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RESEARCH ARTICLE

Assessment of Physical-chemical parameters of water in Al-Dalmaj marsh, Al-Diwaniya province, Iraq

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Abstract

Al-Dalmaj marsh locate in southern med of Iraq, this marsh selected to study physic-chemical parameters during the period October 2012 to January 2013. Five selected site were studied in this period. This study aim to restrict the variant in some physic-chemical parameters of water for Al-Dalmaj marsh, these parameters such as temperature, turbidity, electrical conductivity, pH, dissolved oxygen, total dissolved matters and total alkali calcium the results shows the some variation in selected parameters from site to site.

INTRODUCTION

Mesopotamian marshes are represented by about fifteen thousand kilometers of wetlands. The sources of these wetlands were from Tigris and Euphrates rivers. These wetlands comprise a complex of interconnected shallow freshwater marshlands and lakes they are considered as the most extensive wetland ecosystem in the Middle East [1].

Wetlands are the most important part of life-supporting ecosystems that have sustained human lives and communities over the millennia. Ramsar Convention (1971) was defined Wetlands as the areas of marsh or peat land, fen, or water, permanent or temporary, whether artificial or natural, with the water state that is static or flowing, brackish,fresh or salty origin, including areas of marine water, the range of depth of which at low tide does not exceed 6 meters. This definition evolved with the perspective of restoration and conservationof degrading wetlands worldwide [2].

Wetland covers about 4 to 6 percent of Earth's land surface, expressing a greater portion existence in different wetland ecosystem. Wetlands are a critical element of global and national ecosystems. Wetlands protect the shoreline from mitigate the impact of floods, wave action, absorb pollutants and act as habitats for fauna and flora, including a number of species that are endangered or threatened. Wetlands purify water and are a focal point for recreational and generation of activities. It performs important functions by providing water, food and habitat to numerous species, improving water quality by stabilizing sediments, removing or trapping sediment and nutrients, intercepting surface runoff offering protection for the wetlands by storing flood waters and replenishing ground water [3].

Physical-chemical characteristics of different parts of countries have been studied by many authors [4-6].These parameters are useful for water quality assessment is determined by the presence of both inorganic and organic compounds that are either dissolved or suspended in it. While some of these compounds are harmful or toxic to the ecosystem, some of them are considered nutrients to aquatic organisms and others are responsible for the aesthetics of the water body [7].The pH of water consider as a good indicator to the solubility and bio availability of chemical

components such as nutrients and heavy metals.Tendency of metals being more toxic at lower pH because they are more soluble in such value[8].Though an increase in pH values may have no direct impact for aquatic life, they greatly affect on the solubility and availability of all chemical forms in the water and this might aggravate nutrient troubles leading to a destabilization of the ecosystem[9].
The objective of this work is monitoring the water of Al-Dalmaj marsh over a long period of time in order to describe the variation in physico-chemical parameters and its trend, which is essential component of any pollution control management.

Materials and methods

Description of Study area

Al-Dalmaj marsh is a large wetland locate between Al-Diwaniya province west and Wasit province east, this marsh is famous that have a several types of yearly migrate birds cams from Asia and Europ. Several types of fishes are frequent in this marsh, figure 1, shows the map of the study area.

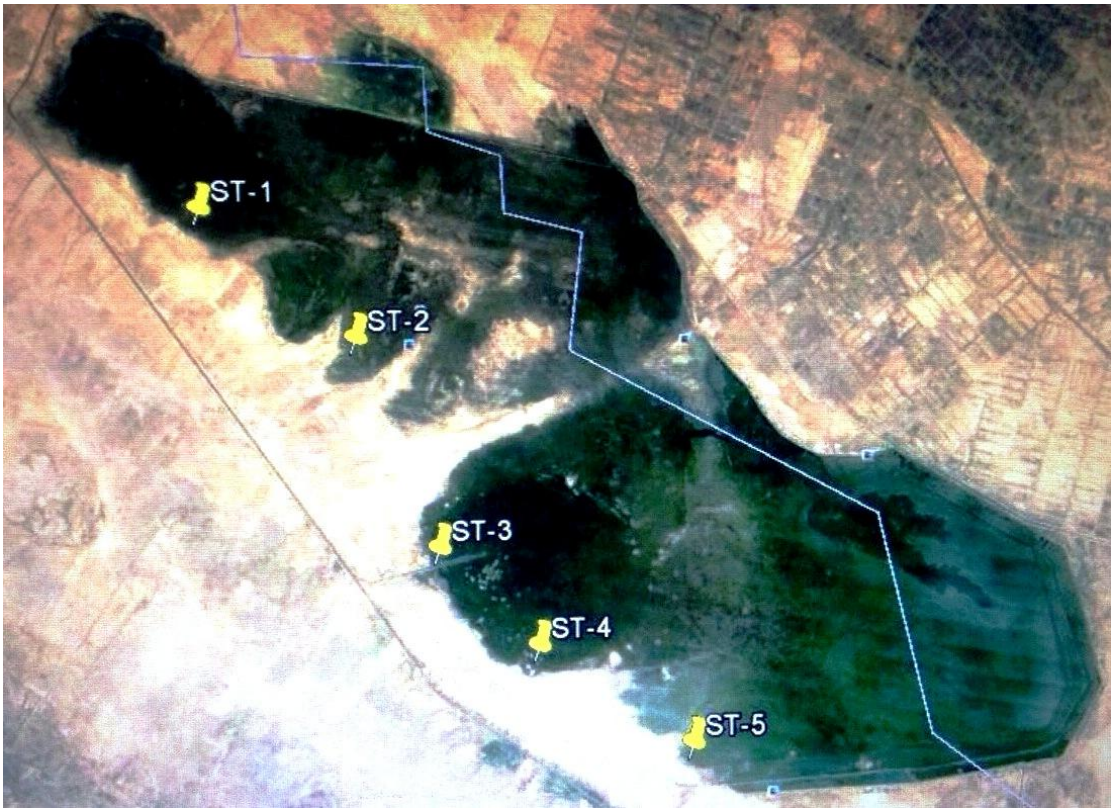

Figure 1. Map of study area

Sampling and collection of water samples

Water samples were collected along Al-Dalmaj marsh from five sampling point for the period from October 2012 to January 2013. Water samples were collected from a depth of 1ft below the surface using polyethylene containers 1L for lab analysis. The containers are washed well with detergent then with distilled water and soaked in 10% nitric acid then washed water sample twice and finally filled with the water sample and 2 mL of concentrated HNO_3 is added and the container is capped sealed and sent to the laboratory where the sample is filtered by passing through 0.45 µm membrane filter.Several parameters were measured locally at the sampling sites[10].

physical-chemical parameters

Water temperatures were measured directly using graduated thermometer between (0C˚-100 C˚). Turbidity was measured by turbidity meter, HANNA type. pH value was measured by portable pH meter type HANNA (hi8010). Calcium concentration was measured by titration with standard solution of Na2EDTA, titration was finished when the pink color appeared. The concentration of calcium was calculated according to the following equation (APHA,2003)

$$Ca(ppm) = \frac{a * b * 400.8}{v}$$

Total alkalinity was measured using Phenolphthalein indictor, 2-3 drops of this indictor to 50 ml of sample and then titrated with standard solution of (0.02N) of hydrochloric acid, the color then changed to colorless; at this point the pH value became 8.3. Total alkalinity is calculated by the following equation(APHA,2003)

Total Alkalinity (mg/L) = $\frac{A*B*50000}{\text{ML OF SAMPLE}}$

Total dissolved solids was calculated according to the following equation:

$$\text{TDS } {}^{mg}/_{l} = \frac{(a-b)*10^6}{\text{ml of sample}}$$

Electrical conductivity was measured using EC-meter by HANNA, model HI99301. All measurements were in µS unit. Dissolved Oxygen measured by Winkler method.

Results &Discussion

Monitoring of water quality is very importance to help policymarkers which make land use decisions that will not only preserve natural areas, but also it will improve thequality of water. The fate and transport of many anthropogenic contaminants are determined by notonly hydrological cycled, but also byphysic-chemical measurements. In order to migrate the impactsof human societies and other organisms have natural waters, it is very important to implementcomprehensive monitoring regimes for surface water. The monitored values of physic-chemical parameters of Al-Dalmaj marsh water samples are noted in the following tables (1-3).

Table 1. Physical-chemical parameters of Al-Dalmaj marsh water samples for November-2012

Parameters	Al-Dalmaj Marsh in Al-Diwaniya province November - 2012				
	Site one	Site two	Site three	Site four	Site five .....
	GPS N"43.22' 18°32 E "49.93' 15 °45	GPS N"55.98' 15 °32 E"40.90' 15 °45	GPS N"16.15' 11°32 E"47.09' 21°45	GPS N 4.54' 9 °32 E"22.15 24°45	GPS N"52.65' 6°32 E"23.62' 28°45
TEMPERATURE	15.67	15.33	15.33	15.17	15.33
TURBIDITY FTU	11.33	10.03	10.53	12.93	14.23
pH	8.19	8.24	8.65	8.66	8.67
T.ALKALINITY Mg/L	248	252	140	138	142
T.D.S Mg/L	1423.33	1295.67	1023.33	1025.67	963.35
E.C µS/CM	1266	1151.67	1184	1270.33	1329
Ca Mg/L	231	210	177	161.7	138.6
D.O Mg/L	9.13	9	8.5	7.87	7.9

Parameters	Al-Dalmaj Marsh in Al-Diwaniya province December - 2012				
	Site one	Site two	Site three	Site four	Site five .....

Temperature

Temperature is an important water quality parameter. Temperature affect by several parameters such as climate, depth of sampling and flow rate of water stream. It is relatively easyto measure water bodies will naturally show variation in temperature seasonally. The changes in temperature of Al-Dalmaj marsh water in the studied stretch did not show widespatial difference the range being 15.17 °C to 15.67 °C in November as shown in table 1. Same thing is clear for the December 2012 and January 2013 as shown in tables 2 and 3 respectively. Figure 2. Illustrate variation from month to month in temperatures for all sampling sites.

Table 2. Physical-chemical parameters Al-Dalmaj marsh water samples for December-2012

Parameters	Al-Dalmaj Marsh in Al-Diwaniya province January– 2013				
	Site one	Site two	Site three	Site four	Site five .....
	GPS N"43.22' 18°32 E "49.93' 15 °45	GPS N"55.98' 15 °32 E"40.90' 15 °45	GPS N"16.15' 11°32 E"47.09' 21°45	GPS N 4.54' 9 °32 E"22.15 24°45	GPS N"52.65' 6°32 E"23.62' 28°45
TEMPERATURE	**11.33**	**11.17**	**11.17**	**10.67**	**10.17**
TURBIDITY FTU	**9.97**	**8.83**	**8.93**	**9.7**	**9.17**
pH	**8.09**	**8.16**	**8.4**	**8.42**	**8.44**
T.ALKALINITY Mg/L	**252**	**250**	**140**	**148**	**146**
T.D.S Mg/L	**1176.33**	**1260**	**1095.33**	**1025.68**	**958**
E.C µS/CM	**1152.67**	**1265.33**	**1289.37**	**1355**	**1367**
Ca Mg/L	**238.7**	**254.1**	**254.1**	**177**	**184**
D.O Mg/L	**8.77**	**7.9**	**7.9**	**8.3**	**7.13**

Table 3. Physical-chemical parameters of Al-Dalmaj marsh water samples for January-2013

	GPS N"43.22' 18°32 E "49.93' 15 °45	GPS N"55.98' 15 °32 E"40.90' 15 °45	GPS N"16.15' 11°32 E"47.09' 21°45	GPS N 4.54' 9 °32 E"22.15 24°45	GPS N"52.65' 6°32 E"23.62' 28°45
TEMPERATURE	13.67	13,33	13	13,23	12.83
TURBIDITY	10.53	9.43	10.43	11.03	12.09
PH	8.16	8.23	8.45	8.59	8.61
T.ALKALINITY *Mg/L*	260	258	196	148	154
T.D.S Mg/L	1264	1057.33	1095.33	989	961.67
E.C µS/CM	1130.33	1267.23	1270.34	1319	1326.67
Ca Mg/L	215.6	238	146	177	169
D.O Mg/L	8.97	8.3	8.43	8	7.7

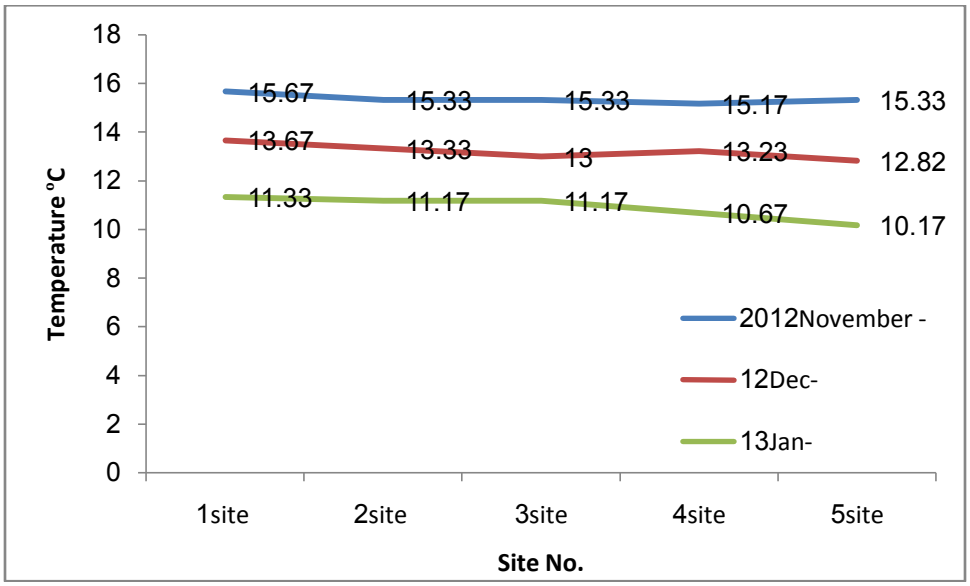

Figure 2. Variation in temperatures for all sampling sites during Period of study

Turbidity

Turbidity act as inhibitor for reach the light into depth of water and then impact for the photosynthesis of plants in water with reduce the bio production in this water [11]. The highest value of turbidity was 14.23 FTU in November 2012 at site five while the lowest value was 8.83 FTU in January 2013 at site two. Figure 3 shows the variant in values for all sites during the period of study.

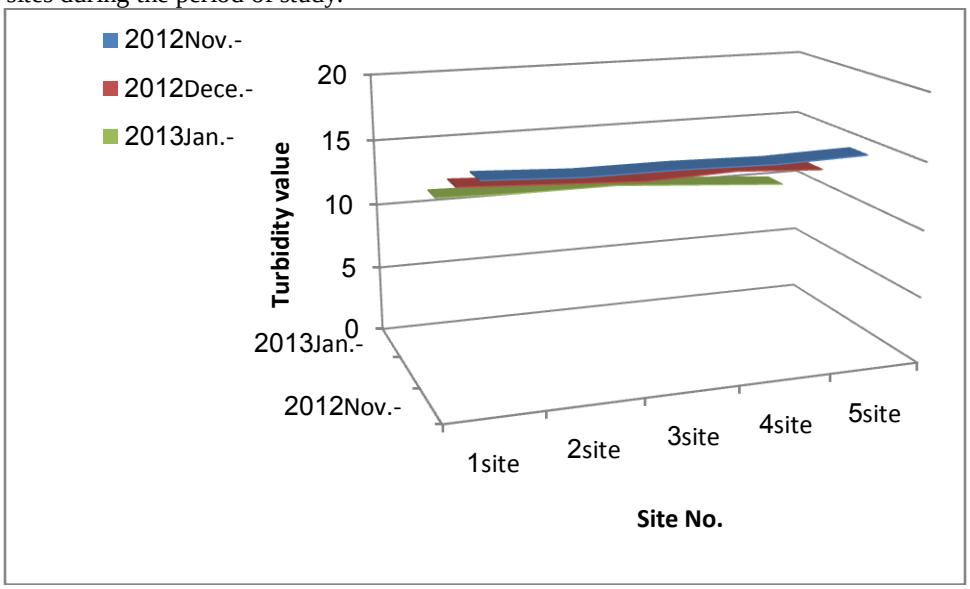

Figure 3. Variation of turbidity for all sampling sites during the period of study

pH value

The scale runsof pH from 0 to 14, if the value at pH equal to 7 that mean the media is neutral while if it less than 7 that mean acidic and if it was greater than 7 that mean alkaline media. The principal components regulating ion of pH in natural wateris the carbonate, which comprises H_2CO_3, HCO_3 and CO_2 [12]. pH values for all sites appeared slight alkalinity in all period of study.

Total alkalinity

Tables (1-3) show the variation between the values of total alkalinity which ranged from 138 mg/L in site 4 for November sample, while the highest value 260 mg/L appeared in site 1 for December. The standard limit in drinking water is 120 mg/L [2]. Comparison between the highest value (260 mg/L) with maximum permissible level (600 mg/L) shows that the quality of water is acceptable. Figure 4, illustrate the values of total alkalinity for all study sites.

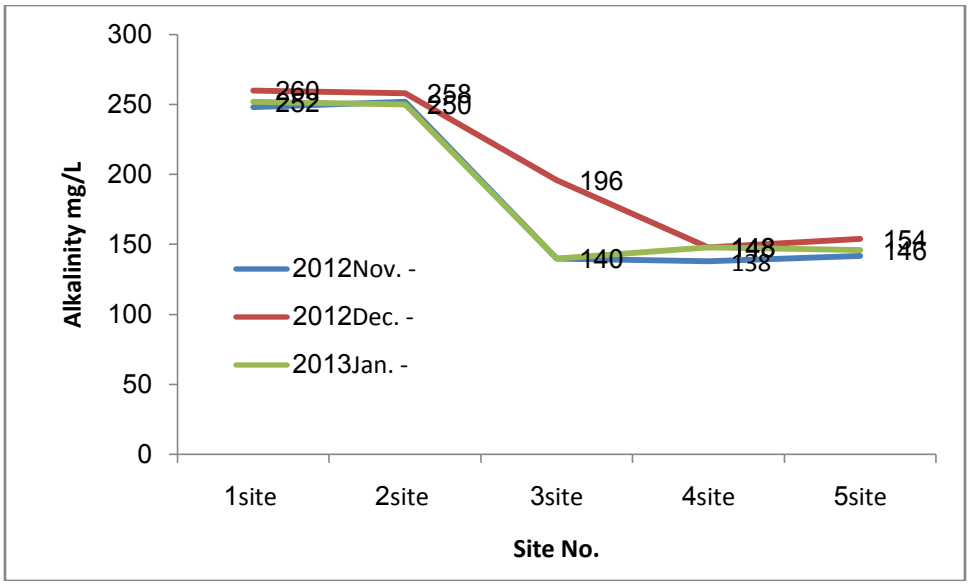

Figure 4. Total alkalinity for all sampling sites during the period of study

Total Dissolve Solids

Total dissolved solids values for water samples of Al-Dalmaj marsh was studied as a parameter for water quality, increasing percentage of this parameter refers to increases the ionic concentration. Previous study Katria*et al.* [13] reported that when the value of TDS increase that indicate pollution in samples. The range of TDS was from the lowest value 958 Mg/L in site 5 at January 2013 to the highest value 1295.67Mg/L in site 2 at November 2012. Figure 5, shows the variation in the values of TDS for all sites of study area for the period of study.

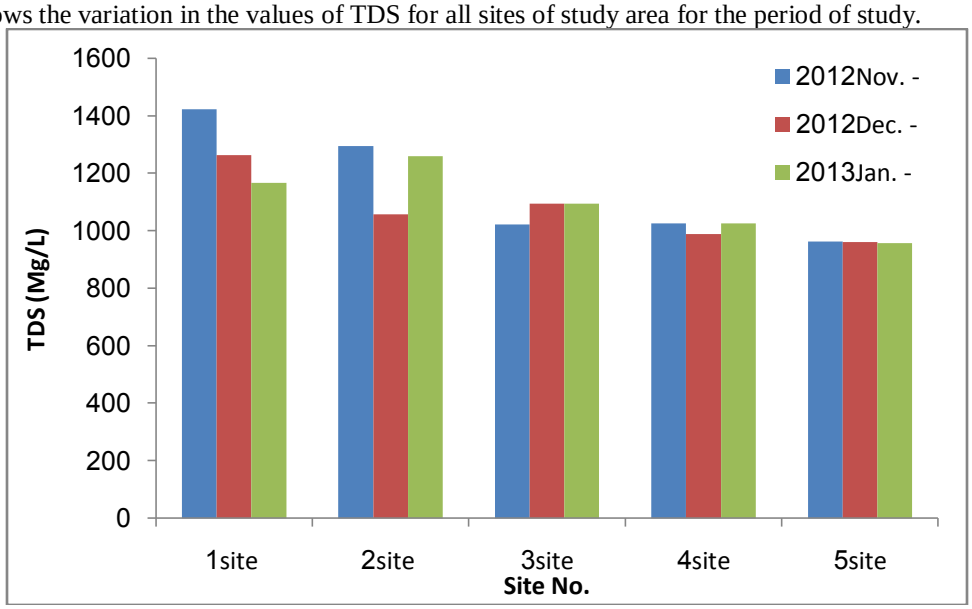

Figure 5. Total Dissolve Solids for all sampling sites during the period of study

Conductivity

Electrical conductivity in normal water is natural. Conductivity defined as ability of water to conduct the electrical current. In previous study Kaizer and Osakwe [14], reported that conductivity is associated with acidification mainly from the impact of acidic deposition.The lowest value of conductivity was 1130.33 µS/CM in site 1 at December 2012 while the highest value was 1367µS/CM in site 5 at January 2013 as shown in tables (1-3).

Calcium

Calcium value ranged from 146 Mg/L in site 3 at December 2012 to 254.1 Mg/L in site 2 at January 2013. There were appeared significant variation between sites and sampling month. Figure 6, shows the variation in the concentrations of calcium for all sites in all period of study.

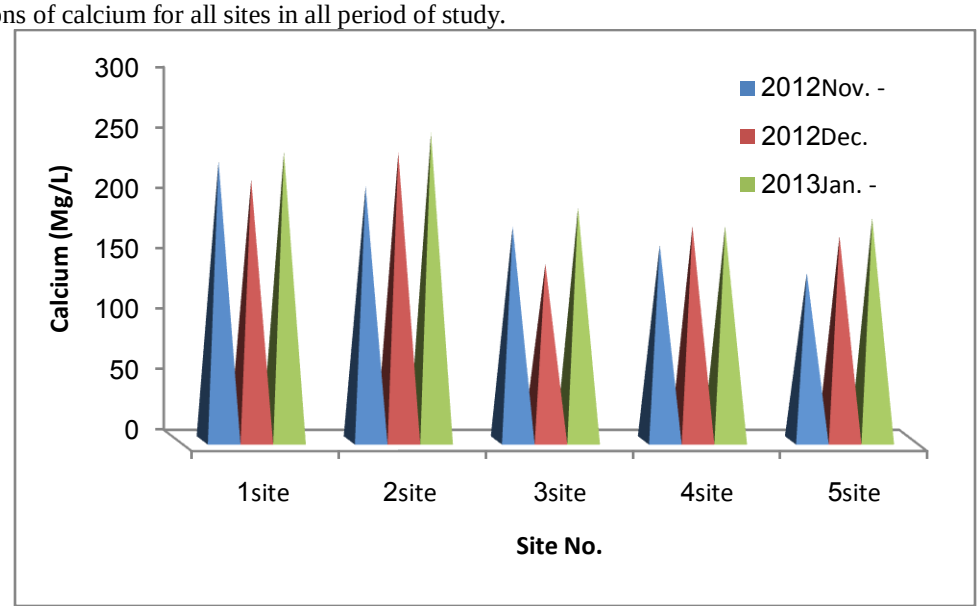

Figure 6. Calcium concentrations for all sampling sites during the period of study

Dissolved oxygen

Dissolved oxygen considered as indictor of the health of an aquatic system. The lowest value of dissolved oxygen was 7.13 Mg/L in site 5 at January 2013, while the highest value was 9.13 Mg/L in site 1 at November 2012. Figure 7, shows the DO for all sites.

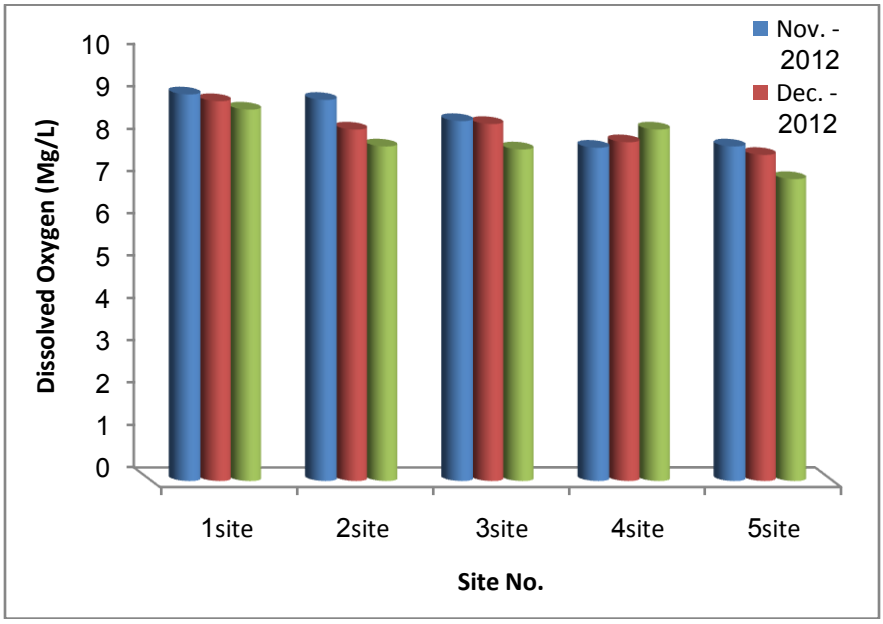

Figure 7. DO for all sampling sites during the period of study

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