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Garcinia cambogia Use of Weight Loss and Hepatotoxicity: A Review

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Abstract

A complex disorder of hunger control and energy metabolism driven by certain biological variables is obesity. This study aims to evaluate the applications of Garcinia cambogia products for appetite suppression and fat burning. This little fruit, which looks a lot like a pumpkin, is marketed and used most frequently these days as a weight-loss supplement. Research has demonstrated that the fruit rind's main organic acid component, (−)-hydroxycitric acid, and the extracts both have anti-obesity properties that reduce food intake and body fat gain by controlling satiety-related serotonin levels, increasing fat oxidation, and lowering de novo lipogenesis. Hydroxycitric acid significantly inhibits adenosine triphosphate-citrate lyase, a catalyst that transforms citrate into acetyl-coenzyme A, which is necessary for the creation of fatty acids, cholesterol, and triglycerides.

Keywords: Weight loss, HCA, anti-obesity, anticancer activity, *Garcinia cambogia*

INTRODUCTION

The Malabar tamarind, or *Garcinia gummi-gutta* (L.) Roxb., is a native of Southeast Asia and was once known scientifically as *Garcinia cambogia* (GC). In Asian countries, the fruit rind has long been used to cure intestinal parasites, rheumatism, edema, constipation, piles, and irregular menstruation. It is also commonly used as a bulking agent, flavoring, or culinary preservation [1, 2]. Biological action has been demonstrated in numerous scientific research, including anti-obesity [3, 4], hypolipidemia [5], and anticancer activity [6], among many other things. As a result of earlier phytochemical analyses of the plant, many organic acids [7], benzophenones [8], and xanthones [9], were identified as important ingredients.

Commercial products containing GC suddenly appeared on the market and garnered a lot of media attention, both positive and negative. Xanthones [9] and benzophenones [8] are important components. The fact that more than 11 million links appear when you type in the search term "Garcinia cambogia" on Google® is proof of its fame and popularity. Its association with Dr. Mehmet Oz, the television personality, was possibly its most significant (and bad) connotation. In these quotations, Dr. Oz asserts that GC is the "Holy Grail of Weight-Loss" [10].

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They are found in the Polynesian islands (30 of which are in India), Asia, and Africa. Its five-centimeter-diameter fruit has been utilized for medicinal and culinary uses for ages, especially in East India. Tamarind extracts have been used as a preservative for fish as well as to improve the flavor of meat, shellfish, and various drinks.

In addition, because of its low pH and potential bacteriostatic action, it has historically been used to induce satiety after meals, treat various intestinal problems, and treat animal oral infections in veterinary medicine. Traditionally, the most often

utilized components of the tiny, oval, reddish-yellow pumpkin for medicinal purposes have been the pulp and rind because they contain large levels of several oxycitric acid (HCA), one of the ingredients that has been linked to positive benefits in a number of studies on the management of body weight.

BOTANICAL DESCRIPTION

With 390 species, Garcinia is the biggest genus in the Clusiaceae family [11]. The primary distribution regions of these polygamous trees or shrubs include tropical Asia, Polynesia, and Africa [12]. *G. gummi-gutta* (L.), from a medical perspective, Roxb. is one of the most important members of the Clusiaceae family. This tree is small to medium in size and can reach a maximum height of 12 meters. It has a spherical crown and drooping branches (Figure 1(a) & (B)) [13]. Young branchlets are glabrous and subterete, while the trunk and bark are lenticellate and reddish-brown. The leaves are opposite, decussate, glossy, dark green, and have petioles that are 5–16 cm long and laminae that are 5–13 × 2–6 cm. The apex of the elliptic, oblanceolate to obovate leaves is often acute and seldom obtuse. The axillary or terminal clusters of polygamous blooms have cream-colored sepals and pink petals (Figure 1(c) & (d)) [13]. Summertime (March–May) is when flowering happens, and fruiting takes place in from June to September rainy season. With 6–8 grooves, the ovoid fruits have a diameter of around 5 cm. When fully ripe, the fruit can be yellow, orange, or red, and it contains six to eight seeds encased in a succulent aril (Figure 1b [25]) [14, 15]. The tree grows slowly, and it is only at the blooming period, which occurs after about 7–9 years, that the male and female trees can be distinguished [16].

GEOGRAPHICAL DISTRIBUTION AND HABITAT

The natural range of GC is limited to India, Nepal, and Sri Lanka; however, it has been brought to other regions of Asia's subtropical belt, such as China, Malaysia, and the Philippines. These plants are found in Southwest India's semi-evergreen to evergreen forests, primarily in the Western Ghats (Karnataka, Kerala, Tamil Nadu, and Maharashtra) (Figure 2). This tree grows best on dry soils in riverbanks and valleys; however, it can be seen growing on plains and hilltops as well. It also occasionally becomes flooded or wet. It can withstand drought and shifting water tables [17–19].

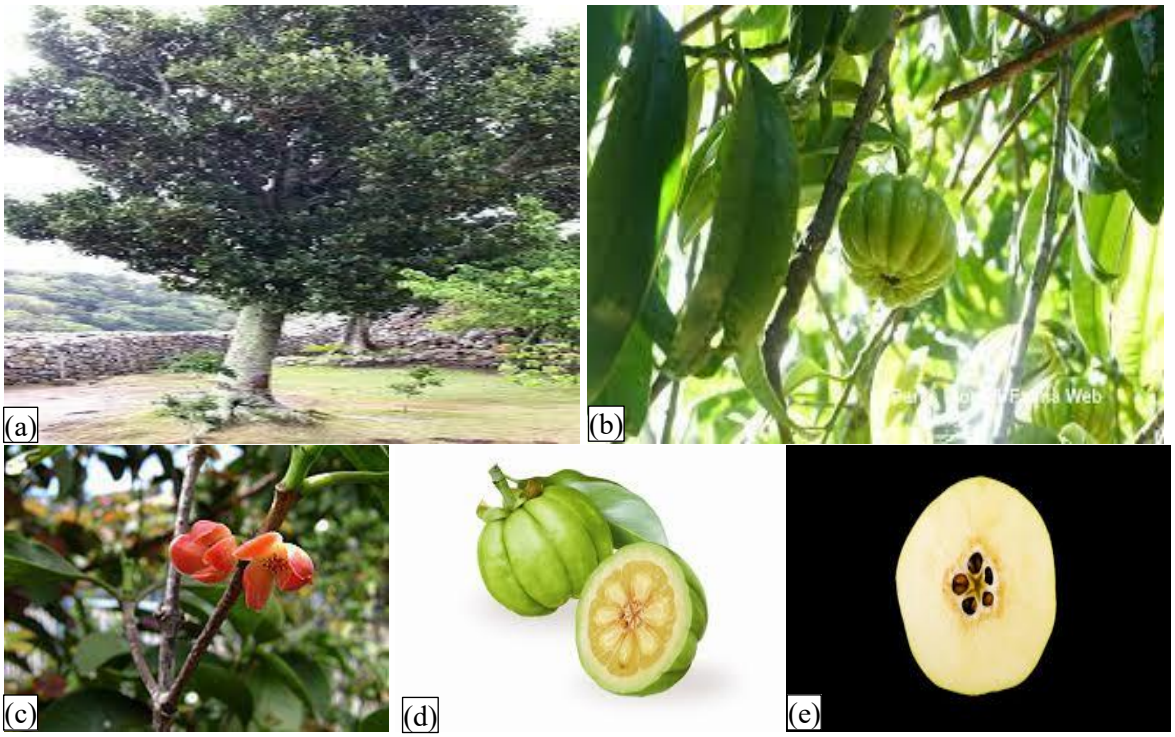

Figure 1. Photographs of the GC tree in habitat (A) a fruiting branch, (B) inflorescence insertion, (C) male flower, and (D) a cross-section of the fruit.

ETHNOBOTANICAL USES

The spice tree GC has significant commercial value. Praised for its smoked rind that has been sun-dried and is frequently used as a flavoring ingredient, particularly in fish curries. The desiccated rind of the fruit has bacteriostatic properties and is used in India and Sri Lanka to cure fish when combined with salt. Additionally, it is used as a regular ingredient in meals and as a replacement for Kokum butter (derived from *Garcinia indica* (Thouars) Choisy) additional stuffing [20, 21]. In medicine, the fruit rind is used to treat intestinal diseases and rheumatism as an emetic, hydragogue, anthelmintic, and purgative. It is also used as a rinse in veterinary medicine to treat oral diseases in cattle [22]. Although the fruits are edible, they should not be consumed fresh due to their high acidity [23, 24]. In India, a tonic made from the fruit is used to treat a variety of cardiac conditions since it has a high vitamin C content [25].

It is not GC, only used medicinally; the gum is used as a varnish; the resin is used to polish gold and silver jewelry; and as a replacement for acetic acid in the coagulation of rubber latex, as a pigment in water colors and miniature artworks [26].

Figure 2. Geographical distribution of GC, indicating the native and exotic ranges.

PHARMACOKINETICS HYDROXYCITRIC

Acid in GC

The pericarp or fruit rind [23] of the GC fruit contains HCA, up to 30% by weight [23–25]. HCA can exist as a lactone or as free acid. It is believed that the former version is physiologically active. To achieve greater stability, the free acid is often transformed into its less active lactone form since it is unstable.

In order to stop HCA from cyclizing into a less effective lactone, the acid has been mixed with several counterions to create stable salts. Commercial HCA comes in single, double, or triple salt forms, as well as free acid. The variations in solubility and bioavailability are caused by preparations using distinct counterions. For instance, it has been demonstrated that the Na^+ salt of HCA inhibits lipogenesis more effectively than its lactone. However, when linked to (−)-HCA, Na^+ salt is very hygroscopic, which would be considered unfavorable for the synthesis of medications for dry administration [23]. The pericarp or fruit rind [2] of the GC fruit contains HCA, up to 30% by weight [23–25]. HCA can be found either free or in the form of lactone. It is believed that the former version is physiologically active. To achieve greater stability, the free acid is often transformed into its less active lactone form since it is unstable.

EFFICACY AND SAFETY OF GARCINIA PLUS

A few medications are available to treat or prevent obesity, but price, effectiveness, and side effects must be considered. For instance, it appears that some of the pharmacological medicines now on the market that are approved for the treatment of weight loss include sibutramine, rimonabant, orlistat, and phentermine [26–28]. For example, there have been reports of dry mouth, headache, sleeplessness, palpitations, and dizziness after using phentermine. The Food and Drug Administration withdrew Meridia (sibutramine) from the market in 2010 because of the medication's potential for major cardiovascular events. The Food and Drug Administration withdrew Meridia (sibutramine) from the market in 2010 because evidence supporting the use of herbs as a successful approach to illness treatment and health management is beginning to surface. Numerous ethnobotanical studies have documented the results of bioprospecting investigations into the therapeutic uses of plants because of the medication's potential for major cardiovascular events [29]. In Eastern cultures, plant extracts have been used for many years. But recently, the use of these extracts has spread more widely around the globe. In the treatment of obesity, it has been discovered that several chemical components extracted from plants and crude extracts can prevent diet-induced obesity and considerably lower body weight. Because plant extracts are used so widely, a careful analysis of the data is required. The effectiveness of Garcinia/HCA is still up for discussion though. Notwithstanding the concerns, there is convincing proof of HCA's effectiveness in encouraging weight reduction and reducing food consumption, which has led to the promotion of several over-the-counter slimming products that include HCA (Table 1).

Table 1. Summary of patients with GC-related liver injury, characteristics, presentation, and pattern of liver injury.

Author (Year) [Reference]	Number of Cases	Age	Sex	Duration of GC Containing Supplement Use	Presenting Symptoms	Pattern of Liver Injury	Mortality
Stevens et al. [30] (2005)	2	28.5	M	5 weeks; 5 days	Fatigue, jaundice	Hepatocellular; cholestatic	0
Jones and Andrews [31] (2007)	1	19	M	120 days	Nausea, vomiting, and jaundice	Hepatocellular	0
Dara et al. [32] (2008)	2	36.5	F	7 days; 14 days	Nausea, vomiting, fatigue, anorexia, and abdominal pain	Hepatocellular	0
Shim and Saab [33] (2009)	1	28	M	90 days	Fatigue, jaundice	Hepatocellular	0
Fong et al. [34] (2010)	8	30.9	F	7–56 days	Nausea, vomiting, fatigue, itching, and abdominal pain	Hepatocellular	0
Danan and Teschke [35] (2010)	1	19	M	7 days	Fever, fatigue, myalgia, arthralgia, and rash	Cholestatic	0

CASE DISCUSSION

A 36-year-old woman with no notable medical history reported experiencing low-grade fever, nausea, vomiting, and stomach pain for three days. She stated that to reduce weight, she had been on a 500-calorie diet and had been taking GC for four weeks. She also reported having jaundice, exhaustion, and anorexia. The patient denied having recently received blood transfusions, used illegal drugs, or having a family history of liver illness. She was in upon a physical examination, she revealed a cutaneous scleral icterus.

Severe hepatomegaly measuring 2 cm below the costal border, along with jaundice. Alkaline phosphatase was 104 U/L (32–91), total bilirubin was 7.4 mg/dl (0.3–1.0), direct bilirubin was 4.9 mg/dl (0.0–0.4), aspartate aminotransferase (AST) was 5340 U/L (15–41), and alanine aminotransferase (ALT) was 5615 U/L (7–52). HIV, CMV, Epstein–Barr virus, Herpes simplex virus, parvovirus,

hepatitis A, B, and C, and autoimmune markers (anti-nuclear, anti-smooth muscle, anti-mitochondrial, and anti-liver kidney microsomal 1 antibodies) were all found to have negative serologies. Alpha fetoprotein, alpha-1 antitrypsin, and serum ceruloplasmin levels were all within normal ranges. An abdominal Doppler ultrasonography revealed a little coarsening of the echotexture in the minor ascites and the liver. Monogamous heterosexual relationship and denied drinking.

We suspected drug-induced liver impairment based on her recent usage of herbal remedies, and we estimated the likelihood using the most recent version of the Rousseau Uclaf Causality Assessment Method (RUCAM). The patient had an RUCAM score of 8, which is consistent with likely drug-induced liver damage [9]. Conservative management was implemented, and GC was terminated. Because of the substantial clinical improvement and the downward trend of liver function tests, a liver biopsy was not required. The patient was discharged on the sixth day of the hospital stay. Her liver function tests returned to normal at the follow-up appointment two weeks later (Figure 3).

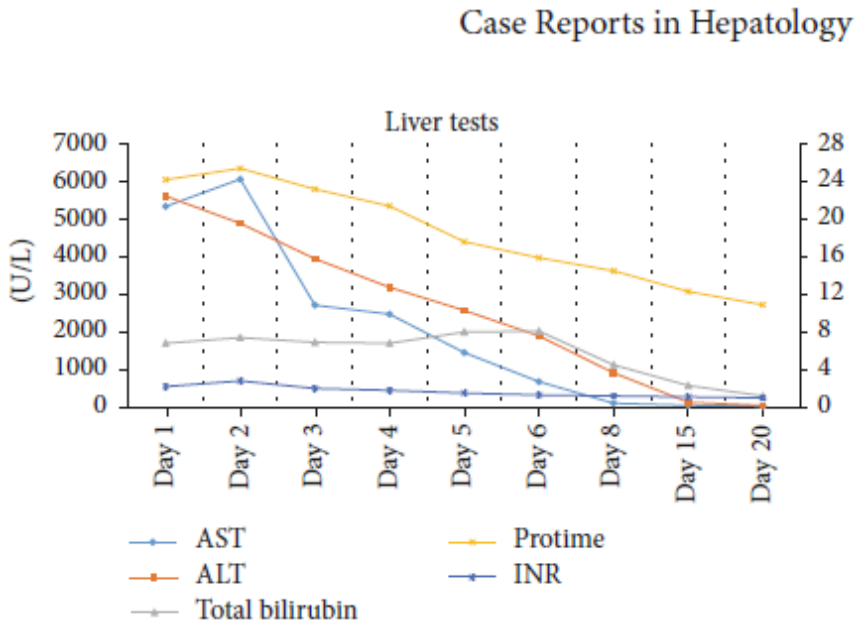

Figure 3. Changes in liver tests during hospitalization are plotted from admission at day 1–20.

CONCLUSIONS

DS are sometimes seen as natural and safe; however, they may cause serious morbidity and death, as well as have detrimental side effects. This example shows hepatotoxicity. It was connected to using GC as a weight-loss supplement. Since many patients may not admit that they use DS, the doctor should constantly inquire about this information. Our story underscores the necessity of improved postmarket surveillance and emphasizes how critical it is to report these kinds of incidents to support this process going forward.

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