

## NATURAL HEALTH PRODUCT

### MALABAR TAMARIND – *GARCINIA GUMMI-GUTTA*

This monograph is intended to serve as a guide to industry for the preparation of Product Licence Applications (PLAs) and labels for natural health product market authorization. It is not intended to be a comprehensive review of the medicinal ingredient.

#### Notes

- ▶ Text in parentheses is additional optional information which can be included on the PLA and product label at the applicant's discretion.
- ▶ The solidus (/) indicates that the terms and/or the statements are synonymous. Either term or statement may be selected by the applicant.

#### Date

August 9, 2013

#### Proper name(s)

*Garcinia gummi-gutta* (L.) N. Robson (Clusiaceae) (USDA 2013)  
(Synonym: *Garcinia cambogia* Desr (USDA 2013; McGuffin et al. 2000))

#### Common name(s)

Malabar tamarind (USDA 2013)

#### Source material(s)

Fruit rind (Hayamizu et al. 2008)

#### Route(s) of administration

Oral

#### Dosage form(s)

- ▶ The acceptable pharmaceutical dosage forms include, but are not limited to capsules, chewables (e.g. gummies, tablets), liquids, powders, strips or tablets.

- This monograph is not intended to include foods or food-like dosage forms such as bars, chewing gums or beverages.

**Use(s) or Purpose(s)** Statement(s) to the effect of

Could help to temporarily increase satiety/feeling of fullness (Gatta et al. 2009).

**Dose(s)** Statement(s) to the effect of

**Subpopulation(s)**

Adults ( $\geq 18$  years)

**Quantity(ies)**

*Standardized Extracts*

1.5-2 g extract per dose standardized to 50-60% hydroxycitric acid, 2 to 3 g of standardized extract per day (Kim et al. 2011; Gatta et al. 2009; Ishii et al. 2003; Heymsfield et al. 1998).

**Directions for use**

Take before meals.

**Duration of use**

No statement required.

**Risk information** Statement(s) to the effect of

**Caution(s) and warning(s)**

If you are pregnant or breastfeeding, consult a health care practitioner prior to use.

**Contraindication(s)**

No statement required.

**Known adverse reaction(s)**

No statement required.

## Non-medicinal ingredients

Must be chosen from the current NHPD *Natural Health Products Ingredients Database* (NHPID) and must meet the limitations outlined in the database.

## Storage conditions

No statement required.

## Specifications

- ▶ The finished product specifications must be established in accordance with the requirements described in the NHPD *Quality of Natural Health Products Guide*.
- ▶ The medicinal ingredient must comply with the requirements outlined in the *Natural Health Products Ingredients Database* (NHPID).

## References cited

Gatta B, Zuberbuehler C, Arnold M, Aubert R, Langhans W, Chapelot D. Acute effects of pharmacological modifications of fatty acid metabolism on human satiety. *British Journal of Nutrition* 2009;101:1867-1877

Hayamizu K, Tomi H, Kaneko I, Shen M, Soni MG, Yoshino G. Effects of *Garcinia cambogia* extract on serum sex hormones in overweight subjects. *Fitoterapia* 2008;79:255-261

Heymsfield SB, Allison DB, Vasselli JR, Pietrobelli A, Greenfield D, Nunez C. *Garcinia cambogia* (Hydroxycitric acid) as a potential antiobesity agent, a randomized controlled trial. *Journal of the American Medical Association* 1998;280(18):1596-1600

Ishii Y, Kaneko I, Shen M, Hayamizu K, Shigematsu N, Tomi H, Yoshino G, Shimaski H. Safety of *Garcinia cambogia* extract in healthy volunteers: High-dose administration study II. *Journal of Oleo Science* 2003;52(12):663-671

Kim JE, Jeon SM, Park KH, Lee WS, Jeong TS, McGregor RA, Choi MS. Does Glycine max leaves or *Garcinia Cambogia* promote weight-loss or lower plasma cholesterol in overweight individuals: a randomized control trial. *Nutrition Journal* 2011;10: 94

McGuffin M, Kartesz JT, Leung AY, Tucker AO, editors. *Herbs of Commerce*. 2<sup>nd</sup> edition. Silver Spring (MD): American Herbal Products Association;2000.

USDA 2013: United States Department of Agriculture, Agricultural Research Service, National Genetic Resources Program. Germplasm Resources Information Network (GRIN). [Internet].

National Germplasm Resources Laboratory, Beltsville (MD). [*Garcinia gummi-gutta* L. Last updated 2006 October 6; Accessed 2013 March 7]. Available from: [http://www.ars-grin.gov/cgi-bin/npgs/html/tax\\_search.pl](http://www.ars-grin.gov/cgi-bin/npgs/html/tax_search.pl)

## References reviewed

Antonio J, Colker M, Torina GC, Shi Q, Brink W, Kalman D. Effects of a standardized guggulsterone phosphate supplement on body composition in overweight adults: a pilot study. *Current Therapeutic Research* 1999;60:220-227

ASHP 2005: American Society of Health-System Pharmacists. American Hospital Formulary Service (AHFS) Drug Information. Philadelphia (PA): Lippincott Williams and Wilkins;2005

Asghar M, Monjok E, Kouamou G, Ohia SE, Bagchi D, Lokhandwala MF. Super CitriMax (HCA-SX) attenuates increases in oxidative stress, inflammation, insulin resistance, and body weight in developing obese Zucker rats. *Molecular and cellular biochemistry* 2007; 304(1-2): 93-99

Badmaev V, Majeed M. Open field, physician controlled, clinical evaluation of botanical weight loss formula citrin. Presented at: Nutracon 1995: Nutraceuticals, Dietary Supplements and Functional Foods; July 11-13, 1995; Las Vegas, Nev. [as reviewed in Heymsfield et al. 1998 and Soni et al. 2004]

Behne D, Kyriakopoulos A, Gessner H, Vormann J, Gunther T. Sex-related effects of zinc deficiency on the selenium metabolism in rats. *Journal of trace elements and electrolytes in health and disease* 1992 Mar;6(1):21-5.

Burdock G, Bagchi M. Letter to the editor: *Garcinia cambogia* toxicity is misleading. *Food and Chemical Toxicology* 2005;43:1683-1684

Brinker F. 2010. Final updates and additions for Herb Contraindications and Drug Interactions, 3rd edition. including extensive Appendices addressing common problematic conditions, medications and nutritional supplements, and influences on Phase I, II & III metabolism with new appendix on botanicals as complementary adjuncts with drugs. [Internet]. Sandy (OR): Eclectic Medical Publications. [Updated July 13, 2010; Accessed 2012 January 9]. Available from: <http://www.eclecticherb.com/emp/updatesHCDI.html>

Brinker F. Herb Contraindications and Drug Interactions. 3<sup>rd</sup> edition. Sandy (OR): Eclectic Medical Publications;2001.

Cheema-Dhadli S, Halperin ML, Leznoff CC: Inhibition of enzymes which interact with citrate by (-) hydroxycitrate and 1,2,3,- tricarboxybenzene. *European journal of biochemistry* 1973, 38:98-102.

Conte AA. A non-prescription alternative on weight reduction therapy. American Journal of Bariatric Medicine. Summer 1993:17-19. [as reviewed in Heymsfield et al. 1998, Jena et al. 2002; Soni et al. 2004]

Conte AA. How I do it in my bariatric practice: A non-prescription alternative in weight reduction therapy. Bariatrician. 1993:7-19. [as reviewed in Kriketos et al. 1999]

Conte AA. The effects of (-)-hydroxycitrate and chromium (GTF) on obesity. Journal of the American College of Nutrition 1994;13:535 [Abstract 60]

CPhA 2001: Canadian Pharmacists Association. Compendium of Nonprescription Products: Companion to CPS. Ottawa (ON): Canadian Pharmacists Association; 2001

Downs BW, Bagchi M, Subbaraju GV, Shara MA, Preuss HG, Bagchi D. Bioefficacy of a novel calcium-potassium salt of (-)-hydroxycitric acid. Mutation Research 2005;579(1-2):149-162

Fukuoka M, Kobayashi T, Hayakawa T. Mechanism of testicular atrophy induced by di-n-butyl phthalate in rats. Part 5. Testicular iron depletion and levels of ferritin, haemoglobin and transferrin in the bone marrow, liver and spleen. Journal of Applied Toxicology 1995 Sep-Oct;15(5):379-86

Girola M, De Bernardi M, Contos S, et al. Dose effect in lipid-lowering activity of a new dietary integrator (chitosan, *Garcinia cambogia* extract, and chrome). *Acta Toxicol Ther.* 1996; 17:25-40 [as reviewed in Heymsfield et al. 1998 and Soni et al. 2004]

Glykon Technologies Group, LCC. Inherent Safety of HCA Salts. 2006 [Accessed 2012-07-11]. Available from: <http://www.glykon.com/page7/page7.html>

Graff L, Muller G, Burnel D. In vitro and in vivo evaluation of potential aluminum chelators. Veterinary and Human Toxicology. 1995;37(5):455-461.

HC 2011: Health Canada. Canada Vigilance Adverse Reaction Online Database. Ottawa (ON): Marketed Health Products Directorate, Health Canada; 2011. [Accessed 2012 January 9]. Available from: <http://webprod3.hc-sc.gc.ca/arquery-rechercheei/index-eng.jsp>

Hayamizu K, Ishii Y, Kaneko I, Shen M, Sakaguchi H, Okuhara Y, Shigematsu N, Miyazaki S, Shimaski H. Effects of long-term administration of *Garcinia cambogia* extract on visceral fat accumulation in humans: A placebo-controlled double blind trial. Journal of Oleo Science 2001; 50(10):805-812

Hayamizu K, Ishii Y, Kaneko I, Shen M, Okuhara Y, Sakaguchi H, SHigematsu N, Shimasaki H. No-observed-adverse-effect level (NOAEL) and sequential-high-doses administration study on *Garcinia cambogia* extract in humans. Journal of Oleo Science 2002;51:365-9

Hayamizu K, Ishii Y, Shigematsu N, Okuhara Y, Tomi H, Furuse M, Yoshino G, Shimasaki H. Safety of *Garcinia cambogia* extract in healthy men: high-doses administration study I. Journal of Oleo Science. 2003a;52(9):499-504

Hayamizu K, Ishii Y, Kaneko I, Shen M, Okuhara Y, Shigematsu N, Tomi H, Furuse M, Yoshino G, Shimasaki H. Effects of *Garcinia cambogia* (Hydroxycitric acid) on visceral fat accumulation: A double-blind, randomized, placebo-controlled trial. Current Therapeutic Research 2003b; 64(8):551-567

IOM 2005: Institute of Medicine. Panel on Dietary Reference Intakes for Electrolytes and Water, and the Standing Committee on the Scientific Evaluation of Dietary Reference Intakes, Food and Nutrition Board, Institute of Medicine. Dietary Reference Intakes for Water, Potassium, Sodium, Chloride, and Sulfate. Washington (DC): National Academies Press.

Jena BS, Jayaprakasha GK, Singh RP, Sakariah KK. Chemistry and biochemistry of (-)-hydroxycitric acid from *Garcinia*. Journal of agricultural and food chemistry 2002;50:10-22

Kaats G, Pullin D, Parker L, Keith S. 1996 [as reviewed in Heymsfield et al. 1998 and Soni et al. 2004]

Kiyose C, Ogino S, Kubo K, Takeuchi M, Saito M. Relationship between *Garcinia cambogia*-induced impairment of spermatogenesis and meiosis-activating sterol production in rat testis. Journal of clinical biochemistry and nutrition 2006;38:180-187

Kovacs EMR, Westerterp-Plantenga MS. Effects of (-)-hydroxycitrate on net fat synthesis as de novo lipogenesis. Physiology & Behaviour 2006;88(4-5):371-381

Kovacs EM, Westerterp-Plantenga MS, Saris WH. The effects of 2-week ingestion of (-)-hydroxycitrate and (-)-hydroxycitrate combined with medium-chain triglycerides on satiety, fat oxidation, energy expenditure and body weight. International journal of obesity and related metabolic disorders : journal of the International Association for the Study of Obesity 2001; 25(7):1087-94

Kovacs EMR, Westerterp-Plantenga MS, de Vries M, Brouns F, Saris WHM. Effects of 2-week ingestion of (-)-hydroxycitrate and (-)-hydroxycitrate combined with medium-chain triglycerides on satiety and food intake. Physiological & Behaviour 2001b;74:543-549

Kriketos AD, Thompson HR, Greene H, Hill JO. (-)-hydroxycitric acid does not affect energy expenditure and substrate oxidation in adult males in a post-absorptive state. International Journal of Obesity 1999;23:867-873

Lewis YS, Neelakantan S. (-)-Hydroxycitric acid – the principal acid in the fruits of *Garcinia cambogia*. Phytochemistry 1965;4:619-625

Lim K, Ryu S, Nho HS, Choi SK, Kwon T, Suh H, So J, Tomita K, Okuhara Y, Shigematsu N. (-)-Hydroxycitric acid ingestion increases fat utilization during exercise in untrained women. *Journal of Nutritional Science and Vitaminology* (Tokyo) 2003;49(3):163-7

Lim K, Ryu S, Ohishi Y, Watanabe I, Tomi H, Suh H, Lee WK, Kwon T. Short-term (-)-hydroxycitrate ingestion increases fat oxidation during exercise in athletes. *Journal of Nutritional Science and Vitaminology* (Tokyo). 2002;48(2):128-33

Louter-van de Haar J, Wielinga PY, Scheurink AJW, Nieuwenhuizen AG. Comparison of the effects of three different (-)-hydroxycitric acid preparations on food intake in rats. *Nutrition and Metabolism*. 2005;2:23

Mansi IA, Huang J. Rhabdomyolysis in response to weight-loss herbal medicine. *The American Journal of the Medical Sciences*. 2004;327(6):356-7

Márquez F, Babio N, Bulló M, Salas-Salvadó J. Evaluation of the safety and efficacy of hydroxycitric acid or *Garcinia cambogia* extracts in humans. *Critical Reviews in Food Science and Nutrition* 2012; 52(7):585-594

Martindale Sweetman SC , editor. *Martindale: The Complete Drug Reference*, 35th edition. London (GB): Pharmaceutical Press;2007.

Mattes RD, Bormann L. Effects of (-)-hydroxycitric acid on appetite variables. *Physiology & Behaviour* 2000;71:87-94

Meachem SJ, Nieschlag E, Simoni M. Inhibin B in male reproduction: pathophysiology and clinical relevance. *European Journal of Endocrinology*. 2001;145:561-571

Michno A, Skibowska A, Raszeja-Specht A, Cwikowska J, Szutowicz A. The role of adenosine triphosphate citrate lyase in the metabolism of acetyl coenzyme a and function of blood platelets in diabetes mellitus. *Metabolism* 2004;53(1):66-72

Natural Standard. *Garcinia (Garcinia cambogia L.)*, Hydroxycitric acid. Natural Standard Professional Monograph [Internet]. Natural Standard Inc; 2012 [Accessed 2012-07-11]. Available from <http://naturalstandard.com/databases/herbssupplements/garcinia.asp>

Natural Standard. Hydroxycitric acid. Natural Standard Professional Monograph [Internet]. Natural Standard Inc; 2012 [Accessed 2012-07-11]. Available from <http://naturalstandard.com/databases/herbssupplements/hydroxycitricacid.asp>

Opala T, Rzymiski P, Pischel I, Wilczak M, Woźniak J. Efficacy of 12 weeks supplementation of a botanical extract-based weight loss formula on body weight, body composition and blood chemistry in healthy, overweight subjects – A randomised double-blind placebo-controlled clinical trial. *European Journal of Medicinal Research*. 2006;11:343-350



Pierik F, Burdorf A, de Jong F, Weber R. Inhibin B: a novel marker of spermatogenesis. *Annals of Medicine* 2003;35(1):12-20

Preuss HG, Bagchi D, Bagchi M, Rao CVS, Dey DK, Satyanarayana S. Effects of a natural extract of (-)-hydroxycitric acid (HCA-SX) and a combination of HCA-SX plus niacin-bound chromium and *Gymnema sylvestre* extract on weight loss. *Diabetes, Obesity and Metabolism* 2004a;6:171-180

Preuss HG, Bagchi D, Bagchi M, Rao CVS, Satyanarayana S, Dey DK. Efficacy of a novel, natural extract of (-)-hydroxycitric acid (HCA-SX) and a combination of HCA-SX, niacin-bound chromium and *Gymnema sylvestre* extract in weight management in human volunteers: A pilot study. *Nutrition Research* 2004b;24:45-58

Preuss HG, Bagchi D, Rao CVS, Echard BW, Satyanarayana S, Bagchi M. Effect of hydroxycitric acid on weight loss, body mass index and plasma leptin levels in human subjects. *FASEB Journal* 2002; 16, A1020 [as reviewed in Soni et al. 2004]

Preuss HG, Garis RI, Bramble JD, Bagchi D, Bagchi M, Rao CV, Satyanarayana S. Efficacy of a novel calcium/potassium salt of (-)-hydroxycitric acid in weight control. *International Journal of Clinical Pharmacology Research* 2005;25(3):133-44

Ramos R, Flores Saenz J, Alarcon D. 1996 [as reviewed in Heymsfield et al. 1998]

Ramos RR, Saenz JL, Aguilar CF. Extract of *Garcinia cambogia* in the control of obesity [*in Spanish*]. *Investigacion medica International* 1995;22;97-100 [as reviewed in Soni et al. 2004 and Preuss et al. 2004]

Rothacker DQ, Waitman BE. Effectiveness of a *Garcinia cambogia* and natural caffeine combination in weight loss: a double-blind placebo-controlled pilot study. *International Journal of Obesity* 1997;21(suppl 2):53. [as reviewed in Heymsfield et al. 1998 and Soni et al. 2004]

Saito M, Ueno M, Ogino S, Kubo K, Nagata J, Takeuchi M. High dose *Garcinia cambogia* is effective in suppressing fat accumulation in developing male Zucker obese rats, but is highly toxic to the testis. *Food and Chemical Toxicology* 2005;43:411-419

Shara M, Ohia SE, Schmidt RE, Yasmin T, Zardetto-Smith A, Kincaid A, Bagchi M, Chatterjee A, Bagchi D, Stohs SJ. Dose- and time-dependent effects of a novel (-)-hydroxycitric acid extract on body weight, hepatic and testicular lipid peroxidation, DNA fragmentation and histopathological data over a period of 90-days. *Molecular and Cellular Biochemistry* 2003;254, 339–346

Shara M, Ohia SE, Schmidt RE, Yasmin T, Zardetto-Smith A, Kincaid A, Bagchi M, Chatterjee A, Bagchi D, Stohs SJ. Physico-chemical properties of a novel (()-hydroxycitric acid extract and its dose- and time-dependent effects on body weight, selected organ weights, hepatic lipid peroxidation and DNA fragmentation, hematology and clinical chemistry, and histopathological changes over a period of 90-days. *Molecular and Cellular Biochemistry* 2004; 260,171–186.



Soni MG, Burdock GA, Preuss HG, Stohs SJ, Ohia SE, Bagchi D. Safety assessment of (-)-hydroxycitric acid and Super CitriMax®, a novel calcium/potassium salt. Food and Chemical Toxicology 2004;42:1513-1529

Thom E. A randomized, double-blind, placebo-controlled trial of new weight-reducing agent of natural origin. The Journal of International Medical Research 2000;28:229-233

Thom E. Hydroxycitrate (HCA) in the treatment of obesity. International Journal of Obesity 1996; 20(suppl 4): 48 [as reviewed in Heymsfield et al. 1998, Jena et al. 2002, and Soni et al. 2004]

Tomita K, Okuhara Y, Shigematsu N, Suh H, Lim K. (-)-Hydroxycitrate ingestion increases fat oxidation during moderate intensity exercise in untrained men. Bioscience, biotechnology, and biochemistry 2003;67(9):1999-2001

Toromanyan E, Aslanyan G, Arroyan E, Gabrielyan E, Panossian A. Efficacy of Slim339 in reducing body weight of overweight and obese human subjects. Phytotherapy Research 2007; 21:1177-1181

van Loon LJC, van Rooijen JJM, Niesen B, Verhagen H, Saris WHM, Wagenmakers AJM. Effects of acute (-)-hydroxycitrate supplementation on substrate metabolism at rest and during exercise in humans. American Journal of Clinical Nutrition. 2000;72:1445-14450

Vasques CA, Rossetto S, Halmenschlager G, Linden R, Heckler E, Fernandez MS, Alonso JL. Evaluation of the pharmacotherapeutic efficacy of Garcinia cambogia plus Amorphophallus konjac for the treatment of obesity. Phytotherapy Research 2008;22(9):1135-40

Venkateswara Rao G, Karunakara AC, Santhosh Babu RR, Ranjit D, Chandrasekara Reddy G. Hydroxycitric acid lactone and its salts: preparation and appetite suppression studies. Food Chemistry 2010;120:235-239

Westerterp-Plantenga MS, Kovacs EMR. The effect of (-)-hydroxycitrate on energy intake and satiety in overweight humans. International Journal of Obesity. 2002;870-872