

A study on the presence of Oxalate ions in Psidium Guajava
and Manilkara Zapota fruits

MATERIALS AND METHODS

3.1 Objectives

- i) To study the oxalate content in Guava fruit and Sapota fruit
- ii) To compare the oxalate content of different days ripened Guava and Sapota fruit.

3.2 Materials and Methods

3.2.1 Chemicals required

Dilute H_2SO_4 , N/20 KMnO_4 Solution.

3.2.2 Apparatus Required

100 ml measuring flask, pestle and mortar beaker. Filtration flask, funnel, burette, pipette, filter paper.

3.2.3 Materials Required

Pulp of guava and sapota fruits at different stage of ripening, 0.005N KMnO_4 and dil. H_2SO_4

3.3 Methodology

3.3.1 Procedure

The first step is to standardize KMnO_4 . In order to standardize the N/20 KMnO_4 solution we prepare 0.05N oxalic acid.

3.3.2 Preparation of standard oxalic acid:

Weight accurately about 1.2g of oxalic acid and make up into 200ml standard flask using distilled water.

3.3.3 Standardization of KMnO_4

(Standard oxalic acid & KMnO_4)

Fill up the burette with potassium permanganate solution after washing and rinsing the burette. Pipette out 20ml of standard oxalic acid solution in to a clean conical flask. Add an equal volume of dilute sulphuric acid and heat the mixture at 60°C . Titrate against potassium permanganate solution. The end point is the appearance of permanent pale pink colour. Repeat the titration to get concordant value and calculate the normality of potassium permanganate solution.

3.3.4 Standardization of free oxalate ion present in the given fruit pulps

Procedure

Oxalate ions are extracted from the fruit by boiling pulp with dil. H_2SO_4 . Then oxalate ion is estimated volumetric by titrating the solution with standard KMnO_4 solution.

Weight 50.0 gm of fresh guava and crush is to a fine pulp using pestle motor. Transfer the crushed pulp to a beaker and add about 50ml dil. H_2SO_4 to it. Boil the content for about 10min. Cool and filter the content up to 100 ml measuring flask make the volume up to 100 ml by adding distilled water. Pipette out 10ml of this solution into the other 100ml standard measuring flask. Take in to a titration flask and add 20ml of dil. H_2SO_4 acid to it. Heat the mixture to about 60°C and titrate it against N/20 KMnO_4 solution taken in a burette. The end point in appearance of permanent pale pink colour. Repeat the above experiment) with 50.0 gm of 1, 2, 3 and 4 days old guava fruit.

3.4 CALCULATION

1. Calculation of strength of oxalic acid = 63

Equivalent weight of oxalic acid = 63

$$\begin{aligned} \text{Normality of oxalic Acid} &= \frac{\text{Weight/liter}}{\text{Equivalent weight}} \\ &= \frac{0.79 \times 4}{63} \end{aligned}$$

$$\text{Normality of Oxalic acid} = 0.0501\text{N}$$

2. Calculation of strength of KMnO_4

$$\text{Volume of oxalic acid } V_1 = 20\text{ml}$$

$$\text{Strength of oxalic acid } N_1 = 0.0501\text{ N}$$

$$\text{Volume of } \text{KMnO}_4 \text{ } V_2 = 19.8\text{ml}$$

$$\text{Normality of } \text{KMnO}_4 \text{ } N_2 = ?$$

$$V_1 N_1 = V_2 N_2$$

$$N_2 = \frac{V_1 N_1}{V_2}$$

$$= \frac{20 \times 0.0501}{19.8}$$

$$\text{Normality of } \text{KMnO}_4 \text{ (} N_2 \text{)} = 0.0506\text{ N}$$

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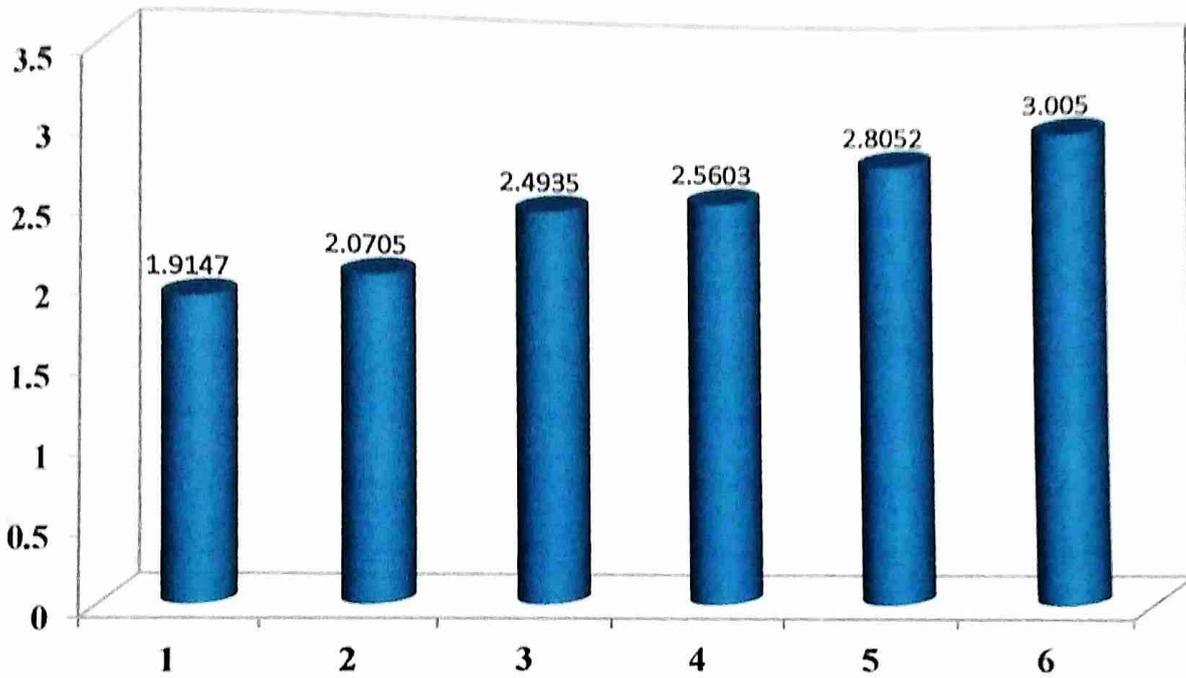



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The oxalate content of guava and sapota fruits at different stages of ripening were found out by permanganometric method. The result is given below:

Chart 4.1

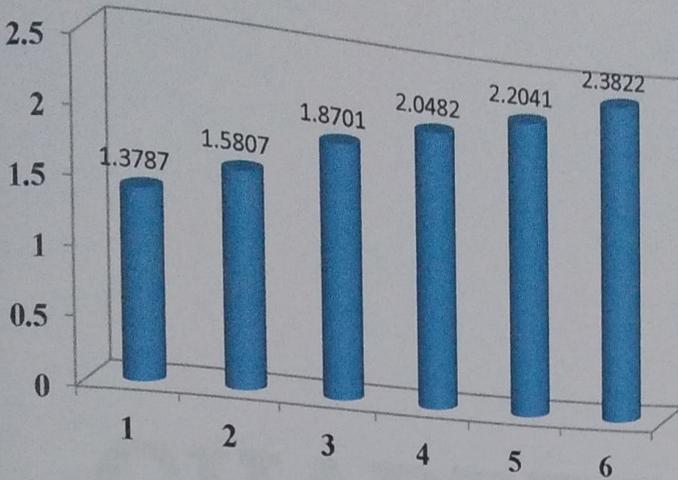
Chart representing the changes in oxalate content of guava fruit during ripening



1. Fresh guava
2. First day guava
3. Second day guava
4. Third day guava
5. Fourth day guava
6. Fifth day guava

Chart 4.2

Chart representing the changes in oxalate content of s fruit during ripening



1. Fresh sapota
2. First day sapota
3. Second day sapota
4. Third day sapota
5. Fourth day sapota
6. Fifth day sapota

From the above table it was found that the amount of oxalate content varies with ripening of fruits. Among the five days of guava and sapota fruits, fruits had minimum oxalate content. As days went on during ripening the oxalate content increased progressive and had the maximum oxalate content in the fully ripe fruit.

CONCLUSION

This project centered upon estimating the amount of oxalate present in the sapota and guava fruits during ripening. The oxalate content was on the increase in both the fruits and the days passed in that is as the ripening proceeded. It should be noted that the increase in oxalate content was more in sapota than in guava. The presence of oxalate is injurious to health.

Oxalate rich foods are usually restricted to some degree, particularly in patients with high urinary oxalate level. Guava and sapota fruit have the highest percentage of vitamin C among citrus fruits. It also contains oxalate amount of which varies with ripening of the fruit. During ripening of guava and sapota fruit; the oxalate content increases progressively and the fully ripe has the maximum oxalate content.

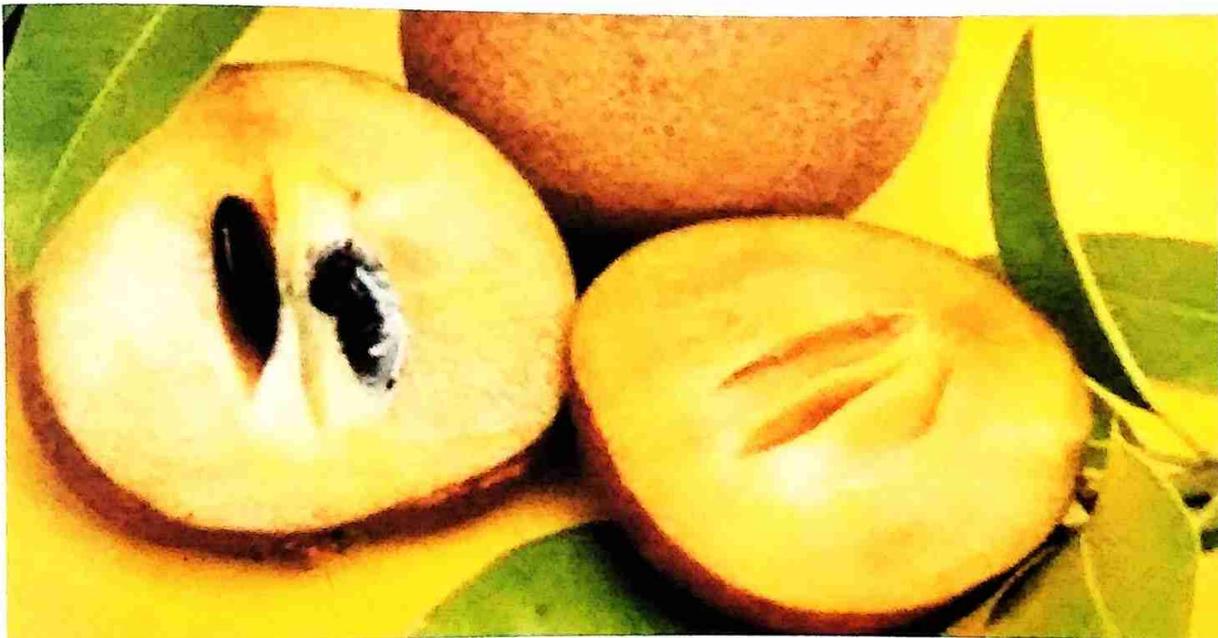
Oxalate from an insoluble complex with calcium in the urine, or hyper-oxaluria, is even more important to stone formation than high levels of calcium or hypercalciuria. Excessive intake of food and drink containing oxalate leads to calcium oxalate stone. Also, excessive intake of vitamin C which metabolized to oxalate may lead to hypercalciuria and an increase in stone formation. Pain medication can be prescribed for symptom relief. Surgical techniques have also been developed to remove kidney stones.

Rather having to undergo treatment it is best to avoid kidney stone in the first place. Avoid calcium rich foods and drink more water. Water helps to away that from stones in the kidneys.

PSIDIUM GUAJAVA FRUIT



MANILKARA ZAPOTA FRUIT



Analysis of water parameter in Thamiraparani River in
Kanayakumari District

MATERIALS AND METHODS

3.1. Water Analysis

Sampling of water for analysis

The water samples are were collected in the polythene double Stoppard bottles which were cleaned previously with acid and de-ionized water. (NEERI,1986). The physio chemical characteristic was analysed as per standard method (APHA, 1975).

Water samples for a period of 3 months from December 2019 to February 2020 were collected. Sampling was done during afternoon hours between 12 PM and 3 PM.

Precautions to be taken during analysis

After the collection of the sample, it is important to note that the shorter the interval between the collection and analysis of a sample more reliable will be the analytical data. First of all, the pH of the sample is found out followed by electrical conductivity. To take individual aliquot for each analysis, the bottle was shaken well and then pipetted out the required volume of the sample. Generally, constituents which are more susceptible for change are determined first. The pH of the sample their relative position of acidity or alkalinity components are related to gas content of the sample. Filtration may affect the gas content. So, the pH of the unfiltered raw samples was determined immediately after the bottle is uncapped.

The loss of carbon dioxide from water converts the bicarbonates into carbonate. Precipitation of calcium carbonate from the sample affects the pH, electrical conductivity

should be estimated immediately after the measurement of pH. The electrical conductivity gives an indication of total ionic concentration of the sample. Keeping in view of these points, the following tests were conducted.

3.2. EXPERIMENTAL METHODOLOGY

3.2.1. Determination of Temperature

Water temperature is measured using a graduated 110° C mercury thermometer.

Temperature reading was taken as soon as samples were collected.

3.2.2. Determination of pH

20 ml of the water was pipetted out into a 100 ml beaker. 40 ml of distilled water was added, stirred well the glass rod and allowed to stand for 30 minutes with intermittent stirring. The pH meter was adjusted with the buffer solution. The electrodes were washed with a jet of water and carefully wiped dry with a piece of filter paper. The electrodes were immersed in the beaker containing water and the function switch changed to the particular pH range (0-7 or 7-14). The pH meter reading directly indicated pH value of the sample.

3.2.3. Determination of Electrical conductivity

The instrument used is called conductivity bridge which operates under the principle of wheat stone bridge employing the cathode ray tube as null indicator. The bridge scale was calibrated before finding out the electrical conductivity of the samples. The electrode was washed with 10% nitric acid then with distilled water. The conductivity cell was carefully wiped with a filter paper strip. It was then immersed into the test sample and the EC values read, recorded and reported in $\mu\text{mhos/cm}$ at 25° C to the nearest 0.01 unit.

Conductivity = meter reading (conductance) X cell constant

3.2.4. Determination of TDS.

TDS stands for total dissolved solids. Take 100ml of sample in a pre-weighed evaporating dish. Dry over a water bath. Keep it at 180⁰C for one hour. Cool in a desiccator. Take the final weight.

TDS (mg/liter) = $\frac{\text{final weight of sample} - \text{initial weight of the sample}}{\text{Sample volume}} \times 1000$

Sample volume

3.2.5. Determination of hardness by EDTA method.

- Take 25 or 50 ml of well mixed sample in a conical flask.
- Add a pinch of Eriochrome Black T and titrate with standard EDTA (0.01 M) till wine red colour changes to blue, then note down the volume of EDTA required(A).
- Run a reagent blank. Note the volume of EDTA(B).
- Calculate volume of EDTA required by sample, C = A – B (from volume of EDTA required in the above steps)

Total hardness as CaCO₃(mg/l) = $\frac{C \times D \times 1000}{\text{Volume of sample in ml}}$

Volume of sample in ml

Where,

C = volume of EDTA required by sample (with EBT indicator)

D = mg CaCO₃ equivalent to 1 ml EDTA titrant (1 ml 0.01 M EDTA)

3.2.6. Determination of calcium by EDTA method.

- Take 25 or 50 ml of sample water in a conical flask.
- Add 1 ml NaOH to raise pH to 12.0 and a pinch of moroxide indicator.
- Titrate immediately with EDTA till pink colour changed to purple. Note the volume of EDTA used (A).
- Run a reagent blank. Note the ml of EDTA required (B) and keep it aside to compare of sample titrations.
- Calculate the volume of EDTA required by sample, $C = A - B$

Calcium hardness as CaCO_3 (mg/l) = $\frac{C \times D \times 1000}{\text{Volume of sample in ml}}$

Volume of sample in ml

3.2.7. Determination of magnesium by EDTA method.

Magnesium hardness = Total hardness as CaCO_3 (mg/l) – Calcium hardness as CaCO_3 (mg/l).





MATERIALS AND METHODS

3.1. Water Analysis

Sampling of water for analysis

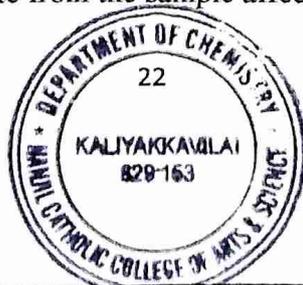
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4.1. Temperature

Table 4.1

variation of temperature between December 2019 to February 2020

Station	S1	S2	S3	S4	S5	S6
December	27.5	30	31	30.5	32.5	28.5
January	29	30	32.5	30	31	30
February	29	31	32	30	32	32

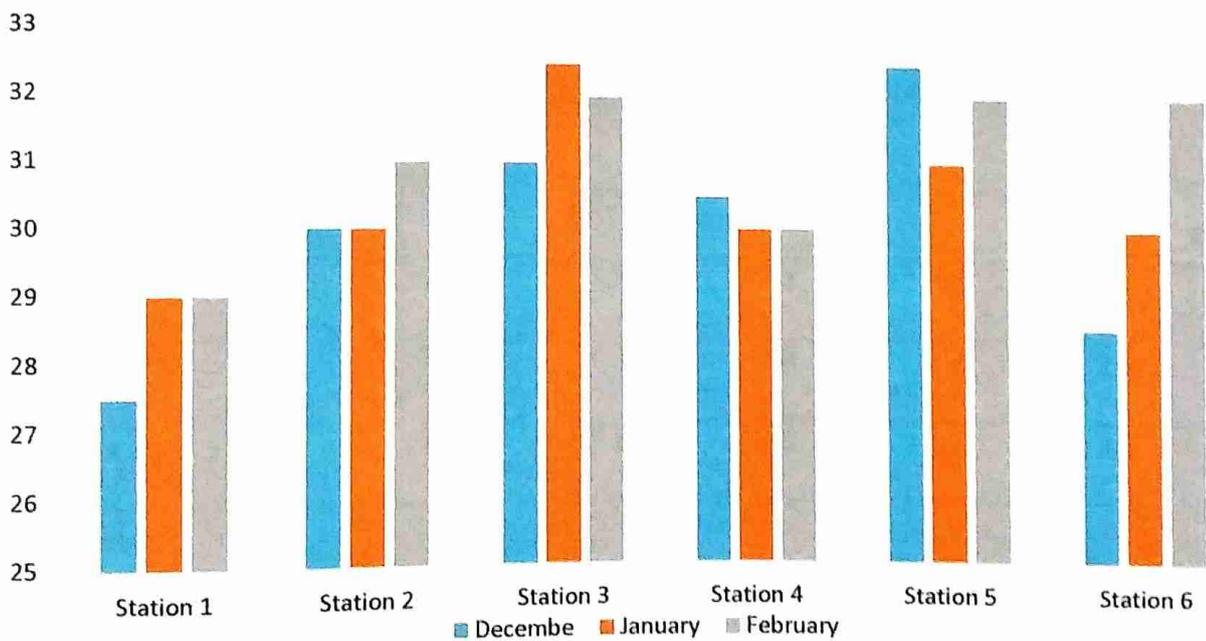


Fig: 4.1 Variation of temperature from December 2019 to February 2020

The temperature observed during the present study is given in the table 1. The temperature of the lake is high in station 3 during the month January 2020. the temperature of the sea is high in station 5 during the month December 2019. The temperature of the lake is very low in station 1 during the month December 2019 and in sea the low temperature is observed in station 6 during the month December 2020.

The maximum temperature observed can be attributed to the high intensity of solar radiation and evaporation and the minimum temperature is due to frequent clouds, high humidity.

4.2. Hydrogen ion concentration

Table 4.2

variation of pH from December 2019 to February 2020.

Station	S1	S2	S3	S4	S5	S6
December	7.2	7.4	7.3	7.4	7.5	7.4
January	7.4	7.2	7.7	7.8	7.7	7.2
February	7.6	7.2	7.8	7.5	7.3	7.5

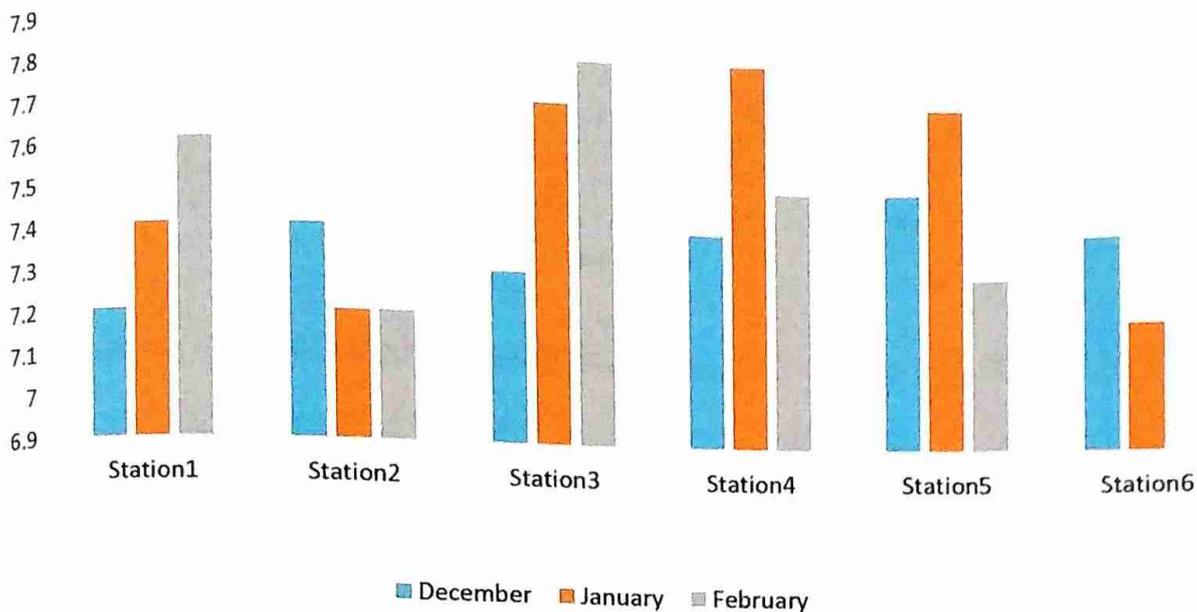


Fig: 4.2 Variation of pH from December 2019 to February 2020.

The hydrogen ion concentration in the Veli-Akkulam water system shown in Table 2. The pH of the water in this system ranges from 7.2 to 7.8. In the station 3 and 4 the pH value is same and maximum. The pH value is comparatively low for station 1 and 6. According to WHO the pH limits are 7.0 to 8.5. The maximum pH value observed in the station 3 and 4 is due to the discharge of sewage and domestic wastes dumped in the water body.

4.3. Electrical conductivity

Table 4.3

variation of electrical conductivity from December 2019 to February 2020.

Station	S1	S2	S3	S4	S5	S6
December	0.3	0.3	0.4	0.5	0.7	0.4
January	0.2	0.5	0.2	0.7	0.5	0.8
February	0.4	0.2	0.2	0.8	0.6	0.5

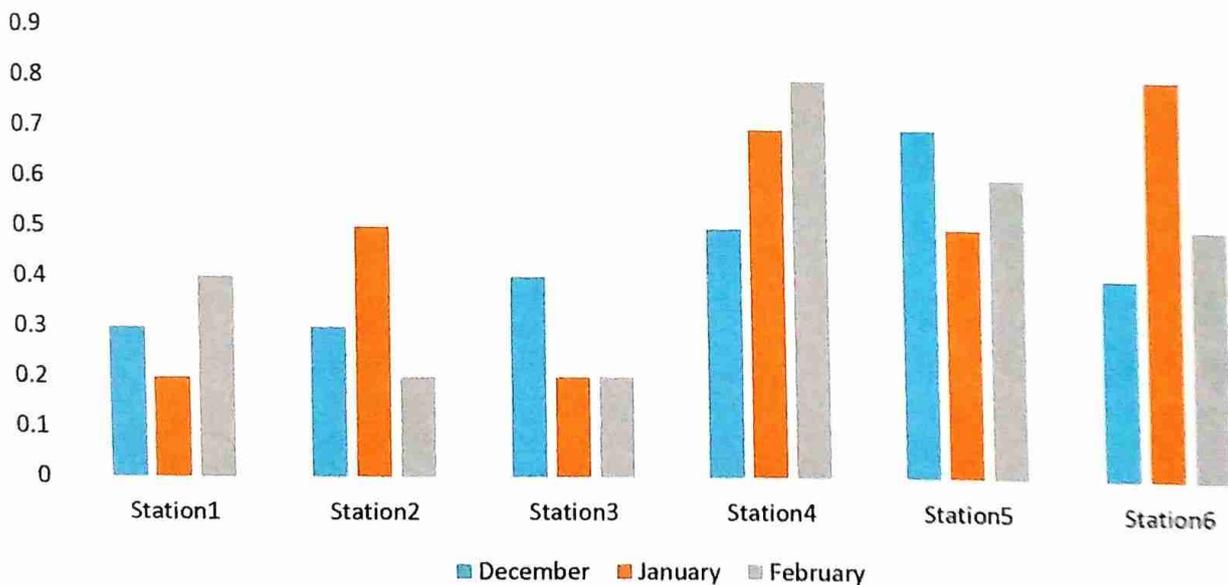


Fig: 4.3 Variation of electrical conductivity from December 2019 to February 2020.

During the study the electrical conductivity ranged from 0.2 $\mu\text{mhos/cm}$ to 0.8 $\mu\text{mhos/cm}$. the maximum electrical conductivity is observed in Station 4 and 6 during the

month January and February due to the presence of various ions added to the water. The lowest value observed in Station1, Station2 and Station3.

4.4. Total dissolved solids

Table 4.4

Variation of TDS from December 2019 to February 2020.

Station	S1	S2	S3	S4	S5	S6
December	112	160	242	357	285	116
January	153	227	180	269	305	280
February	165	170	198	205.8	176	215

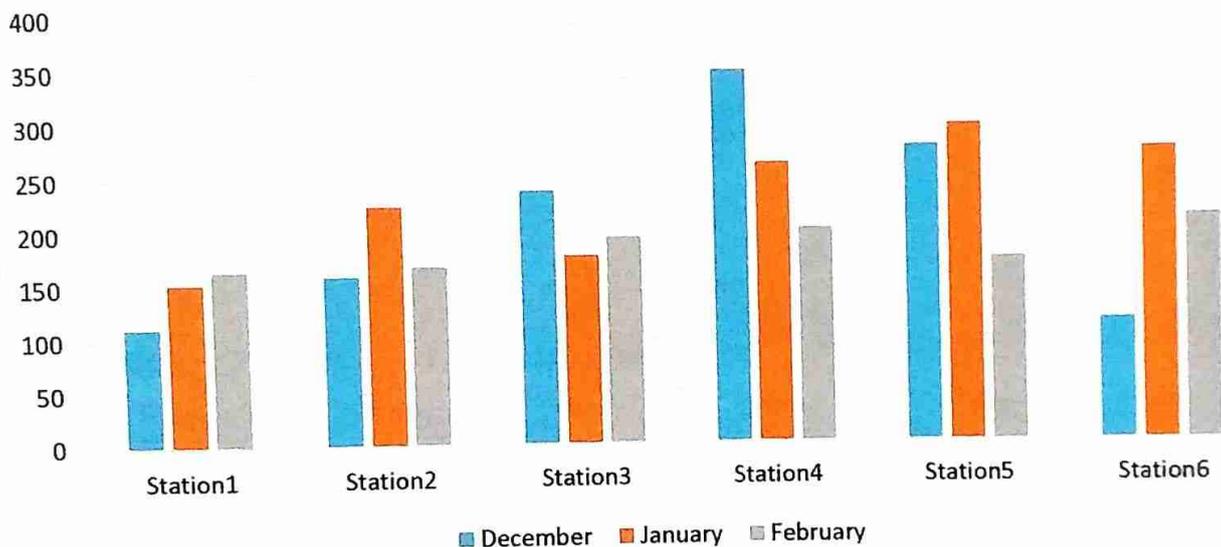


Fig: 4.4 Variation of TDS from December 2019 to February 2020.

In the present study higher amounts of total dissolved solids are present in the section 4 and 5. TDS values in lakes are typically found to be in the range of 50 mg/l to 250 mg/l in areas of especially hard water or high salinity. TDS concentration is the sum of cations and anions in the water. Therefore, the total dissolved solids test provides a

qualitative measure of the amount of dissolved ions. Drinking water will tend to be 25 mg/l to that TDS in drinking water should not exceed 500 mg/l.

4.5. Total hardness

Table 4.5

Variation of total hardness from December 2019 to February 2020.

Station	S1	S2	S3	S4	S5	S6
December	1.4	6	2.6	16.8	13.5	17.6
January	6.8	5.4	4.8	15.4	13.6	15.9
February	2.4	7.8	1.2	17	18	16.2

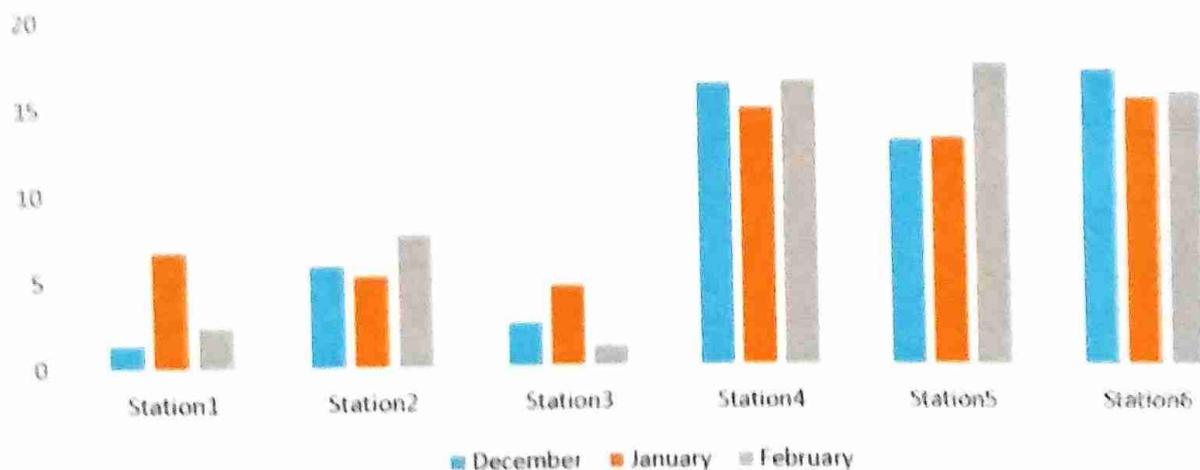


Fig: 4.5 Variation of total hardness from December 2019 to February 2020.

The total hardness of the Veli-Akkulam water system is shown in table 5. In this study the very high amount of hardness present in section 5 during the month of February. The lowest amount of hardness is present in the station 3. Hard water form precipitates on boiling or when soap is added to it. Hardness is due to the presence of calcium, magnesium or ferrous (iron salts) as chloride, sulphate or bicarbonates. The degree of hardness is

equivalent to CaCO₃ concentration and designated as soft (0-60 mg/l), medium hard (60-120 mg/l), hard (120-180 mg/l), very hard (above 180 mg/l)

4.6. Calcium

Table 4.6

Variation of calcium from December 2019 to February 2020.

Station	S1	S2	S3	S4	S5	S6
December	1.9	2.4	2.6	3.7	2.8	2.5
January	1.6	2.2	1.4	4	2.5	2.7
February	1	1.8	1.2	3.9	2.1	3.4

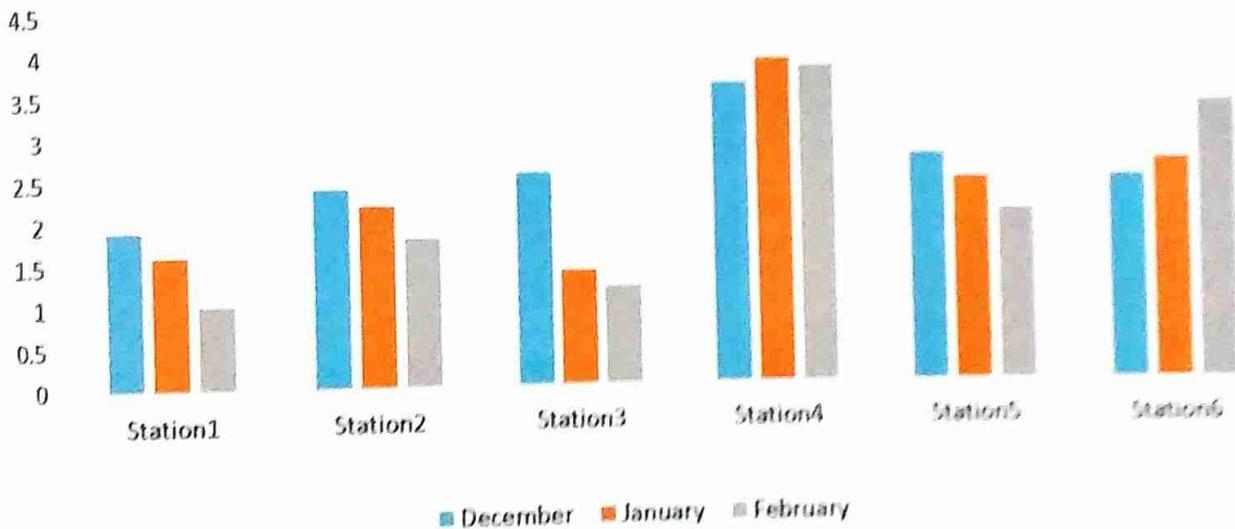


Fig:4.6 Variation of calcium from December 2019 to February 2020.

In the present study the highest calcium value is recorded at station 4 (4 mg/l) due to heavy sewage loads, hospital wastes, industrial wastes, calcium contain effluents, agricultural wastes. The very high amount of calcium increases the hardness of water and increases eutrophication.

In the station 1,2 and 3 retting of coconut husk is done. It may cause the hardness of water.

4.7. Magnesium

Table 4.7

Variation of magnesium from December 2019 to February 2020.

Station	S1	S2	S3	S4	S5	S6
December	2.7	2.5	2.4	9.1	11.5	9.2
January	3.6	4.6	1.2	13	12.6	12.3
February	1.8	0.4	6.8	7.8	9.5	10.4

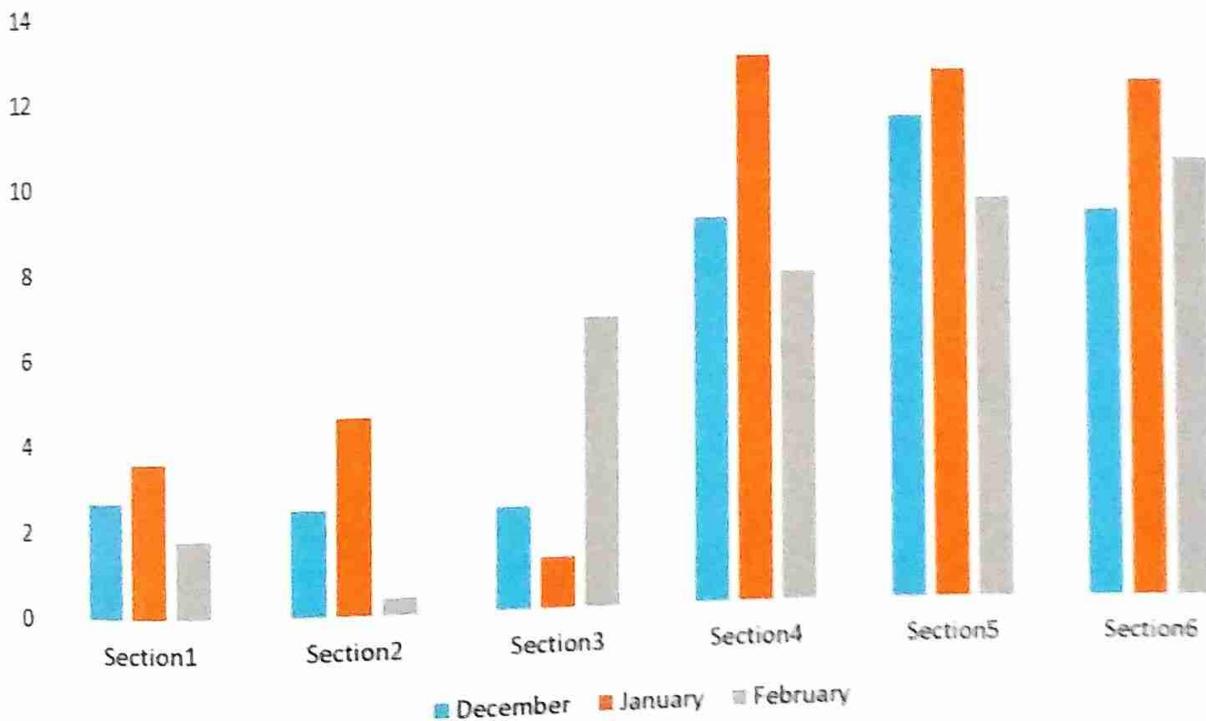


Fig: 4.7 Variation of magnesium from December 2019 to January 2020.

In the present study a very high amount of magnesium was observed in the station 4 during the month January. Water should have a magnesium hardness of less than 40 mg/l

as CaCO_3 to minimize scaling at elevated temperatures. The presence of magnesium in the water bodies are mainly due to the entry of effluents from hospitals and from industrial wastes or may be through runoff and also by leaching from natural sources. A very low amount of magnesium is observed during the month February 2020 at station 2 is 0.4 ppm

Water analysis









