Journal of Pharmacognosy and Phytochemistry
Available online at www.phytojournal.com

**E-ISSN:** 2278-4136
**P-ISSN:** 2349-8234
JPP 2018; SP3: 515-517

**Akshay KR**
Assistant Horticulture Officer, Dept. of Horticulture, Mudigere, Chikmagalur. Karnataka, India

**Sudharani N**
Assistant professor (FS&N), CoH, Mudigere, UAHS, Shivamogga, Karnataka, India

**Madaiah D**
Professor and Head (PHT), CoH, Mudigere, UAHS, Shivamogga, Karnataka, India

**Shivakumar BS**
Professor and Head (FSC), CoH, Mudigere, UAHS, Shivamogga, Karnataka, India

**Sreekanth HS**
Assistant professor (FSC), CoH, UHS Campus, GKVK, Bangalore, Karnataka, India

**Correspondence**
**Akshay KR**
Assistant Horticulture Officer, Dept. of Horticulture, Mudigere, Chikmagalur. Karnataka, India

**National conference on "Conservation, Cultivation and Utilization of medicinal and Aromatic plants"**
**(College of Horticulture, Mudigere Karnataka, 2018)**

# Back yard malabar tamarind (*Garcinia Gummi- gutta*): A miracle anti-obesity agent

**Akshay KR, Sudharani N, Madaiah D, Shivakumar BS and Sreekanth HS**

**Abstract**
The aim of the study is to know the anti-obesity property of Garcinia gummi-gutta. Obesity (BMI ≥ 30 kg/m$^2$) is associated with several chronic and debilitating health problems including hyperlipidemia, hypertension, coronary heart disease, diabetes, cancer and disease of the gall bladder, osteoarthritis, shortage of breath, abnormal dilation of the veins, backache, and even psychological problems. A wide variety of weight management strategies are presently available, and some involve the use of dietary supplements which are marketed as slimming aids. One such slimming aid is *Garcinia gummi-gutta*. It is rich in one principal component to reduce obesity and cholesterol level i.e. (-) - Hydroxy citric acid (HCA). HCA is a derivative of citric acid and is found in *Garcinia gummi-gutta* and *Garcinia indica.* HCA also being reported to increase the release or availability of serotonin in the brain, thereby leading to appetite suppression by reducing carbohydrate metabolism. Hence Malabar Tamarind can be exploited for its commercial use in various value added products to maintain general health of the public.

**Keywords:** Garcinia gummi-gutta, Obesity, Serotonin and Hydroxy citric acid

## Introduction
Infection as a major cause of suffering and death is giving way to new epidemics of non-communicable disorders such as cancer, cardiovascular diseases, and diabetes, which continue to plague the world at an alarming rate (WHO, 2012) [16]. According to the World Health Organization (WHO) standard, overweight subjects are diagnosed with BMI values in the range of 25–29.99. Obesity itself, defined as BMI ≥ 30, is associated with several chronic and debilitating health problems including hyperlipidemia, hypertension, coronary heart disease, diabetes, cancer, and disease of the gall bladder, osteoarthritis, shortage of breath, abnormal dilation of the veins, backache, and even psychological problems. The prevalence of overweight and obesity has increased over the last decade, and current measures have not been able to stem the tide. A wide variety of weight management strategies are presently available, and some involve the use of dietary supplements marketed as slimming aids. One such slimming aid is *Garcinia* extract, (-)-hydroxycitric acid (HCA). HCA is a derivative of citric acid and can be found in plant species native to South Asia such as *Garcinia gummi-gutta* and *Garcinia indica*,(WHO, 2004) [2]. HCA has also been reported to increase the release or availability of serotonin in the brain, thereby leading to appetite suppression. (United States Food and Drug Administration, 2010) [15]. Other postulated weight loss mechanisms include inhibition of pancreatic alpha amylase and intestinal alpha glucosidase, thereby leading to a reduction in carbohydrate metabolism (Li Oon Chuah, 2013) [8]. Animal studies have suggested that HCA causes weight loss and human trials involving the use of HCA as a weight loss supplement have been carried out. The primary objective of this systematic review was to examine the efficacy of HCA in reducing body weight in humans, using data from randomised clinical trials.

## Materials and methods
Electronic searches of the literature were conducted. The search terms used included dietary supplements, antiobesity agents, body weight, hydroxycitrate, *garcinia*, and derivatives of these. Only randomised, double-blind, placebo-controlled studies were included in this paper. No age, time, or language restrictions were imposed for inclusion of studies.
*Garcinia* has been used for centuries in Asian countries for culinary purposes as a condiment

and flavoring agent in place of tamarind or lemon and to make meals more filling (Lim TK, 2012) [9]. Besides its use as a flavouring agent, the dried rind of *G. gummi-gutta* combined with salt and other organic acids can help to lower the pH and thus provides a bacteriostatic effect in curing fish. *G. gummi-gutta* contains large amounts of hydroxycitric acid (HCA). Similar to *G. gummi-gutta*, *G. atroviridis* and *G. indica* also contain significant HCA content and are sometimes used interchangeably with *G. gummi-gutta* in food preparation. The different features among these three different types of *Garcinia* are summarised in Table 1.

**Table 1:** Comparison of *G. gummi-gutta* and *G. indica* (Sharma *et al*., 2005) [11]

| Species | Common name | Origin | Feature |
|---|---|---|---|
| *G. gummigutta* | Malabar Tamarind | **India:** evergreen forests of Western Ghats, from Konkan, Travancore, Dakshina kannada, Coorg and Chickmagalur District | Small- or medium-sized tree with a rounded crown and horizontal or drooping branches, under the family of Guttiferae. Its fruits are ovoid, about 5 cm in diameter, yellow or red when ripe with six to eight grooves, enclosing six to eight seeds, and are edible. |
| *G. indica* | Kokum | **India:** forests of Western Ghats, Konkan, Mysore, Coorg, and Wayanad | Slender evergreen tree with drooping branches. Its fruits are spherical, 2–4 cm in diameter, dark purple when ripe with five to eight large seeds surrounded. |

**Uses in Traditional Medical Systems:** Aside from its use as a preservative and as a condiment in cuisine, *Garcinia* extract has been used in the traditional Ayurvedic medical system (Khare CP, 2007) [6]. A decoction of *G. gummigutta* is given as purgative in the treatment of intestinal worms and other parasites, for bilious digestive conditions, for dysentery, rheumatism, and in the treatment of tumours. The fruit rind is used in rickets and enlargement of spleen and to heal bone fractures. The fruit is used in a lotion with vinegar to rub over the abdomen of women after confinement.

**Phyto constituents:** Several types of organic acids such as HCA, citric, tartaric, malic, and succinic acids are isolated from *Garcinia*. However, HCA is the principal acid of the fruit rinds of *G. gummigutta*, *G. indica*, and *G. atroviridis* (Lewis *et al*., 1965) [7].

**Anti-obesity Effects of *Garcinia* / HCA**

Obesity, particularly caused by accumulation of visceral fat, is a serious risk factor of various life-style diseases such as coronary heart disease, diabetes, hyperlipidemia, hypertension, and cancer (WHO, 2004) [2]. Human obesity is influenced by genetic and environmental factors and particularly by changes in diet and physical activity, which contributes greatly to the development of insulin resistance, a most common underlying abnormality in human obesity (Uauy R, 2005) [14]. We arranged the anti-obesity effects of *Garcinia*/HCA based on their distinct mechanisms into 4 types, namely,

**(a) Serotonin (5-Hydroxytryptamine, 5-HT) Regulation and Food Intake Suppression**

HCA, the primary acid in the fruit rinds of *G. gummigutta*, has been reported as the active ingredient in inhibiting ATP citrate lyase. ATP citrate lyase, which is an extra mitochondrial enzyme catalyzing the cleavage of citrate to oxalo acetate and acetyl-CoA, was inhibited by HCA. Thus, the availability of two-carbon units required for the initial steps of fatty acid and cholesterol biosynthesis during carbohydrate feeding was limited. As a result, the consumed carbon source was diverted to glycogen synthesis in liver. A signal was then sent to the brain due to this metabolic alteration, resulting in rising of serotonin level concomitant with a reduced appetite (Sullivan *et al.*, 1974) [13].

**(b) Decreased *De Novo* Lipogenesis**

The reduction of the acetyl-CoA by HCA and thus limiting the availability of building blocks required for fatty acid and cholesterol biosynthesis has led to suggestions that HCA inhibited lipogenesis. Several studies conducted by Sullivan and colleagues had confirmed the inhibition of *in vivo* and *in vitro* rates of lipogenesis in several tissues reported to convert carbohydrate into fatty acids (such as liver, adipose tissue, and small intestine), in which HCA was predominantly given to rodent. The mechanism underlying the anorectic effect of HCA is still unclear. Furthermore, whether the suppression of body weight regained was solely due to reduced food intake or whether there was involvement of increased EE remained unknown. (Heber D, 2003) [3].

**(c) Increased Fat Oxidation**

Ishihara *et al*. conducted a study on acute and chronic effects of HCA on energy metabolism. Acute administration of 10 mg/100 $\mu$L of a 0.48 mol/L HCA solution per mice significantly increased ($P < 0.05$) serum free fatty acid levels and concentration of glycogen in the muscle and lowered the RQ during resting and exercising conditions in mice. Lipid oxidation was significantly enhanced, and carbohydrate oxidation was significantly less in these mice during the early stages of running. The results showed that HCA decreased the RER (Respiratory exchange ratio) and carbohydrate oxidation during 1 hour of exercise (Ishihara *et al*., 2000) [4].

**(d) Down regulation of a Spectrum of Obesity-Associated Genes**

Lipogenic transcription factors, including SREBP1c, liver X receptors, PPAR$\gamma$, and C/EBP$\alpha$, are highly expressed in the adipose tissue and actively participate in the lipid metabolism of adipocytes by coordinating lipogenic and adipocyte-specific gene expression [10]. This inturn release the leptin. Leptin, a biomarker of the obesity regulatory gene, is produced by fat tissue and is known to regulate energy intake and metabolism. Leptin binds to the medial nucleus of the hypothalamus and induces a sensation of satiety and thus controlling the appetite (Dagogo-Jack S, 2001) [1].

**Conclusion**

In the recent years, more clinical trials had been conducted to elucidate the functional effects of *Garcinia*/HCA supplementation on promoting human health. The nutraceutical industry is flourishing, and interested in establishing scientific credibility has attained importance for many companies and scientists. A multitude of metabolic functions had been reported for HCA or HCA-

containing *Garcinia* extract, such as reducing blood lipids, inducing weight loss, suppressing appetite, and reducing food intake based on results obtained in both animal trials and human clinical trials. Many diet supplements containing *HCA in* combination of active ingredients rather than containing a single agent. Thus it is difficult to evaluate the effectiveness of single agents when the combination products are tested. In addition, awareness of the safety and efficacy of the weight management supplements available in the market should be raised among health care providers in order to assist their patients in analyzing the risks and benefits of the dietary supplements. Hence, scientific more in-depth investigations to be carried on the potential health promoting effects of G. gummi-gutta as a diet supplement are prerequisites for new discoveries of alternative therapies.

**Future line of work**

Malabar Tamarind has to be evaluated for its nutritive values, Anti-cholesterol, Anti-obesity, Anti-microbial, Anti diabetic and its toxic properties in depth. Further there is scope for the incorporation of rind, seed and pulp in several value added products to make it available for the consumers in their day today life.

**References**


1. WHO, Global database on body mass index. 2012, http://apps.who.int/bmi/index.jsp, 2.
2. Expert consultation WHO, Appropriate body-mass index for Asian populations and its implications for policy and intervention strategies. The Lancet. 2004; 363:157-163.
3. United States Food and Drug Administration. Meridia (sibutramine): market withdrawal due to risk of serious cardiovascular events.http://www.fda.gov/safety/medwatch/safetyinformation/safetyalertsforhumanmedicalproducts/ucm228830.htm, 2010.
4. Li Oon Chuah, Wan Yong Ho, Boon Kee Beh, Swee Keong Yeap. Updates on Antiobesity Effect of *Garcinia* Origin (−)-HCA, Evid Based Complement Alternat Med. 2013, 751658.
5. Lim TK. Edible Medicinal and Non-Medicinal Plants, *Springer*; 2012, 2.
6. Sharma PC, Yelne MB, Dennis TJ. Database on Medicinal Plants Used in Ayurveda. New Delhi, India: Central Council for Research in Ayurveda & Siddha, 2005, 2
7. Khare CP. Indian Medicinal Plants: An Illustrated Dictionary. Berlin, Germany: Springer, 2007.
8. Lewis YS, Neelakantan S. Hydroxycitric acid-the principal acid in the fruits of *Garcinia gummi-gutta* desr. Phytochemistry. 1965; 4(4):619-625.
9. Uauy R, Díaz E. Consequences of food energy excess and positive energy balance. Public Health Nutrition. 2005; 8(7 A):1077-1099. [PubMed].
10. Sullivan AC, Triscari J, Hamilton JG. Effect of hydroxycitrate upon the accumulation of lipid in the rat: I. Lipogenesis. Lipids. 1974; 9(2):121-128. [PubMed]
11. Heber D. Herbal preparations for obesity: are they useful? Primary Care. 2003; 30(2):441-463.
12. Ishihara K, Oyaizu S, Onuki K, Lim K, Fushiki T. Chronic (−)-hydroxycitrate administration spares carbohydrate utilization and promotes lipid oxidation during exercise in mice. Journal of Nutrition. 2000; 130(12):2990-2995. [PubMed].
13. Dagogo-Jack S. Human leptin regulation and promise in pharmacotherapy. Current Drug Targets. 2001; 2(2):181-195. [PubMed]