UNIVERSITY OF BARISHAL

Report On

Determination of The Contents of Cold Drinks

Course Name: Computer Fundamentals and Office Applications

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AIM

Comparative study and qualitative analysis of different brands of cold drinks available in market.

PURPOSE

In recent days, soft drink brands were put into various questions regarding their purity. News flashed that they contain harmful pesticide, whicharouse many interest in knowing its contents becauseI have been drinking them for years. I wanted toconfirm that whether the charge imposed on these brands are true or not.

Another fact which inspired me to do this project is that I am in touch with qualitative analysis whose knowledge with other factors helped me to do so.

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INTRODUCTION

The era of cold drinks began in 1952 but the industrialization in India marked its beginning with launching of Limca and Goldspot by parley group of companies. Since, the beginning of cold drinks was highly profitable and luring, many multinational companies launched their brands in India like Pepsi and Coke.

Now days, it is observed in general that majority of people viewed Sprite, Miranda, and Limca to give feeling of lightness, while Pepsi and Thumps Up to activate pulse and brain.

Soft drinks are non-alcoholic water-based flavored drinks that areoptionally sweetened, acidulated and carbonated. Some carbonatedsoft drinks also contain caffeine; mainly the brown-colored coladrinks.

Soft drinks are called "soft" in contrast to "hard drinks"
(alcoholic beverages). Small amounts of alcohol may be present in a softdrink, but the alcohol content must be less than 0.5% of the totalvolume if the drink is to be considered non-alcoholic.

Also called soda, pop, coke, soda pop, fizzy drink, tonic, seltzer,sparkling water or carbonated beverage.
The first marketed soft drinks in the Western world appeared in the17th century. They were made from water and lemon juicesweetened with honey.

Theory

Cold drinks of different brands are composed of alcohol, carbohydrates, carbon dioxide, phosphate ions etc. These soft drinks give feeling of warmth, lightness and have a tangy taste which is liked by everyone. Carbon dioxide is responsible for the formation of froth on shaking the bottle.

The carbon dioxide gas is dissolved in water to form carbonic acid which is also responsible for the tangy taste. Carbohydrates are the naturally occurring organic compounds and are major source of energy to our body. General formula of carbohydrates is

$C_X (H_2O)_Y$

On the basis of their molecule size carbohydrates are classified as:-

Monosaccharide, Disaccharides and Polysaccharides. Glucose is a monosaccharide with formula $C_6H_{12}O_6$ .It occurs in Free State in the ripen grapes in bones and also in many sweet fruits. It is also present in human blood to the extent of about 0.1%. Sucrose is oneof the most useful disaccharides in our daily life. It is widelydistributed in nature in juices, seeds and also in flowers of many plants. The main source of sucrose is sugar cane juice which contain 15-20 % sucrose and sugar beet which has about 10-17 % sucrose. The molecular formula of sucrose is $C_{12}H_{22}O_{11}$. It is produced by a mixture of glucose and fructose. It is non-reducingin nature whereas glucose is reducing. Cold drinks are a bit acidic in nature and their acidity can be measured by finding their pH value. The pH values also depend upon the acidic contents such as citric acid and phosphoric acid.

Apparatus

- Test Tube
- Test Tube Holder
- Test Tube Stand
- Stop Watch
- Beaker
- Burner
- pH Paper
- Tripod Stand
- China Dish

- Wire Gauge
- Water Bath

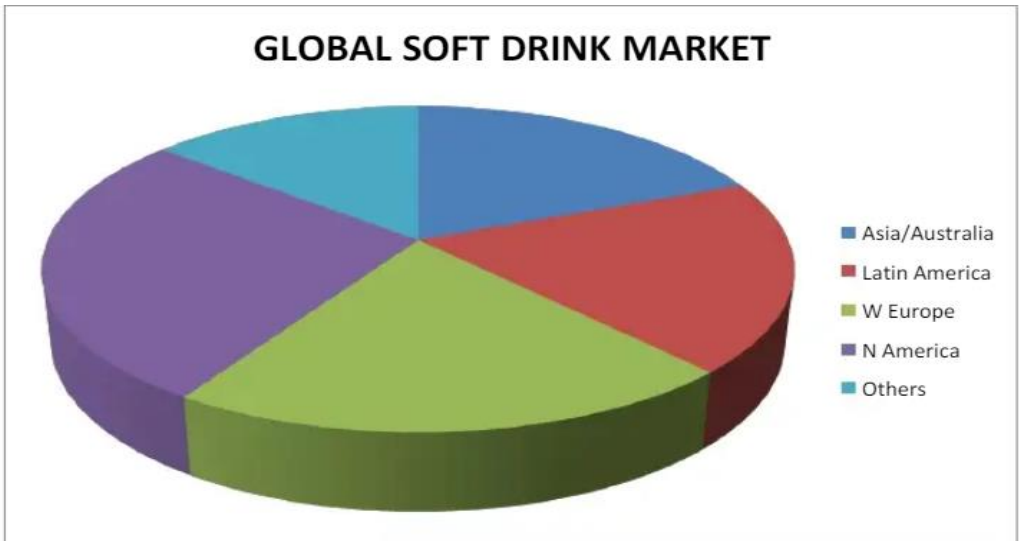
Chemicals Required

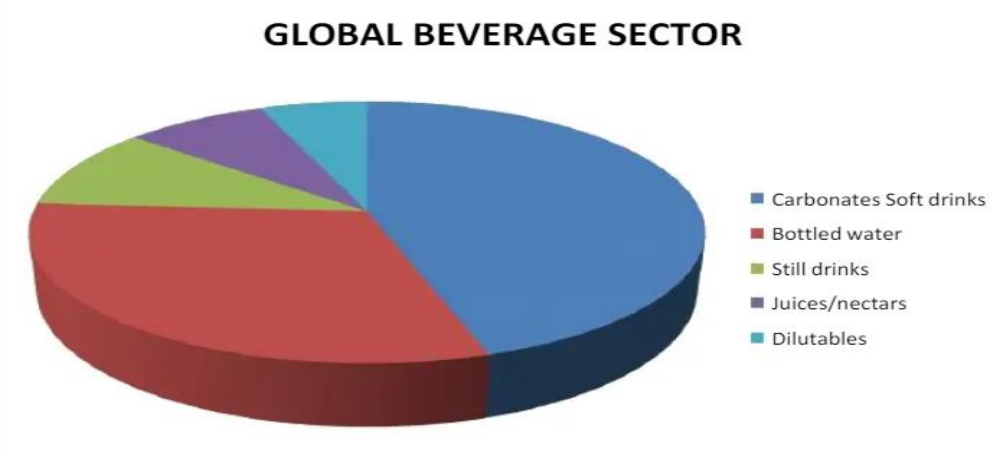
- Iodine Solution
- Potassium Iodine
- Sodium Hydroxide
- Fehling's A & B Solution
- Lime Water
- Concentrated HNO3
- Benedict Solution
- Ammonium Molybdate

Soft Drink Industry Market

Global Scenario

- Globally, carbonated soft drinks are third most consumed beverages.
- Per capita annual consumption of carbonated.
- Soft drinks is nearly four times the per capita consumption of fruit beverages .
- Soft drink consumption is growing by around 5% a year, accordingto the publication Global Soft drinks 2002.
- Total volume reached 412,000 million litres in 2001, giving aglobal per capita consumption of around 67.5 litres per year.





Source: Zenith International

Ingredients
Most soft drinks are characterized by carbonated water, sugar, andcaffeine. Variations in soft drinks generally advertise either flavor differences, or the absence of one or more of the three main ingredients.

Cola
The largest segment of the soft drink industry is the colas. Colas wereoriginally blends of extracts of the coca leaf and the cola nut, mixed withsugar water. The coca leaf is no longer used, but the cola nut remains inthe recipes that are public, and reportedly is also still in the secret Coca-Cola recipe. The cola nut comes from the Ivory Coast in Africa, primarily from two species of trees, *Cola acuminata* and *Cola nitida.*

Sweeteners
Sugar has been largely replaced
by high fructose corn syrup, largely because the latter is not price controlled, an d is a little bit sweeter, soless is needed. The artificial sweetener aspartame is th e low-caloriesweetener of choice at the time this is being written, having replacedcyclamates and saccharin as the favorites.

Flavors
Acids are added to soft drinks for extra bite, and mouth feel.
The primary acid used in colas is phosphoric acid, while the one used incitrus flavored drinks is usually citric acid. Carbonated water (water thathas the gas carbon dioxide dissolved in it under pressure) is also mildlyacidic (it is chemically carbonic acid, H_2CO_3).

Preservatives
Sodium benzoate is used as a broad spectrum antimicrobial,
inhibiting bacteria, molds, and yeasts. The high acid content of the soft drink isn ecessary for the preservative action. Sodium citrate buffers the acids, sothe pH stays low (acidic). It also emulsifies any fats or fat-solublecompounds in the flavorings, keeping them in solution.Potassium sorbate is added to inhibit yeasts and fungi.Ascorbic acid (Vitamin C) is used as an anti-oxidant.

Colors
In colas, the color comes from caramel coloring (burnt sugar). Red40 and other colors are used in fruit flavored drinks such as orange soda.

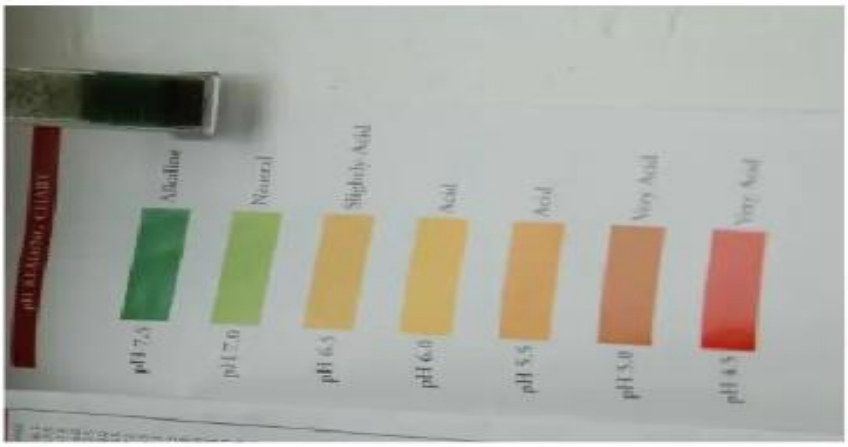
Detection of pH

Test :

Red litmus turns blue for alkaline; blue litmus turns red tests for acid. Litmus paper is the easiest and most foolproof way of determing whether something is acid or base.

Procedure:

Small samples of cold drinks of different brands were taken in a test tube and put on the pH paper. The change in the color of pH paper was noticed and was compared with the standard pH scale.

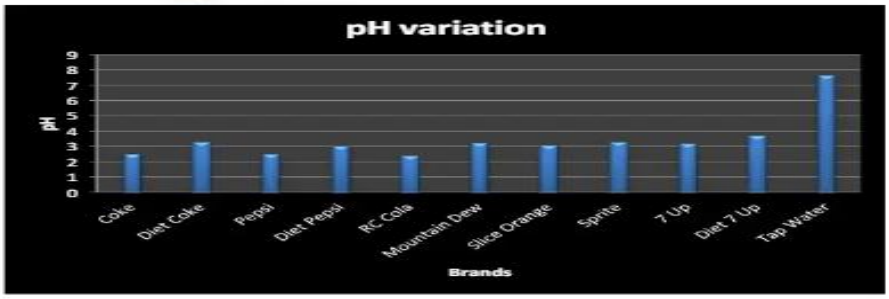


pH Scale

Observation

pH values taken individually, there was no statistically significant difference in pH among the drinks. The table shows the pH values of each beverage upon opening the soft drink can. The control for this study, had a pH of 7.67.

S. No.	Beverages	pH
Cola		
1	**Coke**	2.525
2	**Diet Coke**	3.289
3	**Pepsi**	2.530
4	**Diet Pepsi**	3.031
5	**RC Cola**	2.382
	Avg.	2.751
Non –Cola		
1	**Mountain Dew**	3.229
2	**Slice Orange**	3.059
3	**Sprite**	3.298
4	**7 Up**	3.202
5	**Diet 7 Up**	3.706
	Avg.	3.298
Control		
1	**Tap Water**	7.67



Result —

pH value is always less than 7 so soft drinks are acidic in nature. They are acidic because of the presence of citric acid and Phosphoric acid.

Test For Carbon Dioxide

Test

Lime Water Test :Clear, colorless limewater absorbs carbon dioxide readily from air, giving a milky solution. This is due to the insoluble suspension of calcium carbonate formed.

$$Ca(OH)_2(aq) + CO_2(g) \rightarrow CaCO_3(s) + H_2O(l)$$

Procedure

As soon as the bottles were opened, one by one the sample was passed through lime water. The lime water turned milky.

$Ca(OH)_2(s) + CO_2(g)$ ----------> $CaCO_3(s) + H_2O(s)$

Observation

SR. NO.	NAME OF THE DRINK	TIME TAKEN (SEC.)	CONCLUSION
1	**Pepsi**	26.5	CO2 IS PRESENT
2	**Dew**	21	CO2 IS PRESENT
3	**Limca**	35	CO2 IS PRESENT
4	**Fanta**	36	CO2 IS PRESENT

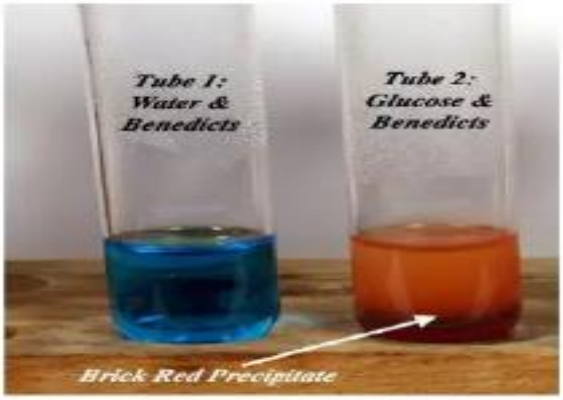
Result

All the soft drinks turns lime water milky so all of them contain dissolved carbon dioxide in water. The carbondioxide (CO2) dissolves in water to form carbonic acid, which is responsible for its tangy taste.

Test For Gulucose

Test

1.Benedict's Reagent Test



Carbohydrates make up a group of organic compounds which supply the body with energy and include sugars and starches. Benedict's solution is used to test for simple sugars, such as glucose. It is a clear blue solution of sodium and copper salts. In the presence of simple sugars, the blue solution changes color to green, yellow, and brick-red, depending on the amount of sugar.

Procedure:

Small samples of cold drinks of different brands were taken in a test tube and a few drops of Benedict's reagent were added. The test tube was heated for few seconds. Formation of reddish color confirmed the presence of glucose in cold drinks.

Observation

SR. NO.	NAME OF THE DRINK	OBSERVATION	CONCLUSION
1	**Pepsi**	REDDISH COLOUR	GLUCOSE IS PRESENT
2	**Dew**	PRECIPITATE	GLUCOSE IS PRESENT
3	**Limca**	REDDISH COLOUR	GLUCOSE IS PRESENT
4	**Fanta**	PRECIPITATE	GLUCOSE IS PRESENT

Conclusion-

All the samples gave positive test for glucose with Benedict's reagent. Hence all the drinks contain glucose.

2. FEHLING'S SOLUTION TEST

Fehling I consists of 7 g of hydrated copper(II) sulfate dissolved in 100 mL of dist. water.
Fehling II is made by dissolving 35 g of potassium sodium tartrate and 10 g of sodium hydroxide in 100 mL of dist. water.
Fehling's reagent: Equal volumes of Fehling I and Fehling II are mixed to form a deep blue solution.

Procedure:

Small samples of cold drinks of different brands were taken in a test tube and a few drops of Fehling's A solution and Fehling's B solution was added in equal amount. The test tube was heated in a water bath for 10 minutes. Appearance of brown precipitate confirmed the presence of glucose in cold drinks.

OBSERVATON

SR. NO.	NAME OF THE DRINK	OBSERVATION	CONCLUSION
1	**Pepsi**	REDDISH BROWN PRECIPITATE	GLUCOSE IS PRESENT
2	**Dew**	REDDISH BROWN PRECIPITATE	GLUCOSE IS PRESENT
3	**Limca**	REDDISH BROWN PRECIPITATE	GLUCOSE IS PRESENT
4	**Fanta**	REDDISH BROWN PRECIPITATE	GLUCOSE IS PRESENT

Result

All the samples gave positive test for glucose with Fehling's (A & B) solutions. Hence all the cold drinks contain glucose.

Test For Phosphate

Test:

Ammonium Molybdate When added to phosphate ions, warmed with nitric acid, forms a canary yellow precipitate of ammonium phosphomolybdate. Confirmatory test for presence of phosphates. $PO_4^{3-} + 12(NH_4)_2MoO_4 + 21HNO_3 + 3H^+ \text{----> } (NH_4)_3PO_4 \cdot 12MoO_3\downarrow + 21HN_4NO_3 + 12H_2O$

Procedure:

Small samples of each brand of cold drinks were taken in separate test tubes and Ammonium Molybdate followed by concentrated Nitric Acid (HNO3) was added to it. The solution was heated. Appearance of canary-yellow precipitate confirmed the presence of phosphate ions in cold drinks.

Observation

SR. NO.	NAME OF THE DRINK	OBSERVATION	CONCLUSION
1	**Pepsi**	CANARY-YELLOW PRECIPITATE	PHOSPHATE IS PRESENT
2	**Dew**	CANARY-YELLOW PRECIPITATE	PHOSPHATE IS PRESENT
3	**Limca**	CANARY-YELLOW PRECIPITATE	PHOSPHATE IS PRESENT
4	**Fanta**	CANARY-YELLOW PRECIPITATE	PHOSPHATE IS PRESENT

Result

All the soft drinks samples gave positive test for phosphate ions. Hence all the cold drinks contain phosphate.

Test For Alcohol

Test and Procedure

Small samples of each brand of cold drinks were taken in separate test tubes and Iodine followed by Potassium Iodide and Sodium Hydroxide (NaOH) solution was added to each test tube. Then the test tubes were heated in hot water bath for 30 minutes. Appearance of yellow colored precipitate confirmed the presence of alcohol in cold drinks

$CH_3CH_2OH + 4I_2 + 6NaOH \text{ ------> } CHI_3 + HCOONa + 5NaI + 5H_2O$

Observation

SR. NO.	NAME OF THE DRINK	OBSERVATION	CONCLUSION
1	**Pepsi**	YELLOW PRECIPITATE	ALCOHOL IS PRESENT
2	**Dew**	YELLOW PRECIPITATE	ALCOHOL IS PRESENT
3	**Limca**	YELLOW PRECIPITATE	ALCOHOL IS PRESENT
4	**Fanta**	YELLOW PRECIPITATE	ALCOHOL IS PRESENT

Result

All the cold drinks samples gave positive test for alcohol. Hence all the cold drinks contain glucose

Test For Sucrose

Test and Procedure

5 ml samples of each brand of cold drinks were taken in separate china dishes and were heated very strongly until changes occur. Black colored residue left confirmed the presence of sucrose in cold drinks.

OBSERVATON

SR. NO.	NAME OF THE DRINK	OBSERVATION	CONCLUSION
1	**Pepsi**	BLACK RESIDUE	SUCROSE IS PRESENT
2	**Dew**	BLACK RESIDUE	SUCROSE IS PRESENT
3	**Limca**	BLACK RESIDUE	SUCROSE IS PRESENT
4	**Fanta**	BLACK RESIDUE	SUCROSE IS PRESENT

Results:

All the brands of cold drinks contain sucrose. But amount of sucrose varies in each brand of drink. Fanta contains highest amount of sucrose.

Result

After conducting several tests, it was concluded that the different brands of cold drinks namely:

1. Pepsi
2. Dew
3. Limca
4. Fanta

- All soft drinks contains glucose, alcohol, sucrose, phosphate and carbon dioxide.
- All cold drinks are acidic in nature.
- All 4 soft drink samples manufactured in India was used as a pesticides.
- The variations in the pesticide residues in different samples could be due to the difference in ingredients, location of the manufacturing plants, difference in batches etc.

Conclusion

Dis-Advantages Of Cold Drinks

- The consumption of sugar-sweetened soft drinks is associated with obesity ,type 2 diabetes, dental caries, and low nutrient levels.
- Caffeine is linked to anxiety and sleep disruption when consumed in excess,
- Sodium benzoate has been investigated by researchers at University of Sheffield as a possible cause of DNA damage and hyperactivity.
- The combination of too much phosphorus with too little calcium in the body can lead to a degeneration of bone mass.
- Oral bacteria ferment carbohydrates and produce acid, which dissolves tooth enamel during the dental decay process; thus, sweetened drinks are likely to increase risk of dental caries. The risk is greater if the frequency of consumption is high. This has led to dentists referring to soft drinks as "liquid chainsaws".
- A large number of soft drinks are acidic, and some may have a pH of 3.0 or even lower. [Drinking acidic drinks over a long period of time and continuous sipping can therefore erode the tooth enamel.
- For transportation of soft drinks syrup the commercial truck must use the hazardous matter place cards reserved for highly consive material.
- Soft drinks have also ability to remove blood so they are very harmful to our body.
- There have been a handful of published reports describing individuals with severe hypokalemia (low potassium levels) related to chronic extreme consumption of colas.

Uses Of Cold Drinks

- To clean a toilet
- To remove rust spots from chrome car bumpers
- To clean corrosion from car battery terminals
- To loosen a rusted bolt

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