HYDROXYCITRIC ACID CONTENT IN LOCAL EXOTIC FRUITS AS A POTENTIAL DIETARY SUPPLEMENT FOR WEIGHT REDUCTION

M.Z.M. Daud*, N. Ibrahim, A.R. Mohamed, and K.S.K. Ismail

School of Bioprocess Engineering, Northern Malaysia University College of Engineering,
Lot 1132, Jejawi Industrial Estate, 02600 Arau, Perlis.
*Corresponding author. Phone: +604 9798751, Fax: +604 9798755
Email: zulkali@kukum.edu.my

ABSTRACT

The content of several exotic Malaysian fruits were investigated to identify the concentration of hydroxycitric acid (HCA) in them. Among the fruits studied were *Garcinia atroviridis*, *Canarium sp*. and *Averrhoa belimbi* L. HCA captured high interest for its potential function as an appetite suppressor. Using FTIR, it was investigated that *Garcinia atroviridis* had the nearest IR profile to obtain the HCA extract. On the other hand, *Averrhoa belimbi* showed the worst profile and could be concluded that it doesn't contain any HCA.

Keywords: hydroxycitric acid (HCA), exotic fruits, weight management

1 INTRODUCTION

Younger generations recently in Malaysia have changed their lifestyle – consuming fast foods and soft drinks almost everyday resulting in obesity, a growing health problem. Obesity is defined as an increase of adipose mass resulting from a chronic imbalance between energy intake and expenditure (Hayamizu et al, 2003). Because of limited success in the pharmacological management of weight, the use of herbal weight loss products has gained popularity (Chang, 2000).

A herb-derived compound, hydroxycitric acid (HCA) as shown in Figure 1, isolated from related plants has shown to have a therapeutic action where it reduces food intake and weight gain in many rodent studies and decreased visceral fat and body weight in humans (Brandt et al, 2006). HCA is a naturally occurring compound, hence it is safe to use. In addition to this it does not act upon the Central Nervous System. This means that it is not a stimulant and does not interfere with normal sleep cycles.

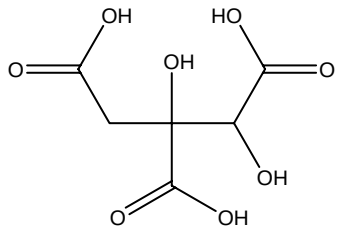

Figure 1 Hydroxycitric acid

Research showed that rats treated with HCA 2 hours before an intragastric or intraduodenal glucose infusion showed a reduced response of blood glucose due to delayed intestinal glucose absorption (Peter et al, 2005). There are also human clinical study which demonstrated beneficial effects for weight loss and fat loss (Downs et al,

2005). Attempts has also been made to isolated several microorganisms, *Streptomyces* sp. U121 and *Bacillus megaterium* G45C that can produce HCA (Hiroyuki et al, 2005). However, this paper will focus on HCA production from potential exotic fruits, particularly sour fruits via extraction method.

From literature, most of the studies related to HCA extraction involved *Garcinia cambogia*, a plant native to India. Extracts of the Garcinia genus, particularly *Garcinia mangostana* and *Garcinia kola*, have been extensively reported to exhibit diverse biological activities such as anti-HIV, antimicrobial, antioxidant and anti-inflammatory activities (Mackeen, M.M et al, 2000). Another genus available in Malaysia, *Garcinia atroviridis* or commonly known as 'asam gelugor' by the Malays were used as a condiment in Southeast Asia cuisine. Therefore, this study was conducted to evaluate the HCA capacity from local exotic fruits, namely *Garcinia atroviridus*, *Canarium sp*. (kedondong) and *Averrhoa belimbi* L. (belimbing buluh).

2 MATERIALS AND METHOD

2.1 PREPARATION OF THE RAW MATERIAL

Garcinia atroviridus, *Canarium sp*. and *Averrhoa belimbi* L. were collected from local villages in Perlis, Malaysia. The fruits were washed thoroughly and skinned. It was then pitted and cut into small pieces.

2.2 EXTRACTION PROCESS

The pieces of fruits were separately soaked in methanol for 3 days. 50g of each fruit rinds was extracted with 200 ml of methanol.

2.3 ANALYTICAL METHODS

The extraction solution is filtered (Whatman) and diluted, prior to analysis. FTIR (Perkin Elmer, USA) was used to determine the functional groups contained inside the fruits' extract between wavelengths of 550 - 4000 cm^{-1}. KBr is used as blank.

3 RESULTS AND DISCUSSION

Three exotic fruits have been tested for their HCA contents using FTIR. According to Jena et al (2002), the (-)-HCA lactone displayed strong IR bands at 3200, 1760 and 1680 cm^{-1}. Comparing the spectrum from the three fruits, the nearest spectrum for HCA is shown by *Garcinia atroviridus*. Eventhough *Canarium sp.* and *Averrhoa belimbi* L. were as sour as G. atroviridis, the spectrum showed diverse results.

4 CONCLUSION

From the three exotic fruits investigated, it was found that only *Garcinia atroviridis* showed positive to have HCA in its extract.

ACKNOWLEDGEMENT

The authors would like to thank UiTM Arau, Perlis for the FTIR analysis.

REFERENCES

Brandt, K. M. S., Langhans, D.V.M.W., Geary, N. and Leonhardt, M. (2006). "Beneficial and Deleterious Effects of Hydroxycitrate in Rats Fed a High-Fructose Intake." Nutrition, 22, 905-912.

Chang, J. (2000). "Medicinal Herbs: Drugs or Dietary Supplements?" Biochemical Pharmacology, 59, 211-219.

Downs, B.W., Bagchi, M., Subbaraju, G.V, Shara, M.A., Preuss, H.G. and Bagchi, D. (2005). "Bioefficacy of a Novel Calcium-Pottasium Salt of (-)-Hydroxycitric acid." Mutation Research, 579, 149-162.

Hayamizu, K., Hirakawa, H., Oikawa, D., Nakanishi, T., Takagi, T., Tachibana, T. and Furuse, M. (2003). "Effect of *Garcinia cambogia* Extract on Serum Leptin and Insulin in Mice." Fitoterapia, 74, 267-273.

Hiroyuki, H., Takashi, Y. and Yasuhiro, Y. (2005). "Production of Hydroxycitric Acid by Microorganisms." Bioscience, Biotechnology and Biochemistry. 69(8), 1555-1561.

Jena, B.S., Jayaprakasha, G.K., Singh, R.P. and Sakariah, K.K. (2002). "Chemistry and Biochemistry of (-)-Hydroxycitric Acid from Garcinia". J. Agric. Food Chem., 50, 10-22.

Mackeen, M.M., Ali, A.M., Lajis, N.H., Kawazu, K., Hassan, Z., Amran, M., Habsah, M., Mooi, L.Y. and Mohamed, S.M. (2000). "Antimicrobial, antioxidant, antitumour-promoting and Cytotoxic Activities of Different Plant Part Extracts of *Garcinia atroviridis* Griff. Ex T. Anders." J Ethnopharmacology, 72, 395-402.

Peter Y. Wielinga, Renate E. Wachters-Hagedoorn, Brenda Bouter, Theo H. van Dijk, Frans Stellaard, Arie G. Nieuwenhuizen, Henkjan J. Verkade, and Anton J. W. Scheurink. (2005). "Hydroxycitric acid Delays Intestinal Glucose Absorption in Rats." Am J Physiol Gastrointest Liver Physiol. 288: 1144-1149.