

Application Note NS001: GI Analysis of Breakfast Cereals using the NutriScan GI20

Introduction:

Glycemic Index, GI, is most relevant for carbohydrate based foods. Breakfast cereals are mostly carbohydrate based and the GI of breakfast cereals is important as a nutritional guide for consumers to compare one product versus another.

A number of samples of breakfast cereals were analysed using the NutriScan GI20. This application notes present the results of these analyses.

Procedure:

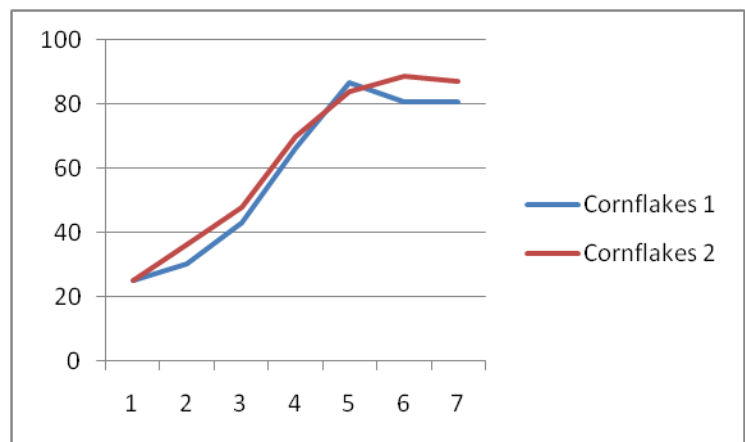
The GI20 simulates the enzymatic digestion of foods in the human gut and measures the amount of glucose released from the food samples over a 5 hour digestion process.

Duplicate sample of 7 breakfast cereals were digested under gentle agitation and incubation at 37C for five hours. The glucose concentration of a 1ml sample extracted from the digests at 15, 30, 60, 120, 180, 240 and 300 minutes were collected using the Analox GM9 Glucose Analyser. The Glycemic Index is calculated as the ratio of the glucose released from the food to the total available carbohydrates available in the food.

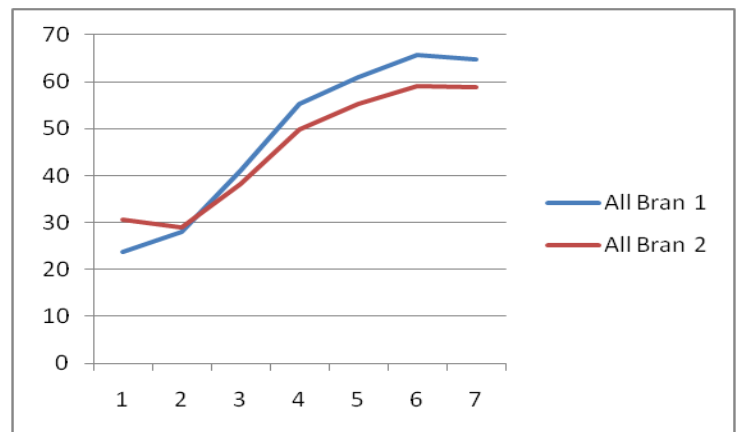
2 of the breakfast cereals, Cornflakes and Albran, have well established GI values and were used as low and high standards in order to scale the glucose responses for the new cereals.

The figure below shows the plot of the progressive glucose response for each sample.

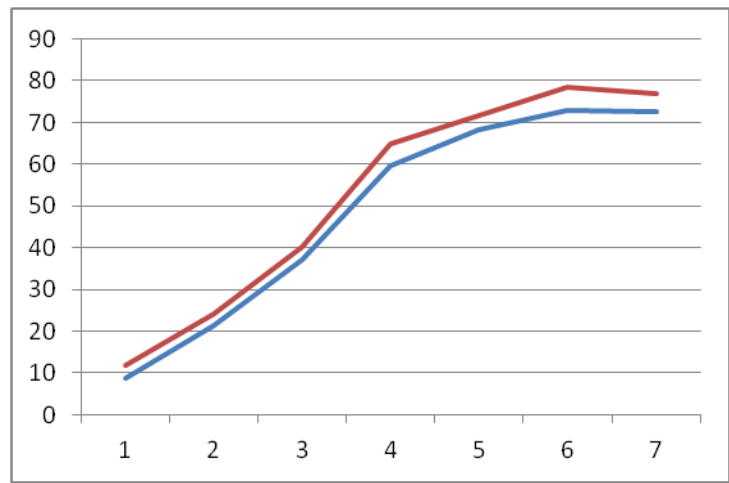
Cornflakes 1	Cornflakes 2
25	25
30	36
43	48
66	70
87	84
81	89
81	87



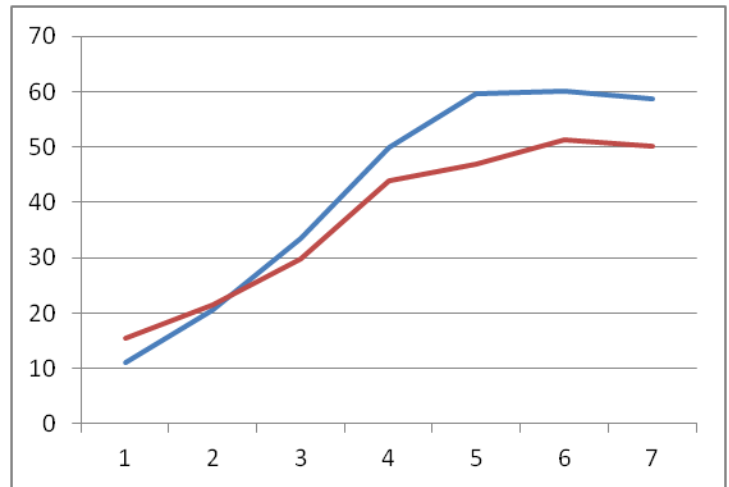
All Bran 1	All Bran 2
24	31
28	29
41	38
55	50
61	55
66	59
65	59



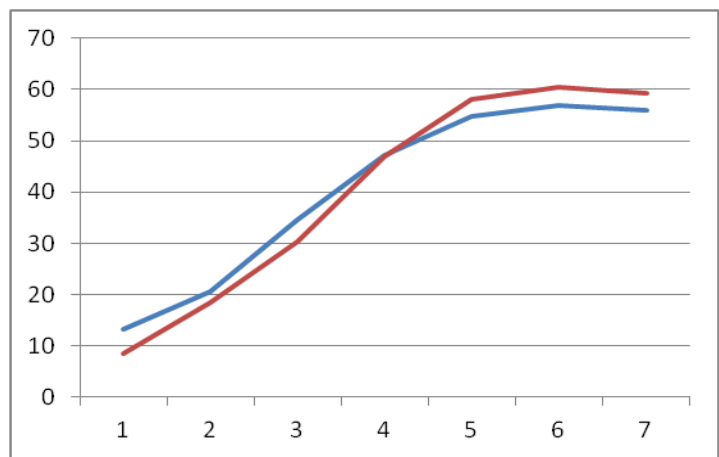
Grain Flakes 1	Grain Flakes 2
9	12
22	24
37	40
60	65
68	72
73	79
72	77



Muesli 1	Muesli 2
11	16
20	22
33	30
50	44
60	47
60	51
59	50



Extruded 1	Extruded 2
13	9
21	18
35	30
47	47
55	58
57	60
56	59

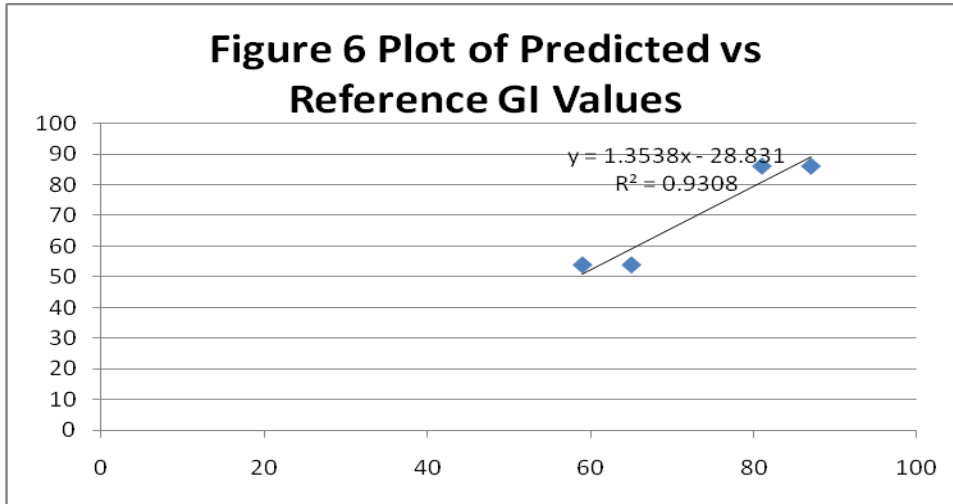


Based on these plots the Glycemic Index has been predicted for each sample. Table 1 shows the predicted GI values.

Table 1. Predicted Glycemic Index for each sample.

	Repeat 1	Repeat 2	Average
Cornflakes	81	87	84
All Bran	65	59	62
Grain Flakes	74	77	75.5
Muesli	64	57	60.5
Extruded	62	64	63

Based on data provided by CSIRO, Cornflakes should have a GI value of 86 and All Bran a GI value of 54. Using the predicted GI values for the Cornflakes and All Bran samples, a XY plot was drawn and the slope and bias corrections calculated as shown in Figure 6.



The slope and bias were applied to the predicted GI values for each sample.

Table 2. Corrected Glycemic Index for each sample.

	Repeat 1	Repeat 2	Average
Cornflakes	82	91	85.5
All Bran	60	52	56
Grain Flakes	72	77	74
Muesli	59	50	54.5
Extruded	56	59	57.5

Discussion:

The NutriScan GI20 Glycemic Index Analyser provides a means of predicting Glycemic Index in food samples by simulating the enzymatic digestion of the foods and the measurement of the release of glucose from the food during digestion.

The sources of error in this technology include instrumental errors and sampling errors. It is important to perform at least duplicate tests for each sample. Since the sample used for this test is the equivalent of 50mg of available carbohydrates, then weighing the sample is a significant source of error. A 4 decimal place balance is required in order to accurately prepare each test sample. Also the nature of the samples will affect the reproducibility of the tests. Samples that contain large chunks or pieces, eg, fruit or nuts, are very difficult to obtain a representative 50-100mg sub sample. If the food is ground to a fine powder then it will not react the same as the raw or unground food. As such samples were chopped using a Zylsis Food Processor but the Muesli sample could not be reduced to a point where the two samples used in the analysis were consistent.

Instrumental errors include the addition of the reagents using peristaltic pumps which have a precision of approximately 10%. However the major source of error is probably the precision of the injection of the sample into the GM9 Glucose Analyser and the subsequent precision of the analyser itself.

The GI20 needs to be calibrated against standard samples. Unfortunately the only standards available to us were the Cornflakes and All Bran samples provided by CSIRO. As such, the correction of the Predicted GI values to align them with these standards is considered an acceptable practise.