Flame Photometric Estimation of Sodium and Potassium Ion Present In Water Sample of Darna and Godavari River.

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ABSTRACT: Flame Photometry also known as flame atomic emission spectrometry is a branch of analytical science that examined the species in form of atom, mostly it works on principle of ionization of alkali metal salt drawn into a non-luminous flame. Alkali metal salt absorb energy from flame and emit the light of characteristic wavelength which is observed by change in intensity of color, the energy absorb was enough to vaporize alkali metal salt. In present article the comparative studies on sodium and potassium content present in water sample collected from Darna and Godavari (Nashik) River were calculated.

Key Word: Flame photometry, Alkali metal salt, Sodium, Potassium.

INTRODUCTION:

In 1860's the Kirchhoff and Bunsen studied possibility characteristic radiation emitted by atoms excited in flames for quantitative analysis. And then the instrument was developed for the quantitative analysis of Sodium, a reproducible method of introducing a sample into a flame and to then find a convenient technique to measure the emission of intensity. in the 1920's Lundegardh largely overcame these difficulties by introducing a nebulizer that enabled the sample to be presented to the air/acetylene flame in aerosol form. The emission was dispersed by a quartz prism spectrograph and recorded photographically. Precision was typically 5 – 10% Greater convenience resulted from the introduction of simple colored filters for wavelength selection, together with photocell/galvanometer combinations for measuring intensities directly. As a result simple and inexpensive instruments of this type using air/coal gas or air/acetylene flames became widely available from the late 1940's for the determination of Sodium, Potassium, Lithium and Calcium.

Work on many other elements then became possible with the use of grating spectrometers equipped with photo multiplier detectors through to the development of atomic absorption in the late 1960's, which restricted the use of flame emission. (BWB technology) Essentially, a flame

photometer is a device which atomizes a sample solution into a flame, isolates the characteristic spectral emission of an element, and detects and measures this emission. The new atomizer burner units on the market can safely spray the most flammable samples, even gasoline, into the flame. In inorganic mixtures, atoms and molecules are excited by application of energy in the form of heat or electricity. Low temperature excitation can best be obtained by a flame, producing temperatures from 1000 to 3000 deg C. Because of the low temperature of the flame in comparison to the arc and spark emission sources, it excites only the alkali metals (sodium, potassium, etc.), the lower states of the alkaline earths (calcium, magnesium, barium, etc.) and, to a lesser extent, other elements. This is an advantage when it is desired to detect these substances in the presence of a large amount of material of higher excitation potential, atomic spectroscopy viz atomic absorption spectrophotometry and inductively coupled plasma-atomic emission spectrometry (ICP-AES), a relatively new and very expensive technique. In all cases the atoms are excited by light, the absorbances of light due to the electrons going to a higher energy level are measured.

CHARACTERISTIC WAVELENGTHS OF THE ELEMENTS

It is common knowledge that when Sodium is introduced into a flame it emits a radiation in the yellow region of the visible spectrum. Table 1 gives details of the measurable atomic flame emissions of the alkali and alkaline earth metals in terms of the emission wavelength and the colours produced.

Table 1. Details of the measurable atomic flame emissions of the alkali and alkaline earth metals in terms of the emission wavelength and the colours produced.

Element	Emission wavelength (nm)	Flame color
Potassium (K)	766	Violet
Lithium (Li)	670	Red (Carmine)
Calcium (Ca)	622**	Orange
Sodium (Na)	589	Yellow
Barium (Ba)	515*	Lime Green

** Barium is measured at 515nm to avoid interference with the Ca band at 554nm.*

*** Calcium is measured by using the Calcium hydroxide band emission at 622nm. However, the main atomic emission occurs at 423 nm.*

STUDY AREA:

In the present article the sample from the river Godavari which is the main source of water supply for Nasik city and all along the banks of river venue were collected. The pesticides and chemical fertilizers used on agricultural fields are usually washed away into the river which contains traces of impurity; these activities are responsible for deterioration of water quality of the river. So with the help of flame photometers we are trying to find out the limits of various inorganic ions in water specifically sodium and potassium which are the major cation and anion of the extracellular and intracellular fluid in body.

MATERIAL AND METHODS:

Material: Sodium Chloride (AR), Potassium Chloride (AR), Distilled water, Water sample collected from Darna and Godavari River.

Instrument: Equiptronics-EQ-850A/855A manufacture by- Equiptronics India pvt.ltd.

Apparatus: Volumetric flasks, beaker, Glass rod.

Preparation of standard solution:

As per Indian standard Institution the solution was prepared as follow.

An analytical reagent quality sodium chloride (NaCl) is weigh about 2.542 gm and transfers it into 1 liter volumetric flask through a funnel. Simultaneously weigh 1.909 gm of analytical reagent quality of potassium chloride (KCl) and transfer it into the same volumetric flask through the same funnel. Add double distilled water to the flask, dissolved the crystals and make up the solution to the mark with double distilled water. The stock standard solution contains 1000 ppm/1000 ppm of sodium and potassium. From this stock standard solution 100, 80, 60, 40, 20 ppm solution of lower concentration was prepared. Aspirate Distilled Water and set the read out 00 by adjusting the zero control. Aspirate the standard solution that has higher concentration adjust the nobe to 100. For optimum performance the instrument should be allow 15 min to warm up during this warm up period a blank demonized water sample should be aspirated. Emissions were noted for all standard solution. Lastly water sample solutions were aspirated and emission was noted.

Procedure:

The procedure for practical was carried out as per the SOP (Standard Operating Procedure) provided in manual of Equiptronics. The SOP was as follow.

1. Ensure that the compressor unit, LPG pipe are properly connected and secured.
2. Switch ON the main unit and compressor unit.
3. Adjust the air regulator knob to achieve a reading between 0.4-0.6.
4. Open the regulator valve from LPG cylinder.
5. Open the Fuel control valve from main unit.
6. Insert the igniter on the burner and ignite the flame. If the flame is not ignited within few attempt increase the fuel flow gradually once the flame is ignited it will be yellow non-oxidizing flame. Slowly reduce the flame so as to get a blue oxidizing flame. Allow the flame to stabilize for 5 min.
7. Take distilled water in the beaker and insert the capillary aspirator insert the required filter.
8. Adjust the zero control to '00' on display. Remove the distilled water and place the beaker containing the repaired sample of known concentration and select appropriate filter.
9. Allow the flame to stabilize for 1-2 min.
10. Adjust the calibration knob to adjust the value of the standard on display.
11. Repeat the operation as given in 8 & 10 above.
12. On pressing freeze switch the reading will be averaged and stored.
13. Remember to aspirate with distilled water between two readings to flush out earlier content.'
14. At the end of the experiment shut 'OFF' the fuel valve first when the flame is extinguished close the air valve and shut down the main unit and compressor unit.

RESULT AND DISCUSSION:

The concentration of sodium and potassium present in water sample collected from river was compare against standard solution (concentration in ppm) of sodium and potassium. Table 2 Graph was plotted on Y axis (Intensity of emission) verses X-axis (concentration in ppm).

(Figure 1 and 2) The concentration of sodium and potassium ions present in Godavari and Darna (Sample A & B) river is 26 ppm and 08 ppm and 58 ppm and 14 ppm respectively. Concentration of sodium present in the water sample is more than potassium.

Table 2. Emission for Na^+ and K^+ with respective concentration and unknown sample.

Sr. No.	Concentration in ppm	Emission for Na^+	Emission for K^+
1	20	24	26
2	40	36	42
3	60	58	61
4	80	78	80
5	100	100	100
6	Sample- A	58	14
7	Sample-B	26	08

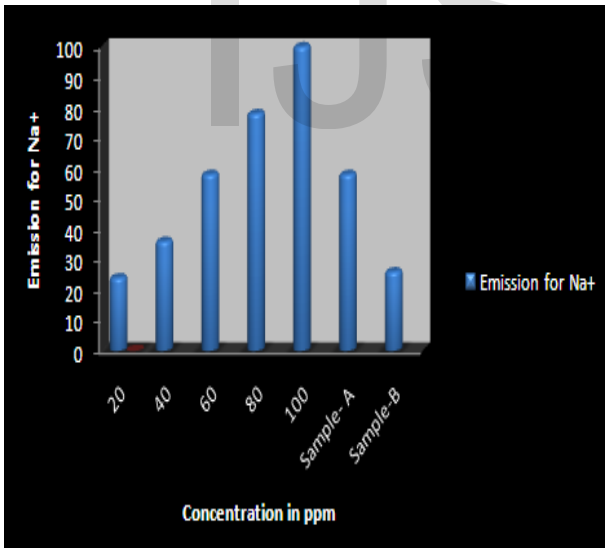

Figure 1. Concentration of Sodium ions

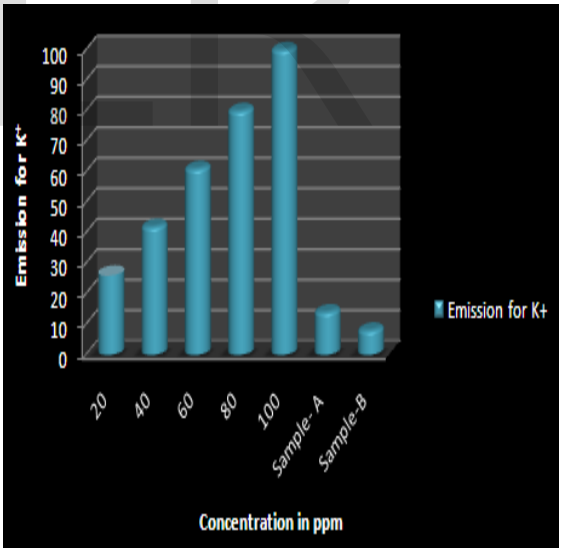

Figure 2. Concentration of Potassium ion

CONCLUSION:

The conservation of river is in the interest of man as it's ecological, cultural and tourist value is immense. This study will help in understanding the amount of element being received in the river and its biological magnification in animals, particularly those at the lower level of food chain.

This study will also help to make aware those local people or adjacent farmers for proper management of waste disposal and also to minimize use of synthetic inputs. The study indicated that increase in toxic waste day by day in river produced biological magnification in food chain, which is a challenge to scientists, policy makers, administrators and all those involved in the conservation of the environment.

CONFLICT OF INTERESTS

The author has not declared any conflict of interests.

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