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# Estimation of Saccharin in Soda Beverages Syrups, Kulfies and Candies

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**Abstract**: The name saccharin is aptly derived from Latin word "Saccharum" for sugar. It is a non-nutritive & non caloric artificial sweetener with its sweeteness as 300 times more than that of sucrose solution of equal weight/concentration. Saccharin is manufactured as white crystalline powder which is stable at high temp. (upto 300°C). Saccharin causes serious health hazards affects. A comparative analysis of saccharin in different food products to evaluate them (from health view point) was performed by using gravimetric method and U.V. spectrophotometric method.

**Key Words:** Saccharin, Carcinogenic, Allergy, Heart problems, Soda beverages, Syrups, Kulfies and Candies

## Introduction

Saccharin was first synthesized in United States in 1879 by two chemists I. Remsen and C. Fahlberg when they were researching the oxidation product of Toluene Sulfonamide. Essentially the same production is still used by many manufacturers.

The formula of saccharin is $C_7H_5NO_3S$ and a molecular weight of 183.18. The melting point of saccharin ranges between 229 and 230°C. It is generally odorless, but at times exhibits a faint, aromatic odor. Its solutions are acidic (Food Chemical Codex, 1981). Chemically saccharin is O-Benzosalfimide, Gluside, Benzoic Sulfimide, Sulfobenzoic amide and its Sodium and Calcium salt. Saccharin and its Sodium, Calcium salts have high stability and long shelf-life. (O. DeGramo, 1952). Saccharin are used in diet pops, artificial table sweeteners, in liquid or powder form soft drinks, fruit juices, beverages mixes, processed fruit, chewing gums, candies, jams, Jellies, sauce, dietetics, medicinal preparation for diseases like diabetes mellitus and obesity, particularly where the presence of sugar might lead to spoilage by fermentation or mold growth.

Saccharin has a bitter metallic aftertaste. Saccharin may be combined with other sweeteners or lactose which helps to eliminate this aftertaste. Saccharin is widely used in Pharmaceuticals, cosmetics and in dietary products.

According to various scientific research reports saccharin causes tumor and bladder cancer; it also causes skin allergic responses, toxic reactions particularly, heart and gastrointestinal tract problems. (W. H. O, 1995).

The National Academy of Sciences has completed its review of the scientific evidence linking cancer to saccharin, concluding that the artificial sweeteners causes cancer in laboratory animals is probably low potency carcinogen in humans and probably also enhances the cancer causing ability of other substances. The safe limit of saccharin is 2.5mg/kg body weight.

The Cancer Association of Pakistan launched a compaign against cancer in 1978 (Anonymous, 1978). The present investigation has been carried out to employ a gravimetric and ultraviolet spectrophotometric method for the determination of saccharin contents in the local made food products. The information thus available will be helpful in the cancer compaign, as saccharin can be doubted as a carcinogenic compound.

## Materials and Methods

Samples of saccharin concentrates of soda beverages, syrups, kulfies and candies were collected from the local market and the following standard methods were applied for the quantitative analysis of the samples.

**Gravimetric Method:** Saccharin contents of different food product were measured quantitatively by gravimetric method using acetic acid and lead acetate as solvent as given by the method of AOAC (1990).

**Ultravioloet Spectrophotometric Method**: For candies, saccharin was extracted by chloroform and estimated by U. V. spectroscopy at 235nm (Hussein *et al.* 1976).

The results obtained were analysed statistically using Completely Randomized Design (CRD) with factorial arrangements of treatment. (Steel and Torrie, 1992).

Soda beverages, syrups, kulfies and candies collected from the local market and surrounding areas.

## Results and Discussions

Saccharin concentration in different food commodities for Gravimetric method and Ultraviolet Spectrophotometric method revealed significant results mostly except a few non-significant results.

Table 1: Food commodities of different areas of Fsd.

| Name of Commodity | Product | Collected From |
|---|---|---|
| Soda Beverages | Cola I | Katchary Bazar Fsd |
| | Cola II | Jhang Bazar Fsd |
| | Orange I | Makki Market Fsd |
| | Orange II | Anarkali Bazar Fsd |
| | Lemon I | Satiyana Road Fsd |
| | Lemon II | Faizaabad Fsd |
| Syrups | Sharbat Bazuri | Gulfishan Cly Fsd |
| | Sharbat Sundal | Razaabad Fsd |
| | Sharbat Anar | Samanabad Fsd |
| Ice Cream | Shahi Kulfi | Razaabad Fsd |
| | Orange Kulfi | Samanabad Fsd |
| | Kulfi | Satiyana Road Fsd |
| | Badam | Jhang Bazar Fsd |
| | Ice Lolly | Ayub Cly Fsd |
| | Fruit Ice Cream | Jhang Bazar Fsd |
| Candies | Butter Scoutch | G.M. Abad Fsd |
| | Azim Milk Toffee | Razaabad Fsd |
| | Milkona Toffee | Samanabad, Fsd |
| | Supper Toffee | Satiyana Road Fsd |

Table 2:Saccharin concentration in different food commodities

| Name of Commodity and Test | Product | Collected from |
|---|---|---|
| Soda Beverages | | |
| (Tested by gravimetric method) | Cola I | 6.29 |
| | Cola II | 4.68 |
| | Orange I | 9.57 |
| | Orange II | 8.29 |
| | Lemon I | 9.32 |
| | Lemon II | 13.41 |
| Syrup | | |
| (Tested by gravimetric method) | | |
| | Sharbat-Bazuri | 4.44 |
| | Sharbat-Sundal | 4.80 |
| | Sharbat-Anar | 5.10 |
| Ice-Creams | | |
| (Tested by gravimetric method) | | |
| | Shahi Kulfi | 7.17 |
| | Orange Kulfi | 4.45 |
| | Kulfi | 18.80 |
| | Badam | 19.66 |
| | Ice lolly | 11.58 |
| | Fruit ice cream | 17.20 |
| Candies | | |
| (tested by U.V spectrophotometric method) | Butter Scoutch | 26.59 |
| | Azim Milk Toffee | 30.14 |
| | Milkona Toffee | 27.62 |
| | Supper Toffee | 25.32 |

In Table 2, the amount of saccharin contents determined from nineteen samples of Soda beverages, syrups, candies and ice-creams have been reported. The results indicate that the amount of saccharin content in the six different brands of beverges are not the same and range between 4.62 to 13.4mgs/ 100ml. Statistics applied on saccharin concentration to analyse the data. The ANOVA results are found significant indicating that all brands contain different amount of saccharin (Table 3).

Table 3:Analysis of varience table showing saccharin concentration in beverages

| S.O.V | D.F | S.S | M.S | Fcal |
|---|---|---|---|---|
| Between | 5 | 136.181 | 27.236 | 3242.411** |
| Within | 12 | 0.101 | 0.008 | |
| Total | 17 | 136.282 | | |

* Significant
** Highly Significant
Least Significant Different Test (LSD)

LSD = 0.1591 $\propto$=0.05

| $X_2$ | $X_1X_4$ | $X_5$ | $X_3$ | $X_6$ | |
|---|---|---|---|---|---|
| 4.680 | 6.290 | 8.290 | 9.320 | 9.570 | 13.410 |
| F | F | D | C | B | A |

Different digits show significant relation.
The saccharin amount determined in three syrups brand have been illustrated in Table 2. It is obvious form the data that sacchari amount range from 4.44 to 5.10 mgs/100ml. CRD was applied on saccharin contents the F.Cal was significant showing saccharin contents varied from brand to brand (Table 4).

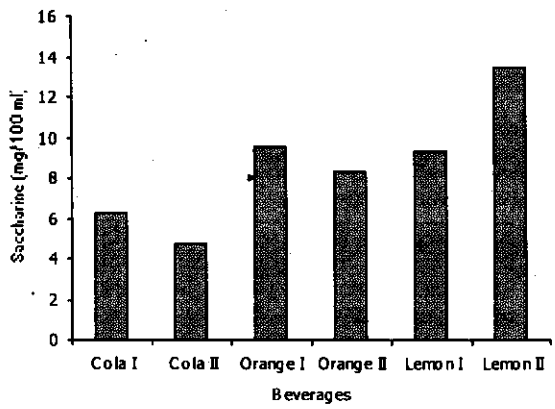


Fig. 1: Amount of Saccharin in different beverages

Table 4:Analysis of varience table showing saccharin concentration in syrups

| S.O.V | D.F | S.S | M.S | Fcal |
|---|---|---|---|---|
| Between 2 | 0.6655 | 0.328 | 5.629* | |
| Within | 6 | 0.349 | 0.258 | |
| Total | 8 | 1.004 | | |

* Significant
** Highly Significant
Least Significant Difference Test (LSD)

LSD value = 0.4812 $\propto$=0.05

| $X_1$ | $X_2$ | $X_3$ |
|---|---|---|
| 4.44 | 4.8 | 5.1 |
| B | AB | A |

Similar digits show non-significant difference.
Different digits show significant difference.

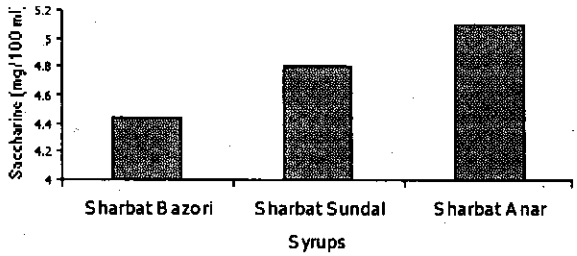


Fig. 2: Amount of Saccharin in Different Syrups

Ice cream samples when subjected to chemical analysis for the determination of saccharin contents, it is found that contents range between 4.45to 19.66 mgs/100ml. ANOVA results were significant indicating that there are significant difference among saccharin concentration of all brands (Table 5).

Table 5: Analysis of varience table showing saccharin concentration in Ice cream

| S.O.V | D.F | S.S | M.S | Fcal |
|---|---|---|---|---|
| Between | 5 | 613.86 | 122.772 | 10317.023** |
| Within | 12 | 0.143 | 0.012 | |
| Total | 17 | 614.003 | | |

* Significant
** Highly Significant
Least Significant Difference Test (LSD)

LSD = 0.1949 $\propto$=0.05

| $X_2$ | $X_1$ | $X_5$ | $X_6$ | $X_3$ | $X_4$ |
|---|---|---|---|---|---|
| 4.450 | 7.170 | 11.580 | 17.200 | 18.00 | 19.660 |
| F | F | D | C | B | A |

Different digits show significant difference.

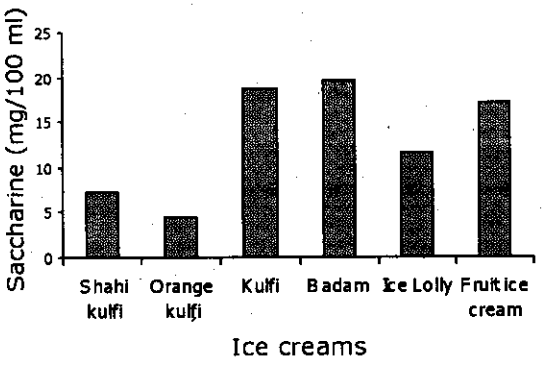


Fig 3: Graph Between Saccharin And Ice-Cream

The analytical data from candies have shown variation ranging from 25.33 to 30.14 mgs/100ml (Table 2). Statistical studies illustrated a significant different in Azim Milk Toffee and Supper Toffee while Butter Scoutch and Milkona Toffee showed non significant difference (Table 6)

Table 6:Analysis of varience table showing saccharin concentration in candies (U.V spectrophotometric method)

| S.O.V | D.F | S.S | M.S | Fcal |
|---|---|---|---|---|
| Between | 3 | 37.486 | 12.495 | 29.025* |
| Within | 8 | 3.444 | 0.43 | |
| Total | 11 | 40.93 | | |

* Significant
** Highly Significant
Least Significant Difference Test (LSD)

LSD= 1.235 $\propto$=0.05

| $X_4$ | $X_1$ | $X_3$ | $X_2$ |
|---|---|---|---|
| 25.33 | 26.59 | 27.62 | 30.14 |
| C | B | B | A |

Similar digits show non-significant relation.
Different digits show significant difference.

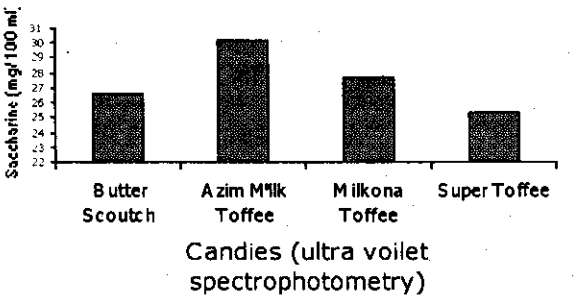


Fig 4: Graph Between Saccharin And Candies (U.V )

The analytical data recorded in the present survey is very alarming in the sense that amount of saccharin found in different brands of any food commodity is not uniform. Again the daily acceptable intake of saccharin recommended in 5mg/kg/day. and when the present results are interpreted in the light of permissible dose, almost all the subjected food commodities show higher amount of saccharin that the life hazards as it is recently reported in a study of bladder cancer patients where a possible link between the disease and use of saccharin has been established (How *et al.* 1977).

## References

Anonymous 1978. Pakistan Times (Daily Newspaper) Jan 6th, P2, Col. 3.

AOAC 1990. Official methods of analysis. JAOAC: 56,162.

Food Chemical Codex 1981. 3rd ed., National Academy Press Washington, D.C.

How, J.D. Burch, A.B. Miller, B. Morrison, P. Cordon, L. Weldon, L. Chambers, C. Fordor and G. M. Winsor 1977. Artificial sweetener and human bladder cancer. Lancet No. 8038:578.

Hussein, M. M., H. Jacin and F. B. Rodriques 1976. Quantitiative determination of saccharin in food by U.V spectrophotometry. J. Agric. Food Chem. 24:36-40.

O. DeGarmo, J. Am. Pharamaceut. Assoc., 41:17,1952.

Milton H. and Dr. W. Krops MD 1995. Harmful food additives. Ashley Books Inc/Publishers Port Washington, New York, PP, 25

Steel R. D. G. and J. H. Torrie 1992. Principles and Procedure of statistics 2nd ed. Mcgraw Hill Book Co. New York, USA.

W.H.O. 1995. Toxiciological evaluation of some food colors, enzymos, flavours, enhancers, thickening agents and certain other additives W.H.O Food Additives Sr. No. 6,13.