RESEARCH PAPER | Home Science | Volume : 3 | Issue : 6 | June 2013 | ISSN - 2249-555X

Acceptability and Glycemic Response of Honey Incorporated Traditional Sweet Preparation

KEYWORDS: Honey, Glycemic Response, Glycemic Index

Charu Katare
Department of Home Science, Govt. KRG PG Autonomous College, Gwalior, Madhya Pradesh, India

Seema Rana
Department of Home Science, Govt. KRG PG Autonomous College, Gwalior, Madhya Pradesh, India

ABSTRACT *Honey is the sweetening agent known to the early man, and naturally found its way into traditions, rituals, customs and food of Indian households. It is the most complete natural food and ensures to get the daily dose of essential nutrients. Sugar (primarily sucrose) has been a part of the daily diet for literally hundreds of years, but research is now suggesting excessive consumption of simple sugars with high glycemic index (GI) values have been shown to cause overeating and weight gain. The study was undertaken to determine acceptability, glycemic response (GR) and GI of honey incorporated traditional sweet preparation ladoo. It was observed that there was a significant reduction ($p<0.001$) in GR of honey incorporated ladoo compared to glucose and ladoo prepared with cane sugar. Honey incorporated ladoo fell into low GI category with almost the same acceptability as cane sugar ladoo.*

INTRODUCTION

The use of honey for its medicinal properties is widespread and has been well documented in literature. Honey is considered a valuable medicinal food in Indian system of medicine and is found to be useful in management of diabetes (Agrawal et al., 2006).Traditional importance and use of honey as therapeutics has been mentioned by the Egyptian and Sumerian physicians as early as 4000 years ago (Maryann n., 2000). Beneficial effect of honey on glycemic status has been also reported by many researchers. It is the sweetening agent known to the early man, and naturally found its way into traditions, rituals, customs and food of Indian households. It is the most complete natural food and ensures to get the daily dose of essential nutrients. Honey is a concentrated solution of different carbohydrates with glucose and fructose as the major ones. The main sugars are the monosaccharides fructose and glucose. Additionally, about 25 different oligosacharides have been detected (Doner LW., 1977, Siddiqui IR., 1970). Honey is also shown to contain minerals like selenium, magnesium, Chromium, Potassium Zinc and Copper. Zinc appears to lower blood glucose levels via improvement of insulin sensitivity (Song M et al., 2003).

Sugar (primarily sucrose) has been a part of the daily diet for literally hundreds of years, but research is now suggesting excessive consumption of simple sugars with high glycemic index (GI) values have been shown to cause overeating and weight gain. Honey has been "rediscovered" as a valuable food. Honey is a high carbohydrate food; its glycemic index (GI) varies within a wide range from 32 to 85, depending on the botanical source (Stefan Bogdanov, 2008).There is substantial scientific evidence to support that low GI foods may be beneficial for the prevention and treatment of a number of chronic diseases. Data shows that there are strong correlations between consumption of high glycaemic index (GI) foods and increased weight gain, and that low GI foods can be beneficial for weight management and weight loss (Brand-Miller J. et al., 2002). In The present study ladoo, a traditional sweet made with wheat, Bengal gram flour and sesame seeds simultaneously prepared with cane sugar and honey was evaluated for acceptability and glycemic response.

MATERIALS AND METHODS

Preparation and Sensory evaluation of ladoo

A traditional sweet laddoo was prepared with wheat, bengal gram flour, sesame seeds and ghee. A pinch of cardamom was added as a flavoring agent. Two varieties of ladoo were made one with cane sugar (CSL) and another with honey (HIL) as a sweetener. The preparations were then subjected to organoleptic evaluation for various attributes like appearance, texture, colour, flavor and softness. A 9 point hedonic scale (Belle Lowe., 1961) determined organoleptic qualities of both the varieties of ladoo. These preparations were tested by the panel of 7 judges for its organoleptic quality and acceptability. The judges were requested to taste the ladoo and award a score with reference to a number of attributes viz. appearance, texture, colour, flavour and softness during the tasting session. This procedure was repeated two more times. The similar scores obtained in both replications were considered acceptable.

Selection of sample

To determine Glycemic Index of individual food items subjects in normal health were contacted for the study. 10 well informed and motivated normal healthy volunteers in the age group of 25-45 years, who were willing to participate in the study, were enrolled to carry out the stu dy.

Collection of baseline data & determination of Glycemic Index

All the subjects were asked to attend the testing session after a 10-12 hour overnight fast on the day test was performed, having been instructed not to consume unusually large meals, drink alcohol or exercise vigorously on the previous day, and to avoid cycling or walking to the laboratory. On the first day subjects were given the standard or reference carbohydrate i.e. 25 g glucose dissolved in 150 ml of water. Blood glucose level was measured in capillary whole blood obtained by finger prick (Accu-Chek Roche Diagnostics India Pvt Ltd, Mumbai) in the fasted state at 0 and after 30, 60, 90 and 120 minutes on consumption of the reference (glucose) food. Blood glucose curves were constructed and the incremental area under the curve (IAUC) was calculated for reference food (glucose) by the trapezoidal rule (Gibaldi.M and D.Perrier.,1982). Equicarbohydrate quantity of both the varieties of ladoo with honey and sugar (containing 25g carbohydrate which was calculated on the basis of carbohydrate content given in Nutritive value of Indian foods by C. Gopalan, 2004 were administered keeping interval of 3 days between administration of reference food as well as each test food.

Calculation of Glycemic Index

The Glycemic Index (GI) values were calculated by the method of Wolever et al., 1990. The glycemic index was calculated by dividing the IAUC for the test food by the IAUC for the reference food and multiplying by 100 for each individual.

Volume : 3 | Issue : 6 | June 2013 | ISSN - 2249-555X

The following formula was used:

$$GI = \frac{\text{IAUC for tested Food}}{\text{IAUC for Reference Food}} \times 100$$

IAUC – Incremental Area Under the blood glucose response Curve.

The final glycemic index for each test food was calculated as the mean of the respective GI's of the ten individuals.

Statistical analysis
Statistical analysis was performed by using a one way Anova by Sigma stats software package (3.5).

RESULTS AND DISCUSSION

Table-1
Mean scores for sensory attributes

Combination	CSL	HIL
Appearance	9	9
Texture	9	8
Colour	8	8
Flavour	9	9
Softness	8	8
Overall acceptability	8.6	8.4

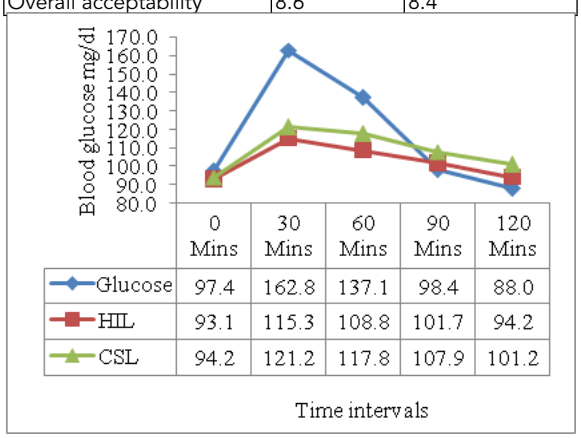

Figure 1: Mean plasma glucose level on consumption of reference and test foods at 30 minute interval for 2 hours

Table – 2
IAUC & GI in normal healthy subjects

S. No.	Food preparations	IAUC	GI
1	Glucose	175.91	-
2	CSL	114.16*	64.89
3	HIL	79.16*	45.00

Values are given in mg/dl (mean)
* Significant change P<0.001

Sensory evaluation of the CSL and HIL scored almost similar for attributes like appearance, texture, colour, flavour and softness (table 1). Hence acceptability of both the products was almost the same. Subjects expressed a liking for sweetness imparted by honey and were also appreciated for beneficial properties of honey. Blood glucose level was monitored for 2 hours at a interval of 30 minutes after administration of reference food and test foods. The blood glucose response curves for the test foods (ladoo) compared to that for the reference food (glucose) in the same subjects are shown in fig.1. A comparison of glycemic response of the reference food and test foods showed highest increment at peak by glucose followed by ladoo with cane sugar and ladoo with honey at 60 minutes. Maximum reduction in plasma glucose level was noticed after administration of ladoo with honey at the end of 2 hours which indicated that HIL elicited lowest glycemic response. Observations of a study support our findings which reports elevation of PGL (plasma glucose level) was greater after honey than after sucrose at 30 minutes, and was lower after honey than it was after sucrose at 60, 120, and 180 minutes (Ali-Wali N., 2003). On the basis of blood glucose values obtained at 30 minute interval IAUC (Incremental area under the curve) was calculated. It was found that there was significant ($p<0.001$) difference in IAUC of test foods CSL and HIL and reference food glucose (table 2). According to a study, given that honey has a gentler effect on blood sugar levels on a per gram basis, and tastes sweeter than sucrose so that fewer grams would be consumed, it would seem prudent to recommend honey over sucrose (Shambaugh P. et al., 1991).

Foods may be divided into three groups: foods with low GI (GI= 55 or less), foods with medium GI (GI= 69) and foods with high GI (GI=70 or more) (Foster-Powell et al., 2002). GI of CSL and HIL was found to be 64.89 and 45.00 respectively in normal healthy subjects, showing CSL had a moderate GI where as HIL obtained a GI value which fell into low GI category. This indicated that honey incorporation in ladoo has no adverse effect on glycemic response and was well tolerated by subjects. This finding is supported by a study which reported that honey has lower glycemic index compared to many other carbohydrates (Abdulrhman M et al., 2009). The American Diabetes Association's standards of care recommend that "the use of the glycemic index and glycemic load may provide a modest additional benefit for glycemic control over that observed when total carbohydrate is considered alone" (Amanda R. et al., 2011).

CONCLUSION

In the present study it was noticed that honey may be used as a sweetener by normal as well as subjects with overweight and obesity instead of using cane sugar as honey is seen to have no adverse effect on glycemic status and products with honey have a low GI compared to product made with cane sugar. We suggest that honey can be seen as a better alternative for cane sugar since honey has lower GI and is loaded with nutrients and bioactive compounds.

REFERENCE

1. Abdulrhman M, El-Hefnawy M, Hussein R, et al, (2009), "The glycemic and peak incremental indices of honey, sucrose and glucose in patients with type 1 diabetes mellitus: effects on C-peptide lev-el—a pilot study." Acta Diabetol. [Epub ahead of print]. | 2. Ali-Wali N. (2003). Intrapulmonary administration of natural honey solution, hyperosmolar dextrose or hyposmolar distill water to normal individuals and to patients with type-2 diabetes mellitus or hypertension: their effects on blood glucose level, plasma insulin and C-peptide, blood pressure and peaked expiratory flow rate. Eur J Med Res 31; 8(7):295-303. | 3. Amanda R. Kirpitch, MA, RD, CDE, LDN and Melinda D. Maryniuk, MEd, RD, CDE, LDN, (October 2011), "The 3 R's of Glycemic Index: Recommendations Research, and the Real World." Clinical Diabetes vol. 29 no. 4 155-159. | 4. Belle Lowe, Experimental Cookery from the chemical and physical stand Point. John Wiley & Sons / Mc New York, pp. 36-41, Fourth printing July 1961. | 5. Brand-Miller J, Holt S, Pawlak D, McMillan J. (2002), "Glycemic index and obesity." Am J Clin Nutr.76 (1):281S–285S. | 6. Doner LW, (1977), "The sugars of honey - a review." J Sci Food Agric 28 :443– 456 . | 7. Foster-Powell K, Holt SH, Brand-Miller JC, (2002), "International table of glycemic index and glycemic load values." Am J Clin Nutr.; 76:5–56. | 8. Gibaldi, M. and D. Perrier, (1982) Pharmacokinetics. 2nd Rev. Ed. Marcel Dekker, New York. | 9. Gopalan C, Rama Sastri BV, Balasubramanian SC, (2004), "nutritive Value of Indian Foods." Hyderabad: national Institute of nutrition, Indian Council of Medical Research. | 10. Maryann, n. (2000), "Honey as medicine has a long history — New Zealand honey is focus of intensive research." Health Facts, 25: 4–5. | 11. O. P. Agrawal, A. Pachauri , H. Yadav , J. Urmila , HM Goswamy , A.Ch-apperwal , P. S. Bisen , G. B. K. S. Prasad, (11 April 2006), "Subjects with impaired glucose tolerance exhibit high degree of tolerance to honey". | 12. Shambaugh P, Worthington V, Herbert JH, (1991 Jan), "Differential effects of honey, sucrose, and fructose on blood sugar levels." J Manipulative Physiol Ther, 14(1):91-2. | 13. Siddiqui IR, (1970)," The sugars of honey." Adv Carbohyd Chem25 :285–309, | 14. Song M, Hwang I, Rosenthal M, Harris D, Yanaguchi D, Yi I, Go V, (2003), "Antidiabetic action of arachidonic acid Zinc in genetical diabetic Goto- Kakizaki rats." Metabolism, 52: 7-12. | 15. Stefan Bogdanov, PhD, Tomislav Jurendic, Robert Sieber, PhD and Peter Gallmann, PhD (December 2008) "Honey for Nutrition and Health": A Review J Am Coll Nutr. vol. 27 no. 6 677-689. | 16. Wolever TMS, Boume GH (eds), (1990), "The glycemic index. Aspects of some Vitamins, minerals and enzymes in health and diseases." World Review Nutr Diet 62, 120-185.