ISSN: 2394-1391

Original Article

Indian Journal of Biology
Volume 6 Number 2 / July – December 2019
DOI: http://dx.doi.org/10.21088/ijb.2394.1391.6219.4

A Study on Na, K ion Concentrations in few Common, Widely Sold Packaged Drinks in India

Monojit Ray

How to cite this article:
Monojit Ray. A Study on Na, K ion Concentrations in few Common, Widely Sold Packaged Drinks in India. Indian J Biol. 2019;6(2): 89–92.

Abstract

Common, available and widely sold fruit juices, milk product soft drinks differ from common carbonated soft drinks available in India, significantly with reference to sodium and potassium ions, the two important elements among the eleven bulk essential elements present in our body. For present study along with physicochemical parameters like pH, total dissolved solid (TDS), conductance etc. Sodium ion concentrations and potassium ion concentrations within some common, available and widely sold fourteen packed drinks in India are considered. These are mainly fruit drinks, energy drinks, packaged coconut water & Amul brand milk products. The variation of pH, TDS, salinity, conductance, sodium ion concentrations and potassium ion concentrations are significant among these packaged drinks.

Keywords: pH, Conductance, Salinity, TDS, Sodium, Potassium, packed drinks.

Introduction

Lower pH value denotes, higher the order of acidity of packed drinks. pH of human blood always remain within the range 7.15–7.45. Total Dissolved Solid (TDS) indicates the amount of dissolved substance, conductance denotes the amount of ions present and salinity value reflect the amount of salt present. $[K^+]$ / $[Na^+]$ values for carbonated soft drinks available in India are mostly less than unity. Only for RC Cola, Pepsi, Coca cola and Thums up the values are greater than unity.[1] 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.[2] Sodium ion regulates, blood pressure, blood volume, osmotic pressure and of pH of human blood.[3] Potassium is the most important intracellular ion. The refreshing packed drinks, widely consumed specially during summer, provide sodium and potassium ions to human body.[4-14] Sodium ion concentrations and potassium ion concentrations within human body fluid and blood are almost constant. The exact concentrations of the ions are different for different type of cells. The extracellular potassium ion concentration is 0.2 g per liter (approx), at the same time, the intracellular potassium ion concentration is 6 g per liter (approx). The extracellular sodium ion concentration is 3.45 g per liter (approx), whereas, the intracellular sodium ion concentration is 0.23 g per liter (approx).[3] For

Author's Affiliation: Principal and Professor of Chemistry, Barrackpore Rastraguru Surendranath College, Barrackopre, North 24 Parganas, Kolkata, West Bengal 700120, India.

Corresponding Author: Monojit Ray, Principal and Professor of Chemistry, Barrackpore Rastraguru Surendranath College, Barrackopre, North 24 Parganas, Kolkata, West Bengal 700120, India.

E-mail: monojit1972@gmail.com

Received on 09.10.2019, **Accepted on** 13.11.2019

the present study samples taken are Del Monte Pineapple juice, Del Monte Pineapple orange juice, Del Monte Mango juice, Del Monte Green apple juice, Paper Boat Coconut water, V-fresh Coconut water, Red Bull Energy Drink, Red Bull Orange Energy Drink (Limited Edition), Cavin's Rose Lassi, Amul Kool cafe cinnamon, Amul Kool cafe classic, Amul Kool elachi, Amul Lassi and Amul Masti spiced butter milk. Most of these drinks subjected for present study contain higher potassium ion concentration than sodium ion concentration. Present study reflects that coconut water is huge source of potassium ions. Amul products contain significantly higher potassium and sodium ion concentrations than other drinks.

Materials and Methods

The entire study was carried out at the Environmental Chemistry Research Laboratory, Barrackpore Rastraguru Surendranath College, Barrackopre, North 24 Parganas, WB. All the packaged drinks samples used were sealed tetra pack/metal can and manufactured within last one month of study date. Sodium ion concentrations and potassium ion concentrations were measured using Systronics (India) made Flame photometer 128 µC of the Environmental Chemistry Research Laboratory, Barrackpore Rastraguru Surendranath College. Total Dissolved Solid (TDS), pH, Temperature, conductance and salinity were measured using EUTECH made Multi-parameter PCSTester 35. Redistilled and ion free water, prepared at laboratory, were used for all the analysis. All the measurements were carried out between 18°–20°C.

Results

Tables 1 to 3 are shown below.

Table 1: Energy value and Maker of few common, packed soft drinks in India

No.	Brand Name	Company	Energy value (Kcal/100 ml)
1	Del Monte Pineapple juice	Field Fresh Foods Privet Limited	53.0
2	Del Monte Pineapple orange juice	Field Fresh Foods Privet Limited	47.0
3	Del Monte Mango juice	Field Fresh Foods Privet Limited	62.0
4	Del Monte Green apple juice	Field Fresh Foods Privet Limited	46.0
5	Paper Boat Coconut water	Kovai Agro Foods	24.0
6	V-fresh Coconut water	Cocoas Product	20.0
7	Red Bull Energy Drink	Rauch Fruchtsafte GmbH & Co	45.0
8	Red Bull Orange Energy Drink	Rauch Fruchtsafte GmbH & Co	45.0
9	Cavin's Rose Lassi	Cavin Kare Private Limited	88.0
10	Amul Kool cafe cinnamon	Amul Fed Dairy	100.0
11	Amul Kool cafe classic	Amul Fed Dairy	100.0
12	Amul Kool elachi	Amul Fed Dairy	89.0
13	Amul Lassi	AmulFed Dairy	79.0
14	Amul Masti spiced butter milk	AmulFed Dairy	29.3

Table 2: Physico-chemical Parameters of few common, packed soft drinks consumed in India (Temp = 18°–20°C)

No.	Brand Name	pH	TDS mg/lit	Salinity mg/lit	Conductance μS/cm
1	Del Monte Pineapple juice	3.00	595	412	839
2	Del Monte Pineapple orange juice	3.45	1230	878	1732
3	Del Monte Mango juice	3.15	628	436	880
4	Del Monte Green apple juice	2.93	978	690	1378
5	Paper Boat Coconut water	4.25	7970	6390	11220
6	V-fresh Coconut water	4.42	8750	7110	12330
7	Red Bull Energy Drink	3.34	1360	974	1917
8	Red Bull Orange Energy Drink	3.05	1010	709	1430
9	Cavin's Rose Lassi	4.61	3030	2270	4290
10	Amul Kool cafe cinnamon	6.23	2740	2030	3930
11	Amul Kool cafe classic	6.03	2620	1950	3720
12	Amul Kool elachi	6.38	2210	2960	4190
13	Amul Lassi	3.75	2290	1680	3270
14	Amul Masti spiced butter milk	3.90	8870	7120	12500

Table 3: Na, K ion concentrations of few common, packed soft drinks consumed in India (Temp = 18°–20°C)

No.	Product Name	Brand	Batch Number	Na^+ mg/lit	K^+ mg/lit
1	Pineapple juice	Del Monte	HC20E9	20.7	495.1
2	Pineapple orange juice	Del Monte	HC27B9	288	8125
3	Mango juice	Del Monte	HC02G9	37.7	576.3
4	Green apple juice	Del Monte	HC24G9	77.5	98.4
5	Coconut water	Paper Boat	UP13F19A1	223	5794
6	Coconut water	V Fresh	B230519A01	189	7168
7	Energy Drink	Red Bull	1720292	16.2	3.0
8	Orange Energy Drink	Red Bull	1734915	610.5	6.4
9	Rose Lassi	Cavin's	BC58 "L3"	2342	2591
10	Kool cafe cinnamon	Amul	KEW1431	2564	5280
11	Kool cafe classic	Amul	KEW1661	782	1994
12	Kool elachi	Amul	GAW1661	1754	3501
13	Lassi	Amul	GAW1849	1144	2210
14	Masti spiced butter milk	Amul	GAW1926	21862	8014

Discussion

The energy value / 100 ml packed drinks subjected under present study are listed in Table 1. Amul Kool café classic, Amul Kool cafe cinnamon, Amul Kool Elachi and Amul Lassi provide maximum energy while, packed coconut water and Amul Masti spiced butter milk provide minimum energy to human body. Among these drinks only Red Bull energy drink contain caffeine, the stimulating agent used for refreshing body and mind. Del monte products contain original fruit parts. Paper boat and V fresh Coconut water packs contains original coconut water. Amul products are derived from milk products. pH, Conductance, salinity and TDS data are listed in table 2. Sodium ion and potassium ion concentration data are represented in Table 3. Healthy 19 to 50 years old adult should consume 1.5 g sodium ion and 2.3 g potassium ion per day. Any human body having 70 kg weight, contain 15 liters extracellular fluid, which contain approximately 50 g sodium ion, and this is the 90% of the total body sodium ion.[3-7,9-14] Amul products and Cavin's rose lassi contain relatively very high sodium ion concentration. It should be noted that Amul brand Masti spiced butter milk contain 21862 mg/liter sodium ion concentration which is extraordinarily higher than other soft drinks, fruit juice and carbonated soft drinks available in market. It is significant that, non-fruit soft drinks which are common and available in India contain potassium ion concentration between 0–80 mg/liter.[1] Appy brand apple drinks contain around 107–114 mg/liter potassium ion, Maza and Frooti contain 154–155 mg/liter potassium ion,[1] Tropicana brand fruit drinks contain always above 238 mg/liter potassium ion, Real brand fruit drinks contain above 130 mg/liter potassium ion,[2] whereas Del Monte brand fruit drinks contain 98.4 to 8125 mg/liter potassium ion concentration. Packed coconut water contains very high potassium ion concentration, i.e. above 5700 mg/liter. Amul products also contain high potassium ion concentrations and potassium ion prevent stroke, osteoporosis, kidney stone and hypertension.

Conclusion

All the drinks are acidic (pH < 7) and most of them have high TDS and conductance values. Del monte green apple juice is most acidic (pH = 2.3) and Amul Kool elachi is least acidic (pH = 6.38). The energy value/100 ml packed drinks ranges between 20–100 Kcal. According to energy value the drinks can be broadly arranged as: Amul Kool products/Lassi > fruit juices > coconut water. Except Del Monte pineapple juice all the other drinks have TDS value above 600 mg/lit. According to World Health Organization (WHO) drinks having TDS value less than 300 mg/lit are "Excellent" and that having between 300 mg/lit to 600 mg/lit are "Good".[1] Amul Masti spiced butter milk and coconut waters shows high conductance values. High conductance value indicates the presence of larger amount of dissolved salts. This is also evident from sodium ion and potassium ion concentration data (Table 3). The products subjected for present study can be arranged in terms of sodium ion content as follows: Amul Masti spiced butter milk > Amul Kool cafe cinnamon > Cavin's Rose lassi > Amul Kool elachi > Amul lassi > Amul Kool cafe classic > Red Bull Orange Energy Drink > Del Monte pineapple orange juice > Paper boat coconut water > V fresh

& pure coconut water > Red Bull energy drink > Del Monte green apple juice > Del Monte mango juice > Del Monte pineapple juice.

The above mentioned drinks can be arranged in terms of potassium ion content as follows: Del Monte pineapple orange juice > Amul Masti spiced butter milk > V fresh & pure coconut water> Paper boat coconut water> Amul Kool cafe cinnamon> Amul Kool elachi > Cavin's Rose lassi > Amul lassi > Amul Kool cafe classic > Del Monte mango juice > Del Monte pineapple juice > Del Monte green apple juice > Red Bull Orange Energy Drink > Red Bull energy drink.

In all the drinks subjected for study $[K^+]$ / $[Na^+]$ is greater than unity except both the Red bull energy drinks, which also contain added vitamins. All the Amul products and coconut water have very high potassium ion content. Patients suffering from kidney diseases or problem should not consume drinks containing high potassium concentration, hence, they should avoid coconut water, Del Monte pineapple orange juice and Amul product drinks. During summer, sweating release significant amount of sodium ions from the body fluid. Amul products and Cavin's rose lassi can provide large amount of sodium ions.

Acknowledgement

The author is extremely grateful to Governing Body and Research monitoring committee of Barrackpore Rastraguru Surendranath College for financial assistance & funding a research project.

References

1. Ray M and Nag C. Some Important Physico-chemical Parameters and Sodium, Potassium ion concentrations in common, available and widely consumed Soft drinks in India. Indian journal of experimental biology 2015;5(12):51-54
2. Ray M and Chatterjee O. Comparison of physico-chemical parameters, sodium and potassium ion concentrations: A study on packed fruit juices in India, Conscientia. 2015.
3. AK Das. Bioinorganic Chemistry. Books and Allied (P) Ltd.; 2008.
4. O Aurelia, O Cristian. Testing of the hygenic quality of the carbonated soft drinks, Analele Universitatii din Oradea, Fascicula Protectia Mediului. 2011.
5. Carbonated drinks: Good hosts to bad health, 2011, Consumer voice.
6. Ashurst P. Soft drink and fruit juice problems solved. Woodhead Publishing Limited. 2009.
7. Gibson, Sigrid. Sugar-sweetened soft drinks and obesity: a systematic review of the evidence from observational studies and interventions». Nutrition Research Reviews. 2008.
8. Louis J.C., 1980, The Cola Wars. Everest House.
9. Martin Hickman Caution. Some soft drinks may seriously harm your health, The Independent on Sunday. 2007.
10. Michael F Jacobson PhD. Liquid Candy: How Soft Drinks are Harming Americans' Health, Washington DC. 2005.
11. Oliver, Thomas, 1986, The Real Coke. Random House.
12. Tordoff MG, Alleva AM. Effect of drinking soda sweetened with aspartame or high-fructose corn syrup on food intake and body weight, American Journal of Clinical Nutrition. 1990.
13. Vartanian LR, Schwartz MB, Brownell KD. Effects of soft drink consumption on nutrition and health: a systematic review and meta-analysis, American Journal of Public Health, 2007.
14. Wolff E, Dangsinger ML. Soft drinks and weight gain: How strong is the link?, Medscape Journal of Medicine. 2008.