

Some Important Physico-Chemical Parameters and Sodium, Potassium Ion Concentrations in Common, Available and Widely Consumed Soft Drinks in India

Monojit Ray*, Chandrima Nag**

Abstract

In the present study we tried to find out the pH, Conductance, Total Dissolved Solids (TDS), Salinity, Sodium ion concentrations and Potassium ion concentrations within some common, available and widely sold soft drinks in India. For this purpose we had studied total 21 soft drinks among which seven are widespread selling fruit drinks. Most of them show high acidity, high conductance, high TDS and high salinity values. The sodium ion concentrations and potassium ion concentrations are significant and vary widely among these drinks.

Keywords: Physico-Chemical Parameters; Sodium; Potassium; Soft Drinks; India.

Introduction

Sodium ions and potassium ions play vital roles within our body, so, they are very significant. Sodium ion regulates, blood volume, blood pressure, pH and osmotic pressure of blood. Sodium ion is the most important extra-cellular ion, whereas, potassium ion is the most significant intracellular ion. The refreshing soft drinks or fruit drinks provide those ions to our body after consumption of them. In India during every summer large number of people consumes these packed soft drinks and fruit drinks. Conductance value indicates the amount of ions presents within these soft drinks. Salinity denotes the amount of salt present and TDS reflect the amount of soluble substances. The pH value denotes the order of acidity within soft drinks. 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 sodium ion concentration is 3.45 g per liter (approx) whereas; the intracellular sodium ion concentration is 0.23 g per liter (approx). 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 salinity of human blood is 9g / liter. The pH of human blood lies between 7.15-7.45 (approx).

Author's Affiliation: *Associate Professor of Chemistry, Nabadwip Vidyasagar College, Nabadwip, Nadia, WB, Pin 741302. **UG Student, Krishnanagar Womens' College, Krishnanagar, Nadia, WB, Pin 741101.

Reprint's request: Monojit Ray, Associate Professor of Chemistry, Nabadwip Vidyasagar College, Nabadwip, Nadia, WB, Pin 741302.

E-mail: monojit1972@gmail.com

Materials and Methods

The entire study was carried out at the Research Laboratory, Department of Chemistry, Nabadwip Vidyasagar College, Nabadwip, Nadia. All the soft drinks samples used were sealed metal cans of 300 ml or pet bottles of 500 ml / 200 ml, and manufactured within last one month of study date. Temperature, pH, conductance, TDS and salinity were measured using EUTECH Mult-parameter PCSTester 35. Sodium ion concentrations and potassium ion concentrations were measured using Systronics Flame photometer 130 of Department of Chemistry, Nabadwip Vidyasagar College. 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

Table 1: Energy value and Maker of few common, available and widely consumed soft drinks in India

No.	Brand Name	Company	Energy value Kcal/100ml
1	RC Cola	Iceberg Foods Limited	44.41
2	RC Q Orange	Iceberg Foods Limited	53.7
3	Sprite	The Coca Cola Company	48
4	7UP	PepsiCo Inc.	40
5	Fanta	The Coca Cola Company	52
6	Mirinda	PepsiCo Inc.	55
7	Pepsi	PepsiCo Inc.	43
8	Coca Cola	The Coca Cola Company	44
9	Coca Cola Zero	The Coca Cola Company	0.3
10	Diet Coke	The Coca Cola Company	0.2
11	Diet Pepsi	PepsiCo Inc.	0.3
12	Thumbs Up	The Coca Cola Company	40
13	Limca	The Coca Cola Company	44
14	Appy Fizz	Parle Agro	54
15	Appy	Parle Agro	63
16	Maaza	The Coca Cola Company	54
17	Frooti	Parle Agro	65
18	Slice	Varun Beverages Limited	63
19	RedBull	Rauch Trading AG	45
20	Peach Coolada fruit Drink	FieldFreshFruits Private Limited	52.7
21	Litchi Flavored Drink	Pran Exports Ltd.	59.2

Table 2: Physico-chemical Parameters and Na, K ion concentrations of few common, available and widely consumed soft drinks in India (Temp = 18° - 20°C)

No.	Brand Name	pH	TDS mg/lit	Salinity mg/lit	Conductance µS/cm	Na ⁺ mg/lit	K ⁺ mg/lit
1	RC Cola	2.50	730	508	1032	24	40
2	RC Q Orange	2.60	490	334	694	55	04
3	Sprite	3.34	335	224	483	117	05
4	7UP	3.38	452	308	602	152	00
5	Fanta	2.80	408	278	514	66	09
6	Mirinda	2.65	388	268	550	51	00
7	Pepsi	2.71	472	530	1010	35	38
8	Coca Cola	2.45	624	430	893	40	49
9	Coca Cola Zero	3.18	645	473	860	114	80
10	Diet Coke	2.77	795	555	1120	83	79
11	Diet Pepsi	3.18	613	422	865	108	49
12	Thums Up	2.45	826	572	1163	47	49
13	Limca	2.76	356	242	500	47	03
14	Appy Fizz	3.30	631	439	887	141	114
15	Appy	3.00	603	416	850	140	107
16	Maza	3.44	712	495	1004	135	155
17	Frooti	3.34	708	493	1001	146	154
18	Slice	3.10	582	402	820	45	161
19	RedBull	3.30	1140	757	1586	>200	03
20	Peach Coolada fruit Drink	3.00	552	380	777	30	140
21	Litchi Flavored Drink	3.18	455	312	640	110	38

Discussion

The energy value /100 ml soft drinks are listed in Table 1. Appy, Frooti and Slice provide maximum energy, while, Diet Coke, Diet Pepsi and Coca Cola Zero provide minimum energy to human body. Study of physico-chemical parameters shows that all the soft drinks and fruit drinks have pH value below 3.5, i.e., all are acidic in nature. Table 2 clearly shows that Coca Cola, Thums Up and RC Cola are most

acidic. Maza is the least acidic. Total dissolved solid (TDS) is maximum for Red Bull and least for Sprite. Conductance values suggests that RC Cola, Pepsi, Diet Coke, Thums Up, Maza, Frooti contain relatively high ion concentrations. Red Bull contains highest ion concentrations. Relatively low ion concentrations are found within Limca, Fanta and Sprite.

Sprite, 7UP, Fanta, Mirinda, Slice, Frooti, Maza, Appy, Appy Fizz, Peach Coolada fruit Drink, Limca, RC Q Orange and Litchi flavored drink does not

contain any caffeine. Some drinks contain caffeine, the stimulating agent used for refreshing body and specially mind. These drinks are Pepsi, Diet Pepsi, Coca Cola, Diet Coke, Coca Cola Zero, Thums Up, Red Bull and RC Cola. Some drinks contain original fruit parts, viz., slice contains 15% alfanso mango pulp, Frooti contain 19% mango pulp, Maza contain 19.5% mango pulp and Appy contain 14% apple juice. Appy Fizz contains 12.7% apple juice. Peach Coolada fruit drink contain mango pulp and peach bits. Sprite, 7UP, Coca Cola, Diet Coke, Coca Cola Zero, Thums Up, Fanta, Mirinda, Diet Pepsi, Pepsi, Red Bull, Limca, RC Q Orange, RC Cola and Litchi flavored drink contain no fruit.

Though Litchi flavored drink contain vitamin C 15 mg / 100 ml. still Red Bull is the only drinks which contain added vitamins. Every 100 ml Red Bull contain niacin 8 mg, pantothenic acid 2 mg, Vitamin B₆ 2 mg, Vitamin B₁₂ 2 mg, Vitamin B₂ 0.06 mg. Among these drinks Appy and Frooti, are the only drinks which contain no added preservatives.

According to the World Health Organization (WHO) drinks having TDS value less than 300 mg/liter may be considered as "excellent" where as drinks having TDS value between 300 mg/liter and 600 mg/liter may be considered as "good" for the health. Among these twenty one drinks only ten have TDS vales between 300 and 600 mg/lit. TDS value of Appy is 603 mg/lit.

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. Sweating during summer release huge sodium ions from the body fluid. Among the selected studied soft drinks, Red Bull contains maximum sodium ion concentrations. Appy Fizz, Appy, Maza, Frooti, 7UP, Sprite, Coca Cola Zero, Diet Pepsi and Litchi Flavored Drink contain relatively high sodium ion concentrations. The sodium ion concentration is less (i.e., below 50 mg/lit) within RC Cola, Peach Coolada Fruit drink, Pepsi Coca Cola, Slice, Thums Up and Limca.

Potassium ions prevent stroke, osteoporosis, kidney stone and hypertension. Relatively high potassium ion concentrations (i.e., above 100 mg/lit) are found within Maza, Slice, Frooti, Appy Fizz, Appy and Peach Coolada fruit drink. RC Q Orange, Sprite, Fanta, Limca and Red Bull contain very low potassium concentration. 7UP and Mirinda do not

contain any potassium ions. Patients suffering from kidney diseases, should not consume drinks containing high potassium concentrations, so, 7UP and Mirinda should be preferred.

Acknowledgement

C Nag thanks M Ray for guidance during Summer Project 2015 at NabadwipVidyasagar College.

References

1. DasA K, 2008, Bioinorganic Chemistry. Books and Allied (P) Ltd., India.
2. El-FakiA E and EisaE S, March 2010, Physico-chemical Characteristics of some soft Drinks of Sudan during Shelf Life, Journal of Science and Technology 11(2).
3. IS,1973, Indian Standard Specification for Carbonated beverages, No. 2346, Indian standards Institution, MankBhavan, New Delhi, India.
4. dahlL K, LeitIG and HeineM, 1972, Influence of Dietary Potassium and Sodium/Potassium molar ratio on the development of salt Hypertension, The Journal of Experimental Medicine.
5. AureliaO, CristianO, 2011, Testing of the hygienic quality of the carbonated soft drinks, Analele Universitatii din Oradea, Fascicula Protectia Mediului, Vol. XVII.
6. Carbonated drinks: Good hosts to bad health, 2011, Consumer voice.
7. Ashurst, P., 2009, Soft drink and fruit juice problems solved. Woodhead Publishing Limited.
8. Gibson, Sigrid, 2008, "Sugar-sweetened soft drinks and obesity: a systematic review of the evidence from observational studies and interventions". Nutrition Research Reviews.
9. Louis, J.C., 1980, The Cola Wars. Everest House.
10. Martin Hickman Caution, 2007, Some soft drinks may seriously harm your health, The Independent on Sunday.
11. Michael F Jacobson PhD, 2005, Liquid Candy: How Soft Drinks are Harming Americans' Health, Washington DC.
12. Mitchell, Alan J., 1990, Formulation and Production of Carbonated Soft Drinks.
13. Oliver, Thomas, 1986, The Real Coke. Random House.
14. Riley, John J. 1972, A History of the American Soft Drink Industry. Arno Press.

15. Tordoff, M.G.; AllevaAM., 1990, Effect of drinking soda sweetened with aspartame or high-fructose corn syrup on food intake and body weight, American Journal of Clinical Nutrition.
16. Vartanian, L.R.; Schwartz, M.B.; Brownell, K.D., 2007, Effects of soft drink consumption on nutrition and health: a systematic review and meta-analysis, American Journal of Public Health.
17. Wolff, E.; Dangsinger, M.L., 2008, Soft drinks and weight gain: How strong is the link? Medscape Journal of Medicine.

Indian Journal of Trauma and Emergency Pediatrics

Handsome offer for subscribers!!

Subscribe **Indian Journal of Trauma and Emergency Pediatrics** and get any one book or both books absolutely free worth Rs.400/-.

Offer and Subscription detail

Individual Subscriber

One year: Rs.1000/- (select any one book to receive absolutely free)

Life membership (valid for 10 years): Rs.5000/- (get both books absolutely free)

Books free for Subscribers of **Indian Journal of Trauma and Emergency Pediatrics**. Please select as per your interest. So, don't wait and order it now.

Please note the offer is valid till stock last.

CHILD INTELLIGENCE

By Dr. Rajesh Shukla

ISBN: 81-901846-1-X, Pb, vi+141 Pages

Rs.150/-, US\$50/-

Published by **World Information Syndicate**

PEDIATRICS COMPANION

By Dr. Rajesh Shukla

ISBN: 81-901846-0-1, Hb, VIII+392 Pages

Rs.250/-, US\$50

Published by **World Information Syndicate**

Order from

Red Flower Publication Pvt. Ltd.

48/41-42, DSIDC, Pocket-II, Mayur Vihar, Phase-I

Delhi - 110 091 (India)

Tel: 91-11-22754205, 45796900, Fax: 91-11-22754205

E-mail: redflowerppl@gmail.com, redflowerppl@vsnl.net

Website: www.rfppl.co.in