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Study of Sodium, Potassium and Fluoride elements present in water sample collected from Shivana River.

Pravin Chavan^{1*}, Megha Rai², and Shivaji Jadhav².

¹Department of Chemistry, M.T.E.S. DoshiVakil Arts & G.C.U.B. Science & Commerce College, Goregaon- Raigad(M.S.) India.

²Department of Chemistry, Dr. RafiqZakaria College for Woman, Navkhanda, Jublee Park, Aurangabad (MS)

ABSTRACT

Sodium and Potassium metal salts present in water absorb energy from flame and emit the light of characteristic wavelength. This is observed by change in intensity of color. Here the energy absorbed was enough to vaporize alkali metal salt. In our study, determination of sodium and potassium in Shivana river water sample was analyzed by calibration curve method using flame photometer. Physical and chemical parameters like temperature, pH and fluoride content in same water sample were also as well as determined. Fluoride ion is measured by color comparator.

Keywords: Water quality, River water, fluoride, Sodium, Potassium, Fluoride kit and Flame photometry.

**Corresponding author*

INTRODUCTION

In India, river water is mainly used for domestic purposes like agriculture, drinking, washing, bathing, cooking etc. hence, now a day, the concentration of water parameters balance is very essential. In agriculture field, balance of elemental concentration is very important as it contributes to the health of the plants. Therefore, river water analysis is one of the important concerns. Aiming this we have determined Shivana river water content concentrating sodium and potassium metals by flame photometry using calibration curve method.[1-2]

Fluoride content in the domestic usable water is one of the major issues to human being. The over limit ($> 1.5\text{mg/l}$) of fluoride in human body to a prolonged period from drinking water, causes damage to enamel of the teeth and eventually results in skeletal complications. Thus leading to fluorosis.[3-4] Further studies contradict this as low concentration of fluoride in drinking water have been considered beneficial to prevent dental carries .[5-6]

Fluoride stimulates growth of many plant species but its excessive amount may prove toxic to plant and getting feeded by such plant vegetables may impose toxicity to human by initiating fluorosis.[7-9] Fluorosis is one of the worldwide problem not only India, but also in 20 developing countries like Argentina, U.S.A., Algeria, Libya, Turkey, Iran, China, Australia, south Africa, Kenya, Iraq, Srilanka, Canada, Thailand, New Zealand, Japan etc.[10-11] Hence, we have reported that Shivana river water contains fluoride ion by easy and conventional method.

Study area

Shivana River flows from south-western slope of Ajanta hill, Talkidamp, Lasurgaon and finally meets Godhavari River.

The study area was Lasurgaon district- Aurangabad of Maharashtra. Lasurgaon is 40 km from district- Aurangabad. The District Head Quarter IS Aurangabad. The Latitude of Aurangabad: 19.8762° N and The Longitude of Aurangabad: 75.3433° E. River is the source of water, used for domestic purposes. The lithology is also responsible for the quality of river water.

Purposefully water was collected from the belt area of upper and lower parts of Lasurgaon District Aurangabad. The Water collected from upper and lower parts were designated as upstream as (US) and downstream as (DS).

Sample Collection

Water samples were taken from Shivana River. Sterile half litre polythene bottles were used for sample collection. Samples were collected directly without using any preservatives, from two said sites as Upstream as(US) and Downstream as (DS) of river. Later the water samples were transported to the laboratory, where Water quality parameter was performed immediately. This analysis was carried out in the months of August 2017.

MATERIAL AND METHOD

Instruments & Chemicals

Sodium Chloride (AR), Potassium Chloride (AR), Distilled water, Flame photometer-Equiptronics-EQ-855A SR.NO.091014(Figure 1).

Fluorides colour comparator: It contains a colour comparator, which has five numbers colour slots of colour, ranging from Red to yellow corresponding to the fluorides content in the water sample(Prerana Laboratory), Micro thermometer, digital pH meter.

Apparatus: Volumetric flasks, beaker, Glass rod.

Preparation of standard solution

Standard solution- sodium chloride (NaCl) and potassium chloride was individually prepared (weigh 2.542 gm) and (weigh 1.909 gm) in one liter volumetric flask and dilute up to mark by double distilled water. The stock standard solution contains 1000 ppm of sodium and potassium. From this stock standard solution 20, 40, 60, 80, 100 ppm solution of lower concentration was prepared.

Procedure- (Calibration curve method)

1. Start the instrument and ignite the flame, slowly reduce the flame yellow to blue oxidizing flame and allow the flame to stabilize for 5 min.
2. Take distilled water in the beaker and insert the capillary aspirator. Insert the required filter.
3. Adjust the zero control to '00' on display. Remove the distilled water and place the beaker containing the repaired sample of known concentration 20, 40, 60, 80, 100 ppm and select appropriate filter.
4. Allow the flame to stabilize for 1-2 min and measure the known concentration sample reading.
5. Finally, to take the unknown concentration samples reading (table-1).

Matching the colour for fluoride analysis

Take 3 cm³ sample in a test bottle, then add 8 to 10 drop of Fluoride test reagent, shake well and place the test bottle contain water sample with Fluoride test reagent in comparator. Hold the comparator against light, placing it between source of daylight and the observer, at his eye level. Match the colour of test water with six numbers colour slots provided for fluorides contents colour on comparator corresponding to 0.0, 0.5, 1.0, 1.5, 2.0 and 2.5 ppm level as shown in then record reading one by one (Figure 2).

The temperature and pH value of water sample was measured by micro thermometer under investigation and digital pH meter. The pH meter was standardized using buffer of pH 4.0 and pH 9.2.

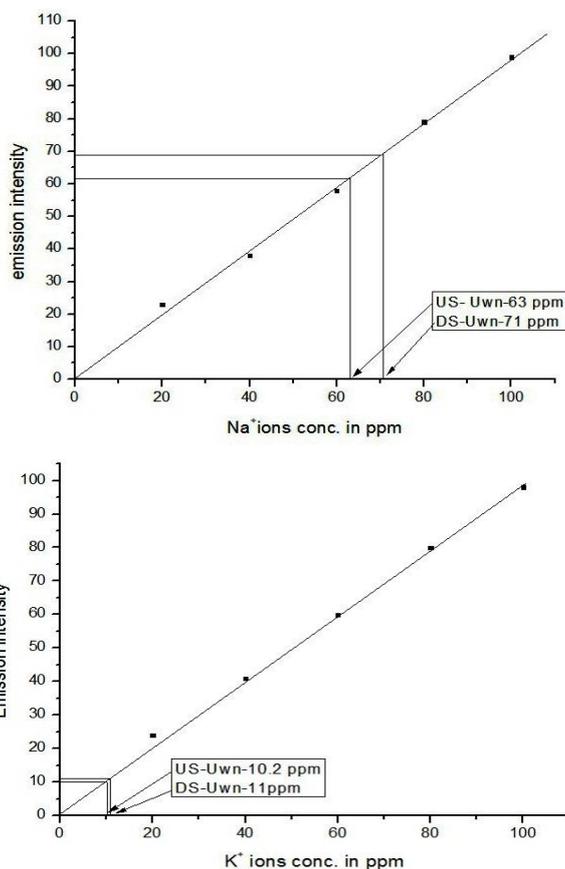


Figure 1: Flame photometer.

Figure 2: Determination of fluoride in water by using kit.

Table1: Emission for Na⁺ and K⁺ of standard and unknown samples.

Sr. No.	Concentration in ppm	Emission of Na ⁺	Emission of K ⁺
1	20	23	24
2	40	38	41
3	60	58	60
4	80	79	80
5	100	99	98
6	Upstream unknown	62	10
7	Downstream unknown	69	11



Graph 1 and 2: Unknown samples concentration in ppm.

RESULTS AND DISCUSSION

The concentration of sodium and potassium present in water sample collected from upstream and Downstream of Lasurgaon Shivana River was compared against standard solution (ppm) of sodium and potassium. The graph was plotted on Y axis (Intensity of emission) vs X-axis (concentration in ppm) (Graph 1 and 2).

The concentration of sodium and potassium ions present in upstream river site is 63 ppm and 10.2 ppm while in downstream river site is 71 ppm and 11 ppm respectively (Graph 1 and 2). Thus concentration of sodium present in the water sample is more than potassium. In Upstream river water sample both metals measure less than downstream Shivana river water sample (Table-1). pH of upstream water sample is 6.5 and downstream water sample is 6.7.

Table 2: Water samples contain fluoride.

SR. No.	Sample	pH	Temperature (°C)	Fluoride in ppm
1	Upstream	6.5	24	0.6
2	Downstream	6.7	25	0.6

The concentration of fluoride is 0.6 ppm in both upstream and downstream Shivana water samples (table-2). Upstream and downstream Shivana river water sample temperature is 24°C and 25°C.

CONCLUSION

In conclusion, we reported Sodium and Potassium (concentration in ppm) content of Shivana River water by Flame emission photometry.

The significance of fluoride in water has always been subject of debate. Whereas an intake fluoride is less quantity (less than 1.5 ppm) is known to be beneficial for human health in preventing dental caries high fluoride concentration in water causes dental and skeletal fluorosis, In this method determination of fluoride content was highlighted.

According to above results, we convey that Shivana River water is good for domestic purposes.

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