DIURNAL CYCLE OF PHYSICO—CHEMICAL FEATURES OF THE SAGAR GADHERA FROM THE GARHWAH HIMALAYA

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The diurnal fluctuations of some physico-chemical parameters were investigated from the rivulet Sagar gadhera (Chamoli). The Sagar gadhera provides the water supply to Gopeshwar town. Data collected on the diurnal cycle revealed narrow fluctuations.

The investigations on the diurnal cycle of the fresh waters of India has been made by some workers. There is little information available on the diurnal cycle of abiotic factors of the torrential mountain streams of the Himalayas. Hence, it was considered desirable to study diurnal cycle of physico-chemical features of the snow-fed water of Sagar gadhera which originates at an elevation of about 2565 msl of Panar Bughyal of Garhwal Himalaya.

The diurnal cycle study was made at the intake chamber of Gopeshwar water supply scheme near Gangolgaun (Chamoli) on April, 15-16, 1986. Samples of surface water were collected at four hourly interval for twenty four hours, using a water sampler of one litre capacity. All the physico-chemical parameters were assayed following standard methods.

The observations recorded for 24 hours during spring season are shown in Table 1. In Sagar gadhera the water temperature follows a definite pattern of diurnal increase (day time) and decrease (night time). The water temperature fluctuated between 10°C to 17°C. The atmospheric temperature fluctuated between 16°C to 24°C, being maxi-
Table 1—Diurnal variation in physico-chemical features of the Sagar gadhera.

<table>
<thead>
<tr>
<th>Time (hrs)</th>
<th>Temperature (°C)</th>
<th>Transparency (cm)</th>
<th>Dissolved Oxygen (mg/l)</th>
<th>pH</th>
<th>Free Chloride (mg/l)</th>
<th>Oxygen Saturation (%)</th>
<th>Alkalinity (mg/l)</th>
<th>BOD (mg/l)</th>
<th>Filtrable Solids (mg/l)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>10</td>
<td>18</td>
<td>68</td>
<td>10.5</td>
<td>3.13</td>
<td>7.56</td>
<td>2.0</td>
<td>23.8</td>
<td>27.57</td>
</tr>
<tr>
<td>10</td>
<td>16.6</td>
<td>20</td>
<td>80</td>
<td>11.0</td>
<td>4.42</td>
<td>7.58</td>
<td>2.6</td>
<td>24.0</td>
<td>40.59</td>
</tr>
<tr>
<td>14</td>
<td>17.0</td>
<td>24</td>
<td>86</td>
<td>11.0</td>
<td>5.68</td>
<td>7.57</td>
<td>2.0</td>
<td>24.2</td>
<td>56.12</td>
</tr>
<tr>
<td>18</td>
<td>17.0</td>
<td>24</td>
<td>72</td>
<td>10.5</td>
<td>4.66</td>
<td>7.58</td>
<td>3.0</td>
<td>24.2</td>
<td>46.16</td>
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<tr>
<td>22</td>
<td>13.0</td>
<td>19</td>
<td>—</td>
<td>11.30</td>
<td>3.86</td>
<td>7.56</td>
<td>5.0</td>
<td>24.6</td>
<td>42.93</td>
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<tr>
<td>2</td>
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<td>16</td>
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<tr>
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<td>17</td>
<td>70</td>
<td>11.30</td>
<td>3.43</td>
<td>7.58</td>
<td>6.6</td>
<td>24.0</td>
<td>29.59</td>
</tr>
</tbody>
</table>

The atmospheric temperature was always higher than the water temperature.

The transparency of water varied from 68 to 86 cm which was maximum at 14 hrs. The turbidity varied from 10% to 11.3% and was minimum at 02 hrs. There was a positive relationship between water temperature and dissolved oxygen during day and night. The dissolved oxygen was maximum at a water temperature of 17°C and minimum at 12.5°C. The over saturation of oxygen was at peak during day and minimum at night time. It was noted that the increase in dissolved oxygen during the day time due to photosynthetic activity of the autotrophs and decrease during night due to respiratory activity of the heterotrophs.

pH of water varied from 7.56 to 7.58 during the diurnal cycle as against the maximum permissible range of pH (7.0-8.5) recommended by WHO and ICMR. A slight increase in pH value during day and decrease at night was observed.

Free CO₂ ranged between 2 mg/l to 3 mg/l, being minimum at the day time and maximum during night. It might be due to photosynthetic activity during day time and respiration during night. Chloride value ranged from 23.8 to 24.6 mg/l. The chloride value was found to be lowest at morning hours. Total dissolved solids varied from 134 to 168 mg/l which are not related to diurnal temperature. However, these
values were highest at the day time. The filterable solids varied from 14 to 18 mg/l which are not related to the dissolved solids. The filterable solids have a difference of 4 mg/l within a diurnal cycle.

In Sagar gadhara diurnal water temperature follows a definite pattern. The atmospheric temperature was found higher than the water temperature contrary to the observations made by Singh et al. at Ramsar well. In the present case it may be due to melting of snow at the peaks of Panar Bughyal and finding its entry in the Sagar gadhara. The water temperature and dissolved oxygen shows a positive relationship similar to the findings reported for pond water and mountain stream water. The oxygen saturation confirms the view of Singh et al.

A slight increase in pH value during day and decrease at night in Sagar gadhara supports the observations made by earlier workers. However the same pH value during day and night were observed by few workers. Michael and Sharma et al. recorded the differences in minimum and maximum value of pH as 0.2 and 0.6 respectively. In the present study this value is 0.02 which shows a narrow fluctuation. High concentration of free carbon dioxide results in lowering of pH similar to Saha. Free CO₂ and alkalinity due to bicarbonate exhibit a negative relationship with diurnal water temperature.

Chloride served as a basis for detecting pollution of ground waters by sewage before the development of bacteriological procedures. In the present study the chloride contents varied from 23.8 to 24.6 mg/l and do not exhibit definite variation pattern. The total dissolved solids and diurnal temperature are not related. In the lower region of Sagar gadhara the fishes are caught in maximum number by fishermen during night. The cause might be that during night dissolved oxygen content and oxygen saturation values comparatively decreased causing disturbance to the fishes. Perhaps to cope with this fluctuation the fishes move swiftly and get trapped in nets. However, the impact of physico-chemical factors on the activity of specific fish and other biota is not studied.

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