Chapter 7

Summary and Conclusion

CHAPTER 7

SUMMARY AND CONCLUSION

7.1 SUMMARY

The summary of the research work of the thesis is a given below:

BANGALORE

From the analysis of 15 water samples from Bangalore District, we can conclude the following points:

Physico-Chemical parameters of water samples

1 Calcium, Magnesium, Chloride, Nitrate, Sulphate, pH, Fluoride, EC, COD, DO, Total Hardness, Sodium and Potassium, Carbonate and Phosphates are well within the permissible limits.

2 Bicarbonate was having highest value (434.9 mg/L) for one of the samples.

3 TDS was highest for one of the samples (941 mg/L)

4 Two samples had highest Nitrite content (4 mg/L).

Heavy metals

Two of the water samples from Bangalore District show the presence of small amount of Iron. One of the samples contain Copper and another Zinc. All the other heavy metals like Cadmium, Chromium, Lead and Manganese, etc. were absent in the other water samples.

Bacterial Coliforms

Except one sample, all the other samples does not contain Coliforms in the water samples.

BELGAUM

Physico-Chemical parameters of water samples

1 Calcium, Magnesium, Chloride, Nitrate, Nitrite, Sulphate, pH, TDS. Total Hardness, Sodium and Potassium were well within the permissible limits.

2 Bicarbonate had highest value (411 mg/L) for one of the samples.

3 Carbonate was highest for one of samples (32.4 mg/L).

4 Fluoride content was highest for one sample (1.6 mg/L).

5 Except for one sample, all the other samples contain less than the permissible limits of Phosphates (0.14 mg/L).

6 The highest DO value was found to be 6.5 mg/L.

7 One of the samples contained higher COD (24.4 mg/L) than the permissible limits.

Heavy metals

Heavy metals like Iron, Cadmium, Chromium and Lead etc. were absent in all the water samples. Copper, Manganese and Zinc were present in a few samples. Which were well within the permissible limits.

Bacterial Coliforms

Some samples were found to be contaminated with Coliforms while a large number of other samples were suitable for human consumption.

BELLARY

Physico-Chemical parameters of water samples

1 Calcium, Magnesium, Nitrate, Nitrite, Sulphate, pH, TDS, EC, DO, COD, Total Hardness, Carbonate, Bicarbonate, Sodium and Potassium were well within the permissible limits.

2 The Chloride content in one of the samples was higher than the permissible limits (474 mg/L).

3 The Phosphate content was 0.16 mg/L for one sample, which was higher than the permissible limits.

4 The Fluoride content was found to be higher than the permissible limits for one of the samples (1.6 mg/L).

Heavy metals

Cadmium, Chromium and Lead were absent in all the water samples. Iron, Copper, Manganese and Zinc were present in one of the samples that were well within the permissible limits.

Bacterial Coliforms

Only one sample from Bellary district was found to contain Coliforms while all the other samples were suitable for human consumption.

CHAMARAJNAGAR DISTRICT

Physico-Chemical parameters of water samples

1 Magnesium, Nitrate, Nitrite, Sulphate, COD, Chloride, Total Hardness, Chloride, Bicarbonate, Carbonate, Sodium and Potassium were well within the permissible limits.

2 In the present study area, the highest pH value was 8.7.

3 The electrical conductivity was found to be highest for one of the samples (2016 µmhos/cm).

4 Regarding the Dissolved Oxygen content one of the samples had the highest value (6.8 mg/L).

5 The TDS value for one of the samples was (1290 mg/L).

6 The Calcium concentration in the study area varied from 7 to 146 mg/L.

7 The Phosphate concentration in one of the water samples was found to be higher than the permissible limits (0.22 mg/L).

8 The concentration of Fluoride varies from 0.9 to 1.6 mg/L.

Heavy metals

Iron, Copper, Manganese and Zinc were present in maximum number of the water samples. All the other water samples contain the heavy metals within the permissible limits.

Bacterial Coliforms

One of the samples was found to be highly contaminated with Coliforms (more than 100/100 ml), while all other samples were suitable for human consumption.

CHIKKAMAGALORE

Physico-Chemical parameters of water samples

1 Calcium, Magnesium, Chloride, Nitrate, Nitrite, Sulphate, pH, TDS, DO, Total Hardness, Fluoride, Sodium and Potassium, Carbonates were well within the permissible limits

2 Regarding the COD, one of the samples contain higher than the permissible limits (24.4 mg/L).

3 The concentration of Fluoride in one of samples was higher than the permissible limits (1.6 mg/L).

4 The Phosphate concentration in one water samples was found to be highest (1.65 mg/l).

5 The concentration of Bicarbonate in the study area varied from 54.9 to 428 mg/L.

Heavy metals

Cadmium, Chromium and Lead concentration were trace in all the water samples. The Iron, Copper, Manganese and Zinc concentration were well within the permissible limits.

Bacterial Coliforms

In the present study, all the samples from Chikkamagalore district were suitable for human consumption

CHITRADURGA DISTRICT

Physico-Chemical parameters of water samples

1 Calcium, Magnesium, Nitrate, Sulphate, pH, TDS, COD, Total Hardness, Sodium and Potassium, Carbonates were well within the permissible limits

2 Dissolved Oxygen content was higher for one of the samples (6.5 mg/L).

3 The Chloride content was higher than the permissible limits for one of the samples (475 mg/L).

4 Nitrite concentrations in all the water samples were well within the permissible limits except for one sample (3.78 mg/L).

5 The concentration of Fluoride in one of the water samples was higher than the permissible limits (1.6 mg/L).

6 The concentration of Bicarbonate in this study area varies from 70.1 to 434 mg/L.

Heavy metals

Cadmium and Chromium were trace in all the water samples. Iron, Copper, Manganese, Lead and Zinc were present in a few samples which were well within the permissible limits.

Bacterial Coliforms

Except two samples, all the other samples do not contain Coliforms in the water samples.

DAKSHINNA KANNADA

Physico-Chemical parameters of water samples

Only Chemical oxygen demand was found to be high (24.4 mg/L). All the other remaining parameters were well within the permissible limits in all samples.

Heavy metals

Cadmium, Lead and Chromium concentration was trace in all the water samples. Iron, Copper, Manganese and Zinc were present in only two or three samples that were well within the permissible limits.

Bacterial Coliforms

Two samples were found to be highly contaminated with Coliforms (30/100 ml and 17/100 ml), while the remaining samples were suitable for human consumption.

DHARWAD

Physico-Chemical parameters of water samples

1. One of the samples had highest Dissolved Oxygen (6.7 mg/L).
2. The TDS values varied from 137.6 to 1098 mg/L.
3. All the parameters like Calcium, Magnesium, Chloride, Nitrate, Nitrite, Sulphate, pH, COD, Total Hardness, Sodium and Potassium, Phosphate, Fluoride, Carbonate and Bicarbonate were well within the permissible limits.

Heavy metals

Cadmium, Manganese and Chromium concentration was trace in all the water samples. The Iron, Copper, Lead and Zinc were present in a few samples which were all well within the permissible limits.

Bacterial Coliforms

Two samples from Dharwad district were found to be contaminated with Coliforms, while all the other samples were suitable for human consumption.

HASSAN

Physico-Chemical parameters of water samples

1. One of the samples had higher pH compared to the permissible limits (9.1).
2. The electrical conductivity for the water samples varied widely from 466 to 5269 μmhos/cm.
3. The value of COD for one of the samples was higher than the permissible limits.
4. The concentrations of Chloride in a few samples were very high compared to the permissible limits (918 mg/L).
5. The TDS values varied from 340 to 3372 mg/l.
6. Regarding the Calcium content, one of the samples contained (242 mg/L)
7. The concentration of Magnesium in study area was higher than the permissible limits (203 mg/L).
8. The value of Nitrate in sample no.10 from study area was higher than the permissible limits (57.5 mg/l).
9. The concentration of Fluoride for some samples was very high (0.9 to 2.1 mg/L).
10. The concentration of Bicarbonate in the study area varies from 12.7 to 666.1 mg/L.

11. The concentration of Carbonate in study area was absent except for four samples.
12. Other parameters like DO, Total Hardness, Phosphate, Nitrite and Sulphate were well within the permissible limits.

Heavy metals

Copper, Iron, Manganese and Zinc were present in a few water samples, which were within the permissible limits.

Bacterial Coliforms

Some samples were found to be highly contaminated with Coliforms (7/100ml, 46/100 ml, 40/100 ml and 38/100 ml respectively), while a large number of other samples were suitable for human consumption.

KODAGU DISTRICT

Physico-Chemical parameters of water samples

1. All the parameters like Calcium, Magnesium, Chloride, Nitrate, Sulphate, pH, Total Hardness, Sodium and Potassium, Carbonate and Bicarbonate were well within the permissible limits.
2. The concentration of COD was higher than the permissible limits for one of the samples (24.4 mg/L).
3. Higher concentrations of phosphates were recorded for two samples (sample no. 3 and 12).
4. Nitrite concentrations of all the samples were well within the permissible limits except three samples.
5. All the samples for Fluoride concentration were well within the permissible limits except for one of the samples (1.6 mg/L)

6. The concentration of Carbonate in the study was absent except for four samples.

Heavy metals

Iron, Copper Manganese and Zinc were present in a few samples, which were well within the permissible limits. All the other heavy metals were absent in the water samples.

Bacterial Coliforms

Only one sample from Kodagu district was found to be contaminated with Coliforms (17/100 ml) while all the other samples were suitable for drinking purpose.

KOLAR DISTRICT

Physico-Chemical parameters of water samples

1. PH, DO, Calcium, Magnesium, Total Hardness, Nitrate, Nitrite, Fluoride, Carbonate and Bicarbonate were well within the permissible limits.
2. The electrical conductivity was found to highest 2239 µmhos/cm for one of the samples.
3. In the study area, the COD was within the permissible limits except for one sample.
4. The concentration of Chloride was higher than the permissible limits for one of the samples (276 mg/L).
5. The TDS values varied from 282 to 1433 mg/L. Some of the samples are not suitable for drinking purpose, but are useful for the agricultural purpose
6. The higher concentration of phosphates were recorded for one of the water samples (0.16 mg/L).
7. The Sodium and Potassium concentration for the water samples varied from 15 to 223 mg/L.

Heavy metals

Two of the water samples show the presence of small amounts of Iron. One of the samples contains Zinc and another Manganese. All the other heavy metals like Cadmium, Chromium, Lead and Copper etc. were absent in the water samples.

Bacterial Coliforms

The bacterial Coliforms were absent in all the samples except for one sample, which was suitable for drinking purpose.

MANDYA DISTRICT

Physico-Chemical parameters of water samples

1. The electrical conductivity values in the present study area samples varied from 540 to 2209 μmhos/cm.
2. The value for Chemical oxygen demand was higher than the permissible limits for one of the samples (17.4 mg/L)
3. Higher concentration of phosphates was recorded for one of the samples (0.17 mg/L)
4. Nitrite concentration was well in within the permissible limits except for one sample (3.78 mg/L).
5. The concentration of Fluoride was well within the permissible limits except for one sample.
6. The concentration of Bicarbonate in the study area varies from 54 to 576 mg/L.
7. Other parameters like pH, DO, TDS, Calcium, Magnesium, Total Hardness, Nitrate, Sulphate and Carbonates were well within the permissible limits.

Heavy metals

Iron, Copper, Manganese and Zinc were present in a few samples, which were well within the permissible limits. All the other heavy metals like Cadmium, Chromium and Lead were absent in the other water samples.

Bacterial Coliforms

One of the samples was found to be highly contaminated with Coliforms while a large number of samples were suitable for human consumption.

MYSORE DISTRICT

Physico-Chemical parameters of water samples

1. One of the samples had higher pH compared to the permissible limits (pH value was 9.2).
2. The electrical conductivity values in the study area varied from 543 to 2133 μmhos/cm.
3. DO was well within permissible limits except for one sample.
4. The COD was higher than the permissible limits for some samples (24.4 mg/L).
5. The phosphates concentration was recorded higher for one of the samples (0.17 mg/L).
6. The concentration of Fluoride varies from 0.8 to 1.8 mg/L. The results indicate that some samples have higher values than the permissible limits.
7. DO, TDS, Calcium, Magnesium, Total Hardness, Nitrate, Nitrite, Sulphate, Bicarbonate, Carbonate, Sodium and Potassium were well within the permissible limits.

Heavy metals

Copper, Manganese and Zinc were present in a few samples. All the other heavy metals like Iron, Cadmium, Chromium and Lead were absent in the other water samples.

Bacterial Coliforms

Two samples from Mysore district were found to be contaminated with Coliforms, while all the other samples were suitable for human consumption.

SHIMOGA

Physico-Chemical parameters of water samples

1. pH, EC, DO, Chloride, TDS, Total Hardness, Calcium, Magnesium, Sulphate, Nitrate, Nitrite, Fluoride, Carbonate, Bicarbonate, Sodium and Potassium were well within the parameters.
2. COD was within the permissible limits except for one of the samples (26.1mg/L).
3. The phosphate concentration for the water samples was higher than the permissible limits in one of the samples (0.23 mg/L).

Heavy metals

Cadmium content was trace in all the water samples. All the other heavy metals like Iron, Copper, Manganese, Zinc, Chromium and Lead were present in a few water samples.

Bacterial Coliforms

One of the samples was found to be contaminated with Coliforms while a large number of other samples were suitable for human consumption.

UDUPI DISTRICT

Physico-Chemical parameters of water samples

1. The concentration of Sulphate was found to be high in one of the samples (240 mg/L), while all the samples are within the permissible limits.
2. The values for Chemical oxygen demand varied widely from 0 to 17.4 mg/L
3. The Phosphate concentration was found to be high in one of the water samples (0.17 mg/L).
4. The concentration of Fluorides was well within the permissible limits except for one the samples.
5. Other parameters like pH, EC, DO, Chloride, TDS, Total Hardness, Calcium, Magnesium, Nitrate, Nitrite, Carbonate, Bicarbonate, Sodium and Potassium were well within the permissible limits.

Heavy metals

Iron, Manganese and Zinc were present in a few samples. All the other heavy metals like Copper, Cadmium, Chromium, and Lead etc. were absent in the other water samples.

Bacterial Coliforms

Two samples from Udupi district were found to be contaminated with Coliforms, while all the remaining samples were suitable for human consumption.

7.2 CONCLUSION

From the analysis of water samples of different districts, we can conclude that almost all the water samples are useful for the human consumption (except one or two samples from each district). All the water samples can be used for the irrigation purpose even though a few samples may contain slightly higher amount of Nitrate, Fluoride, Sodium and Potassium and heavy metals.

The analysis of water samples from Hassan district show higher values for all the parameters compared to the permissible limits. Regarding the heavy metals content of the water samples, the concentration was found to be well within the permissible limits (in fact some of the heavy metals were below the detectable limits in majority of the water samples).

The bacteriological examination shows that all the water samples can be used for the human consumption (except a very few in each of the districts). One of the water samples from Chamarajnagar district was found to be highly contaminated with Coliforms (100/100ml) which is not useful for human consumption.

The hydrogeochemical analysis shows that almost all the district water samples are useful for human consumption as well as for the irrigation purpose (except a few water samples from Mysore and Chitradurga districts which contain high salinity and high sodium content).