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Investigation of the Glycemic Load of Umunnochi and Nsukka Honey Samples for possible Health benefits

Nwaneri T. U.; Offurum, J.C.; Iheme C.; Chinagorom E. N. & Nwaozuzu S.C.
Department of Chemical Engineering
Imo State Polytechnic, Umuagwo-Ohaji
E-mail: jullyengine@yahoo.com

ABSTRACT

This research work is anchored on the Investigation of the Glycemic Effect of Honey Samples from Umunnochi (in Abia State of Nigeria) and Nsukka (in Enugu State of Nigeria), which implies the measurement of how fast and high the blood sugar rises, as well as how quickly the body responds by bringing it back to normalcy after ingestion. As the effect of different foods on blood glucose apparently depends on many factors (including digestibility and the form of food), it becomes a source of concern in the case of Honey, which has high digestibility (with all natural liquid syrup). The honey samples used in this study were collected from Umunnochi and Nsukka extracts respectively, and was subjected to physicochemical analysis (including the sugar content screening) using standard methods. The results of the analysis indicated that the Nsukka honey sample has glucose, sucrose and reducing sugar contents of 20.67,12.70 and 2.04% respectively (giving rise to a total sugar content of 33.37%), while that of Umunnochi honey sample has 21.59, 13.13 and 2.38% respectively (giving rise to a total sugar content of 37.10%). Also, the glycemic load of Nsukka honey sample was evaluated to be and 14.10%, while that of Umunnochi honey is 15.78%. In comparison with the Codex Standard (1-19%), the results of glycemic load for the two samples as being reasonably high for normal persons. But in contrast to this affirmation, the results were beneficial to people with abnormalities of blood glucose regulation, notably Diabetics or Hypoglycemia. Generally, these findings gave credence to the research goal, as a number concerned people will benefit from them by avoiding foods that produce too great a rise and/or foods that are too sudden a fall in blood glucose.

Keywords: Investigation, Glycemic Index, Honey Samples, Health Benefits

INTRODUCTION

The prevalence of obesity and type 2 diabetics has increased in most countries in recent years and escalating estimates of future diabetes prevalence have become of great concern to Health professionals

worldwide. Perhaps, the most worrying trends are the increase in the prevalence of obesity among youths (Shields, 2006). Glycemic index is the measurement of the ability of different types of carbohydrate-based foods, to raise blood glucose levels within 24 hrs. The interest in low GI – diets as a tool in weight management is increasing.

The Glycemic Index (GI) and Glycemic Load (GL) of diets have been proposed as possible targets for the prevention and treatment of both type-2 diabetic (Barclay *et al,* 2008) and obesity (Ebbeling *et al,* 2003; Nelson *et al* 2005). Therefore, greater exploration of the dietary *GI* and *GL* (especially in children and adolescents) is worth-while. *GI* is a measure of the glycemic response elicited by the ingestion of a carbohydrate-containing food, and it is considered to be indicative of carbohydrate and quantity (Barclay *et al,* 2008). However, different types of starch differ in their ability to increase postprandial blood glucose and insulin secretion.

Epidemiological studies have demonstrated that high *GI* and *GL* diets are associated with increased risk of diabetics among adults (Barclay *et al* 2008). Also, high *GI* and *GL* diets have been associated with obesity among youths (Nelson *et al* 2005), and these parameters are thus suggested as possible targets for weight loss promotion among children and adolescents.

Honey contains sucrose in substantial quantity and the major difference between protein and sucrose is the ability of sucrose to elicit a rise in blood glucose and stimulate insulin secretion. Insulin is a powerful anabolic hormone that stimulates Adipocyte (cell specialized for storage of fats that are found in connective tissue) differentiation, in adipose tissue expansion, as well as activation of insulin, signaling is crucial issue for the development of obesity.

MATERIALS AND METHOD

Preparation of the Honey Samples

The honey sample from Nsukka (Sample A) was, first, clarified by mixing 25g of each of the Samples with 10ml of neutral Lead Acetate. The mixture was the transferred into a 500ml beaker containing 250ml water. Then a 25g of the clarified honey were collected, poured into a 1000ml beaker containing 100ml water and stirred properly.

After the clarification, 10% Potassium Oxide was mixed with 100ml of water in an empty wind glass bottle, and a little quantity (2ml) of the mixture was added to a 250ml of the clarified samples and then poured into a 1000ml-measuring cylinder. Distilled water was used to make up the mixture to 500ml volume. This final product was then subjected filtration by means of filter paper, to get rid of any particles remaining in the mixture. This same procedure was used for the Umunnochi honey (Sample B)

Determination of Glucose Content

2g of each of the samples was weighed into a 250ml volumetric flask and distilled water was used to make up the volume. An aliquot of 25ml the mixture was transferred to a 250ml iodine flask. Then 50ml of 0.1N iodine was pipetted into the flask, which was already containing a mixture of 50ml volume of 0.2N sodium carbonate and 50ml volume of 0.2N sodium bicarbonate solution. It was allowed to stand in the dark cupboard for 2 hours, after which it was acidified with 12ml of 25%-H_2SO_4, and then titrated with standard sodium thiosulphate using starch as an indicator. The same procedure was used for the blank.
Thus, the percentage glucose content is given by:

$$\%age\ Glucose = \frac{Normality\ of\ thiosulphate \times dilution\ factor \times (B - S) \times 0.009005 \times 100}{0.01 \times weight\ of\ sample}$$

Where: **B** = Volume of Blank Solution; **S** = Volume of Sample.

Determination of Reducing Sugar

25g of sample was weighed into a 250ml volumetric flask. 10ml of neutral Lead Acetate solution was then added, and this was diluted (to the brim) with distilled water. An aliquot of 25ml of the mixture was transferred to a 500ml volumetric flask, containing 100ml water. Potassium Oxalate was added in small amounts until there is no further precipitation; it was, again filled to the brim with distilled water. Thus the solution was mixed very well and filtered by means of filter paper, after which the mixture was titrated against sodium thiosulphate (using starch as an indicator) Thus, the percentage Reducing Sugar content is given by:

$$\%age\ Reducing\ Sugar = \frac{Dilution\ factor \times Fehling\ factor \times 100}{Weight\ of\ Sample}$$

Determination of Sucrose

10g of prepared honey sample was weighed into 250ml volumetric flask, and this was made up with distilled water. An aliquot of 100ml of the volume was put into a 500ml volumetric flask in which 100ml of HCl was added. The mixture was left for about 36hours at a regulated temperature of 30°C. Afterwards, it was, again, diluted with distilled water to 500ml. An aliquot of 100ml of this final mixture was then transferred to a 250ml volumetric flask, neutralized with NaOH and make up to brim of the flask (with continuous stirring). The solution was titrated against Fehling solution. The percentage sucrose content was evaluated using the following relation:

%age Sucrose = (%age Reducing Sugar after Inversion – %age Reducing sugars before Inversion) X 0.95

Glycemic Load

Glycemic Load (GL) combines both the quality and quantity of a carbohydrate. It is an excellent way to predict blood glucose values of

different types and amounts of food. The *GL* of each of the samples was obtained by simple evaluation, using the following relation:

$$GL = \frac{(GI) \times (\text{Total Sugar Content, } TSC)}{100}$$

Where: GI (for Honey) = 25%; TSC = %age Glucose + %age Sucrose + %age Reducing Sugar).

RESULTS AND DISCUSSION

The results of the analysis the parameters, conducted on the samples, are as presented in *Table 1*.

Table 1: Results of Analysis on the Samples

PARAMETER	Result on Sample A	Result on Sample B	CODEX Standard
Glucose Content (%)	36.67	41.59	45.00
Reducing Sugar Content (%)	3.04	3.38	Not Applicable
Sucrose Content (%)	16.70	18.13	> 5
Total Reducing Sugar (%)	56.41	63.10	60.00
Glycemic Load (%)	14.10	15.78	1-19

The results of analysis showed that the parameters assessed are in close range as applied to both samples, even though the Umunnochi honey has little higher values than its Nsukka counterpart. The total sugar for Nsukka Honey is 33.37%, while that of Umunnochi is 37.1%. This is traceable to the glucose contents of the samples, which above account greatly for the total sugar content of food samples (liquid and solid). Though within the acceptable standard limit, the Glycemic Load, *GL* observed for both samples (*14.10%* for Nsukka honey and *15.78%* for Umunnochi honey) could be expressed as being high. This can

advantageous in a given condition, but detrimental in another condition (Salmeron *et al,* 1997). By implication, the results gave credence to the research interest on the glycermic effect of the study samples on human health. Reasonably high glycemic load could be important to people with abnormalities of blood glucose regulation, notably diabetic or hyperglycemic patients (giving more advantage to the Umunnochi honey), and in the contrary, high glycemic load has the capacity of causing obesity and depression on normal persons, especially youths/adolescents, thereby giving more advantage to the Nsukka honey (Ebelling *et al,* 2003; Nelson *et al*). The findings necessitate the need for glycemic load analysis, to properly guide people in both conditions on the consumption level of honey samples. Generally, all the parameters analyzed during this study were within acceptable standards, and as such recommended for consumption at the required level of the consumer's health status.

CONCLUSION

The glycemic effect of a given honey sample (as applicable to other foods) is a measurement of how fast and high the blood glucose rises, as well as how quickly the body responds by bringing it back to normalcy after ingestion The results of the present study indicated that the Umunnochi honey sample higher values of the assessed parameters, when compared with that of Nsukka. This, however, gave the Umunnochi honey more consumption advantage by normal person than the Nsukka honey, in recalcitrance to the case with diabetic and hyperglycemic individuals that need more of the higher glycemic loaded honey samples to complement their taste demand without increasing the body sugar level.

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