6.0 WATER CHARACTERISTICS OF PUBLIC TAPS (STATIONS TW1 TO TW2)

Temperature (°C)

The temperature record of two tap water stations is given in Table 69. It showed that, the value ranged from 27°C to 31°C. The lowest values was both during June 2004 and November 2004 and the highest during March and April 2004. The mean values of TW1 and TW2 were 28.58°C and 29.17°C respectively. The mean value showed the range from 27°C (June 2004) to 31°C (March 2004). The mean annual value was 28.88°C.

Turbidity (NTU)

Turbidity of public taps (Table 70) showed the range from 1.23 NTU (TW2) during February 2004 to 27.50 NTU (TW1) during July 2004. The mean values were 7.59 NTU (TW2) and 8.82 NTU (TW1). TW1 showed higher turbidity than TW2. The mean monthly value showed that, the lowest value was 2.90 NTU during February 2004 and the highest value was 24.91 NTU during July 2004. The mean annual value was 8.42 NTU. As per BIS (1991) the desirable value of drinking water is 5 NTU, and the permissible value is 10 NTU. In the case of TW1, except November 2003 and February 2004 all the values were found above the desirable limit. But June and July 2004 showed the values above permissible limit. In TW2, June to October 2004 showed the values above the desirable limit and July to October 2004 showed the values above the permissible limit. The mean annual value was also found to be above the desirable limit of BIS.


**Conductivity (mS)**

The conductivity values are given in Table 71. From the table it can be noted that the lowest value was 0.01 mS shown by TW1 during April 2004. Highest value was 0.80 mS shown by TW2 during June. The mean values of TW1 and TW2 were 0.24 mS and 0.33 mS respectively.

The monthly mean values of conductivity were lowest in March and April 2004 (0.05 mS) and highest (0.75 mS) in June 2004. The annual mean value was 0.29 mS.

**Chloride (mg/L)**

Table 72 shows the values of chloride of two public taps during Nov 2003 to Octo.2004. The lowest value was 14.27 mg/L (TW2) during December 2004 and highest value was 62.48 mg/L (TW1) during August 2004. The mean value of TW1 was 30.77 mg/L and that of TW2 was 26.44 mg/L.

The monthly mean value showed the range from 16.65 mg/L during January 2004 to 45.44mg/L during August 2004. The mean annual value was 28.61 mg/L. BIS (1991) stated that desirable and permissible limits for Chloride are 250 mg/L and 1000 mg/L respectively. In this study all the Chloride values were found below the desirable limit of BIS.

**Total Solids (mg/L)**

Table 73 shows the values of TS in the two public taps-highest value noted was 560.00 mg/L by TW2 during July 2004 and lowest value was 98.00 mg/L by TW1 during January 2004. The mean values of TW1 and TW2 showed almost same. The monthly mean value showed the range from 152.00 mg/L during December 2003 to 393.00 mg/L during September 2004. The mean value was 285.42 ± 112.60 mg/L.
Total Dissolved Solids (mg/L)

The record of TDS of two public taps is given in Table 74. It showed that the lowest value was 65.00 mg/L (TW1) during January 2004 and highest value was 264.00 mg/L (TW2) during January 2004. The mean value of TW1 (167.5 mg/L) was lower than the mean value (182.83 mg/L) of TW2. The monthly mean value showed the range from 128.00 mg/L to 229.00 mg/L – the lowest value was during December 2003 and the highest value during August 2004. According to BIS (1991) the desirable limit of TDS is 500 mg/L and permissible limit is 2000 mg/L and so the two taps were below the desirable limit of BIS with respect to TDS.

Nitrate (mg/L)

The concentrations of Nitrates of two taps are shown in Table 75. The values showed the range from 0.01 mg/L to 0.56 mg/L. TW1 showed the lowest value during May 2004 and TW2 showed the highest value during September 2004. The mean values of TW1 and TW2 were 0.24 mg/L and 0.22 mg/L respectively.

The monthly mean values showed the range from 0.04 mg/L during December 2003 and May 2004 to 0.53 mg/L during April 2004. The mean annual value was 0.23 mg/L. It was realized that all the values were below the desirable limit (45 mg/L) specified by BIS.

Nitrite (mg/L)

Nitrite values of tap water are shown in Table 76. The Table showed that the lowest value was 0.01 mg/L and the highest was 0.09 mg/L. Certain months showed similar values. The highest value was shown by TW2 during December 2003. The means of TW1 and TW2 were 0.03 mg/L and 0.02 mg/L respectively indicating that Nitrite of TW1 was higher than TW2.
The monthly mean values showed the range from 0.01 mg/L to 0.09 mg/L. May 2004 showed lowest value and December 2003 showed the highest value. The mean annual value was 0.03 ± 0.02 mg/L.

**Phosphate (mg/L)**

Table 77 showed the values of phosphates of tap water. The values noted from the table were in the range from (0.00) of TW2 during April 2004 to 0.06 of TW1 and TW2 during November 2003. The mean values of TW1 and TW2 were 0.03 mg/L and 0.02 mg/L respectively. The content of Phosphates in TW1 was greater than TW2.

The monthly mean values showed the range from 0.01 mg/L to 0.06 mg/L. April and October 2004 showed the lowest values whereas November 2003 showed highest value. The mean annual value was 0.03± 0.02 mg/L.

**Silicate (mg/L)**

The contents of Silicates of two tap water are shown in Table 78. The values ranged from 0.01 mg/L during July and August 2004 (TW1) to 0.52 mg/L during November 2003 (TW2). The mean values of TW1 (0.21 mg/L) and TW2 (0.22 mg/L) were almost similar.

The monthly mean values showed the range from 0.02 mg/L during August 2004 to 0.50 mg/L during November 2003. The mean annual value was 0.21 ± 0.16 mg/L.

**pH**

The estimates of pH are given in Table 79. The value was lowest (6.52) in TW1 during May 2004 and highest (8.95) in TW1 during September 2004. The mean value of TW1 was 8.02 and that of TW2 was 7.37. The monthly mean values showed the range from 6.81 to 8.41. The lowest value was during May.
2004 the highest value was during March 2004. The mean annual value was 7.70. Based on BIS (1991) the pH values were within the desirable limit.

**DO (mg/L)**

Table 80 showed the values of DO in the two Public taps. The lowest and highest values were 2.22 mg/L (TW2) during September 2004 and 7.92 (TW1) during February 2004 respectively. The mean value of TW1 was 5.15 mg/L and the mean value of TW2 was 5.35 mg/L.

The mean annual value was 5.25 mg/L. It showed that the greatest value was during February 2004 (7.85 mg/L) and lowest (3.32 mg/L) during January 2004.

**Total Hardness (mg/L)**

The values of TH are furnished in Table 81. May 2004 of TW2 showed lowest value (24.00 mg/L) and January 2004 showed the highest value of 81.00 mg/L in TW2. The mean value of TW1 (55.79 mg/L) was greater than the mean value of TW2 (50.32 mg/L).

The mean annual value was 53.05 mg/L; September 2004 showed lowest monthly mean value (39.10 mg/L) and January 2004 (79.50 mg/L) showed the highest value. The data revealed that all the values were below the desirable limit of BIS (300 mg/L).

**Calcium Hardness (mg/L)**

Calcium hardness values of two taps are given in Table 82. March 2004 of TW2 showed the lowest value (4.82 mg/L) and November 2003 of TW2 showed the highest value (26.82 mg/L). The mean value of TW2 was greater than the mean value of TW1.
The annual mean value was 12.35± 6.37 mg/L. Lowest monthly mean was reported during March 2004 and highest value during November 2003. The data revealed that all the values were below the desirable limit of BIS.

**Magnesium Hardness (mg/L)**

The values of Magnesium hardness are given in Table 83. TW1 showed the lowest value (7.57 mg/L) during August 2004 and the highest value of 128.00 mg/L during July in TW2. The mean value of TW2 was (48.37 mg/L) higher than the mean value of TW1 (41.80 mg/L).

The annual mean was 45.08 ± 25.67 mg/L. August 2004 showed lowest monthly value (20.17 mg/L) and July 2004 showed highest monthly value (88.00 mg/L).

**Iron (mg/L)**

The values of Iron in tap water are given in Table 84. Zero (0.0 mg/L) was the lowest and 0.87 mg/L was the highest value. The highest was shown by TW2 during August 2004. The mean value of TW2 was higher than TW1 by about 2 mg/L. The mean annual value was 0.19± 0.28 mg/L. Lowest monthly mean value was detected in December 2003, January 2004 and March 2004. The highest value of 0.68 mg/L was detected in August 2004. Desirable limit of Iron (BIS, 1991) is 0.3 mg/L and the permissible limit is 1.0 mg/L. Accordingly all the values were below the permissible limit. Generally, during July to October 2004 the values were found above the desirable limit set by BIS.

**Sodium (mg/L)**

Sodium values of tap water are presented in Table 85. The lowest value was 10.68 mg/L of TW1 during October 2004, and the highest value was 27.45 mg/L during June 2004 of TW1. The mean value of TW1 (19.38 mg/L) was
greater than TW2 (17.02 mg/L). In the case of monthly mean values, December 2003 showed the lowest value (13.12 mg/L) and April 2004 showed the highest value (24.99 mg/L). The mean annual value was 18.20 ± 4.99 mg/L.

**Potassium (mg/L)**

From the Table 86 it can be seen that Potassium values showed in the range from 9.21 mg/L (TW1) during November 2003 to 28.56 mg/L (TW2) during April 2004. The mean values of TW1 (15.75 mg/L) and TW2 (15.40 mg/L) showed almost same values.

The mean annual value was 15.57 mg/L. In the case of monthly mean values, November 2003 was the lowest and April 2004 was the highest. Lowest value was 9.73 mg/L and the highest value was 27.42 mg/L.

**BOD (mg/L)**

Table 87 showed the values of BOD in the tap water. The values ranged from 1.23 mg/L (TW2) during March 2004 and 7.89 mg/L (TW1) during September 2004. The mean value of TW1 (3.66 mg/L) was lower than TW2 (4.47 mg/L).

The lowest monthly mean was during February 2004 and highest during October 2004, the values being 2.22 mg/L and 7.52 mg/L respectively. The mean annual value was 4.06 ± 2.08 mg/L.

It was evident from the analysis that tap water consisted of characteristics quite suitable for drinking purpose, although iron content was slightly higher than desirable limit during rainy months.

**Coliforms**

Coliforms were not detected in the tap water samples studied.
Table No 69: Chirayinkeezhu grama panchayat: Temperature (°C) of two public taps (stations TW1 and TW2) during Nov.2003 to Octo.2004.

<table>
<thead>
<tr>
<th>MONTH AND YEAR</th>
<th>STATIONS</th>
<th>MEAN ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TW1</td>
<td>TW2</td>
</tr>
<tr>
<td>2003 NOV</td>
<td>27</td>
<td>30</td>
</tr>
<tr>
<td>2003 DEC</td>
<td>28</td>
<td>29</td>
</tr>
<tr>
<td>2004 JAN</td>
<td>29</td>
<td>30</td>
</tr>
<tr>
<td>2004 FEB</td>
<td>31</td>
<td>31</td>
</tr>
<tr>
<td>2004 MAR</td>
<td>28</td>
<td>30</td>
</tr>
<tr>
<td>2004 APR</td>
<td>31</td>
<td>29</td>
</tr>
<tr>
<td>2004 MAY</td>
<td>29</td>
<td>29</td>
</tr>
<tr>
<td>2004 JUNE</td>
<td>27</td>
<td>27</td>
</tr>
<tr>
<td>2004 JULY</td>
<td>28</td>
<td>28</td>
</tr>
<tr>
<td>2004 AUG</td>
<td>28</td>
<td>29</td>
</tr>
<tr>
<td>2004 SEPT</td>
<td>28</td>
<td>29</td>
</tr>
<tr>
<td>2004 OCT</td>
<td>29</td>
<td>29</td>
</tr>
<tr>
<td>MEAN ± SD</td>
<td>28.58 ± 1.31</td>
<td>29.17 ± 8.15</td>
</tr>
</tbody>
</table>
Table No 70: Chirayinkeezhu grama panchayat: Turbidity (NTU) of two public taps (stations TW1 and TW2) during Nov.2003 to Octo.2004.

<table>
<thead>
<tr>
<th>MONTH AND YEAR</th>
<th>STATIONS</th>
<th>MEAN ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TW1</td>
<td>TW2</td>
</tr>
<tr>
<td>2003 NOV</td>
<td>4.00</td>
<td>2.34</td>
</tr>
<tr>
<td>2003 DEC</td>
<td>5.00</td>
<td>3.98</td>
</tr>
<tr>
<td>2004 JAN</td>
<td>5.78</td>
<td>2.89</td>
</tr>
<tr>
<td>2004 FEB</td>
<td>4.56</td>
<td>1.23</td>
</tr>
<tr>
<td>2004 MAR</td>
<td>7.89</td>
<td>6.45</td>
</tr>
<tr>
<td>2004 APR</td>
<td>6.78</td>
<td>4.64</td>
</tr>
<tr>
<td>2004 MAY</td>
<td>5.78</td>
<td>4.87</td>
</tr>
<tr>
<td>2004 JUNE</td>
<td>12.12</td>
<td>12.00</td>
</tr>
<tr>
<td>2004 JULY</td>
<td>27.50</td>
<td>22.32</td>
</tr>
<tr>
<td>2004 AUG</td>
<td>8.45</td>
<td>10.34</td>
</tr>
<tr>
<td>2004 SEPT</td>
<td>8.94</td>
<td>12.34</td>
</tr>
<tr>
<td>2004 OCT</td>
<td>9.89</td>
<td>12.00</td>
</tr>
<tr>
<td>MEAN ± SD</td>
<td>8.89 ± 6.33</td>
<td>7.95 ± 7.95</td>
</tr>
</tbody>
</table>
Table No 71: Chirayinkeezhu grama panchayat: Conductivity (mS) of two public taps (stations TW1 and TW2) during Nov.2003 to Octo.2004.

<table>
<thead>
<tr>
<th>MONTH AND YEAR</th>
<th>STATIONS</th>
<th>MEAN ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TW1</td>
<td>TW2</td>
</tr>
<tr>
<td>2003 NOV</td>
<td>0.76</td>
<td>0.54</td>
</tr>
<tr>
<td>2003 DEC</td>
<td>0.63</td>
<td>0.25</td>
</tr>
<tr>
<td>2004 JAN</td>
<td>0.70</td>
<td>0.20</td>
</tr>
<tr>
<td>2004 FEB</td>
<td>0.10</td>
<td>0.11</td>
</tr>
<tr>
<td>2004 MAR</td>
<td>0.06</td>
<td>0.04</td>
</tr>
<tr>
<td>2004 APR</td>
<td>0.01</td>
<td>0.09</td>
</tr>
<tr>
<td>2004 MAY</td>
<td>0.21</td>
<td>0.28</td>
</tr>
<tr>
<td>2004 JUNE</td>
<td>0.70</td>
<td>0.80</td>
</tr>
<tr>
<td>2004 JULY</td>
<td>0.40</td>
<td>0.20</td>
</tr>
<tr>
<td>2004 AUG</td>
<td>0.20</td>
<td>0.18</td>
</tr>
<tr>
<td>2004 SEPT</td>
<td>0.10</td>
<td>0.12</td>
</tr>
<tr>
<td>2004 OCT</td>
<td>0.10</td>
<td>0.10</td>
</tr>
<tr>
<td>MEAN ± SD</td>
<td>0.33 ± 0.30</td>
<td>0.24 ± 0.22</td>
</tr>
</tbody>
</table>
Table No 72: Chirayinkeezhu grama panchayat: Chloride (mg/L) of two public taps (stations TW1 and TW2) during Nov.2003 to Oct.2004.

<table>
<thead>
<tr>
<th>MONTH AND YEAR</th>
<th>STATIONS</th>
<th>MEAN ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TW1</td>
<td>TW2</td>
</tr>
<tr>
<td>2003 NOV</td>
<td>36.92</td>
<td>25.56</td>
</tr>
<tr>
<td>2003 DEC</td>
<td>22.67</td>
<td>14.27</td>
</tr>
<tr>
<td>2004 JAN</td>
<td>15.62</td>
<td>17.67</td>
</tr>
<tr>
<td>2004 FEB</td>
<td>20.80</td>
<td>22.80</td>
</tr>
<tr>
<td>2004 MAR</td>
<td>14.84</td>
<td>30.02</td>
</tr>
<tr>
<td>2004 APR</td>
<td>18.00</td>
<td>28.00</td>
</tr>
<tr>
<td>2004 MAY</td>
<td>32.00</td>
<td>42.00</td>
</tr>
<tr>
<td>2004 JUNE</td>
<td>28.00</td>
<td>36.00</td>
</tr>
<tr>
<td>2004 JULY</td>
<td>46.00</td>
<td>30.00</td>
</tr>
<tr>
<td>2004 AUG</td>
<td>62.48</td>
<td>28.40</td>
</tr>
<tr>
<td>2004 SEPT</td>
<td>52.00</td>
<td>22.72</td>
</tr>
<tr>
<td>2004 OCT</td>
<td>19.88</td>
<td>19.88</td>
</tr>
<tr>
<td>MEAN ± SD</td>
<td>30.77 ± 15.57</td>
<td>26.44 ± 7.75</td>
</tr>
</tbody>
</table>
Table No 73: Chirayinkeezhu grama panchayat: TS (mg/L) of two tap (stations P1 to P2) during Nov.2003 to Octo.2004.

<table>
<thead>
<tr>
<th>MONTH AND YEAR</th>
<th>STATIONS</th>
<th>MEAN ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TW1</td>
<td>TW2</td>
</tr>
<tr>
<td>2003 NOV</td>
<td>300.00</td>
<td>100.00</td>
</tr>
<tr>
<td>2003 DEC</td>
<td>124.00</td>
<td>180.00</td>
</tr>
<tr>
<td>2004 JAN</td>
<td>98.00</td>
<td>286.00</td>
</tr>
<tr>
<td>2004 FEB</td>
<td>294.00</td>
<td>250.00</td>
</tr>
<tr>
<td>2004 MAR</td>
<td>276.00</td>
<td>298.00</td>
</tr>
<tr>
<td>2004 APR</td>
<td>300.00</td>
<td>300.00</td>
</tr>
<tr>
<td>2004 MAY</td>
<td>268.00</td>
<td>340.00</td>
</tr>
<tr>
<td>2004 JUNE</td>
<td>520.00</td>
<td>228.00</td>
</tr>
<tr>
<td>2004 JULY</td>
<td>200.00</td>
<td>560.00</td>
</tr>
<tr>
<td>2004 AUG</td>
<td>262.00</td>
<td>298.00</td>
</tr>
<tr>
<td>2004 SEPT</td>
<td>476.00</td>
<td>310.00</td>
</tr>
<tr>
<td>2004 OCT</td>
<td>310.00</td>
<td>272.00</td>
</tr>
<tr>
<td>MEAN ± SD</td>
<td>285.67 ± 121.31</td>
<td>285.17 ± 108.60</td>
</tr>
</tbody>
</table>
Table No 74: Chirayinkeezhu grama panchayat: TDS (mg/L) of two tap water (stations P1 to P2) during Nov.2003 to Octo.2004.

<table>
<thead>
<tr>
<th>MONTH AND YEAR</th>
<th>STATIONS</th>
<th>MEAN ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TW1</td>
<td>TW2</td>
</tr>
<tr>
<td>2003 NOV</td>
<td>180.00</td>
<td>98.00</td>
</tr>
<tr>
<td>2003 DEC</td>
<td>100.00</td>
<td>156.00</td>
</tr>
<tr>
<td>2004 JAN</td>
<td>65.00</td>
<td>264.00</td>
</tr>
<tr>
<td>2004 FEB</td>
<td>160.00</td>
<td>196.00</td>
</tr>
<tr>
<td>2004 MAR</td>
<td>136.00</td>
<td>188.00</td>
</tr>
<tr>
<td>2004 APR</td>
<td>128.00</td>
<td>172.00</td>
</tr>
<tr>
<td>2004 MAY</td>
<td>182.00</td>
<td>189.00</td>
</tr>
<tr>
<td>2004 JUNE</td>
<td>252.00</td>
<td>129.00</td>
</tr>
<tr>
<td>2004 JULY</td>
<td>186.00</td>
<td>240.00</td>
</tr>
<tr>
<td>2004 AUG</td>
<td>232.00</td>
<td>226.00</td>
</tr>
<tr>
<td>2004 SEPT</td>
<td>220.00</td>
<td>168.00</td>
</tr>
<tr>
<td>2004 OCT</td>
<td>169.00</td>
<td>168.00</td>
</tr>
<tr>
<td>MEAN ± SD</td>
<td>167.75 ± 54.30</td>
<td>182.83 ± 46.05</td>
</tr>
</tbody>
</table>
Table No 75: Chirayinkeezhu grama panchayat: Nitrate (mg/l) of two public taps (stations TW1 and TW2) during Nov.2003 to Octo.2004.

<table>
<thead>
<tr>
<th>MONTH AND YEAR</th>
<th>STATIONS</th>
<th>MEAN ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TW1</td>
<td>TW2</td>
</tr>
<tr>
<td>2003 NOV</td>
<td>0.46</td>
<td>0.03</td>
</tr>
<tr>
<td>2003 DEC</td>
<td>0.05</td>
<td>0.02</td>
</tr>
<tr>
<td>2004 JAN</td>
<td>0.45</td>
<td>0.04</td>
</tr>
<tr>
<td>2004 FEB</td>
<td>0.42</td>
<td>0.32</td>
</tr>
<tr>
<td>2004 MAR</td>
<td>0.04</td>
<td>0.32</td>
</tr>
<tr>
<td>2004 APR</td>
<td>0.54</td>
<td>0.52</td>
</tr>
<tr>
<td>2004 MAY</td>
<td>0.01</td>
<td>0.07</td>
</tr>
<tr>
<td>2004 JUNE</td>
<td>0.21</td>
<td>0.32</td>
</tr>
<tr>
<td>2004 JULY</td>
<td>0.32</td>
<td>0.21</td>
</tr>
<tr>
<td>2004 AUG</td>
<td>0.21</td>
<td>0.14</td>
</tr>
<tr>
<td>2004 SEPT</td>
<td>0.13</td>
<td>0.56</td>
</tr>
<tr>
<td>2004 OCT</td>
<td>0.03</td>
<td>0.12</td>
</tr>
<tr>
<td>MEAN ± SD</td>
<td>0.24 ± 0.19</td>
<td>0.22 ± 0.19</td>
</tr>
</tbody>
</table>
Table No 76: Chirayinkeezhu grama panchayat: Nitrite (mg/l) of two public taps (stations TW1 and TW2) during Nov.2003 to Octo.2004.

<table>
<thead>
<tr>
<th>MONTH AND YEAR</th>
<th>STATIONS</th>
<th>MEAN ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TW1</td>
<td>TW2</td>
</tr>
<tr>
<td>2003 NOV</td>
<td>0.01</td>
<td>0.02</td>
</tr>
<tr>
<td>2003 DEC</td>
<td>0.08</td>
<td>0.09</td>
</tr>
<tr>
<td>2004 JAN</td>
<td>0.06</td>
<td>0.02</td>
</tr>
<tr>
<td>2004 FEB</td>
<td>0.06</td>
<td>0.02</td>
</tr>
<tr>
<td>2004 MAR</td>
<td>0.06</td>
<td>0.02</td>
</tr>
<tr>
<td>2004 APR</td>
<td>0.02</td>
<td>0.01</td>
</tr>
<tr>
<td>2004 MAY</td>
<td>0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>2004 JUNE</td>
<td>0.02</td>
<td>0.01</td>
</tr>
<tr>
<td>2004 JULY</td>
<td>0.02</td>
<td>0.01</td>
</tr>
<tr>
<td>2004 AUG</td>
<td>0.02</td>
<td>0.01</td>
</tr>
<tr>
<td>2004 SEPT</td>
<td>0.01</td>
<td>0.03</td>
</tr>
<tr>
<td>2004 OCT</td>
<td>0.03</td>
<td>0.02</td>
</tr>
<tr>
<td>MEAN ± SD</td>
<td>0.03 ± 0.02</td>
<td>0.02 ± 0.02</td>
</tr>
</tbody>
</table>
Table No 77: Chirayinkeezhu grama panchayat: Phosphate (mg/l) of two public taps (stations TW1 and TW2) during Nov.2003 to Octo.2004.

<table>
<thead>
<tr>
<th>MONTH AND YEAR</th>
<th>STATIONS</th>
<th>MEAN ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TW1</td>
<td>TW2</td>
</tr>
<tr>
<td>2003 NOV</td>
<td>0.06</td>
<td>0.06</td>
</tr>
<tr>
<td>2003 DEC</td>
<td>0.04</td>
<td>0.05</td>
</tr>
<tr>
<td>2004 JAN</td>
<td>0.04</td>
<td>0.01</td>
</tr>
<tr>
<td>2004 FEB</td>
<td>0.02</td>
<td>0.03</td>
</tr>
<tr>
<td>2004 MAR</td>
<td>0.04</td>
<td>0.01</td>
</tr>
<tr>
<td>2004 APR</td>
<td>0.02</td>
<td>0.00</td>
</tr>
<tr>
<td>2004 MAY</td>
<td>0.02</td>
<td>0.01</td>
</tr>
<tr>
<td>2004 JUNE</td>
<td>0.03</td>
<td>0.01</td>
</tr>
<tr>
<td>2004 JULY</td>
<td>0.06</td>
<td>0.02</td>
</tr>
<tr>
<td>2004 AUG</td>
<td>0.01</td>
<td>0.02</td>
</tr>
<tr>
<td>2004 SEPT</td>
<td>0.02</td>
<td>0.01</td>
</tr>
<tr>
<td>2004 OCT</td>
<td>0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>MEAN ± SD</td>
<td>0.03 ± 0.02</td>
<td>0.02 ± 0.02</td>
</tr>
</tbody>
</table>
Table No 78: Chirayinkeezhu grama panchayat: Silicate (mg/L) of two public taps (stations TW1 and TW2) during Nov.2003 to Octo.2004.

<table>
<thead>
<tr>
<th>MONTH AND YEAR</th>
<th>STATIONS</th>
<th>MEAN ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TW1</td>
<td>TW2</td>
</tr>
<tr>
<td>2003 NOV</td>
<td>0.52</td>
<td>0.48</td>
</tr>
<tr>
<td>2003 DEC</td>
<td>0.30</td>
<td>0.38</td>
</tr>
<tr>
<td>2004 JAN</td>
<td>0.28</td>
<td>0.20</td>
</tr>
<tr>
<td>2004 FEB</td>
<td>0.42</td>
<td>0.42</td>
</tr>
<tr>
<td>2004 MAR</td>
<td>0.05</td>
<td>0.28</td>
</tr>
<tr>
<td>2004 APR</td>
<td>0.11</td>
<td>0.29</td>
</tr>
<tr>
<td>2004 MAY</td>
<td>0.29</td>
<td>0.19</td>
</tr>
<tr>
<td>2004 JUNE</td>
<td>0.05</td>
<td>0.20</td>
</tr>
<tr>
<td>2004 JULY</td>
<td>0.01</td>
<td>0.10</td>
</tr>
<tr>
<td>2004 AUG</td>
<td>0.01</td>
<td>0.02</td>
</tr>
<tr>
<td>2004 SEPT</td>
<td>0.38</td>
<td>0.02</td>
</tr>
<tr>
<td>2004 OCT</td>
<td>0.10</td>
<td>0.03</td>
</tr>
<tr>
<td>MEAN ± SD</td>
<td>0.21 ± 0.17</td>
<td>0.22 ± 0.16</td>
</tr>
</tbody>
</table>
Table No 79: Chirayinkeezhu grama panchayat : pH of two public taps (stations TW1 and TW2) during Nov.2003 to Octo.2004.

<table>
<thead>
<tr>
<th>MONTH AND YEAR</th>
<th>STATIONS</th>
<th>MEAN ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TW1</td>
<td>TW2</td>
</tr>
<tr>
<td>2003 NOV</td>
<td>8.59</td>
<td>7.92</td>
</tr>
<tr>
<td>2003 DEC</td>
<td>8.57</td>
<td>7.25</td>
</tr>
<tr>
<td>2004 JAN</td>
<td>8.56</td>
<td>7.91</td>
</tr>
<tr>
<td>2004 FEB</td>
<td>7.32</td>
<td>7.84</td>
</tr>
<tr>
<td>2004 MAR</td>
<td>8.49</td>
<td>8.32</td>
</tr>
<tr>
<td>2004 APR</td>
<td>7.62</td>
<td>7.62</td>
</tr>
<tr>
<td>2004 MAY</td>
<td>6.52</td>
<td>7.09</td>
</tr>
<tr>
<td>2004 JUNE</td>
<td>6.88</td>
<td>6.89</td>
</tr>
<tr>
<td>2004 JULY</td>
<td>7.78</td>
<td>6.68</td>
</tr>
<tr>
<td>2004 AUG</td>
<td>8.45</td>
<td>6.91</td>
</tr>
<tr>
<td>2004 SEPT</td>
<td>8.95</td>
<td>6.97</td>
</tr>
<tr>
<td>2004 OCT</td>
<td>8.55</td>
<td>7.02</td>
</tr>
<tr>
<td>MEAN ± SD</td>
<td>8.02 ± 0.78</td>
<td>7.37 ± 0.53</td>
</tr>
</tbody>
</table>
Table No 80: Chirayinkeezhu grama panchayat: DO of two public taps (stations TW1 and TW2) during Nov.2003 to Octo.2004.

<table>
<thead>
<tr>
<th>MONTH AND YEAR</th>
<th>STATIONS</th>
<th>MEAN ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TW1</td>
<td>TW2</td>
</tr>
<tr>
<td>2003 NOV</td>
<td>3.21</td>
<td>3.72</td>
</tr>
<tr>
<td>2003 DEC</td>
<td>3.22</td>
<td>5.67</td>
</tr>
<tr>
<td>2004 JAN</td>
<td>2.42</td>
<td>4.21</td>
</tr>
<tr>
<td>2004 FEB</td>
<td>7.92</td>
<td>7.78</td>
</tr>
<tr>
<td>2004 MAR</td>
<td>6.34</td>
<td>6.32</td>
</tr>
<tr>
<td>2004 APR</td>
<td>7.04</td>
<td>7.33</td>
</tr>
<tr>
<td>2004 MAY</td>
<td>5.24</td>
<td>5.23</td>
</tr>
<tr>
<td>2004 JUNE</td>
<td>4.52</td>
<td>3.28</td>
</tr>
<tr>
<td>2004 JULY</td>
<td>5.62</td>
<td>5.27</td>
</tr>
<tr>
<td>2004 AUG</td>
<td>4.82</td>
<td>5.27</td>
</tr>
<tr>
<td>2004 SEPT</td>
<td>4.56</td>
<td>2.22</td>
</tr>
<tr>
<td>2004 OCT</td>
<td>6.92</td>
<td>7.89</td>
</tr>
<tr>
<td>MEAN ± SD</td>
<td>5.15 ± 1.70</td>
<td>5.35 ± 1.79</td>
</tr>
</tbody>
</table>
Table No 81: Chirayinkeezhu grama panchayat : Total hardness (mg/L) of two public taps (stations TW1 and TW2) during Nov.2003 to Octo.2004.

<table>
<thead>
<tr>
<th>MONTH AND YEAR</th>
<th>STATIONS</th>
<th>MEAN ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TW1</td>
<td>TW2</td>
</tr>
<tr>
<td>2003 NOV</td>
<td>43.00</td>
<td>40.00</td>
</tr>
<tr>
<td>2003 DEC</td>
<td>62.00</td>
<td>59.00</td>
</tr>
<tr>
<td>2004 JAN</td>
<td>78.00</td>
<td>81.00</td>
</tr>
<tr>
<td>2004 FEB</td>
<td>56.00</td>
<td>74.00</td>
</tr>
<tr>
<td>2004 MAR</td>
<td>40.00</td>
<td>55.00</td>
</tr>
<tr>
<td>2004 APR</td>
<td>70.00</td>
<td>60.00</td>
</tr>
<tr>
<td>2004 MAY</td>
<td>70.00</td>
<td>24.00</td>
</tr>
<tr>
<td>2004 JUNE</td>
<td>56.00</td>
<td>52.00</td>
</tr>
<tr>
<td>2004 JULY</td>
<td>60.00</td>
<td>42.00</td>
</tr>
<tr>
<td>2004 AUG</td>
<td>52.00</td>
<td>36.00</td>
</tr>
<tr>
<td>2004 SEPT</td>
<td>40.00</td>
<td>38.20</td>
</tr>
<tr>
<td>2004 OCT</td>
<td>42.52</td>
<td>42.58</td>
</tr>
<tr>
<td>MEAN ± SD</td>
<td>55.79 ± 12.61</td>
<td>50.32 ± 16.45</td>
</tr>
</tbody>
</table>
Table No 82: Chirayinkeezhu grama panchayat; Calcium hardness (mg/L) of two public taps (stations TW1 and TW2) during Nov.2003 to Octo.2004.

<table>
<thead>
<tr>
<th>MONTH AND YEAR</th>
<th>STATIONS</th>
<th>MEAN ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TW1</td>
<td>TW2</td>
</tr>
<tr>
<td>2003 NOV</td>
<td>11.22</td>
<td>26.84</td>
</tr>
<tr>
<td>2003 DEC</td>
<td>6.32</td>
<td>25.81</td>
</tr>
<tr>
<td>2004 JAN</td>
<td>18.23</td>
<td>18.20</td>
</tr>
<tr>
<td>2004 FEB</td>
<td>12.41</td>
<td>14.04</td>
</tr>
<tr>
<td>2004 MAR</td>
<td>6.23</td>
<td>4.82</td>
</tr>
<tr>
<td>2004 APR</td>
<td>8.32</td>
<td>6.43</td>
</tr>
<tr>
<td>2004 MAY</td>
<td>10.34</td>
<td>9.64</td>
</tr>
<tr>
<td>2004 JUNE</td>
<td>6.40</td>
<td>8.00</td>
</tr>
<tr>
<td>2004 JULY</td>
<td>12.00</td>
<td>9.00</td>
</tr>
<tr>
<td>2004 AUG</td>
<td>19.24</td>
<td>6.40</td>
</tr>
<tr>
<td>2004 SEPT</td>
<td>14.00</td>
<td>8.02</td>
</tr>
<tr>
<td>2004 OCT</td>
<td>12.00</td>
<td>22.60</td>
</tr>
<tr>
<td>MEAN ± SD</td>
<td>11.39 ± 4.31</td>
<td>13.32 ± 8.01</td>
</tr>
</tbody>
</table>
Table No 83: Chirayinkeezhu grama panchayat : Magnesium hardness (mg/L) of two tap water (stations R1 to R2) during Nov.2003 to Octo.2004.

<table>
<thead>
<tr>
<th>MONTH AND YEAR</th>
<th>STATIONS</th>
<th>MEAN ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TW1</td>
<td>TW2</td>
</tr>
<tr>
<td>2003 NOV</td>
<td>17.35</td>
<td>28.78</td>
</tr>
<tr>
<td>2003 DEC</td>
<td>55.68</td>
<td>52.68</td>
</tr>
<tr>
<td>2004 JAN</td>
<td>69.98</td>
<td>82.77</td>
</tr>
<tr>
<td>2004 FEB</td>
<td>43.59</td>
<td>59.56</td>
</tr>
<tr>
<td>2004 MAR</td>
<td>31.98</td>
<td>33.77</td>
</tr>
<tr>
<td>2004 APR</td>
<td>61.68</td>
<td>53.57</td>
</tr>
<tr>
<td>2004 MAY</td>
<td>59.66</td>
<td>14.36</td>
</tr>
<tr>
<td>2004 JUNE</td>
<td>49.60</td>
<td>44.00</td>
</tr>
<tr>
<td>2004 JULY</td>
<td>48.00</td>
<td>128.00</td>
</tr>
<tr>
<td>2004 AUG</td>
<td>7.57</td>
<td>32.76</td>
</tr>
<tr>
<td>2004 SEPT</td>
<td>26.00</td>
<td>30.18</td>
</tr>
<tr>
<td>2004 OCT</td>
<td>30.52</td>
<td>19.98</td>
</tr>
<tr>
<td>MEAN ± SD</td>
<td>41.80 ± 19.18</td>
<td>48.37 ± 31.40</td>
</tr>
</tbody>
</table>
Table No 84: Chirayinkeezhu grama panchayat: Iron (mg/L) of two public taps (stations TW1 and TW2) during Nov.2003 to Octo.2004.

<table>
<thead>
<tr>
<th>MONTH AND YEAR</th>
<th>STATIONS</th>
<th>MEAN ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TW1</td>
<td>TW2</td>
</tr>
<tr>
<td>2003 NOV</td>
<td>0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>2003 DEC</td>
<td>0.01</td>
<td>0.00</td>
</tr>
<tr>
<td>2004 JAN</td>
<td>0.00</td>
<td>0.01</td>
</tr>
<tr>
<td>2004 FEB</td>
<td>0.01</td>
<td>0.03</td>
</tr>
<tr>
<td>2004 MAR</td>
<td>0.00</td>
<td>0.01</td>
</tr>
<tr>
<td>2004 APR</td>
<td>0.00</td>
<td>0.11</td>
</tr>
<tr>
<td>2004 MAY</td>
<td>0.00</td>
<td>0.11</td>
</tr>
<tr>
<td>2004 JUNE</td>
<td>0.01</td>
<td>0.11</td>
</tr>
<tr>
<td>2004 JULY</td>
<td>0.14</td>
<td>0.29</td>
</tr>
<tr>
<td>2004 AUG</td>
<td>0.48</td>
<td>0.87</td>
</tr>
<tr>
<td>2004 SEPT</td>
<td>0.85</td>
<td>0.32</td>
</tr>
<tr>
<td>2004 OCT</td>
<td>0.65</td>
<td>0.48</td>
</tr>
<tr>
<td>MEAN ± SD</td>
<td>0.18±0.30</td>
<td>0.20±0.26</td>
</tr>
</tbody>
</table>
Table No 85: Chirayinkeezhu grama panchayat: Sodium (mg/L) of two public taps (stations TW1 and TW2) during Nov.2003 to Octo.2004.

<table>
<thead>
<tr>
<th>MONTH AND YEAR</th>
<th>STATIONS</th>
<th>MEAN ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TW1</td>
<td>TW2</td>
</tr>
<tr>
<td>2003 NOV</td>
<td>14.09</td>
<td>16.02</td>
</tr>
<tr>
<td>2003 DEC</td>
<td>15.09</td>
<td>11.20</td>
</tr>
<tr>
<td>2004 JAN</td>
<td>18.09</td>
<td>10.90</td>
</tr>
<tr>
<td>2004 FEB</td>
<td>16.03</td>
<td>17.90</td>
</tr>
<tr>
<td>2004 MAR</td>
<td>16.45</td>
<td>17.34</td>
</tr>
<tr>
<td>2004 APR</td>
<td>22.67</td>
<td>27.31</td>
</tr>
<tr>
<td>2004 MAY</td>
<td>21.00</td>
<td>17.60</td>
</tr>
<tr>
<td>2004 JUNE</td>
<td>27.45</td>
<td>22.00</td>
</tr>
<tr>
<td>2004 JULY</td>
<td>23.00</td>
<td>19.60</td>
</tr>
<tr>
<td>2004 SEPT</td>
<td>22.00</td>
<td>12.30</td>
</tr>
<tr>
<td>2004 OCT</td>
<td>10.68</td>
<td>19.00</td>
</tr>
<tr>
<td>MEAN ± SD</td>
<td>19.38 ± 5.10</td>
<td>17.02 ± 4.79</td>
</tr>
</tbody>
</table>
Table No 86: Chirayinkeezhu grama panchayat: Potassium (mg/L) of two public taps (stations TW1 and TW2) during Nov.2003 to Octo.2004.

<table>
<thead>
<tr>
<th>MONTH AND YEAR</th>
<th>STATIONS</th>
<th>MEAN ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TW1</td>
<td>TW2</td>
</tr>
<tr>
<td>2003 NOV</td>
<td>9.21</td>
<td>10.25</td>
</tr>
<tr>
<td>2003 DEC</td>
<td>10.21</td>
<td>13.91</td>
</tr>
<tr>
<td>2004 JAN</td>
<td>15.93</td>
<td>10.43</td>
</tr>
<tr>
<td>2004 FEB</td>
<td>16.35</td>
<td>14.34</td>
</tr>
<tr>
<td>2004 MAR</td>
<td>13.93</td>
<td>16.15</td>
</tr>
<tr>
<td>2004 APR</td>
<td>26.28</td>
<td>28.56</td>
</tr>
<tr>
<td>2004 MAY</td>
<td>17.65</td>
<td>16.84</td>
</tr>
<tr>
<td>2004 JUNE</td>
<td>20.63</td>
<td>14.22</td>
</tr>
<tr>
<td>2004 JULY</td>
<td>20.00</td>
<td>13.96</td>
</tr>
<tr>
<td>2004 AUG</td>
<td>13.07</td>
<td>11.32</td>
</tr>
<tr>
<td>2004 SEPT</td>
<td>16.22</td>
<td>18.34</td>
</tr>
<tr>
<td>2004 OCT</td>
<td>9.56</td>
<td>16.45</td>
</tr>
<tr>
<td>MEAN ± SD</td>
<td>15.75 ± 5.04</td>
<td>15.40 ± 4.86</td>
</tr>
</tbody>
</table>
Table No 87: Chirayinkeezhu grama panchayat : BOD (mg/L) of two public taps (stations TW1 to TW2) during Nov.2003 to Octo.2004.

<table>
<thead>
<tr>
<th>MONTH AND YEAR</th>
<th>STATIONS</th>
<th>MEAN ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TW1</td>
<td>TW2</td>
</tr>
<tr>
<td>2003 NOV</td>
<td>3.14</td>
<td>4.21</td>
</tr>
<tr>
<td>2003 DEC</td>
<td>2.02</td>
<td>4.06</td>
</tr>
<tr>
<td>2004 JAN</td>
<td>2.74</td>
<td>2.21</td>
</tr>
<tr>
<td>2004 FEB</td>
<td>2.22</td>
<td>2.21</td>
</tr>
<tr>
<td>2004 MAR</td>
<td>4.01</td>
<td>1.23</td>
</tr>
<tr>
<td>2004 APR</td>
<td>1.98</td>
<td>4.21</td>
</tr>
<tr>
<td>2004 MAY</td>
<td>2.45</td>
<td>8.56</td>
</tr>
<tr>
<td>2004 JUNE</td>
<td>3.01</td>
<td>6.24</td>
</tr>
<tr>
<td>2004 JULY</td>
<td>2.98</td>
<td>5.02</td>
</tr>
<tr>
<td>2004 AUG</td>
<td>3.61</td>
<td>3.61</td>
</tr>
<tr>
<td>2004 SEPT</td>
<td>7.89</td>
<td>4.81</td>
</tr>
<tr>
<td>2004 OCT</td>
<td>7.83</td>
<td>7.21</td>
</tr>
<tr>
<td>MEAN ± SD</td>
<td>3.66 ± 2.06</td>
<td>4.47 ± 2.12</td>
</tr>
</tbody>
</table>
Table 88 showed a significant positive correlation between Turbidity and TS (0.69), Turbidity and TDS (0.62) of tap water. It was further noted that Total solids was significantly positively correlated with TDS (0.69) and Na (0.67). Further Chloride and Fe were significantly and positively correlated with TDS having r-values of 0.77 and 0.61 respectively. Between Phosphate and Silicate (0.60) and Phosphate and Conductivity (0.58) there was positive significant correlation. A positive significant correlation was obtained between Potassium and Sodium (0.77) and Potassium and Nitrate (0.66). Other positive correlations obtained included Total hardness and Magnesium hardness (0.72); Fe and BOD (0.63).

Negative correlation coefficients were also noted in the correlation matrix. Temperature showed a significant negative correlation with Conductivity (-0.65). Similarly between Turbidity and Silicate there was negative significant correlation (-0.68). Besides Chloride showed negative significant correlation with Nitrite (-0.65) and Total hardness (-0.62). In addition Total solids displayed negative significant correlation with Calcium hardness (-0.66), Silicate (-0.57) and Nitrite (-0.65). Besides Sodium was significantly and negatively correlated with pH (-0.66) and Nitrite (-0.61). Further Total hardness was significantly correlated with BOD (-0.65) and Fe (-0.57). Other negative correlations obtained were as follows: Calcium hardness displayed a negative significant correlation with Potassium (-0.69) and Sodium (-0.74); Fe showed a significant negative correlation with Silicate (-0.61). TDS significant negatively with Silicate (-0.67), and DO was significantly and negatively correlated with Conductivity (-0.69).
Seasonwise correlation of water characteristics of Public Taps

Table 89 and Tables 90 showed the correlation matrix of water parameters of public taps during rainy and non-rainy season respectively. It was inferred that the number of significant positive and negative correlations was much higher than the correlations obtained for the whole year 2003-2004 (Table No. 88).
Table No. 88: Correlation matrix of water characteristics of two Public Taps of Chirayinkeezhu grama panchayat during Nov.2003 to Octo.2004

<table>
<thead>
<tr>
<th></th>
<th>Temp</th>
<th>Turb</th>
<th>Condu</th>
<th>Chlori</th>
<th>TS</th>
<th>TDS</th>
<th>Nitrate</th>
<th>Nitrite</th>
<th>Phos</th>
<th>Silicate</th>
<th>pH</th>
<th>DO</th>
<th>TH</th>
<th>Ca</th>
<th>Mg</th>
<th>Fe</th>
<th>Na</th>
<th>K</th>
<th>BOD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Turbidity</td>
<td>-0.42</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conductivity</td>
<td>-0.65*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chloride</td>
<td>-0.47</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TS</td>
<td>-0.29</td>
<td>0.69*</td>
<td>-0.23</td>
<td>0.56</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TDS</td>
<td>-0.37</td>
<td>0.62*</td>
<td>-0.18</td>
<td>0.77</td>
<td>0.69*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nitrate</td>
<td>0.10</td>
<td>0.04</td>
<td>-0.18</td>
<td>-0.01</td>
<td>0.34</td>
<td></td>
<td>0.05</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nitrite</td>
<td>0.19</td>
<td>-0.35</td>
<td>0.03</td>
<td>-0.65</td>
<td>-0.65*</td>
<td>-0.56</td>
<td>-0.33</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phosphate</td>
<td>-0.22</td>
<td>-0.02</td>
<td>0.58*</td>
<td>-0.07</td>
<td>-0.48</td>
<td>-0.41</td>
<td>-0.16</td>
<td>0.33</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Silicate</td>
<td>0.09</td>
<td>-0.68*</td>
<td>0.29</td>
<td>-0.37</td>
<td>-0.57*</td>
<td>-0.67*</td>
<td>0.11</td>
<td>0.34</td>
<td>0.60*</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>pH</td>
<td>0.56</td>
<td>-0.39</td>
<td>-0.16</td>
<td>-0.44</td>
<td>-0.53</td>
<td>-0.48</td>
<td>0.05</td>
<td>0.42</td>
<td>0.31</td>
<td>0.30</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DO</td>
<td>0.44</td>
<td>-0.03</td>
<td>-0.69*</td>
<td>-0.30</td>
<td>0.11</td>
<td>0.01</td>
<td>0.16</td>
<td>0.00</td>
<td>-0.40</td>
<td>-0.14</td>
<td>-0.13</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total hardness</td>
<td>0.21</td>
<td>-0.29</td>
<td>0.11</td>
<td>-0.62*</td>
<td>-0.41</td>
<td>-0.31</td>
<td>0.31</td>
<td>0.42</td>
<td>-0.01</td>
<td>0.23</td>
<td>0.06</td>
<td>0.07</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ca hardness</td>
<td>-0.17</td>
<td>-0.31</td>
<td>0.30</td>
<td>-0.27</td>
<td>-0.66*</td>
<td>-0.32</td>
<td>-0.32</td>
<td>0.30</td>
<td>0.44</td>
<td>0.41</td>
<td>0.40</td>
<td>-0.26</td>
<td>0.12</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mg hardness</td>
<td>-0.06</td>
<td>0.38</td>
<td>0.14</td>
<td>-0.28</td>
<td>0.00</td>
<td>-0.01</td>
<td>0.27</td>
<td>0.21</td>
<td>0.18</td>
<td>-0.05</td>
<td>-0.20</td>
<td>0.00</td>
<td>0.72*</td>
<td>-0.06</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fe</td>
<td>-0.22</td>
<td>0.36</td>
<td>-0.38</td>
<td>0.51</td>
<td>0.40</td>
<td>0.61*</td>
<td>-0.10</td>
<td>-0.32</td>
<td>-0.45</td>
<td>-0.61*</td>
<td>0.00</td>
<td>0.02</td>
<td>-0.57*</td>
<td>0.10</td>
<td>-0.50</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sodium</td>
<td>-0.23</td>
<td>0.41</td>
<td>0.01</td>
<td>0.42</td>
<td>0.67*</td>
<td>0.43</td>
<td>0.53</td>
<td>-0.61</td>
<td>-0.40</td>
<td>-0.66*</td>
<td>0.17</td>
<td>0.01</td>
<td>-0.74*</td>
<td>0.20</td>
<td>0.00</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potassium</td>
<td>0.20</td>
<td>0.15</td>
<td>-0.37</td>
<td>0.00</td>
<td>0.50</td>
<td>0.05</td>
<td>0.66*</td>
<td>-0.34</td>
<td>-0.53</td>
<td>-0.23</td>
<td>-0.39</td>
<td>0.36</td>
<td>0.24</td>
<td>-0.69*</td>
<td>0.31</td>
<td>-0.10</td>
<td>0.77*</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>BOD</td>
<td>-0.33</td>
<td>0.31</td>
<td>-0.11</td>
<td>0.30</td>
<td>0.48</td>
<td>0.25</td>
<td>-0.31</td>
<td>-0.40</td>
<td>-0.38</td>
<td>-0.39</td>
<td>-0.30</td>
<td>-0.04</td>
<td>-0.65*</td>
<td>0.06</td>
<td>-0.40</td>
<td>+0.63</td>
<td>0.00</td>
<td>0.00</td>
<td>1.00</td>
</tr>
</tbody>
</table>

* Significant $r \geq 0.576$
Table No. 89: Correlation matrix of water characteristics of public taps of Chirayinkeezhu grama panchayat during rainy season Nov.2003 to Octo.2004

<table>
<thead>
<tr>
<th></th>
<th>Temp</th>
<th>Turb</th>
<th>Condu</th>
<th>Chlori</th>
<th>TS</th>
<th>TDS</th>
<th>Nitrate</th>
<th>Nitrite</th>
<th>Phos</th>
<th>Silicate</th>
<th>pH</th>
<th>DO</th>
<th>TH</th>
<th>Ca</th>
<th>Mg</th>
<th>Fe</th>
<th>Na</th>
<th>K</th>
<th>BOD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Turbidity</td>
<td>-0.23</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conductivity</td>
<td>0.25</td>
<td>-0.41</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chloride</td>
<td>-0.89*</td>
<td>0.60*</td>
<td>-0.35</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TS</td>
<td>-0.36</td>
<td>0.61*</td>
<td>-0.83*</td>
<td>0.45</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TDS</td>
<td>-0.63*</td>
<td>0.31</td>
<td>-0.75*</td>
<td>0.53</td>
<td>0.89*</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nitrate</td>
<td>-0.02</td>
<td>-0.44</td>
<td>-0.28</td>
<td>-0.30</td>
<td>0.18</td>
<td>0.36</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nitrite</td>
<td>0.44</td>
<td>0.59*</td>
<td>-0.28</td>
<td>-0.17</td>
<td>0.32</td>
<td>-0.06</td>
<td>0.11</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phosphate</td>
<td>-0.87*</td>
<td>0.16</td>
<td>-0.32</td>
<td>0.78*</td>
<td>0.44</td>
<td>0.69*</td>
<td>-0.16</td>
<td>-0.63*</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Silicate</td>
<td>-0.15</td>
<td>-0.20</td>
<td>0.76*</td>
<td>0.16</td>
<td>-0.77*</td>
<td>-0.64*</td>
<td>-0.59*</td>
<td>-0.50</td>
<td>0.08</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>pH</td>
<td>0.43</td>
<td>0.70*</td>
<td>-0.36</td>
<td>0.00</td>
<td>0.28</td>
<td>-0.16</td>
<td>-0.33</td>
<td>0.84*</td>
<td>-0.46</td>
<td>-0.29</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DO</td>
<td>0.08</td>
<td>-0.30</td>
<td>0.86*</td>
<td>-0.07</td>
<td>-0.89*</td>
<td>-0.80*</td>
<td>-0.51</td>
<td>-0.38</td>
<td>-0.16</td>
<td>0.97*</td>
<td>-0.24</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TH</td>
<td>0.40</td>
<td>-0.51</td>
<td>0.89*</td>
<td>-0.50</td>
<td>-0.94*</td>
<td>-0.87*</td>
<td>-0.05</td>
<td>-0.09</td>
<td>-0.59*</td>
<td>0.66*</td>
<td>-0.22</td>
<td>0.82*</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total hardness</td>
<td>0.59*</td>
<td>-0.74*</td>
<td>0.67*</td>
<td>-0.74*</td>
<td>-0.91*</td>
<td>-0.84*</td>
<td>0.13</td>
<td>-0.14</td>
<td>-0.66*</td>
<td>0.44</td>
<td>-0.21</td>
<td>0.62*</td>
<td>0.88*</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ca hardness</td>
<td>0.34</td>
<td>-0.45</td>
<td>0.93*</td>
<td>-0.40</td>
<td>-0.96*</td>
<td>-0.90*</td>
<td>-0.23</td>
<td>-0.18</td>
<td>-0.48</td>
<td>0.79*</td>
<td>-0.21</td>
<td>0.91*</td>
<td>0.96*</td>
<td>0.83*</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mg hardness</td>
<td>0.58*</td>
<td>0.34</td>
<td>-0.53</td>
<td>-0.37</td>
<td>0.55</td>
<td>0.21</td>
<td>0.06</td>
<td>0.63*</td>
<td>-0.35</td>
<td>-0.77*</td>
<td>0.65*</td>
<td>-0.69*</td>
<td>-0.50</td>
<td>-0.28</td>
<td>-0.55</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fe</td>
<td>-0.70*</td>
<td>0.23</td>
<td>-0.78*</td>
<td>0.61*</td>
<td>0.81*</td>
<td>0.96*</td>
<td>0.30</td>
<td>-0.22</td>
<td>0.78*</td>
<td>-0.52</td>
<td>-0.21</td>
<td>-0.71</td>
<td>-0.87*</td>
<td>-0.79*</td>
<td>-0.87*</td>
<td>0.09</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sodium</td>
<td>-0.26</td>
<td>-0.25</td>
<td>0.61*</td>
<td>0.22</td>
<td>-0.76*</td>
<td>-0.58*</td>
<td>-0.33</td>
<td>-0.42</td>
<td>0.04</td>
<td>0.92*</td>
<td>-0.29</td>
<td>0.89*</td>
<td>0.67*</td>
<td>0.49</td>
<td>0.75*</td>
<td>-0.88*</td>
<td>-0.43</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Potassium</td>
<td>-0.20</td>
<td>-0.14</td>
<td>-0.36</td>
<td>-0.08</td>
<td>0.49</td>
<td>0.63*</td>
<td>0.90*</td>
<td>0.18</td>
<td>0.05</td>
<td>-0.70*</td>
<td>-0.29</td>
<td>-0.68*</td>
<td>-0.29</td>
<td>-0.24</td>
<td>-0.45</td>
<td>0.16</td>
<td>0.50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BOD</td>
<td>-0.20</td>
<td>-0.14</td>
<td>-0.36</td>
<td>-0.08</td>
<td>0.49</td>
<td>0.63*</td>
<td>0.90*</td>
<td>0.18</td>
<td>0.05</td>
<td>-0.70*</td>
<td>-0.29</td>
<td>-0.68*</td>
<td>-0.29</td>
<td>-0.24</td>
<td>-0.45</td>
<td>0.16</td>
<td>0.50</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Significant $r \geq 0.576$
Table No. 90: Correlation matrix of water characteristics of public taps of Chirayinkeezhu grama panchayat during non-rainy season Nov.2003 to Octo.2004

<table>
<thead>
<tr>
<th></th>
<th>Temp</th>
<th>Turb</th>
<th>Condu</th>
<th>Chlori</th>
<th>TS</th>
<th>TDS</th>
<th>Nitrate</th>
<th>Phos</th>
<th>Silicate</th>
<th>pH</th>
<th>DO</th>
<th>TH</th>
<th>Ca</th>
<th>Mg</th>
<th>Fe</th>
<th>Na</th>
<th>K</th>
<th>BOD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Turbidity</td>
<td>0.29</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conductivity</td>
<td>-0.76</td>
<td>-0.08</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chloride</td>
<td>-0.53</td>
<td>0.10</td>
<td>0.86*</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TS</td>
<td>0.41</td>
<td>0.20</td>
<td>0.18</td>
<td>0.09</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TDS</td>
<td>0.73*</td>
<td>0.22</td>
<td>-0.41</td>
<td>-0.52</td>
<td>0.79*</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nitrate</td>
<td>-0.59*</td>
<td>-0.06</td>
<td>0.84*</td>
<td>0.98*</td>
<td>-0.03</td>
<td>0.63*</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nitrite</td>
<td>-0.03</td>
<td>-0.20</td>
<td>-0.14</td>
<td>-0.03</td>
<td>-0.32</td>
<td>-0.26</td>
<td>0.10</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phosphate</td>
<td>-0.68*</td>
<td>0.45</td>
<td>0.69*</td>
<td>0.69*</td>
<td>-0.22</td>
<td>0.57*</td>
<td>0.62*</td>
<td>-0.27</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Silicate</td>
<td>0.15</td>
<td>0.84*</td>
<td>0.29</td>
<td>0.35</td>
<td>0.56</td>
<td>0.34</td>
<td>0.17</td>
<td>-0.51</td>
<td>0.53</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>pH</td>
<td>0.86*</td>
<td>0.68*</td>
<td>-0.59*</td>
<td>-0.43</td>
<td>0.49</td>
<td>0.77*</td>
<td>-0.57*</td>
<td>-0.25</td>
<td>-0.30</td>
<td>0.56</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DO</td>
<td>0.12</td>
<td>0.11</td>
<td>-0.66*</td>
<td>-0.48</td>
<td>-0.81</td>
<td>-0.41</td>
<td>0.42</td>
<td>-0.11</td>
<td>-0.42</td>
<td>0.05</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total hardness</td>
<td>0.54</td>
<td>-0.49</td>
<td>-0.62*</td>
<td>-0.77*</td>
<td>0.24</td>
<td>0.61*</td>
<td>-0.71*</td>
<td>0.22</td>
<td>-0.96</td>
<td>-0.53</td>
<td>0.23</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ca hardness</td>
<td>-0.17</td>
<td>-0.29</td>
<td>-0.32</td>
<td>-0.26</td>
<td>0.73*</td>
<td>-0.47</td>
<td>-0.11</td>
<td>-0.21</td>
<td>-0.72</td>
<td>-0.37</td>
<td>0.76*</td>
<td>0.20</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mg hardness</td>
<td>0.60*</td>
<td>-0.32</td>
<td>-0.41</td>
<td>-0.59*</td>
<td>0.62*</td>
<td>0.83*</td>
<td>-0.61*</td>
<td>-0.26</td>
<td>-0.80</td>
<td>-0.12</td>
<td>0.42</td>
<td>0.36</td>
<td>0.84*</td>
<td>-0.36</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fe</td>
<td>0.05</td>
<td>-0.45</td>
<td>-0.47</td>
<td>-0.42</td>
<td>-0.55</td>
<td>-0.24</td>
<td>-0.26</td>
<td>0.85*</td>
<td>-0.52</td>
<td>0.83*</td>
<td>0.27</td>
<td>0.66*</td>
<td>0.49</td>
<td>0.94*</td>
<td>-0.04</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sodium</td>
<td>-0.30</td>
<td>0.08</td>
<td>0.80*</td>
<td>0.84*</td>
<td>0.48</td>
<td>0.11</td>
<td>0.15</td>
<td>0.38</td>
<td>-0.24</td>
<td>-0.42</td>
<td>-0.29</td>
<td>-0.24</td>
<td>-0.33</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potassium</td>
<td>-0.13</td>
<td>-0.04</td>
<td>-0.17</td>
<td>0.17</td>
<td>0.79*</td>
<td>0.73*</td>
<td>0.24</td>
<td>0.07</td>
<td>0.23</td>
<td>-0.30</td>
<td>0.62*</td>
<td>-0.41</td>
<td>0.36</td>
<td>0.58*</td>
<td>0.23</td>
<td>-0.31</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>BOD</td>
<td>0.08</td>
<td>0.20</td>
<td>0.49</td>
<td>0.38</td>
<td>0.89*</td>
<td>0.52</td>
<td>0.28</td>
<td>-0.05</td>
<td>0.04</td>
<td>0.54</td>
<td>0.21</td>
<td>-0.83</td>
<td>0.01</td>
<td>-0.52</td>
<td>0.29</td>
<td>-0.45</td>
<td>0.78*</td>
<td>-0.80*</td>
</tr>
</tbody>
</table>

• Significant $r = \geq 0.576$
6.2 BACTERIOLOGICAL ANALYSIS OF WATER SOURCES

Total and faecal coliforms (TC & FC)

The count of total and faecal coliforms of various water bodies is presented in Table 91.

Coliforms in dug well

Out of 7 dug wells studied, four wells (W1, W2, W4 and W6) showed the presence of coliforms. The Total Coliforms ranged from 700-5200 CFU/100ml and Faecal Coliforms from 280-3600 CFU/100ml.

Coliforms in pond

Both pond 1 and pond 2 showed the presence of total and faecal coliforms. In pond 1, the count of total coliform was 700 CFU/100ml and faecal coliform was 560 CFU/100ml. In P2 the counts were 2800 CFU/100ml and 600 CFU/100ml total coliforms and faecal coliforms respectively.

Coliforms in tap water

Total coliform and faecal coliforms were absent in tap water.

Coliforms in river

Based on analysis of 4 stations in Vamanapuram river, it was observed that the TC ranged from 1400 CFU/100ml to 2400 CFU/100ml and the FC varied from 200 CFU/100ml to 2000 CFU/100ml.

It was derived from the study that all water sources except tap water were contaminated, as indicated by the high count of faecal coliforms beyond the limit set by BIS (1991) for drinking water.
Table 91: Total coliforms and faecal coliforms in wells (W1 to W7), ponds (P1 to P2), Rivers (R1 to R4) and Taps (TW1 to TW2)

<table>
<thead>
<tr>
<th>Stations</th>
<th>Total coliforms (CFU/100mL)</th>
<th>Faecal coliforms (CFU/100mL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Well</td>
<td></td>
<td></td>
</tr>
<tr>
<td>W1</td>
<td>3600</td>
<td>2800</td>
</tr>
<tr>
<td>W2</td>
<td>800</td>
<td>400</td>
</tr>
<tr>
<td>W3</td>
<td>NIL</td>
<td>NIL</td>
</tr>
<tr>
<td>W4</td>
<td>5200</td>
<td>3600</td>
</tr>
<tr>
<td>W5</td>
<td>NIL</td>
<td>NIL</td>
</tr>
<tr>
<td>W6</td>
<td>700</td>
<td>280</td>
</tr>
<tr>
<td>W7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pond</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P1</td>
<td>700</td>
<td>560</td>
</tr>
<tr>
<td>P2</td>
<td>2800</td>
<td>600</td>
</tr>
<tr>
<td>Tap</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TW1</td>
<td>NIL</td>
<td>NIL</td>
</tr>
<tr>
<td>TW2</td>
<td>NIL</td>
<td>NIL</td>
</tr>
<tr>
<td>River</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R1</td>
<td>2400</td>
<td>2000</td>
</tr>
<tr>
<td>R2</td>
<td>2000</td>
<td>200</td>
</tr>
<tr>
<td>R3</td>
<td>1600</td>
<td>800</td>
</tr>
<tr>
<td>R4</td>
<td>1400</td>
<td>600</td>
</tr>
</tbody>
</table>
6.3 DISCUSSION

Government of India (GOI) attaches greatest importance to safe drinking water supply and recognizes its vital role in the health of the people. The national water policy gives top priority to drinking water supply. GOI has set a target of covering all the uncovered habitation in the country by 2003 AD. GOI provides funds to state government under the aegis of the Rajiv Gandhi National Drinking Water Mission (RGNDWN) set up in 1990 specifically for this purpose. GOI has also laid down minimal per capita water supply norms of 40 lpcd (liters per capita per day) in the rural areas and 70 lpcd in the urban areas. Though water is primarily under the jurisdiction of states, policies of GOI are applicable to the entire country.

The state of Kerala has a total land area of 38863 sq.km. In Kerala though community managed traditional water supplies in the form of open dugwells and ponds have been in existence for generations, the first form of protected water supply system was started at Ernakulam town in 1914. Another protected pipe water system for Trivandrum was started in the 1930's by the erstwhile Travancore state. After the formation of present Kerala state, various urban and rural piped water supply schemes were initiated from first five year plan onwards. Kerala Water Authority was established on 1st April 1984 as an autonomous body of Govt. of Kerala by converting the erstwhile Public Health Engineering Department for the development and regulation of water supply and waste water collection and disposal in the state of Kerala.

According to 1991 census, the state of Kerala has an urban population of 76.80 lakhs and rural population of 214.18 lakhs. The extent of water supply coverage in the state is presently 54 % of rural population and 78% for the urban population. The remaining population has to depend on open draw wells, ponds,
natural streams etc. It has been estimated that 45% of the rural population depend on privately owned wells.

The two types of sources used for water supply are ground water and surface water. As surface water source there are 44 rivers traversing the state, all of which are monsoon fed and fast flowing. The total runoff from these rivers amounts to 702 MCM while the utilizable yield is only 427 MCM. But not all the surface water for drinking purpose is largely through piped water supply schemes.

The water collected from surface or ground water sources, is conveyed to treatment plant for removal of impurities. The treated water after adding quality control contents is stored in clean water reservoirs and pumped to overhead tanks directly into the distribution system for supplying to the customers through individual connection. In addition street taps are provided for domestic consumption.

In Chirayinkeezhu Panchayat, the source of pipewater is Vamanapuram river. It is one of the major rivers in south Kerala with a length of about 81 Km. It is mainly extended in Thiruvananthpuram district, but a small part falls in Kollam district as well. The river originates from the Chenmmunj mottai in the western ghats at an altitude of about 1717 M above mean sea level and debouches into the Arabian sea at Muddalappozhi near Perumathura 25 Km north of Thiruvananthpuram.

In Vamanapuram river there are six main pumping stations. Among them one is Vakkom-Anjengo scheme and through this scheme Chirayinkeezhu gets water supply. By using a pump with 175 horse power (24 hours pumping) now water is pumped into the treatment plant. Firstly the water is aerated, then lime and alum are added which helps to coagulate the particles in the water (coagulation and flocculation), then diverted to sedimentation tank where the floating particles are sedimented. Then the water is passed through a filtration
unit. Into the filtered water coming through the channel or pipes, chlorine or bleaching powder is added. During the time of epidemic more amounts of chlorine are added. After this the water flowing at the tap is checked for residual chlorine so that it is around 0.2ppm. After this the purified water is stored in the overhead tank and from there it is supplied to the public and domestic taps.

The V-A scheme provides water to only a small section of people. Since only 1116 households receive water from the scheme, open dugwell formed the main source of water for domestic consumption. However, some others depended on public wells and tube wells. There are 19 public wells in the panchayat. Due to sand mining in Vamanapuram river, salt water intrusion occurs in summer months. Hence the level of water in wells decreases and quality of water is affected. Acute scarcity of drinking water is experienced in certain places. Water shortage period is during March to May. Chirayinkeezhu comes under the severity code 7, which means scarcity of affected population is greater than 25%

Analysis of characteristics of water collected from taps showed interesting results. Temperature of tap water ranged from 28.58°C to 29.17°C. Turbidity of tap water varied from 7.95 NTU to 8.89 NTU. Annual mean turbidity value of two taps was 8.42 NTU. In the case of Vamanapuram river the annual mean value of turbidity was 15.41 NTU. But the river water in the tap after proper treatment showed a reduction in the turbidity value.

The annual mean value of conductivity of tap water was 0.29 mS. TW1 showed a mean value of 0.33 ms and TW2 of 0.24 mS. In the case of river water the conductivity value was 0.56 mS. It indicated that tap water conductivity was lower than river water conductivity. In tap water the annual mean value of chloride was 28.61 mg/L. The mean value of TW1 varied from tap 2 by a value of 3.33 mg/L. The annual mean value of chloride of river was 39.68 mg/L. It indicated that the tap water value of chloride was lower than river water value, which might be due to the treatment process done in water supply.
The annual mean value of TS of tap water was 285.42 mg/L. The mean value of TW1 and TW2 showed almost same values. The annual mean value of TS of river was 583.88 mg/L. The mean value of TDS of the two taps varied from 167.5 mg/L to 182.83 mg/L. The annual mean value was 175.12 mg/L. In river the annual mean value was 449.52 mg/L. This data clearly showed that the annual mean values of Ts and TDS of tap water, were lower than the values of river water.

The annual mean value of nitrate of tap water was 0.23 mg/L. The value of two taps showed almost same values (0.22 mg/L). In river the annual mean nitrate was 0.29 mg/L. Mini et. al (2003) found that nitrate fluctuated in Vamanapuram river from 0.045 mg/L to 0.426 mg/L in the case of Phosphate, the annual mean value was 0.03 mg/L. Two taps exhibited values of 0.03 mg/L (TW1) and 0.02 mg/L (TW2) respectively. In contrast the river showed a higher mean value of 0.04 mg/L. The mean silicate of tap water was 0.21 mg/L TW1 showed 0.21 mg/L and it was lower than Tw2 (0.22). In the case of river the annual mean silicate value was 0.17 mg/L.

pH of two public taps ranged from 8.02 to 7.37 and annual mean value was 7.70. The annual mean pH value of river was 7.32. It indicated that pH of tap water was slightly higher than the river water but all values were within the limits set by the BIS. Natural water with pH value between 6-8 can be considered as neutral water and majority of potable water belonged to this category (Bulushu, 1987).

In the case of total hardness, the annual mean value was 53.05 mg/L. TW1 showed 55.79 mg/L and TW2 showed 50.32 mg/L. The river water showed the annual mean value of 180.01 mg/L. Thus the treated tap water showed lower values of hardness than river water. Similar decreases were noticed with respect to calcium hardness and magnesium hardness.
The annual mean value of Fe in two taps was 0.19 mg/L. TW1 had value of 0.18 mg/L and TW2 had a value of 0.20 mg/L. It was lower than the mean annual value of 0.23 mg/L in river. Both sodium and potassium also showed similar trends.

It was interesting to note from bacteriological analysis that there was no total and faecal coliforms in tap water, whereas the river contained high amount of total and faecal coliforms - the range of TC was from 1400 to 2400 CFU/100ml and FC varied from 200 to 2000 CFU/100ml. Panicker et al. (2000) made assessment of bacteriological quality of potable water and evaluation of water purification techniques, in Kottayam district. The study showed that the untreated well water contained E. coli, but the tap water supply of municipal was found to be 100% efficient providing bacteriologically safe drinking water as noted in the present study. They suggested that conventional technique of boiling water is an alternative efficient method for the purification of water.

Discussion on correlation matrices obtained with respect to tap water characteristics was avoided, since the matrices exhibited contrasting results when analysed monthwise (one year period) and seasonwise separately (rainy and non-rainy seasons) during 2003-04.

It was inferred from the study that the water distributed in pipelines in Chirayinkeezhu panchayat was of good quality as per BIS (1991). It was also free from coliform bacteria.