STUDY OF SOME PHYSICAL AND CHEMICAL PARAMETERS IN EUPHRATES RIVER IN SAMAWAH CITY, IRAQ

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Abstract

In order to study the monthly variations in the physiochemical parameters of Euphrates river in Samawah city samples were collected in each month from January to July 2019. The results of water properties showed that water temperature ranged between (13°C -31.7°C), pH values (6.7-7.9), electrical conductivity (EC), salinity and total Dissolved solids(TDS) (1290-4260) µS/cm, (0.8256-2.7264)%, (910 - 2130) mg/l respectively.ms.cm^{-1}, turbidity (Tur) (6.42 - 47.73) NTU, secchi depth (SD) (0.34-2.65) m, dissolved oxygen (DO) (4.8-13) mg/l,Biological oxygen demand (1-15) mg/l, total alkalinity (140-190) mg.CaCO$_3$.l^{-1}, total hardness (TH) (250-500) mg.CaCO$_3$.l^{-1}, calcium(Ca$^+$) and magnesium (Mg$^+$) ions (12.024-96.192)and (38.82 – 92.294)mg/l, respectively, nitrate (NO$_3$), nitrite (NO$_2$) values (0.088-3.054) and (1.842- 9.008) mg/l respectively, while phosphate (PO$_4$) and total phosphor (TP) (0.09 -0.797) and (0.068-0.486) mg/l, respectively, Silicate values (1.466-3.95) mg/l. Statistical analysis showed significant differences (p≤0.05) between study sites and month period from march to July.

Key words: Euphrates river, physical and chemical parameters, statistical analysis.

Introduction

Water is an irreplaceable natural resource on the planet. All types of life including human beings depends on water, due to its unique characteristics, there's multiple uses of water for living organisms (Majumder and Dutta, 2014; Singh, 2014). Thus, water may be a resource with restricted and uneven distribution in time and space. All types of life and all activities of human beings dependent on water. Water resources are of great importance to economy and human life and are the main source of meeting the demand for drinking water, for irrigation of lands and industries. The lack of water is considered as a limiting factor of socio-economic development of a country (Këpuska 2013; N'Diaye *et al*., 2013).

The quality of surface or ground water is a function of either each natural influences or human influences. Without human influences water quality would be determined by the atmospheric processes of evapotranspiration and the deposition of dust and salt by wind, by the weathering of bedrock minerals, by hydrological factors that lead to runoff and by the natural leaching of organic matter and nutrients from soil, by

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biological processes within the aquatic environment that can alter the physical and chemical composition of water. The water pollution is measured by estimating the physico-chemical parameters of water (Ramachandra mohan *et al.,* 2014).

The changes in the physico-chemical parameters tend to alter the living conditions, particularly within the number, distribution and diversity of the biota of that ecosystem. Fluctuations in physico-chemical factors adversely have an effect on the organisms, limiting their production and interfering in the physiological processes which reduce their ability to compete with alternative populations within the environment (Lashkar and Gupta, 2009).

Euphrates is the longest river in western Asia. It enters the territory of Iraq and goes to the south until it reaches the geographical area in Al-muthanna province in the area of umm al Dashish in the district of Hilal, which is located at north-west of Al-Rumaitha district, it is about 15 km away. It pass Sammawh city and Alhouishli village and then enters dhi-qar province. Rate of water depth 10 m, it depended on water level, sometime get to highest which is 100 m especially during the river flood and lowest 7 m when the water level is minimum. The width of river is approximately 180m (Fig. 1) (Al-Taee, 2009).

Euphrates river has been studied by ecologists (Al-Taee, 2009; Thair *et al*., 2014; Ahmed, 2012).

The objective of the current study was to assess the ecosystem of Euphrates river, by estimating the various physico-chemical parameters like pH, Temperature, secchi depth,Total Dissolved solids (TDS), Total Alkalinity (TA), Total Hardness (TH), Ca_2+, Mg_2+, Nitrate (NO_3^{-2}) and reactive nitrite (No_2^{-2}) Phosphate (PO_4^{-2}) and total phosphor (TP), Turbidity, Dissolved Oxygen (DO), BOD, Electrical conductivity (*EC*) and salinity.

Material and Methods

Three sampling sites were chosen in Euphrates river depending on, freshwater quality (St. 1), before entering the river city center (St. 2) located at the center of city center and (St. 3) located at the south of the second site (Fig. 1).

Subsurface triplicate 1 L water samples, for physical and chemical parameters, analysis such as water temperature (WT), pH, electrical conductivity (EC), total dissolve solid were measured in field directly by using portable Multimeter (WTW-350i) after calibration and turbidity was measured in field directly by using a turbo-meter (WTW-Turb-550), secchi depth was measured by using secchi disc.

Other parameters was measured according to (APHA, 2003). These parameter included dissolved oxygen (DO), total alkalinity (TA), total hardness (TH), calcium (Ca). Nitrate (NO_3^{-2}), nitrite (NO_2^{-2}) were measured by using the method described Parson *et al*., (1984) and using Spectrophotometer at wavelength of 543 nm. Phosphate (PO_4^{-2}) and total phosphor (TP) were measured according to method of APHA, (2003) and using spectrophotometer at wavelength 880.

All the Statistical analyses were carried out using SPSS (one way ANOVA post hoc non parametric test, for making comparison among the months and stations).

Correlation Coefficient used to find the correlation between physical and chemical parameters.

Results and Discussion

During the study period temperature was ranged between (13°C-31.7^{o}C). The maximum value was observed in January due to clear atmosphere and low water level. (Jayabhaye *et al*., 2005 and Salve and Hiware, 2006).

pH values was ranged between (6.7-7.9) this refer to sub alkaline in nature (Pal *et al*., 2016).

Electrical conductivity, Salinity and Total dissolved solid values varied from (1290-4260) µS/cm, (0.8256-2.7264)%, (910 - 2130) mg/l respectively. Maximum values due to high mixing processes due to waves and rise of materials from deep layers to surface layers with the impact of low temperatures (Al-Mousawi *et al*., 1994) or to influence of agricultural and industrial activity (APHA, 1999), or due to the heavy rainfall, wich leads to the drainage of large quantities of salts from agricultural land located on both sides of the river (Al-Fanharawi and Sahib, 2014). (Fig. 2).

Turbidity values varied from (6.42 to 47.73) NTU. Maximum values Was recorded in May, may be attributed to the direct discharge of untreated wastewater into the river, which contains a large amounts of contaminated
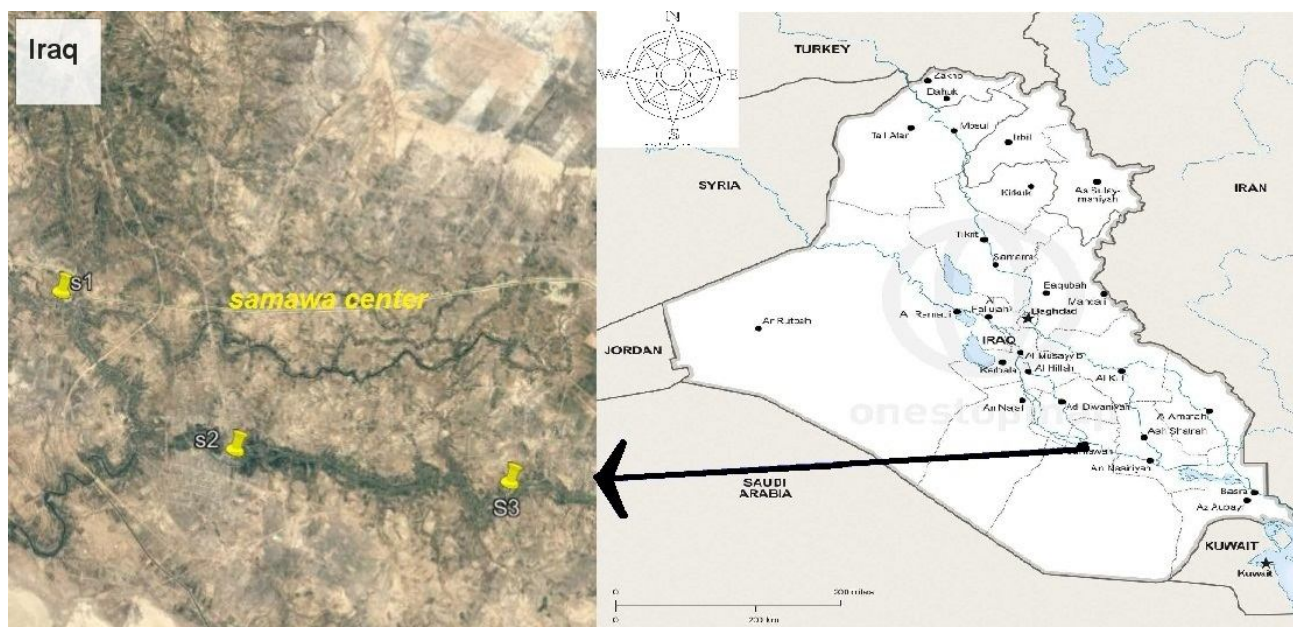

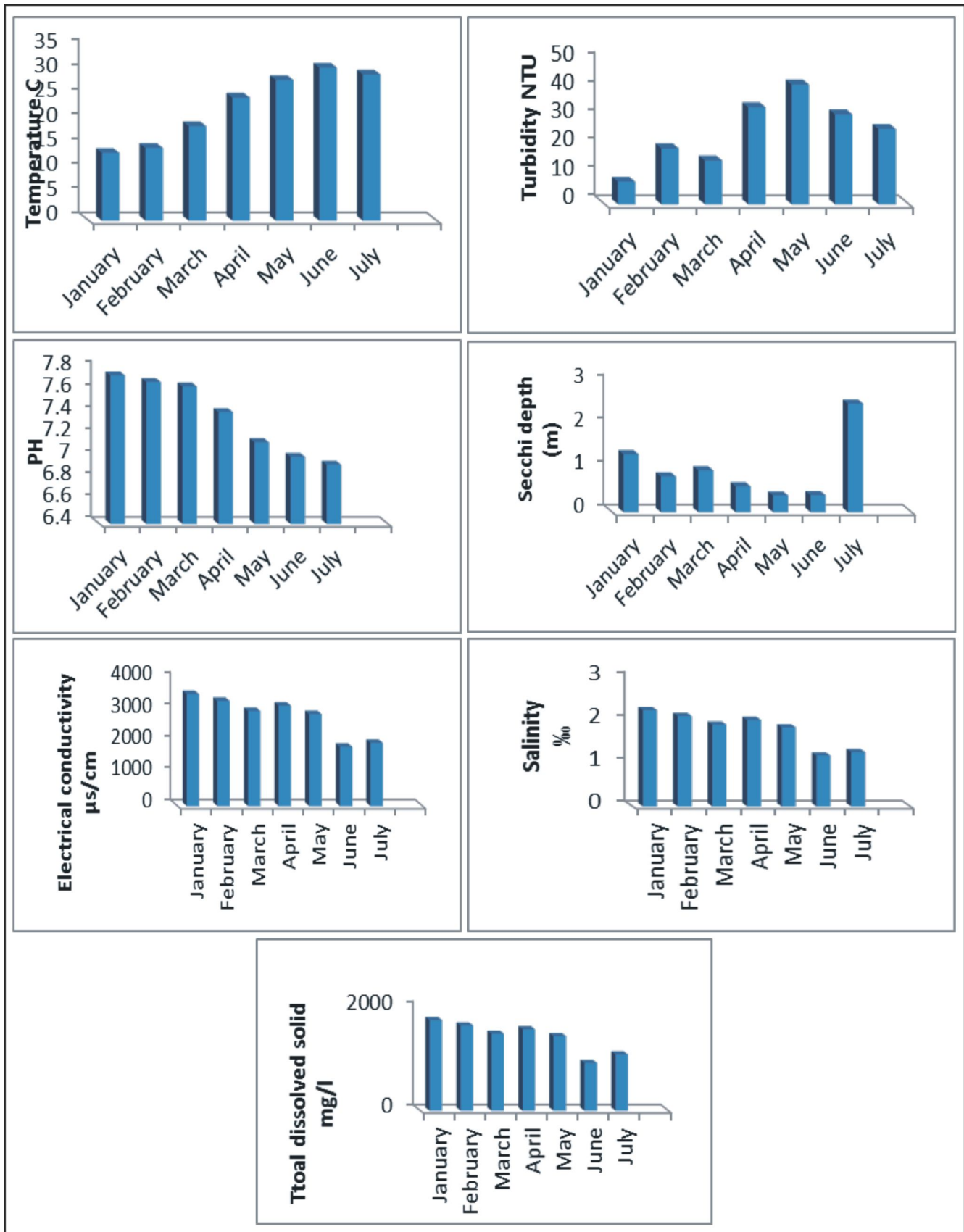**Fig. 1:** The site of study in Euphrates river.

Fig. 2: Monthly variation in water temperature, Turbidity, pH, Secchi disc, Electrical conductivity, Salinity and total dissolved solid.

materials, soil particle, sand and microorganisms that increase turbidity in the water (Mustafa, 2006). while low turbidity may be due to the presence of the plant cover and the slow movement of water (Noaman, 2008).

Secchi depth values range between (0.34-2.65)m, high value recorded in July and low value recorded in May may be attributed to the water level during study period.

The result showed that value of dissolved Oxygen ranged between (4.8-13) mg/l high value recorded in January may be related to effect of temperature deceasing, growth of algae,aquatic plant and mixing good between water layer (soloman *et al*., 2009).

Biological Oxygen Demand was ranged between (1-15) mg/l. High values was recorded in June due to

decomposition of organic matters run directly to the river with domestic sewage (Sadek and Kamel, 2007).

Total alkalinity in current study ranged between (140-190) mg.CaCO$_3$.l^{-1}. Most alkalinity in study area may retune to bicarbonate. Increase total alkalinity was observed in April due to microbial activity decomposition of organic matter (Winner, 2000).

The high values of total hardness and calcium was recorded in January which ranged between (250-500) mg.CaCO$_3$.l^{-1} and (12.024-96.192)mg/l respectively. Increase hardness may be due to increased water discharged from nearby areas (Salman, 2006), also due to the impact of human activity and sewage to the river and soil texture, which is agree with Al-Lami, (2002) and this confirms by Safawi, (2007). The decrease in total
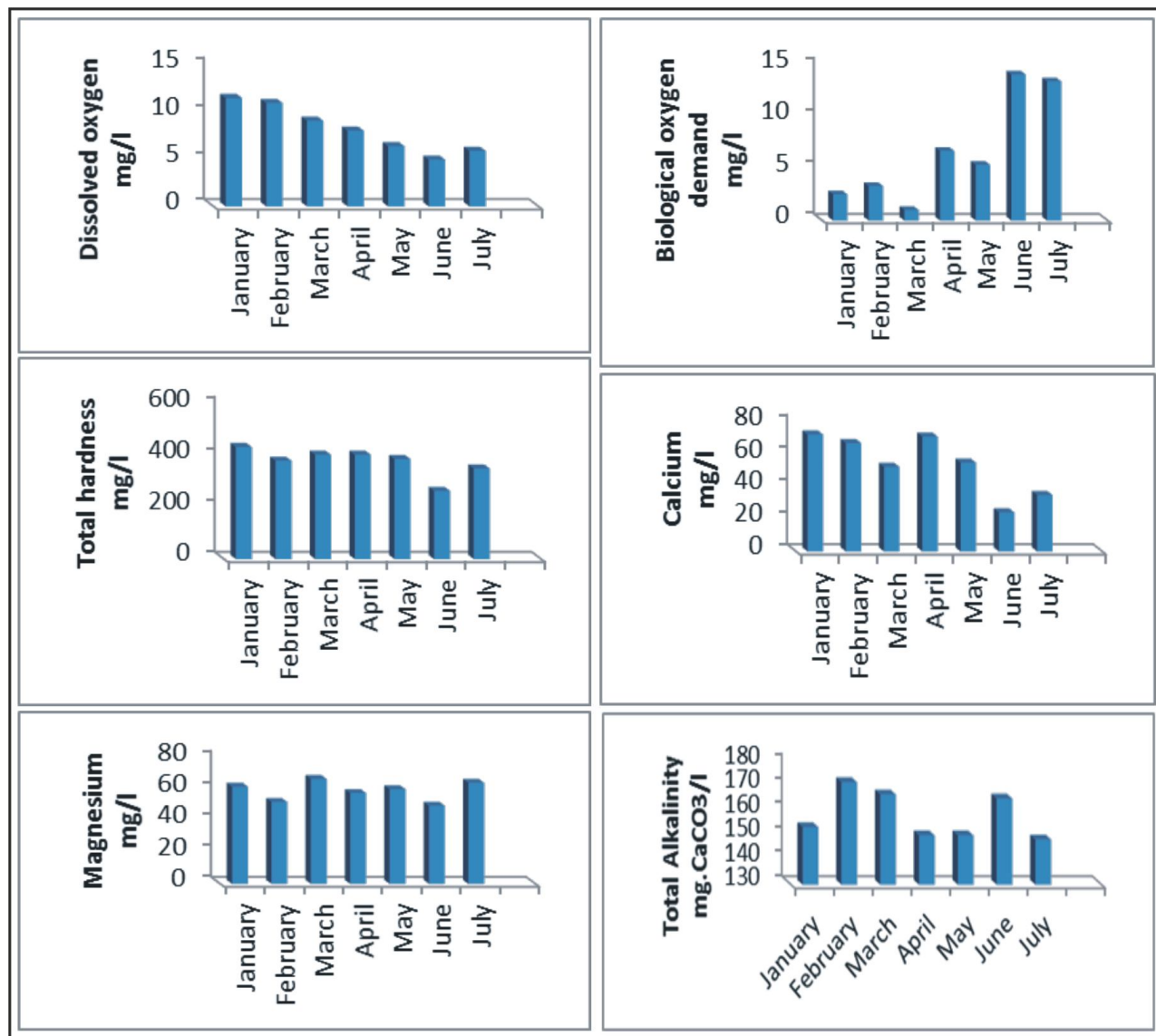

Fig. 3: Monthly variation in Dissolved oxygen, Biological oxygen demand, Total hardness, Calcium , Magnesium and total alkalinity.

hardness is attributed to the consumption of carbon by the photosynthetic organisms (Hussein and Attee, 2000). As well as increasing the growth of aquatic plants, which in turn withdraw magnesium and calcium ions and some important salts, thereby reducing the hardness value (Lind, 1979).

While magnesium recorded high values in January which ranged between (38.82-92.294) mg/l due to directly affected by excreta from land near the river, especially waste containing magnesium ions decomposition of organism containing magnesium (Al-Fanharawi and Sahib, 2014). (Fig. 3).

Nutrient

In current study the results showed that the nitrate, nitrite ranged between (1.842- 9.008) mg/l (0.088-3.054) mg/l respectively. High value of nitrate recorded in February and lowest in June due to the availability of oxygen in surface water has led to a greater concentration of nitrates (AL-Lami, 2001).

While high value of nitrite in April and lowest value

in June may be related to increase uptake by phytoplankton and aquatic plants (Mohammed, 2007).

Phosphate and total phosphor value varied from (0.09 -0.797), (0.068-0.486) mg/l respectively. Highest values recorded in May, due to additional input from agricultural land nearby or due to activity of human. (Hassan, 1997).

Silicate value ranged between (1.466-3.95) mg/l. Highest value recorded in April, while the minimum value in July due to high temperature that leads to increased solubility of nutrients in addition to high currents (Al-Mousawi et al., 1994). (Fig. 4).

Statistical analysis showed significant differences ($p \leq 0.05$) between study sites and month period from march to July affects significantly on DO, BOD_5, NO_3, NO_2, PO_4 and TP. June and July affects significantly on pH, total hardness, calcium, EC,Salinity and TDS While period from January to April affects on SD and Sio_2 The results of Statistical analysis also showed positive correlation between electrical conductivity and salinity,
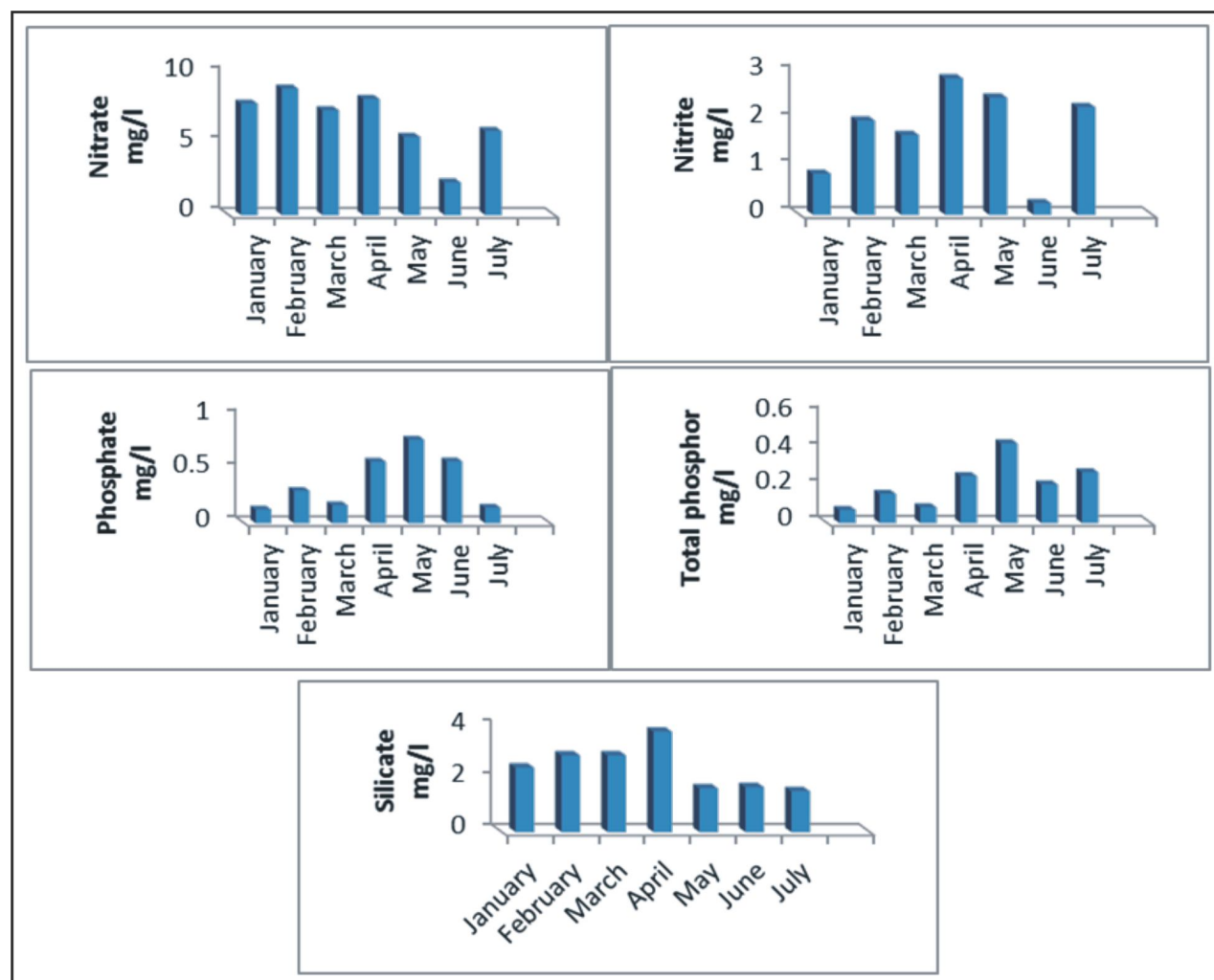

Fig. 4: Monthly variation in Nitrate, Nitrite, phosphate, total phosphor and silicate.

TDS, nitrate (r = 0.095, r = 0.97, r = 0.63). Dissolved oxygen show positive correlation with PH, calcium, nitrate (r = 0.83, r = 0.67, r = 0.81). Calcium show positive correlation with DO, total hardness (r = 0.67, r = 0.91). BOD show positive correlation with temperature (r = 0.828). Silicate show positive correlation with pH, nitrate (r = 0.62, r = 0.68). Nitrate show positive correlation with pH, EC, DO, TDS, Silicate (r = 0.71, r = 0.63, r = 0.81, r = 0.63), r = 0.68). TP show positive correlation with temperature, turbidity, nitrite, phosphate (r = 0.76, r = 0.74, r = 0.62, r = 0.78).

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