
A Quantitative Estimation of the Amount of Sugar in Fruits Jam Available in Bangladesh

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Abstract: This paper deals with the study of sugar in fruits jam of different brands available in the market of Bangladesh. Sugar is a biochemical parameter. The term sugar related to total sugar, reducing sugar and non reducing sugar. Amounts of reducing sugar, non-reducing sugar and total sugar of different fruit's jams available in Bangladesh were determined. The reducing sugar content of different jams ranges from 28.00 % to 60.30 %. The highest amount of reducing sugar (60.30%) was found in Nur mixed Jam and the lowest (28.00%) in Agrokomerc Pineapple Jam. The reducing sugar content of different jams ranges from 28.00 % to 60.30 %. The highest amount of reducing sugar (60.30%) was found in Nur mixed Jam and the lowest (28.00%) in Agrokomerc Pineapple Jam. The total sugar content of different jams ranges from 38.86% to 62.53%. The highest amount of total sugar (62.53%) was found in Nur Apple Jam and the lowest amount of total sugar (38.86%) was found in Agrokomerc Pineapple Jam. Non reducing sugar content of Jams was found in range of 05.33 % to 25.17 %. The highest amount of non reducing sugar (25.17 %) was found in Best Food Orange Marmalade Jam and the lowest (05.33 %) in Nur Apple Jam. The percentage of sugar was determined by using biochemical methods.

Keywords: Fruit's Jam, Sugar, Reducing Sugar, Non Reducing Sugar, Total Sugar, Biochemical Method

1. Introduction

Sugar is an important ingredient of fruit and fruit product. Fruit sugar is something known as fructose. Fructose is often recommended for and consumed by people with diabetes mellitus or hypoglycemia because it has a very low Glycerin Index. Glycerin index (also glaxis index, GI) is a ranking system for carbohydrates based on their immediate effect on blood glucose levels. Sucrose (common name: table sugar, also called saccharine) is a disaccharide (glucose + fructose) with the molecular formula $C_{12}H_{22}O_{11}$.

Jam is a fruit product. Jams are thick; sweet spreads made by cooking crushed or chopped fruits with sugar [1]. Mango jam, Orange jam and Apple jam are favourite to the consumers of Bangladesh. Fresh mango contains a variety of nutrients but only vitamin C and folate are in significant amounts of the daily values as 44% and 11% respectively [2, 3]. Due to shorter shelf life of the mango, it must be converted into various processed products [4]. Jam is prepared from cooked fruit or vegetable pulps after removal of stones and seeds. There are different types of jam which differ from each other in the raw material used, processing

method and additives. The jam can be classified into: Jam, preserves, jellies, and Dietetic jellies. According to the texture it is classified into solid, semi solid and liquid jam. Fruit is a convenient source of food and micronutrients. Most of our people are suffering from malnutrition because they are in need of adequate nutritious food. According to the USDA 10 to 35 percent of our calorie intake should come from protein. Fruit is occupying a larger proportion of daily food item of modern civilized nation certainly due to their great food values. Jams also have good food values as it is made from fruit. Consumer tests are important to evaluate the development of new products as it is possible to assess the personal response of current or potential customers of a product [5]. Many studies of fruit-based products such as jam have used this type of analysis [6-9]. Jams provide more essential nutrients in significant amounts. Mango has antioxidant, anticancer and anti-cardiovascular abilities. Because of the high iron content they are suggested for treatment of anemia and are beneficial to women during pregnancy and menstruation. Mangoes contain an enzyme with stomach soothing properties similar to pepsin. This comforting enzyme helps in digestion [10]. The food represents one of the most important needs of the human

being. In order to obtain a good assimilation of food for an optimal functioning of the organism, the supplying of all nutritive elements in a balanced proportion is required. The nutritional imbalance either over nutrition or under nutrition leads to nutritional diseases. The objective of this study was find out the percentages of reducing sugar, non reducing sugar and total sugar in case of the nutrients studied in the present work have very significant and specific role in human metabolism and their deficiency can be removed through intake of reasonable amount of jam.

2. Experimental

2.1. Analytical Techniques

In present investigation determination of sugar carried out by lane & Eyenon method [11].

2.2. Reagents and Chemicals

All chemicals and reagent used were chemicals and reagents grades. All working solutions were also prepared in redistilled water.

2.3. Preparation of Reagents

1) Fehling's solution-1: 34.6 g of pure $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ was dissolved in distilled water and the solution was made up to 500 mL.

2) Fehling's solution-2: 70 g NaOH with 173 g Rochelle salt (sodium potassium tartrate) were taken and dissolved in distilled water and made the solution up to 500 mL with Distilled water.

3) Methylene blue (1%): 0.5 g methylene blue was taken and volume was made 50 mL.

4) 45% neutral lead acetate solution: 225 g of neutral lead acetate was dissolved in distilled water and the solution was made up to 500 mL.

5) 22% Sodium oxalate solution: 22g of sodium oxalate ($\text{Na}_2\text{C}_2\text{O}_4 \cdot \text{H}_2\text{O}$) was dissolved in distilled water and the volume was made 100 mL.

6) Standard invert sugar solution: 9.5 g of sucrose was taken onto a 1-litre volumetric flask. 100 mL water and 5 mL conc. HCl was added. It was allowed to stand for 3 days 20°C - 25°C for inversion to take place, and then make up to mark with water.

2.4. Estimation of Reducing Sugar, Non Reducing Sugar and Total Sugar

2.4.1. Estimation of Reducing Sugar

5g of Jam sample was taken in a 500 mL Beaker. 100 mL warm water was added and neutralized with 10% NaOH. 2 mL of lead acetate solution was added and it was stand for 10 min. The necessary amount of sodium oxalate solution was added to remove the excess of lead. The volume was made up to 250 mL with distilled water and filtered. 10 mL of a mixed Fehling's solution (5 mL Fehling's solution-1 and 5 mL Fehling's solution-2) were pipetted into a conical flask. A

burette was filled with the clarified sample solution and running the whole volume required to reduce the Fehling's solutions so that, 0.5-1.0 mL was still required to complete the titration. The content of the flask was mixed and then heated to boiling for 2 min. Three drops of methylene blue indicator were added. Then the titration continued till color completely disappeared.

Calculation:

The percentage of total sugar was calculated by the following formula:

$$\text{mg reducing sugars per 100mL} = \frac{\text{Factor} \times 100}{\text{Titre}}$$

$$\% \text{ of Reducing sugar} = \frac{\text{mg}/100\text{mL} \times \text{Dilution} \times 100}{\text{Weight of the sample} \times 1000}$$

The factor is obtained from the invert sugar Table by Pearson, 1970 [12].

2.4.2. Estimation of Total Sugar

5g of Jam sample was taken in a 500 mL beaker. 100 mL of warm water was added and neutralized with 10% NaOH. 2 mL of lead acetate solution was added and kept for 10 min. The necessary amount of sodium oxalate solution was added to remove the excess lead. The volume was made up to 250 mL with distilled water and filtered. 50 mL of the clarified and delead solution was transferred to a 250 mL flask. 10 mL 1N HCl was added into the flask. This solution was then boiled for 2 min. After cooling, 2-3 drops of phenolphthalein was added and the contents were neutralized with NaOH. The solution was filtered and the volume was made 250mL. Thus the sample solution was prepared. 10 mL of a mixed Fehling's solution (5 mL Fehling's solution-1 and 5 mL Fehling's solution-2) were pipetted into a conical flask. A burette was filled with the clarified sample solution and running the whole volume required to reduce the Fehling's solutions so that, 0.5-1.0 mL was still required to complete the titration. The content of the flask was mixed and then heated to boiling for 2 min. Three drops of methylene blue indicator were added. Then the titration continued till color completely disappeared.

Calculation:

The percentage of total sugar was calculated by the following formula-

$$\text{mg total sugars per 100mL} = \frac{\text{Factor} \times 100}{\text{Titre}}$$

$$\% \text{ Total sugar} = \frac{\text{mg}/100\text{mL} \times \text{Dilution} \times 100}{\text{Weight of the sample} \times 1000}$$

The factor is obtained from the invert sugar Table by Pearson, 1970 [12].

2.4.3. Estimation of Non Reducing Sugar

$$\% \text{ Non reducing sugar} = \text{Total sugar} - \text{Reducing sugar}$$

Four replicate measurements were taken for the precision of the analytical data.

The percentage of reducing sugar, non reducing sugar and

total sugar of different Jams are given in Table 1, 2, and 3 respectively.

3. Results and Discussion

The Reducing sugar content of Jams was found in range of 28.00 % to 60.30 %. The highest amount of reducing sugar (60.30%) was found in Nur mixed Jam and the lowest (28.00%) in Agrokomerc Pineapple Jam. The reducing sugars in the Jams were reported to be in the range of 22.0%-40.0% by Pearson (1970) [13].

Non reducing sugar content of Jams was found in range of 05.33 % to 25.17 %. The highest amount of Non reducing sugar (25.17 %) was found in Best Food Orange Marmalade Jam and the lowest (05.33 %) in Nur Apple Jam.

Total sugar content was found in a range of 38.86% to 62.53%. The highest amount of total sugar (62.53%) was found in Nur Apple Jam. The lowest amount of total sugar (38.86%) was found in Agrokomerc Pineapple Jam.

Reducing sugar in four different mango Jams ranged from 48.17-35.26%. Khalid found reducing sugar of mango Jams ranged from 33.63-21.94% [14]. The range is close to the present investigation.

Table 1. Determination of reducing sugar in Jams (Mean ± S.D).

SI. No	Sample	Reducing sugar (%)
1	Shezan Mango Jam	48.17±0.25
2	pran Mango Jam	35.26±0.12
3	Freswel Mango Jam	40.16±0.17
4	Rajshahi Mango Jam	38.00±0.20
5	Nur Apple Jam	57.20±0.40
6	B F Orange Marmalade Jam	32.10±0.22
7	Agrokomerc Pineapple Jam	28.00±0.00
8	Shezan mixed Jam	41.00±0.70
9	Nur mixed Jam	60.30±0.42

% = Gram per 100 of edible portion, B F= Best Food, Agro.=Agrokomerc ± = Standard deviation

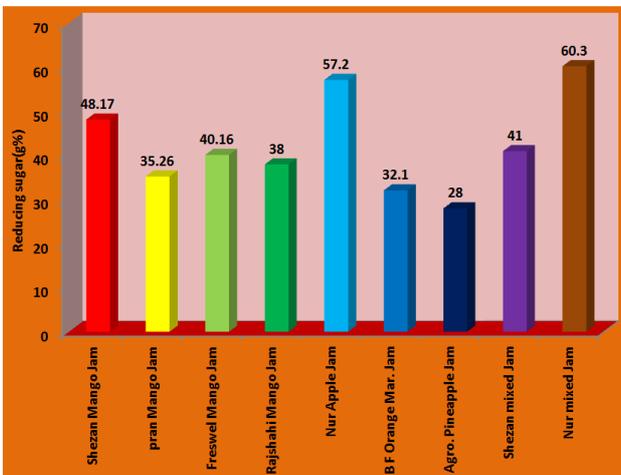


Fig. 1. Comparison of reducing sugar status in different jams.

Table 2. Determination of non reducing sugar in Jams.

SI.No	Sample	Non Reducing sugar(%)
1	Shezan Mango Jam	11.08
2	pran Mango Jam	16.92
3	Freswel Mango Jam	21.99
4	Rajshahi Mango Jam	8.10
5	Nur Apple Jam	05.33
6	BF Orange Marmalade Jam	25.17
7	Agrokomerc Pineapple Jam	10.86
8	Shezan mixed Jam	09.90
9	Nur mixed Jam	01.30

% = Gram per 100 of edible portion, BF-Best Food.

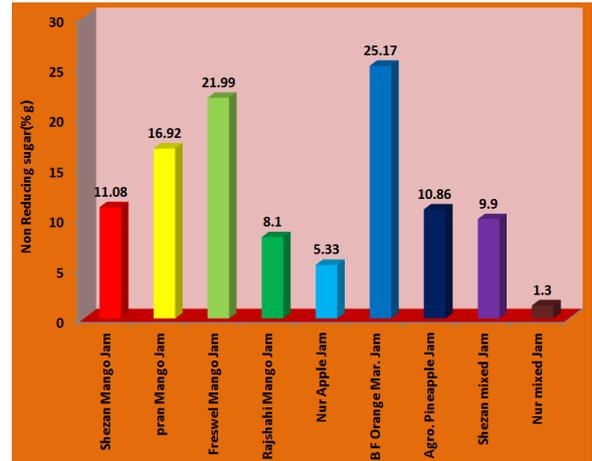


Fig. 2. Comparison of non reducing sugar status in different jams.

Table 3. Determination of Total sugar in Jams (Mean ± S.D).

SI.No	Sample	Total sugar (%)
1	Shezan Mango Jam	59.25±0.33
2	pran Mango Jam	52.18±0.15
3	Freswel Mango Jam	62.15±0.20
4	Rajshahi Mango Jam	46.10±0.30
5	Nur Apple Jam	62.53±0.35
6	Best Food Orange Marmalade Jam	57.27±0.40
7	Agrokomerc Pineapple Jam	38.86±0.60
8	Shezan mixed Jam	50.90±0.25
9	Nur mixed Jam	61.60±0.52

% = Gram per 100 of edible portion, ± = Standard deviation.

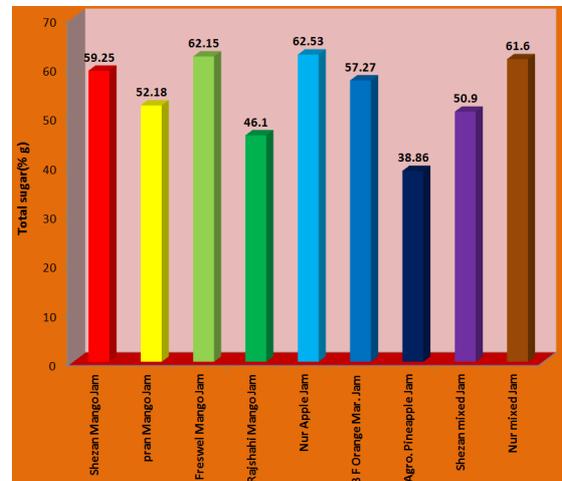


Fig. 3. Comparison of total sugar status in different jams.

4. Conclusion

Fruits of Bangladesh are valuable sources of the essential minerals and vitamins. Around sixty different kinds of fruits are available in Bangladesh. Every human being requires food for their living as well as for the production of necessary energy like all other animals. Different food contains different proportion of carbohydrates. Most of the people are suffering from malnutrition because they are in need of adequate nutritious food. Fruit is occupying a larger proportion of daily food item of modern civilized nation certainly due to their great food values. Jam also has good food values as this is made from fruit, water and sugar. Most of the people like fruits very much but in some cases a few of them don't like that of unknown cause. In that case Jam is only the alternative source of sugar in lieu of fruits.

In view of the experimental results of the analysis of fruit products it could be concluded that the investigated jams showed remarkable observations with few exceptions. The results of the study also provide information about the concentration of reducing sugar, non reducing sugar and total sugar in different jams.

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