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Sugar Content in Artificial Sweetener

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ABSTRACT

In this present work authors undertook an investigation on glucose, artificial sweetener and saccharin. This study compared the reality of the claimed sugar free nature of commercial artificial sweetener. A molecular level investigation is carried out by using FTIR spectroscopy and optical polarization experiment. The result obtained show that the sugar content of the artificial sweetener is substantial.

Keywords: Glucose, Optical activity, IR spectrum.
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INTRODUCTION

The food and beverage [1] industry is increasingly replacing sugar or corn syrup with artificial sweeteners [2] in a range of products traditionally containing sugar. some people choose to limit their food energy intake by replacing high-energy sugar or corn syrup with other sweeteners supposed to have little or no food energy. This allows them to eat the same foods they normally would, while allowing them to lose weight and avoid other problems associated with excessive caloric intake. Sugar substitutes are tooth-friendly, as they are not fermented by the microflora of the dental plaque. Saccharin is the oldest artificial sweetener; and is about 300 times as sweet as sucrose, but has an unpleasant bitter or metallic aftertaste, saccharin is stable when heated, even in the presence of acids, does not react chemically with other food ingredients, and stores well. Blends of saccharin with other sweeteners are often used to compensate for each sweetener's weaknesses. Saccharin [3] is not particularly water-soluble. Saccharin was an important discovery, especially for diabetics. Saccharin goes directly through the human digestive system without being digested. It does not affect blood insulin levels, and has effectively no food energy. An IR spectrum represents a fingerprint of a sample with absorption peaks which correspond to the frequencies of vibrations between the bonds of the atoms making up the material. Because each different material is a unique combination of atoms, no two compounds produce the same IR spectrum. Therefore, IR spectroscopy can result in a positive identification (qualitative analysis) of every different kind of material. In addition, the size of the peaks in the spectrum is a direct indication of the amount of material present. With intuitive

software algorithms, infrared is an excellent tool for quantitative analysis. Fourier transform infrared (FTIR) spectro-microscopy is a newly emerging analytical tool capable of monitoring the biochemistry within an individual living mammalian cell in real time. This unique technique provides infrared (IR) spectra, hence chemical information, with high signal-to-noise at spatial resolutions as fine as 3 to 10 microns. Mid-IR photons are too low in energy (0.05 – 0.5 eV) to either break bonds or to cause ionization. The understanding of structure, dynamics and function of a bio-molecule is one of the most challenging fields in the biological Physics. The IR spectroscopy is supposed to be a powerful tool for the study of bio-molecules.

In this present work authors undertook an investigation on glucose, artificial sweetener and saccharin. This study compared the reality of the claimed sugar free nature of commercial artificial sweetener. A molecular level investigation is carried out by using FTIR spectroscopy and optical polarization experiment. The result obtained show that the sugar content of the artificial sweetener is substantial

MATERIALS AND METHODS

Material Used

Glucose (natural sugar) was collected from Merck India Ltd., commercial artificial sweetner was collected, from medicine company, which contains lactose along with other non sucrose ingredients. Consumable saccharin was collected from Abbott India Ltd. In optical polarization experiment, medicated water was used as the solvent for the mentioned material

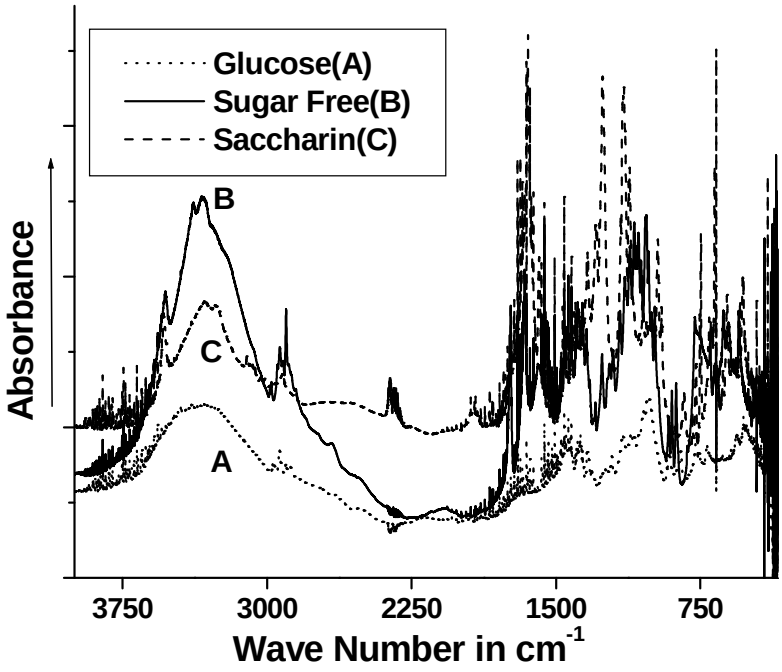

FIGURE 1: Comparison of FTIR spectrum of experimental specimens

Measurement

The FTIR spectrum of the three mentioned specimens was carried out using Model IRAffinity-1 (Shimadzu Corporation Japan) in KBr window between wave number 350-4000 cm^{-1} at a resolution 2 cm^{-1} at room temperature (RT). Glucose or natural sugar, artificial sweetener and saccharin were grounded to very fine particles and mixed with KBr (spectroscopic grade, Merck

Specialities Private Ltd. Germany) to form pellets. Optical activities of the mentioned specimens were measured by Polarimetric method using polaroid half-shade plate. In each case 5% water solution was used The resolution of the Polarimeter was about 1". The measurement determines the specific rotation of the active substance in the experimental solutions which in turns gives the direct information of the characteristics sugar content in the solution.

RESULTS AND DISCUSSION

Figure 1 compares the FTIR spectrum between 600-4000 cm^{-1} of glucose, artificial sweetener and saccharin represented by curve A, B and C respectively. The results show that curve A and curve C compares well over entire range of spectrum. The near common peak around 3340 cm^{-1} is due to OH bond in specimens A, B and NH bond in specimen C. The over all nature of C is different from that in A and B.

The results of optical activity measurement on 5% water solutions of glucose, artificial sweetener and saccharin show that both glucose and artificial sweetener solution exhibits optical activity almost equally. However, saccharin does not exhibit any optical activity. Optical rotation due to the mentioned solutions are measured carefully with standard optical polarimeters and the estimated specific rotations for the specimen A,B and C are estimated to be 64, 56 and 3.5 respectively. For saccharin the obtained specific rotation is within the error limit of the instrument or due to the impurity content in the specimens.

Lactose is a disaccharide which on hydrolysis produces glucose and galactose. Thus, a commercial artificial sweetener containing lactose will produce glucose on hydrolysis. In fact it is the route for high specific rotation of artificial sweetener other than saccharin.

CONCLUSION

Artificial sweetener, in Saccharide group , but saccharin , yield glucose on hydrolysis . The former can not be treated as free from sugar . However saccharin is the real one which is free from sugar.

Acknowledgments
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REFERENCES

[1] M. P. A sugar-free icing composition , European Patent EP1002466
[2] www.inchem.org/documents/jecfa/jecmono/v17je25.htm (accessed on 5th September **2010**)
[3] www.thermo.com.cn/Article.aspx?ID=187 (accessed on 5th September **2010**)