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Levels Of Potassium Sorbate And Sugar In Selected Drinks Using Uv-Visible Spectroscopy

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Abstract
Selected drink samples were purchased from local markets and analyzed for the levels of potassium sorbate and sugar using UV – Vis spectroscopy. Samples were chosen to cover the popular and easily available drinks. The samples collected include Monster Energy Drink, Lacasera Bold Drink, Berry Blast Drink, and Coca-Cola Drink
The results obtained a potassium sorbate range of 6.67 ± 2.36 to 16.67 ± 0 with Berryblast drink giving the highest concentration with a value of 16.67 ± 0 and Monster energy drink giving the least concentration with a value of 6.67 ± 2.36. Potassium sorbate was not detected in the Lacasera Bold drink and Coca-Cola drink samples analyzed. A comparison of the values with the world health organization's regulatory limits of 6-83mg/l revealed them to be within the limits.
The sugar content was also found to be in the range of 1398.20 ± 6.36 to 1565.20 ± 14.83. The highest concentration was obtained in Berry Blast drink with a value of 1565.20 ± 14.83 while the least concentration was detected in Monster energy drink with a value of 1398.20 ± 6.36 obtained. When the values obtained were compared with Standard Organization of Nigeria and World health organization regulatory limits, they were found to be within the set values of 7000-14000mg/l and 10000mg/l respectively. Based on the findings from the analysis, the drinks were deemed to be safe for consumption.

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I. INTRODUCTION

Preservatives and sugar are common ingredients used for drink production to reduce spoilage and sweetening products respectively. Most drinks produced in Nigeria contain a certain amount of sugar or preservative (for example potassium sorbate) and due to the high consumption rate of drinks in Nigeria, there is a need to assess their levels in the drinks sold and consumed by the populace. (Nkem, 2016).

Nutritionists have raised concern over the "perceived" nutritive value of soft and fruit drinks especially with the large amounts consumed globally (Rels*et al*., 2014). Although sugar is naturally occurring and potassium sorbate inhibits the growth of mold, high levels can negatively impact the human body. Health effects of excessive sugar have been known to include diabetes, obesity, heart diseases, etc. (France, 2000) while potassium sorbate can lead to human DNA damage, therefore there is a great need for the monitor and control sugar and preservative containing drinks due to excessive consumption.

To develop more effective, simpler, and less expensive means of food preservation, many chemicals having strong antimicrobial properties were initially utilized for food preservation but were subsequently abandoned when their undesirable physiological and biochemical properties were discovered. For example, boric acid, salicylic acid, creosote, and formaldehyde, which were utilized as preservatives in foods during the 19th century, are no longer used (Chemical book, 2020)**.**

Also, added sugar often regarded as such as include brown sugar, dextrose, fructose, glucose, high-fructose corn syrup is bad for the health and can lead to heart diseases, weight gain, obesity, and tooth cavities. (Kandola, 2019),

As a result of the increased concern on the levels of sugar and potassium sorbate in processed drinks with their attendant health risks, this research work was designed to assess the concentration of potassium sorbate and added sugar in locally available drinks and to ensure compliance with the recommended dietary consumption as set by regulatory bodies. This research work covers the analysis of widely consumed drinks in Nigeria; carbonated drinks produced by Coca-Cola and The La Casera Company, fruit drinks, and energy drinks consumed mainly by youths.

This study aimed to determine potassium sorbate and glucose in selected drinks by UV-vis spectrophotometer, which is the most common analytical tool used on liquid samples. Therefore, the developed method was applied to the analysis of potassium sorbate and sugar in the selected drinks samples

II. MATERIALS AND METHODS

Chemicals and Reagent

3,5- dinitro salicylic acid ($C_7H_4N_2O_7$), Potassium Sorbate (C6H7KO2), .Glucose ($C_6H_{12}O_6$)., Sodium hydroxide (NaOH), Petroleum ether (C6H14}, Distilled Water (H_2O), Hydrochloric acid (HCl).

DETERMINATION OF POTASSIUM SORBATE

Preparation of Standard

Approximately 100mg of potassium sorbate were dissolved in 100.0ml of water in a 250ml volumetric flask. Dilution of the stock solutions was made by adding distilled water to produce 10, 20, 30, 40, 50, and 60mg/l of potassium sorbate standard solutions. Hydrochloric acid (1.2ml, 6 M) was then added to 15ml of each standard, and the sorbate content was extracted using 6ml of petroleum ether. The amount of sorbate was detected with aid of a UV-Vis spectrophotometer. The absorbance of the standard samples was detected at 350nm for potassium sorbate.

Potassium sorbate determination

The liquid samples were analyzed without any pretreatment. 0.4mL of 6M hydrochloric acid was added to 15.0ml of the liquid sample and was extracted by 6 mL of Petroleum ether. The concentration of sugar was determined in a UV- Vis Spectrophotometer at 350nm using distilled water as the blank. Total sugar concentrations were estimated from a standard curve by comparing the absorbance of standard glucose solution to that of the unknown sugar solution

DETERMINATION OF SUGAR BY DINITROSALICYLIC ACID METHOD

The sugar content of the various food samples was estimated by the DNS method according to Mahboubifar et *al*., (2010). The reagents for the DNS methods were prepared in two parts. Solution A and solution B.

Preparation of Solution A

About 80g of NaOH was dissolved in 1000ml of distilled water to prepare a 2M solution of NaOH. 1.5g of 3,5-dinitrosalicylic acid (DNS) was then dissolved in 30 mL of 2M solution of NaOH.

Preparation of Solution B

Exactly 45g of sodium potassium tartrate was dissolved in 75ml of distilled water.

Preparation of DNS reagent

DNS reagent was prepared fresh by mixing 30ml reagents (A) and 75ml (B) and making up the volume to 150 ml with distilled water.

Standard Sugar Solution

The stock standard sugar solution was prepared by weighing 1g of glucose and transferring into 1000ml of water and stirred gently until completely dissolved. Dilution of the stock solutions was made by adding distilled water to produce 0.5, 1, 10, 20, 40, 50, 100, 200, 500, 800, and 1000 mg/l of glucose standard solution.

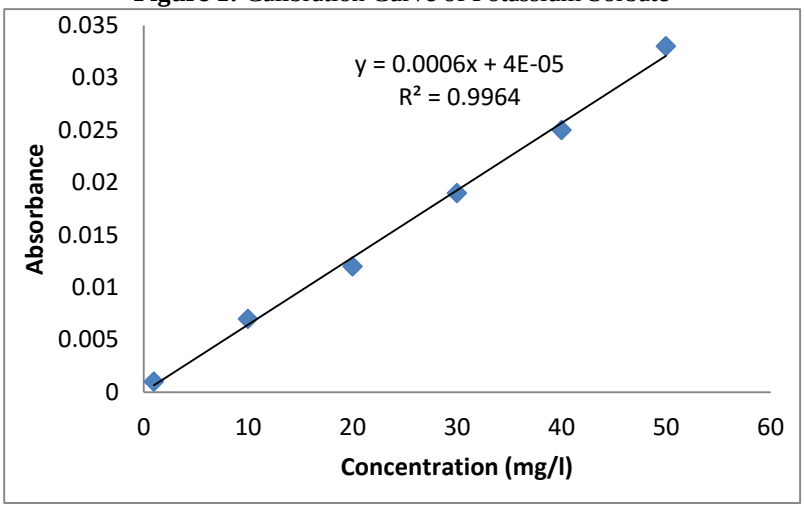
Sugar Determination

1ml of sample and 1ml of sample and 1ml of DNS reagent were added into a boiling tube. The test tube was plugged with cotton and placed in a boiling water bath for 5 minutes. The tubes were then removed, allowed to cool to ambient temperature and 8ml of water was added, homogenized, immediately placed in a cuvette. The concentration of sugar was determined in a UV- Vis Spectrophotometer at 520nm using distilled water as the blank. Total sugar concentrations were estimated from a standard curve by comparing the absorbance of standard glucose solution to that of the unknown sugar solution

III. RESULTS AND DISCUSSION

The concentrations of potassium sorbate and sugar in selected drinks were determined and the results obtained are presented below. A six-point calibration curve was plotted of concentration against and absorbance.

Figure 1: Calibration Curve of Potassium Sorbate



The correlation coefficient value obtained (0.9964) indicates a good linear correlation between concentration and instrumental response. The straight line obtained conformed to the equation y = MX + c, where y is absorbance, x is concentration, m is slope and c is the intercept.

TABLE 1: Concentration of potassium sorbate in selected drinks

Sample	Batch Number	Concentration (mg/l)
Monster Energy Drink	P160321	6.67 ± 2.36
Monster Energy Drink	P230451	8.33 ± 0
Coca-Cola Drink	P230451	<0.01
Coca-Cola Drink	P408172	<0.01
Berry blast Drink	P090321	15.83 ± 3.54
Berry blast Drink	P101642	16.67 ± 0
Lacasera Bold drink	54610303009DL3	<0.01
Lacasera Bold drink	62314025006DL3	<0.01

IV. DISCUSSION

Table 1 shows the concentration of potassium sorbate in different drink samples. Results obtained indicate that Berry blast drink gave the highest concentration of potassium sorbate with a value of 6.67 ± 2.36 while potassium sorbate was not detected in Lacasera and Coca Cola.

The values obtained in this study were within the same range as the values obtained (11.54 mg/l) in drinks sold in Iranian brands (Fatemah *et al.*, 2016). According to the World Health Organization, some drinks that did not declare the presence of potassium sorbate on their labels had them within the range 6-83 mg/L which was within the World Health Organization (WHO) limit. (WHO, 1996).

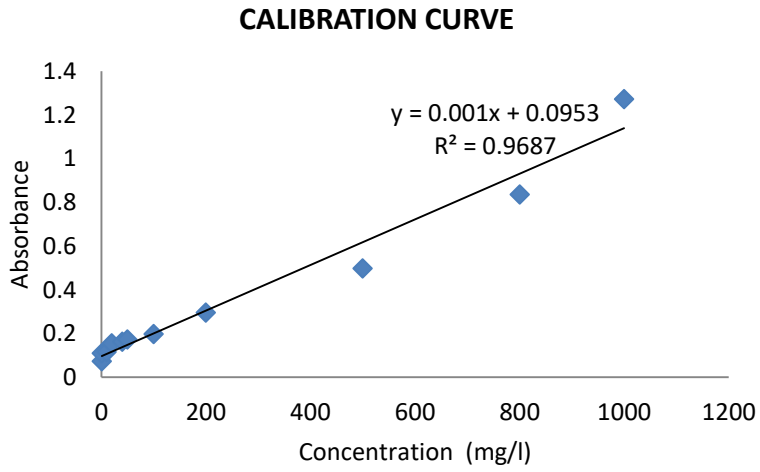


Figure 2: Calibration Curve for Sugar determination

The correlation coefficient value obtained (0.9687) indicates a good linear correlation between concentration and instrumental response. The straight line obtained conformed to the equation y = MX + c, where y is absorbance, x is concentration, m is slope and c is the intercept.

Table: 2: Concentration of sugar obtained in the different drinks analyzed

Sample	Batch number	Concentration (mg/l)
Monster Energy Drink	P160321	1398.20 ± 6.36
Monster Energy Drink	P230451	1414.70 ± 15.56
Coca-cola Drink	P230321	1446.20 ± 12.02
Coca-cola Drink	P408172	1422.70 ± 2.83
Berry blast Drink	P090321	1506.70 ± 1.41
Berry blast Drink	P101642	1565.20 ± 14.83
Lacasera Bold drink	54610303009DL3	1477.20 ± 14.85
Lacasera Bold drink	62314025006DL3	1443.20 ± 3.54 no

V. DISCUSSIONS

Results obtained indicate Berry Blast drink gave the highest concentration of sugar with a value of 1565.20 ± 14.83 mg/l while monster energy drink gave the least value with a concentration of 1398.20 ± 6.36 mg;l

Comparison of the values obtained with the Standard Organization of Nigeria (SON), dietary guideline limit for soft drinks range between 70000ppm (7g/100ml) to 140000ppm (14g/100ml) (Ohilebo, 2020) revealed that the levels were within acceptable limit for consumption.

The World Health Organization recommended an upper limit of free sugars at 10% (100000mg/l) of calories, with an ultimate goal of reducing sugars consumption to 5% (50000mg/l)of calories and the Scientific Advisory Council on Nutrition in England followed roughly the same reasoning and recommended similar restrictions for upper limits of calories from sugars at 10% (100000mg/l), to ultimately achieve an even lower threshold of 5% (50000mg/l), (James *et al*., 2015) also revealed that the levels were within the acceptable limit for consumption.

VI. CONCLUSION

This work investigated the levels of potassium sorbate and sugar in selected drinks. The results obtained showed that the levels of potassium sorbate were within the acceptable limit as well as the levels of sugar present and therefore safe for consumption.

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