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Review Article

Comparison of low and high Sodium and Potassium content in ORS by Flame Emission Spectroscopy

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ABSTRACT

A study was carried out to determine the content of Na and K in two different brands of ORS powder by Flame photometric method. The Na content was found to be higher in Govt. supplied sample and K content was higher in the private sample. A study was conducted to compare sodium and potassium content in various ORS powder brands using Flame Photometry (Atomic Emission Spectroscopy), revealing variations in cation concentration compared to standard requirements. Results indicated that while most samples met specifications, some brands showed significant variance in sodium/potassium levels. Flame photometry proved to be a simple, quick, and accurate method for this quantitative analysis. Oral Rehydration Solution (ORS) is widely used for the treatment of dehydration caused by diarrhoea, cholera, and gastroenteritis. Sodium and potassium are the major electrolytes present in ORS and play an important role in maintaining fluid and electrolyte balance in the body. Accurate estimation of these ions is necessary because excess or deficiency may lead to complications such as hypernatremia, hyponatremia, hyperkalaemia. Flame Emission Spectroscopy (Flame Photometry) is a rapid, simple, and sensitive analytical technique commonly used for the determination of sodium and potassium in ORS formulations. This review paper compares low and high sodium-potassium content in various ORS formulations using flame emission spectroscopy and discusses the principle, methodology, advantages, and analytical significance of the technique. Studies reveal that flame photometry provides accurate and reliable estimation of electrolyte concentration in commercial ORS powders and solutions.

Keywords: ORS Powder, Flame photometry, Sodium, Potassium.**ARTICLE INFO:** Received 12 Dec.2025; Review Complete 21 Feb, 2026; Accepted 29 March. 2026; Available online 15 June. 2026**Cite this article as:**

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INTRODUCTION

Electrolytes are substances that become ions in solution and acquire the capacity to conduct electricity. The balance of the electrolytes in our body is essential for normal functioning of cells and organs. Sodium is the principal extracellular cation and potassium the principal intracellular cation. Sodium levels are directly related to the osmotic pressure of plasma and regulate the total amount of water in the body. Potassium plays an important role in regulation of the heart beat and function of muscles. Potassium together with sodium regulate water and acid-base balance in blood and tissue. In mammals, the maintenance of osmotic pressure and water distribution in various body fluid compartments is primary function of electrolytes like sodium and potassium. They also play a role in maintenance of pH in oxidation reduction reactions, in heart muscle functioning and as cofactors for enzymes.

Oral Rehydration Solution (ORS) is a scientifically formulated mixture of clean water, glucose, and essential electrolytes used to prevent and treat dehydration, particularly that caused by acute diarrheal diseases. It is considered one of the most important, simple, and life-saving medical interventions in modern public health.

Electrolyte

Oral Rehydration Solution (ORS), sodium and potassium are the two most critical electrolytes responsible for restoring fluid balance, maintaining cellular function, and correcting the physiological disturbances caused by dehydration, especially in diarrheal illnesses.

Flame Emission Spectroscopy

Flame Emission Spectroscopy (FES), also known as flame photometry, is an analytical technique widely used for the quantitative determination of alkali and alkaline earth metals, particularly sodium and potassium, in biological and

pharmaceutical samples such as Oral Rehydration Solution (ORS). The method is based on the principle that when metal salts are introduced into a flame, the thermal energy excites the electrons of the metal ions to higher energy levels. As these excited electrons return to their ground state, they emit light at characteristic wavelengths specific to each element. The intensity of this emitted radiation is directly proportional to the concentration of the element in the sample.

Material and Method

Instrument- LABMAN Flame Photometer used for evaluation of different ORS sample.

Chemicals- Sodium chloride, Potassium chloride, ORS powder Two different brands of ORS sachets (CIPLA and Wockhardt WOLYTE-EL ORS) were purchased and analysed for their Sodium and Potassium content.

ORS Sample 1- CIPLA (Oral Rehydration Salts, I.P):

- 21 gm Composition: Sodium chloride- 2.6 gm,
- Potassium chloride- 1.5 gm,
- Sodium citrate- 2.9 gm,
- Dextrose- 13.5 gm,
- Excipient- q.s

ORS Sample 2- Wockhardt WOLYTE-EL(Oral Rehydration Salts, I.P):

- 21 gm Composition: Sodium chloride- 2.6 gm,
- Potassium chloride- 1.5 gm,

- Sodium citrate- 2.9 gm,
- Anhydrous Dextrose- 13.5 gm,
- Excipient- q.s

Preparation of sample ORS solution for analysing Sodium- 1 gm of ORS powder was dissolved in 1000 ml of distilled water to prepare for 10,20,40,60,80 PPM of Sodium.

Preparation of sample ORS solution for analysing Potassium - 1 gm of ORS powder was dissolved in 1000 ml of double distilled water to prepare for 10,20,40,60,80 PPM of Potassium.

For making 10 PPM add 1 ml of sample ORS solution and 9 ml Distilled water, for 20 PPM add 2 ml of sample ORS solution and 8 ml Distilled water, for 40 PPM add 4 ml sample ORS solution and 6 ml Distilled water, for 80 PPM add 8 ml sample ORS solution and 2 ml Distilled water.

EXPERIMENTAL DATA

Table 1: Absorption for Sodium Sample-1 (CIPLA-Oral Rehydration Salts, I.P)

S.No	Concentration	Flame Intensity
1	10 PPM	18
2	20 PPM	21
3	40 PPM	25
4	60 PPM	32
5	80 PPM	42

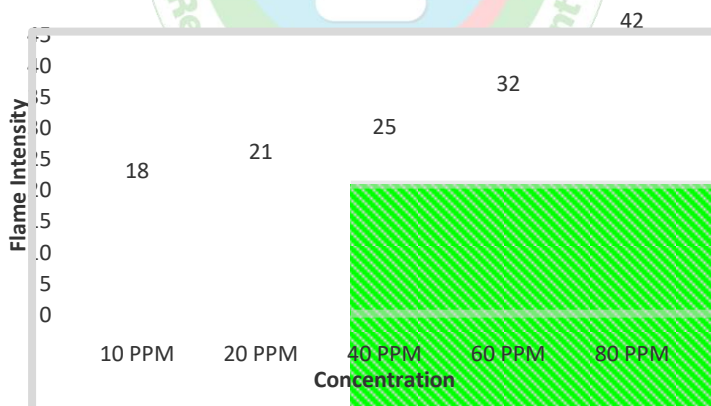


Figure 1: Standard Curve for Sodium absorption

Table 2 Absorption for Potassium Sample-1 (CIPLA-Oral Rehydration Salts, I.P)

S. No	Concentration	Flame Intensity
1	10 PPM	7
2	20 PPM	18
3	40 PPM	32
4	60 PPM	56
5	80 PPM	82

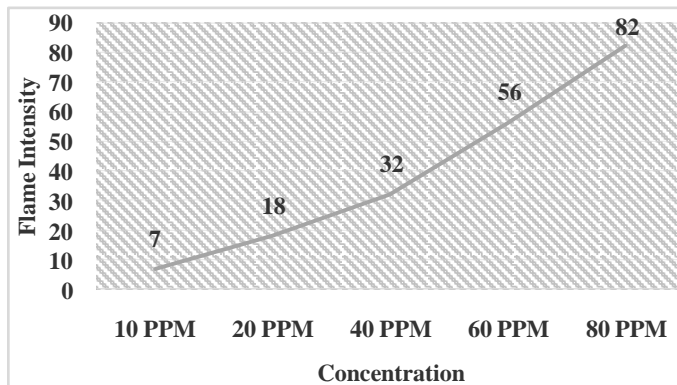


Figure 2: Standard Curve for Potassium absorption

Table 3: Absorption for Sodium Sample-2 (Wockhardt WOLYTE-EL-Oral Rehydration Salts, I.P)

S.No	Concentration	Flame Intensity
1	10 PPM	8
2	20 PPM	18
3	40 PPM	48
4	60 PPM	62
5	80 PPM	86

Standard Curve for Sodium

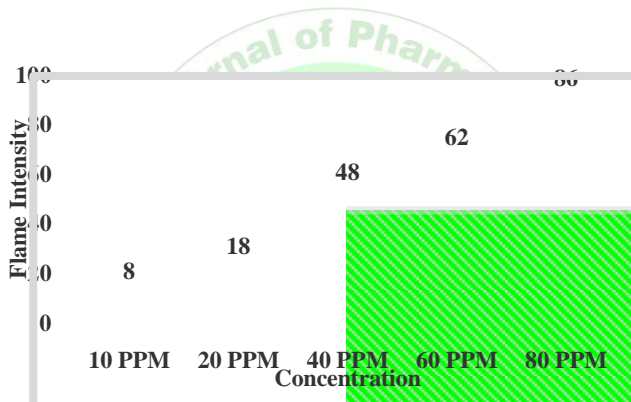


Figure 3: Standard Curve for Sodium absorption

Table 4: Absorption for Potassium Sample-2 (Wockhardt WOLYTE-EL-Oral Rehydration Salts, I.P)

S.No	Concentration	Flame Intensity
1	10 PPM	22
2	20 PPM	46
3	40 PPM	98
4	60 PPM	146
5	80 PPM	195

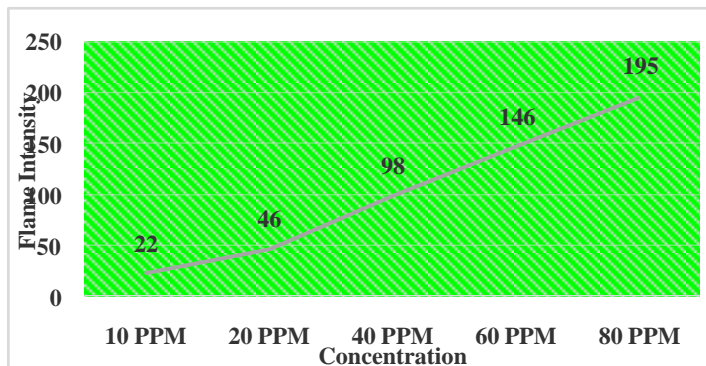


Figure 4: Standard Curve for Potassium

RESULT AND DISCUSSION

Flame emission spectroscopy was used to compare the sodium and potassium contents of two Oral Rehydration Salt (ORS) formulations:

Sample 1- CIPLA ORS

Sample 2- Wockhardt WOLYTE-EL ORS

The flame intensities obtained at different standard concentrations are summarized below.

Table: 5 Comparative Absorption for Sodium in Sample-1 & 2

S. no.	Concentration	CIPLA intensity	Wockhardt Intensity
1	10	18	8
2	20	21	18
3	40	25	48
4	60	32	62
5	80	42	86

It observed that at lower concentration (10–20 ppm), Sample 1 showed slightly higher or comparable intensity.

However, from **40 ppm onward**, Wockhardt showed significantly higher flame intensity than Sample 1.

At 80 ppm:86>42

This indicates that Sample 2 contains higher sodium content / stronger sodium emission responsethan Sample 1.

Table: 5 Comparative Absorption for Potassium in Sample-1 & 2

S. no.	Concentration	CIPLA intensity	Wockhardt Intensity
1	10	7	22
2	20	18	46
3	40	32	98
4	60	56	146
5	80	82	195

Finally it observed for potassium, Sample 2 showed much higher intensity at every concentration level.

At 80 ppm:195>82

This clearly suggests that potassium emission is considerably higher in Sample 2 ORS compared to Sample 1 ORS.

DISCUSSION

The present study compared sodium and potassium contents in two commercially available ORS formulations using flame emission spectroscopy.

The intensity of emitted light is directly proportional to the concentration of metal ions present in the sample. Therefore, higher flame intensity indicates higher concentration of sodium or potassium ions.

CONCLUSION

The present study successfully compared the sodium and potassium contents of two commercially available Oral Rehydration Salt (ORS) formulations, Sample-1 **CIPLA ORS** and Sample-2 **Wockhardt WOLYTE-EL ORS**, using **Flame Emission Spectroscopy**.

For sodium, the flame intensity of Wockhardt increased from **8 to 86**, whereas CIPLA increased from **18 to 42** over the tested concentration range. Similarly, for potassium,

Wockhardt showed a marked rise from **22 to 195**, compared with **7 to 82** for CIPLA.

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