

Glycemic Index Testing Service

Confidential Product Report: *in vivo* GI test

Company: CIC Agri Produce Export (Pvt) Ltd

Product: Fragrance

Date: 29th June 2009

Executive Summary

Fragrance provided by CIC Agri Produce Export (Pvt) Ltd, was submitted in March 2009 to Baker IDI for in vivo Glycemic Index (GI) Testing. The GI test result is shown in **Table 1** below:

Product	GI (mean \pm SEM)*	GI Category
Fragrance	61 \pm 5	Medium

*Standard Error of the Mean

Introduction: What is GI?

GI is a comparative system that ranks carbohydrate-based foods to indicate how fast and to what extent the food will raise the blood glucose level. In GI testing, the blood glucose response to a test food is compared with the response to a reference food such as glucose, which is given the GI value of 100. GI compares serves of food containing equal quantities of available (digestible) carbohydrate. Therefore the GI reflects the *quality* or *type* of carbohydrate in the food rather than the *quantity*.

GI is divided into 3 categories:

Low (GI \leq 55) **Medium (GI = 56-69)** **High (GI \geq 70)**

Foods containing carbohydrates which are slowly digested and absorbed and therefore raise the blood glucose gradually have a low GI. Foods containing carbohydrates which are more quickly digested and absorbed and therefore have a greater effect on blood glucose levels have a high GI.

In vivo GI testing methodology

In vivo Glycemic Index (GI) testing involving human volunteers at Baker IDI is based on the internationally accepted methodology recommended by FAO/WHO Joint Expert Consultation, 1998 and is conducted in accordance with the Australian Standard[®], Glycemic Index of Foods (AS 4694-2007).

In our laboratory, ten or more healthy subjects are required to determine the GI of a food. After an overnight fast, a portion of the test food containing 50 grams of available carbohydrate is consumed by participants and its effect on blood glucose levels is measured over the following two hour period.

Methodology (continued)

On 3 other occasions, a 50 gram portion of glucose (reference food) is consumed and the effect on blood glucose levels is measured over the subsequent two hour period. The GI is determined by dividing the incremental (above baseline) area under the curve (AUC) of the test food by the average incremental AUC of the 3 reference food tests in each participant. The final GI value is the average GI value of 10 or more valid participant results. Valid results are defined as those within ± 2 standard deviations (SD) of the mean GI value.

Food preparation: A test portion of the product was cooked for 16 min in simmering water and drained before serving to the subject along with 250 ml of water.

GI testing of this product was based on the assumption that the available carbohydrate content of the product was 73.9%, measured by direct starch analysis, by the Australian Commonwealth Scientific & Research Organisation (CSIRO).

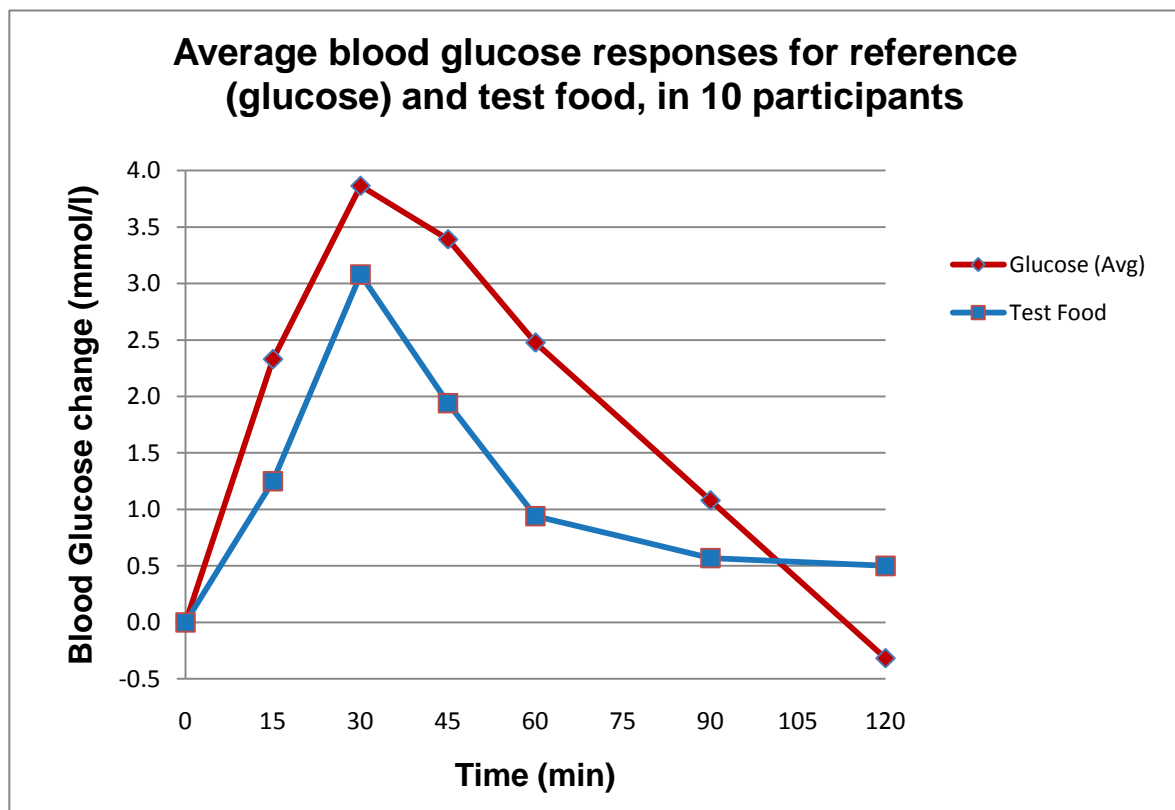
Available carbohydrate is best defined for GI testing purposes as:

1. **Direct analysis:** The sum of starch plus sugars, including the available portion of sugar alcohols and other slowly absorbable sugar derivatives, calculated from their relative availability as set out in the Australian Standard for GI Testing (AS 4694-2007).
or
2. **Difference method:** The total carbohydrate by difference (100 minus protein, fat, fibre, moisture & ash expressed in g/100g) minus the sum of added fibre like substances, including resistant starch and other non digestible oligosaccharides that are not detected in the TDF assay, minus the non digestible portion of sugar alcohols, calculated from their relative availability as set out in the Australian Standard for GI Testing (AS 4694-2007).

On this basis, a 67.7g serve of the test food was consumed by each participant containing 50g available carbohydrate. Water (250ml) was consumed in addition to each of the reference and test meals.

Results

Figure 1 below shows average blood glucose responses in the 10 participants, at each of the blood sampling time points, for the reference and test foods. Blood glucose response is measured as a change in blood glucose level (from baseline) following the carbohydrate load. The reference and test foods contained equal quantities (50g) of carbohydrate.



The average blood glucose response for both the reference and the test food, Fragrance, peaked at 30 min. Over the 2 hour period, the test food produced a significantly smaller incremental area than the reference ($p < 0.05$).

The individual participant AUC and GI values for the reference and test foods are shown in Table 2.

Results (continued)

Table 2: Test results for CIC Agri Produce Export (Pvt) Ltd, Fragrance

Subject	1	2	3	4	5	6	7	8	9	10
AUC Glucose (1)	245	221	167	200	224	390	180	171	286	130
AUC Glucose (2)	328	198	119	225	230	436	332	241	228	146
AUC Glucose (3)	231	211	139	194	244	393	174	118	381	254
AUC Glucose Avg	268	210	142	206	233	406	228	177	298	177
AUC Test Product	144	199	110	101	104	248	140	74	155	129
Participant GI	54	95	78	49	45	61	61	42	52	73
Average GI	61									

Comments

When tested in our laboratory by the *in vivo* method, Fragrance provided by CIC Agri Produce Export (Pvt) Ltd produced a mean GI value of 61, based on 10 valid results. This value is in the low range.

Excluded from this final data set was one outlier with a GI of 113. An outlier is defined as a value greater than 2 standard deviations from the mean.

The GI is not intended to, and does not, constitute medical advice and does not guarantee rates of carbohydrate absorption. Users of the GI should seek advice from professionally qualified medical and health professionals in relation to specific situations and conditions of concern. We recommend that customers using the GI on the packaging of tested products ensure that an accurate overall impression of the nutritional properties of the product is conveyed to the consumer.

These comments in relation to the tested product are not intended to constitute detailed product development advice. If you require information in relation to the modification of products for lowering of GI please contact us to discuss.

Further Reading

Jenkins DJA, Thomas DM, Wolever TMS *et al* (1981): Glycemic index of foods: a physiological basis for carbohydrate exchange. *Am. J. Clin. Nutr.*, **34** 362-366.

FAO/WHO (1998): Carbohydrates in human nutrition. *Report of a Joint FAO/WHO Expert Consultation, 14-18 April 1997, Rome*. FAO Food & Nutrition Paper No 66.

Bjorck I, Liljeberg H & Ostman E (2000):. Low glycaemic-index foods. *Br. J. Nutr.* **83(Suppl. 1)**: S149-S155.

Foster-Powell K, Holt S & Brand-Miller J (2002): International tables of glycemic index and glycemic load values:2002. *Am. J. Clin. Nutr.* **76**: 5-56.

Wolever TMS, Brand-Miller JC, Abernethy J *et al* (2008): Measuring the glycemic index of foods: Interlaboratory study. *Am. J. Clin. Nutr.* **87(Suppl)**: 247S-257S.

GI Testing Service

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