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A STUDY ON PHYSICO-CHEMICAL PARAMETERS, BULK METALS AND NITRATE IONS IN THIRTEEN AVAILABLE MILKSHAKES

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Abstract

Milkshakes are commonly used as refreshing soft drinks, specially during summer or hot climate. Generally, milkshakes source high turbidity and contain high salt concentration[1]. In present study the following Indian brands of milkshakes are analysed; namely Sunfeast, Cavin's, Hershey's, Paper boat, Amul and Winkin Cow. These thirteen milkshakes show high conductance, TDS and salinity. Four of them contain high sodium ion concentration, nine milkshakes have high potassium ion concentration. All the milkshakes contain nitrate ion higher than WHO limit for drinking water. All the milkshakes are rich with respect to calcium ions.

Keywords: Physico-chemical parameter, Sodium, Potassium, Calcium, Nitrate, Chloride. Milkshakes.

INTRODUCTION

Conductance value indicates the amount of ions present and salinity reflect the amount of salt present**.** Human blood pH is slightly alkaline and Total Dissolved Solid **(**TDS**)** indicates the amount of dissolved substance present. Low pH value denotes, higher acidity of packed drinks**.** pH between 6 to 7 is slightly acidic**.** Carbonated soft drinks available like RC Cola, Pepsi, Coca cola and Thums-up the values are greater than unity[2]**.**Sodium ion regulates, blood volume, blood pressure, osmotic pressure and of pH of human blood[3]**.**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]. 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 i n 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 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]. 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 areSunfeast Strawberry Milkshake, Sunfeast Vanilla Milkshake, Sunfeast Badam Milkshake, Cavin's Chocolate Milkshake, Cavin's Kaju Butterscotch Milkshake, Cavin's Vanilla Milkshake, Hershey's Milkshake Almond Flavour, Hershey's Milkshake Strawberry Flavour, Hershey's Milkshake Cookies"N" Cream Flavour, Paper Boat Milkshake Chocolate, Paper Boat Milkshake Vanilla, Amul KOOL Mango Shake and Winkin Cow Strawbericious Thick Shakes.

Materials and Methods

All the samples subjected for analysis were sealed polypacks or metal cans and manufactured within last four month of study date. Four are available in metal cans, five in polymer bottles and two in pouch packs (paper boat products). Temperature, pH, Total Dissolved Solid (TDS), conductance and salinity were measured using EUTECH made Multi-parameter PCS Tester 35 at the Environmental Chemistry Research Laboratory, Barrackpore Rastraguru Surendranath College, Barrackopre, North 24 Parganas, WB. 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. Nitrate and calcium ion concentrations are measured using Systronics (India) made ion meter model numberSYS-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. Ion free, redistilled water, prepared at laboratory, were used for all the analysis.All the measurements were carried out between 20°-23°C.

Table 1

Name, Make, Batch Number and Energy Value of Milkshakes Subjected for analysis

NAME	MAKE	BATCH NO	ENERGY VALUE (kcal/100ml)
Sunfeast Strawberry Milkshake	ITC LIMITED	KASB03C21	110
Sunfeast Vanilla Milkshake	ITC LIMITED	KASV01C21	108
Sunfeast Badam Milkshake	ITC LIMITED	KABD03D21	100
Cavin's Chocolate Milkshake	CAVINKARE PRIVATE LIMITED	AA038 " L4"	106.2
Cavin's Kaju Butterscotch Milkshake	CAVINKARE PRIVATE LIMITED	AA013 " L4"	109

Cavin's Vanilla Milkshake	CAVINKARE PRIVATE LIMITED	AA038 " L4"	111.2
Hershey's Milkshake Almond Flavour	HERSHEY INDIA PRIVATE LIMITED	HM03621	86.43
Hershey's Milkshake Strawberry Flavour	HERSHEY INDIA PRIVATE LIMITED	HM33720	86.47
Hershey's Milkshake Cookies"N" Cream Flavour	HERSHEY INDIA PRIVATE LIMITED	HM29820	91.35
Paper Boat Milkshake Chocolate	SCHREIBER DYNAMIX DIARIES PRIVATE LIMITED	A1005FA5	120.5
Paper Boat Milkshake Vanilla	SCHREIBER DYNAMIX DIARIES PRIVATE LIMITED	A1004HA3	111.3
Amul KOOL Mango Shake	KAIRA DISTRICT CO-OPERATIVE MILK PRODUCERS' UNION LIMITED	KEG0201	104.5
Winkin Cow Strawbericious Thick Shakes	Brirannia Industries Limited	351032EA3	118.8

Table 2

Physico-chemical Parameter Data of Milkshakes Subjected for Analysis

NAME	pH	Conductance (µS/cm)	TDS (ppt)	Salinity (ppt)	DO (mg/lit)
Sunfeast Strawberry Milkshake	6.45	4.02	2.85	2.12	7.6
Sunfeast Vanilla Milkshake	6.52	3.74	2.65	1.96	4.8
Sunfeast Badam Milkshake	6.69	3.87	2.75	2.00	8.7
Cavin's Chocolate Milkshake	6.38	4.51	3.18	2.41	6.3
Cavin's Kaju Butterscotch Milkshake	6.38	4.22	2.99	2.24	8.0
Cavin's Vanilla Milkshake	6.38	4.27	3.02	2.29	7.7
Hershey's Milkshake Almond Flavour	6.70	2.98	2.11	1.53	7.9
Hershey's Milkshake Strawberry Flavour	6.82	2.95	2.09	1.52	6.8
Hershey's Milkshake Cookies"N" Cream Flavour	6.71	3.99	2.84	2.12	5.4
Paper Boat Milkshake Chocolate	6.42	4.86	3.44	2.60	7.2
Paper Boat Milkshake Vanilla	6.38	4.45	3.15	2.36	7.5
Amul KOOL Mango Shake	6.21	4.23	3.01	2.24	7.9
Winkin Cow Strawbericious Thick Shakes	6.47	4.49	3.18	2.37	8.1

Table 3

Ion Concentration Data of Milkshakes (in ppm) Subjected for analysis

NAME	Sodium (ppm)	Potassium (ppm)	Calcium (ppm)	Nitrate (ppm)
Sunfeast Strawberry Milkshake	1181.7	1701.45	6175	4407
Sunfeast Vanilla Milkshake	669	1132.8	7173	3170
Sunfeast Badam Milkshake	407.85	632.1	1786	1863
Cavin's Chocolate Milkshake	1015.8	1619.25	1026	781
Cavin's Kaju Butterscotch Milkshake	729.4	1161	11327	1934
Cavin's Vanilla Milkshake	1030.8	1648.5	10350	6668
Hershey's Milkshake Almond Flavour	808	912.8	7678	4393
Hershey's Milkshake Strawberry Flavour	640.1	794.6	18968	7828
Hershey's Milkshake Cookies"N" Cream Flavour	1452.15	1497.3	18583	3164
Paper Boat Milkshake Chocolate	922	2163.6	18364	3727
Paper Boat Milkshake Vanilla	724.8	1392.6	14345	781
Amul KOOL Mango Shake	744.9	1371.75	13142	11787
Winkin Cow Strawbericious Thick Shakes	1074.15	1717.05	16172	2275

Discussion

All the milkshakes have pH above 6.2 and below 7. Conductance value ranges between 2.95-4.86 µS/cm.Hershey's Milkshake Strawberry Flavour have lowest conductance value whereas Paper Boat Milkshake Chocolate have the highest conductance.For these studied milkshakes TDS value lies between 2.09 to 3.44 ppt. Hershey's products shows relatively lower TDS value, in contrast cavin's and paper boat brand milkshakes shows relatively higher TDS values. Salinity values for these milkshakes ranges between 1.52 to 2.60 ppt. Hershey's Milkshake Strawberry Flavour have lowest salinity value whereas Paper Boat Milkshake Chocolate have the highest salinity. Hershey's Milkshake Cookies"N" Cream Flavour have lowest DO value whereas Sunfeast Badam Milkshake have the highest DO value. Sunfeast Badam Milkshake contain relatively low sodium and potassium ions than expected for any milkshake. Hershey's Milkshake Cookies"N" Cream flavor contain maximum sodium concentration, whereas Paper Boat Milkshake Chocolate contain maximum potassium ions. Most of the milkshakes contain more than ten thousand ppm calcium ion concentration. All the milkshakes contain very high nitrate concentration. The minimum value of nitrate ion within these milkshakes is 781 ppm.

Conclusion

pH value ranges between 6.21-6.82. Amul cool mango shake have the lowest pH whereas Hershey's Milkshake Strawberry Flavour have the highest pH. Ingeneral milkshakes shows high conductance value due to presence of sufficient salts. It is expected that milkshakes have high TDS value and results obtained also support the same. Salinity value reflect the presence of dissolved salts. The trend of salinity

values within these milkshakes are similar to conductance values, as both reflects the amount of dissolved inoraganic salts present. Except Hershey's Milkshake Cookies"N" Cream Flavour and Cavin's Chocolate Milkshake, all other milkshakes have DO between 6.8 to 8.7 mg/lit. All the milkshakes are good source of sodium, potassium and calcium ions. As expected, milk products are rich source of calcium ions. High nitrate concentration within any drink or milkshakes (i.e., above 50 ppm) are not good for human health. Manufacturers must take care about the amount of nitrate ions within these milkshakes for the interest of human health.

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