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PHYSICO-CHEMICAL PARAMETERS & SIGNIFICANT ION CONCENTRATIONS: A STUDY ON FOUR COMMON MILKSHAKES AVAILABLE IN INDIA

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ABSTRACT

In this study we had subjected Winkin Cow (Vanillicious) thick shake, Winkin Cow (Chocolicious) thick shake, Hershley's Milkshake (Chocolate Flavour), Dreamery Milkshake (Chocolate Flavour). These four milkshakes are available in tetrapack. We had studied physico-chemical parameters like Salinity, TDS, Conductance, pH, DO and biologically significant ions like sodium, potassium, calcium and nitrate. Generally milk product beverages are less acidic and have high TDS, salinity and conductance values[1]. All these milkshakes are rich source of sodium, potassium and calcium ions.

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INTRODUCTION

Human blood pH always remain always slightly above 7 and Total Dissolved Solid **(**TDS**)** indicates the amount of dissolved substance present. Conductance value denotes the amount of ions present and salinity reflect the amount of salt present**.** Low pH value denotes, higher acidity of packed drinks**.** For carbonated soft drinks available like RC Cola, Pepsi, Coca cola and Thums-up the values are greater than unity[2]**.** All the Tropicana and Real brand packed juices contain relatively high potassium ion concentration and **[**K^+**]/[**Na^+**]** value lies between 1**.**07 to 48**.**57[3]**.** Sodium ion regulates, blood volume, blood pressure, osmotic pressure and of pH of human blood[3]**.** Potassium is the most important intracellular ion**.**

Calcium ion is the major component of the structural materials of bone, teeth and shell in living systems[4]. Permissible limits for nitrate in drinking water is 45 mg/L NO_3^- (Bureau of Indian Standards, 2012) and have a guideline value of 50 mg/L (WHO 2011) above which it can pose serious health hazards[5]. Refreshing packed drinks which widely consumed specially during summer by the people, provide sodium, potassium, calcium, chloride etc, ions to human body[4, 6-18]. Sodium ion concentration, potassium ion concentration, calcium ion concentration, chloride ion concentration, ammonium ion concentration and nitrate ion concentration within human body fluid and blood are almost constant. The exact concentrations of the ions are different for different type of cells or body fluids. The extracellular potassium ion concentration is 0.2 g per litre (approx), at the same time, the intracellular potassium ion concentration is 6 g per litre (approx). The extracellular sodium ion concentration is 3.45 g per litre (approx), whereas, the intracellular sodium ion concentration is 0.23 g per litre (approx)[3].

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The extracellular chloride ion concentration is 100 milimole per litre (approx), whereas, the intracellular chloride ion concentration is 10 milimole per litre (approx).The $[Ca^{2+}]_{outside\ cell}/[Ca^{2+}]_{inside\ cell}$ = 1000 (approx). For the present study samples taken are Winkin Cow (Vanillicious), Hershley's milkshake (Chocolate Flavor), Winkin Cow (Chocollicious) and Dreamery milkshake (Chocolate Flavour).

MATERIALS AND METHODS

All the samples subjected for study were sealed tetra packs and manufactured within last few months. Nitrate, and calcium ion concentrations are measured using Systronics (India) made ion meter model number SYS-460 at Environmental Chemistry Research Laboratory, Barrackpore Rastraguru Surendranath College, Barrackopre, North 24 Parganas, WB. Calcium ion concentration was measured using ISE 40 electrode. Nitrate ion concentration was measured using ISE 62 electrode. The sodium ion concentrations and potassium ion concentrations were measured at the Environmental Chemistry Research Laboratory, Barrackpore Rastraguru Surendranath College, Barrackopre, North 24 Parganas, WB, using Systronics (India) made Flame photometer 128 µC. Temperature, pH, Total Dissolved Solid (TDS), conductance and salinity were measured using EUTECH made Multi-parameter PCSTestr 35 at the Environmental Chemistry Research Laboratory, Barrackpore Rastraguru Surendranath College, Barrackopre, North 24 Parganas, WB. Dissolved oxygen (DO) values are measured using Luton made portable DO meter. Turbidity values are calculated using Systronics (India) made µC turbidity meter 135. Ion free, redistilled water, prepared at laboratory, were used for all the analysis. All the measurements were carried out between 20°-23°C.

RESULTS AND DISCUSSION

pH of Winkin Cow (Chocollicious) thick shake have the minimum value 6.63 whereas Winkin Cow (Vanillicious) thick shake have the maximum value 6.83. Conductance is maximum for Dreamery milkshake (Chocolate Flavour) and the value is 5.29 µS/cm. Hershley's milkshake (Chocolate Flavour) have the conductance 3.47 µS/cm which is minimum.

The order of Salinity is Dreamery milkshake (Chocolate Flavour) > Winkin Cow (Vanillicious) > Winkin Cow (Chocollicious) > Hershley's milkshake (Chocolate Flavor). TDS values can be represented as Winkin Cow (Chocollicious) > Dreamery milkshake (Chocolate Flavour) > Winkin Cow (Vanillicious) > Hershley's milkshake (Chocolate Flavor). For all the milkshakes Dissolved Oxygen value are around 8 mg/lit. Turbidity values may be arranged in the following order : Winkin Cow (Vanillicious)> Hershley's milkshake (Chocolate Flavor) > Winkin Cow (Chocollicious) > Dreamery milkshake (Chocolate Flavour).

All the milkshakes have sodium ion concentration value around 1000 ppm and Hershley's milkshake (Chocolate Flavour) have the highest sodium ion content. According to potassium ion content the milkshakes can be arranged as Winkin Cow (Chocollicious) > Hershley's milkshake (Chocolate Flavor) > Winkin Cow (Vanillicious) > Dreamery milkshake (Chocolate Flavour). Calcium ion content is above 55 ppm for all milkshakes. Calcium content is highest for Winkin Cow (Chocollicious) and lowest for Hershley's milkshake (Chocolate Flavour).

Table 1. Name, Make, Batch number and Energy value of Milkshakes

Sl No.	Name	Make	Batch Number	Energy Value (Kcal/100 ml)
1.	Winkin Cow (Vanillicious) (Thick Shake)	Britannia Industries Ltd.	351062FA3	118.0
2.	Winkin Cow (Chocolicious) (Thick Shake)	Britannia Industries Ltd.	351061FB3	118.8
3.	Hershley's Milk Shake (Chocolate Flavour)	Hershley India Pvt. Ltd.	H09HM05921	166.2
4.	Dreamery Milk Shake (Chocolate Flavour)	Fonterra Future Diary Pvt. Ltd.	SB1031FC1	112.15

Table 2. Physico-chemical Parameter Data of Milkshakes

Sl No.	Name	pH	Conductance (µS/cm)	Salinity (ppt)	TDS (ppt)	DO (mg/lit)	Turbidity NTU
1.	Winkin Cow (Vanillicious) (Thick Shake)	6.83	4.90	2.64	3.49	7.9	76.7
2.	Winkin Cow (Chocolicious) (Thick Shake)	6.63	4.91	2.62	4.92	8.1	11.6
3.	Hershley's Milk Shake (Chocolate Flavour)	6.79	3.47	1.82	2.46	8.0	36.93
4.	Dreamery Milk Shake (Chocolate Flavour)	6.68	5.29	2.83	3.74	8.0	7.46

Table 3. Ion Concentration Data of Milkshakes (ppm)

Sl No.	Name	Na^+	K^+	Ca^{++}	NO_3^-
1.	Winkin Cow (Vanillicious) (Thick Shakes)	1028.8	1411.8	73	0.772
2.	Winkin Cow (Chocolicious) (Thick Shakes)	1029.0	1938.6	75	0.648
3.	Hershley's Milk Shake (Chocolate Flavour)	1435.35	1650.3	56	0.228
4.	Dreamery Milk Shake (Chocolate Flavour)	974.8	1345.4	64	0.342

Nitrate concentrations for Winkin Cow (Vanillicious) is 0.772 ppm, Winkin Cow (Chocollicious) is 0.648 ppm, Dreamery milkshake (Chocolate Flavour) is 0.342 ppm and Hershley's milkshake (Chocolate Flavor) is 0.228 ppm.

CONCLUSION

Hershley's Milkshake (Chocolate Flavour) provide maximum energy (166.2 kcal/100ml) and Dreamery Milkshake (Chocolate Flavour) provide minimum energy (112.15 kcal/100ml) among these milkshakes. pH of all the milkshakes are slightly acidic. High conductance value for all the milkshakes denotes the presence of adequate salts and ions. This is also evident from salinity data. High TDS values are characteristic of milk products. Dissolved Oxygen values are regular and expected. All the milkshakes are turbit. All these milkshakes are rich source of calcium ion, sodium ion and potassium ion . Nitrate ion concentration for all these milkshakes are below 1 ppm which is good for human health. Since India is the tropical hot country, people prefer to consume beverages having high energy value with sufficient salts for keeping body and mind refreshed. These milkshakes physico- chemical and ion concentration data reflects that these milkshakes are ideal for people of tropical country. However patients having kidney disease should not consume any drinks or milkshakes having high potassium ion concentration.

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