholesterol (Agarwal 1998, Fuhrman 1997, Kohlmeier 1997, Sesso 2004).

Cell Protection

Epidemiological studies have shown that high intakes of tomatoes and tomato products, rich in lycopene, as well as high blood levels of lycopene are significantly associated with healthy prostate function (Deming 2002, Giles 1997, Giovanucci 1995, 2002, Lu 2001, Vogt 2002). The finding of Kucuk et al. suggests that lycopene supplementation may help to maintain healthy prostate cell proliferation (Kucuk, 2001). These effects may be attributed to lycopene's antioxidant and DNA protective properties (Riso 1999, Porrini 2000).

Carotenoids may also play a role in promoting good health and longevity because they help to enhance gap junctional communication (GJC) between cells. (Krutovskikh 1995, Yamasaki 1995, Yamasaki 1995, Dahl 1995, Trosko 2003). Lycopene and beta-carotene have been shown to enhance GJC significantly, and these effects are not related to their known antioxidant properties (Sies 1997, Stahl 1997, Zhang 1991). Thus, carotenoids may act via two distinct mechanisms of action to maintaining good health: as antioxidants to help protect healthy DNA structures, and as promoters of GJC.

How does oxidative Stress correlate to the skin's carotenoid concentration?

Many health conditions have been linked to oxidative stress. A population study of 1,375 subjects was conducted at the Pharmanex Research Institute and found that individuals with high oxidative stress generally have low skin carotenoid levels as measured by Raman spectroscopy, independent of subjects' dietary carotenoid consumption. This correlation was demonstrated by using Urinary MDA test, a proven model for oxidative stress (Smidt and Shieh 2003).

SAFETY

Is this product safe?

G^{3™} is a safe, well tolerated supplement. G^{3™} contains fruit juices naturally found in the food supply. Gác fruit has been consumed by Vietnamese and other Asian cultures for hundreds of years.

Are there any side effects?

There are no known side effects associated with G^{3™}.

Are there any contraindications or known drug interactions?

No contraindications or drug interactions are known for G^{3™}.

Is there anyone who should not use this product?

G^{3™} is safe for the whole family.

KEY STUDIES

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