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A Study of Monthly Changes in some Physical, Chemical, and Phytosanitary parameters in Tigris River at Salah Din Governorate

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ABSTRACT

The current study aims dealt with the measurement of some physical and chemical properties of water and plant nutrients and their monthly fluctuations of Tigris River within the Salah al-Din province for five power stations (Baiji - Tikrit - Mikaishefa - Samarra - Balad) from July (2013) till April (2014). One sample was collected per month from each plant. In the laboratory samples were analyzed according to the methods mentioned. The study examined the measurement (temperature air and water, pH, conductivity, dissolved oxygen, Turbidity, total basal, total hardness, chloride, Sulphate, nitrates, phosphates). The results of the study showed that the temperature of air and water was characterized by its rise in the summer and decrease in winter, ranged from (6- 38^{0}C) and (10- 22 ^{0}C), respectively.
Turbidity was high in April and its value ranged in all stations between (2.3 - 31.5). The electrical conductivity was at the higher value (630 µs/cm) in January, (2014), while the less value is (480 µs/cm) in April (2014). The value of the pH was slightly alkaline to alkaline, ranged between (7.3 - 8.4). Dissolved oxygen values ranged between (6.3- 9.1) mg/L, the highest value of Alkalinity recorded in April (2014) and (200) mg/L, the minimum value is 109 mg/L in January (2014).
The total values of the Tigris River water was ranged from (180 - 280) mg/L. The chloride ions values recorded ranged between (31.1 - 54.8) mg/L, the value of nitrate values ranged between (1.5 - 2.7) mg/L, and phosphate ranged between (0.09 - 0.70) µg/L.
The sulphates had the highest value was (79.4) in September (2013) in the fifth station and the lowest value is (70.0) in the second station in October (2013).

دراسة التغيرات الشهرية لبعض الصفات الفيزيائية والكيميائية والمغذيات النباتية لمياه نهر دجلة في محافظة صلاح الدين

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الخلاصة

تهدف الدراسة الحالية قياس بعض الخصائص الفيزيائية والكيميائية والمغذيات النباتية وتذبذباتها الشهرية لمياه نهر دجلة ضمن محافظة صلاح الدين لخمس محطات هي (بيجي – تكريت – مكيشيفة – سامراء – بلد) للمدة من شهر تموز (2013) حتى شهر نيسان (2014). جمعت عينة واحدة شهرياً من كل محطة وفي المختبر تم تحليل العينات حسب الطرق المذكورة. وتناولت الدراسة قياس (درجة الحرارة، الاس الهيدروجيني، التوصيلية الكهربائية، القاعدية الكلية، الاوكسجين المذاب، الكدرة، القاعدية الكلية، العسرة الكلية، الكلوريد، الكبريتات، النترات، الفوسفات).
اشارت نتائج الدراسة ان درجتي حرارة الهواء والماء تميزت بارتفاعها في فصل الصيف وانخفاضها في فصل الشتاء اذ تراوحت بين (6– 38مْ) و (10– 22.5مْ) على التوالي.
الكدرة كانت مرتفعة في شهر نيسان وتراوحت قيمتها في جميع المحطات بين (2.3 – 31.5) نفتالين وحدة كدرة. اما التوصيلية الكهربائية فكانت اعلى قيمة لها (630) مايكرو سيمس/سم في شهر كانون الثاني (2014) اما اقل قيمة هي (480) مايكرو سيمس/سم في شهر نيسان عام (2014). وكانت قيم الاس الهيدروجيني تميل الى القاعدية اذ تراوحت بين (7.3 – 8.4).

الكلمات المفتاحية:
الخصـــائص الفيزيائية، الكيميائية، المغـذيـات النبـاتيـة، تـذبـذبـاتهـا الشهرية، لمياه نهر دجلة.
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القبول: 2018/1/23

قيم الاوكسجين المذاب تراوحت بين (6.3– 9.1) ملغم/لتر ، اعلى قيمة للقاعدية سجلت في شهر نيسان (2014) وهي (200) ملغم/لتر ، وادنى قيمة هي (109) ملغم/لتر في شهر كانون الثاني (2014). اما قيم العسرة الكلية لمياه نهر دجلة كانت (عسرة – عسرة جداً) اذ تراوحت بين (180 – 280) ملغم/لتر. ايونات الكلوريد سجلت قيماً تراوحت بين (31.1 – 54.8) ملغم/لتر ، اما قيمة المغذيات النباتية فقد تراوحت قيم النترات بين (1.5 – 2.7) ملغم/لتر، والفوسفات تراوحت بين (0.09 – 0.70) مايكرو غرام /لتر. اما الكبريتات فقد سجلت اعلى قيمة في شهر ايلول (2013) (79.4) في المحطة الخامسة وادنى قيمة هي (70.0) في المحطة الثانية في شهر تشرين الاول (2013).

Introduction:

Tigris River is regarded as water resources which can have a great importance to Iraqi people; researchers paid a special attention to the study of water environment since the latter can play an important role in the life of living creatures. The property of water to be good or bad is concerned with physical and chemical trait of water as well as its different usages. According to (Al-ssadi 2002), the increase of food nutrients especially the ratio of phosphorus and Nitrogen in water can lead to a phenomenon called Eutrophication which is food enriching in water environments. This phenomenon is related to the change in smell and flavor of water. The increase in floating Algae over water can lead to increase dirty and reduce a ratio of Oxygen (Shayyish, 2009). Water is having a special trait which can make it different from non-living factors where it is one of more composites which has spread over all the land where it occupies most of the earth area. The ratio of water in the surface of earth is 73%. The Fresh water accounts for 3% of the total land water, but its importance is much higher than its amount (Ghari and Stevin, 2005). A number of populations is concerned with human need for water as well as technical and scientific advances. Since all living creatures are in absolute need for water, it will be very necessary to maintain and keep water secure from pollution. Thus, pollution is one of environmental problem which threats man in all aspects of his own life. (Hogah et al,2010). The disposal of waste water from Industrial, domestic and agricultural fields without treatment led to river pollution and deterioration of water bodies (Al-Hyali et al, 2005).

Methods and Materials:

The Study Area:

The study included the sampling of water from five districts located at the Tigris River with the governorate of Salah al-Din (Baiji, Tikrit, Makishifa, Samarra, Balad) in order to follow the physical and chemical properties and some plant nutrients.

Collecting of Samples:

Samples of study have been collected within one month starting from June 2013 through May 2014 where one sample is selected for each month.

The samples of study are collected using (5) liter plastic bottles. Each can include. Winkler canes are also used whose capacity is (250mg) which are used to measure Oxygen. Samples are transferred immediately to the laboratory.

خريطة توضح المحطات المدروسة

Physical, Chemical and Phytosanitary Tests:

1- Temperature:

Temperature degree has been measured based on temperature standard whereas the tool of measurement starts with (0-1000C).

2- Turbidity:

The blemish was measured using the electronic Turbidity meter and expressed in Nephelometric Turbidity Unit after the device was reset.

3- pH Meter (Hydrogen activity)

pH meter system is used with Buffer solution.

4- Electric Conductivity.

It is measured by Conductivity meter. He expressed the results in unity (µs/cm)

5- Dissolved Oxygen.

It is used by an amended way of Azayid Modification on Winkler method. (APHA, 2005).

6- Total Hardness

It is measured by interaction with Na2EDTA based on standard (0.01N) with reference (Eriochrome Black T) (APHA, 2005).

7- Chloride CI:

The correction was measured with standard silver nitrate solution (0.025N) with potassium dicromate as a reagent. The results were expressed in (mg / l) (ASTM, 1984).

8- Sulphates SO_4^{-2}

It is also measured by Turbidimetric method (APHA, 2005).

9- Nitrite No_3

Anandol method has been followed in order to measure Nitrite. The results were conducted by (mg/l). (Abawe and Hassan, 1990).

10- Reactive Phosphate PO_4^{-2}

Phosphate element was measured based on the method which was carried out by (Strickland and Parson, 1972).

Statistical Analysis:

The results of the study have been analyzed by applying analysis of variation (ANOVA) test Duncun's Multiple Range test were used to compare the significantly differences between mean's of stations and months.

Results and Discussion:

Air and Water Temperature:

Temperature degrees have a strong effect on water properties like fluidity, and capacity of dissolving for the chemical items. (Ramal, 2010). The result of study has shown that changes in temperature with months that. The results of the study showed monthly changes in temperature as shown in Figure (1), with the highest value recorded in August (2013) in the second station (38 ^{0}C), and the lowest value recorded in the month of December (6 ^{0}C). This is due to the atmosphere of Iraq, which is characterized by a large difference in temperature in different seasons of the year.

As for the temperature of water was affected by the temperature of the air being low in winter and high in the summer, ranging between (10 - 22.5 ^{0}C) in Figure(2).

The degree of running water varies according to seasons, climate change, wind and drought.

The results of the statistical analysis indicated that there were significant temporal differences with no spatial differences between stations due to the fact that the weather conditions were similar in all stations.

Turbidity:

It means to describe the degree of obscuring in the water because of small different items which rise in the water. The recorded values of Turbidity in Figure (3) have ranged between (2.3-31.5) (N.T.U. This value is less than the result recorded by (Al-Jumaily2012) during the study which carried out at Tigris river, where it ranged (73.00) N.T.U. This value is also bigger than (Al-Hamdani 2010), where it ranged between (20.3.0.1) N.T.U.

The high and low water level can affect the values of Turbidity and raising of items as well as the year reasons.(Al-Shindah, 2008).

Electrical Conductivity:

It means the way to measure the ability of water to transfer an electronic current. This can depend on Oyauns (Afefi, 2000), as illustrated in Figure(4) When there is a high value concerns electric Conductivity. These values are as follows: (630 µs/cm) in February in (2014) and the lowest value were (480 µs/cm) on April (2014).

Monthly differences in electrical Conductivity have appeared according to a group of researchers like (Al- Juboori,2009, Ashindah,2008) where the highest values of electrical Conductivity were recorded in winter season while the lowest values were in April because of the high slope of water (Ruttner,1973).

The results of study were much more than (Al-sadani, 2009) studies for environment of Tigris river at Salah Ad- Din Province which ranged between (410-567 µs/cm). The results of statistical analysis have shown that there were differences in time within the year months.

Dissolved oxygen:

The amount of dissolved oxygen in water is considered to be one of the most Chemical factors for the living creatures in breathing process to produce enough energy to support and make the life of creatures go on (Al-ssadi, 2009).

In Figure (5), the highest amount of dissolved oxygen was recorded in winter, while the lowest amount of dissolved oxygen was recorded in summer. The reason behind that is that gases cannot be dissolved well especially with high temperature degrees. The highest value thus was recorded at (9.1) mg/L in January (2014) in the third and fifth station. The lowest value was (6.3) mg/L on April (2014) at the second station. The high and low values of dissolved oxygen in both winter and summer can

correspond with previous studies like (Al-sssnjari, 2001, Al-shaheri,2006, Al- Juboori, 2009). The results of statistical analysis have shown that there were differences in time among the results which carried out in the period of the study.

Hydrogen Number(pH):

It means indicator or standard which enables to show the acidity ratio of water (Kumar and Pur, 2012).

The values of hydrogen number have ranged between (8.4-7.3). The highest value was recorded on April at the fourth station in (2014). The lowest value was recorded on March at the third station in (2014). Throwing industrial and food Surplus which contain polluted organic items can cause pH to be reduced as a result of reaction SO_2 with H_2 (Al-Jouid, 2006).

Figure (6) shows that the monthly difference in pH was less than before and the reason behind that is the high capacity of water which contain Carbons and bicarbonate compounds. The lowest values of hydrogen number for Tigris river during the period of the study was (7.3) and this is much more bigger than the value recorded by (Al-ssadani, 2009) and it was (8.4) which was less than the value recorded by (Al-ssadani, 2009) and it was (8.7) and it was bigger than the value which recorded by (Al-shhari, 2006) which (8.0). The results of statistical analysis have shown that there were no differences in location with difference in time.

Total Alkalinity:

The main reason which makes the water have Carbons and bicarbonate properties is to exist Hydroxyl Carbons and bicarbonate compounds in it (APH, 2003).

The values of non- acid properties have ranged during the period of study between (200-109 mg/L) where the lowest value was recorded on January (2014) while the lowest value was recorded on August (2013) as illustrated in Figure(7). the value of Hydrogen rate was over (8.3 mg/L). This assure that Carbons and bicarbonate is caused water to have Alkalinity properties. That was suggested by a number of studies which carried out at Tigris River like (Assaraf, 2006) and (Ashindah, 2008).

As for the monthly changes in total Alkalinity, it is observed that there is a rise in total Alkalinity during the months May, July and August for all the studied stations because of the higher levels of water which helps to clean the areas which are near to the river (Whitton, 1984). The increase in temperature degrees can cause organic items to be increased and this leads to form solved calcium bicarbonate which cause Alkalinity to be up (Manahan,2004).

Total Hardness:

The most causes of hardness are existing positive Ions, especially calcium (Ca) and magnesium(Mg) ions in water (Cech,2003).

The results of monthly changes for the studied stations have shown that the highest values in hardness appeared on summer season and it was (280mg/L) on July (2013) as illustrated in Figure (8).

This is concerned with two points: SO_2 can be increased with the rise of temperature degrees which change Ca into dissolved $Ca(HCO_3)_2$ bicarbonate. The second is concerned with water vaporing and slowing down of water level because of higher temperature. The lowest in hardness values in winter and spring in the studied stations is related to reducing processes because of heavy rains where the values in the fourth and third stations were recorded less than (180mg/L).

According to UNICEF, the values of hardness in Tigris water in the studied areas have ranged between (280-180 mg/L). This can agree about a large number of studies like (Al-Lami ,*et.al*. 2001, Salman, 2006).

Chlorid:

It means Cl- Ion in its negative format. It can have an ability to be united in their composites forming salt elements which are characterized with dissolving in water (WHO.2008).

The measurement of Cl element is necessary for both man and living creatures. The monthly changes in Chlorid have appeared values which ranged between (54.8-31.1mg/L) as illustrated in Figure (9). The highest values were recorded in July, August and April for all the stations. The rise in Chlorid can cause temperature to be as well as industrial surplus which regarded to be sources of Cl in water.

The values of Chlorid can be seen high in summer and down in winter and this can agree with AL-sadani's study (2009) and Al-Hamdani (2010).

Sulfate:

One of the sulfur compounds is formed in the form of negative ions and is found in different concentrations in natural water (APH, 2008).

They are important for vegetables to be grown and every defect with them can affect the production. The values of sulfate have ranged between (70.0 mg/L) in January at the second station while the highest value was recorded in July in the fifth station and it was (79.4mg/L) as illustrated in Figure(10). The cause of rising the values of sulfate is the disposal of industrial materials which are rich in sulfate salts like Ca and Mg sulfate (Kinghorn, 1983).

The source of sulfate salts in water is concerned with a number of industries like compost, paper and oil industries (AL-ssadi, 2009).

Nitrate:

It represents a higher condition of oxidized Nitrogen (Golman and Itorne, 1983). Nitrate can be existed in little amounts in the surface water. But if they are existed with high ratio, they will be poisonous for living creatures. (Weiner, 2000). The highest value was recorded in April at the first station and it was (2.7 mg/L). the lowest value was recorded at the third station in January and it was (1.5 mg/L). the rise of Nitrate in the river is related to the items which are thrown in the river which are rich in Nitrogen composites (Hassan and *et.al* 2011).

High temperatures also act on ammonia oxidation, which increases the concentration of Nitrate (Gachter *et.al*, 2004). The cause of the reduction in Nitrate is that, they are used considerably by living creatures. Nitrate can be an important component of portion in living creatures (Davis and Dewiest, 1966).

There is a similarity with Al-Hamdani's results (2009) which carried out at Tigris river whereas the value was (2.5-0.04 mg/L) and the results of the current study. The results of this study were much bigger than the study which was carried by (Al-Badri 2012) whereas the value has ranged between (1.140-0.01mg/L).

Reactive phosphate:

Phosphorus has taken different form in water like (PO_4^{-3} ،HPo_4^{-2} ،$H_2Po_4^{-1}$). The main sources of phosphorus in water are (cleaner, compost, fertilizers, swages, Industrial Surplus water). (Moss, 1988).

The amounts of phosphor in the natural water are very low. The amounts of phosphorus have existed as phosphate which can be used by living creatures (Khamees and Ayoob. 1989).

The recorded values in July and August were high if compared with the rest of months concerning the study where the highest value of phosphate for the current study is (0.81 µg/L) at the forth station in July (2013). The reason behind that is to increase in temperature degrees as well as using cleaning powders, phosphate composts which reach at the river throughout irrigation water. (AL-timemi, 2004).

The lowest value was recorded in January at the third station which was (0.09 µg/L) as explained in Figure (12).

The reduction of phosphate values is connected with a consumption which is caused by vegetable sledges. (Wetzel, 1983). Enough amount of oxygen can help to unite phosphate in solved composites like Aluminum (Al) and calcium (Ca). then phosphorus will not be dissolved and disappeared with the rest of items and this can cause phosphorus ratio to be low and reduced in the water (Thompson Yeung, 1982).

The current study recorded higher results which are much more than the study which carried out by (Al-Hamdani, 2010) in the same location at Tigris river which ranged between (0.5-0.03 µg/L). this value is less than the value which recorded by (AL-shindah, 2008) where the value was (1.30-0.16 µg/L).

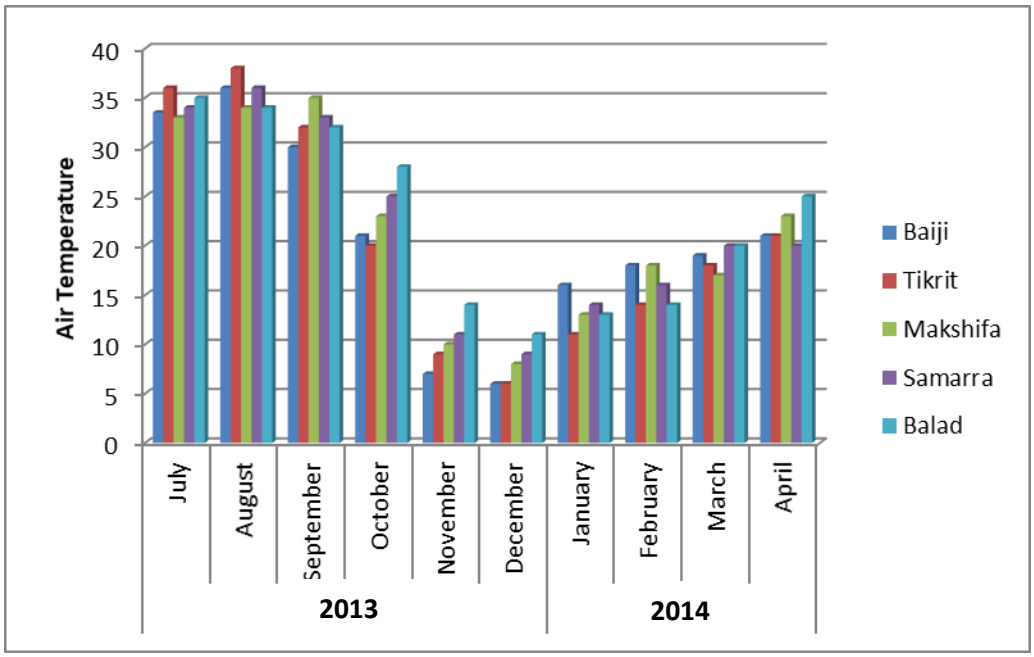

Figure No. (1) Monthly variable aspect in location and time for Air Temperature during the period of the study.

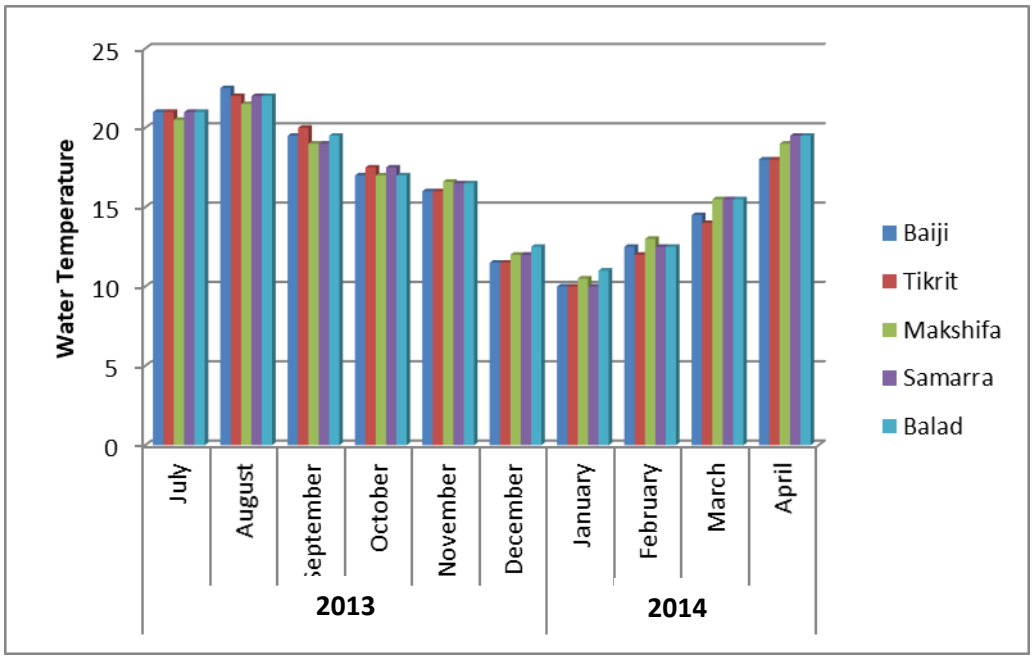

Figure No. (2) Monthly variable aspect in location and time for water Temperature during the period of the study.

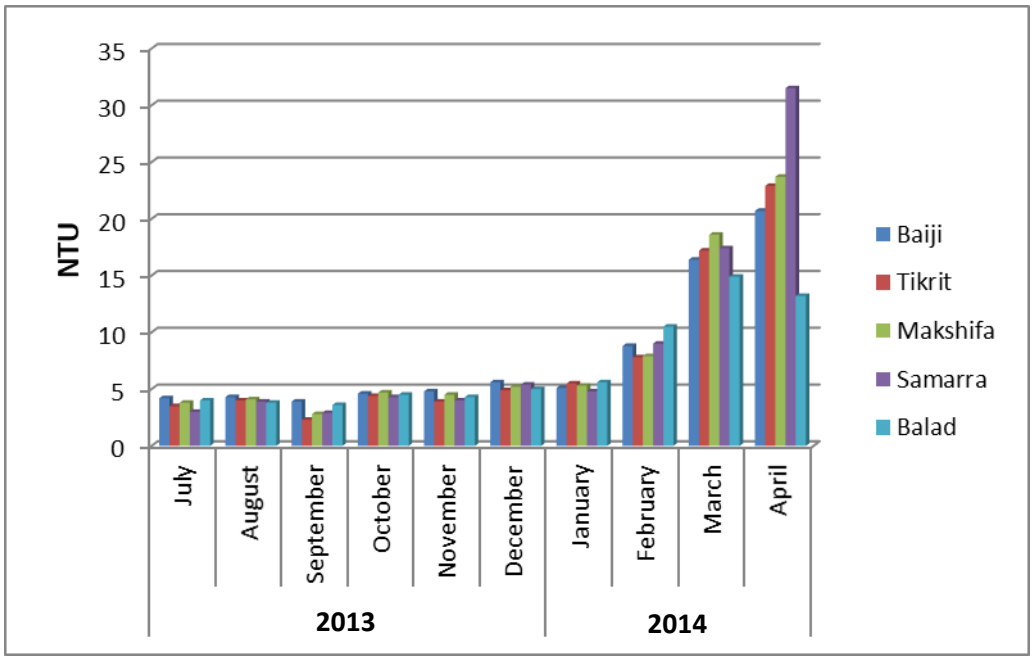

Figure No. (3) Monthly variable aspect in location and time for Turbidity during the period of the study.

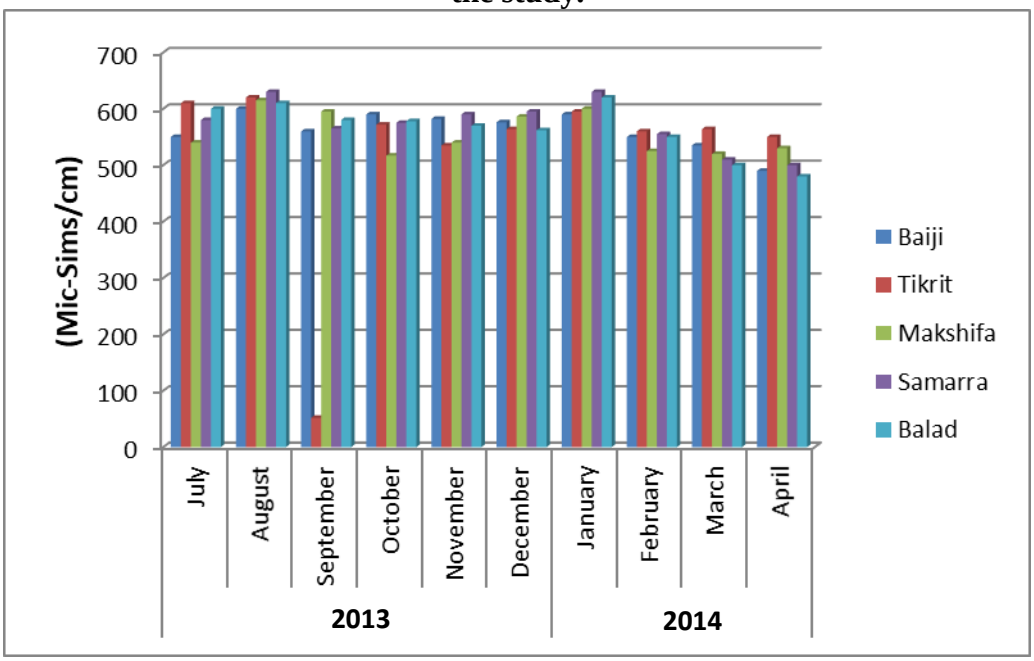

Figure No. (4) Monthly variable aspect in location and time for Electric Conductivity during the period of the study.

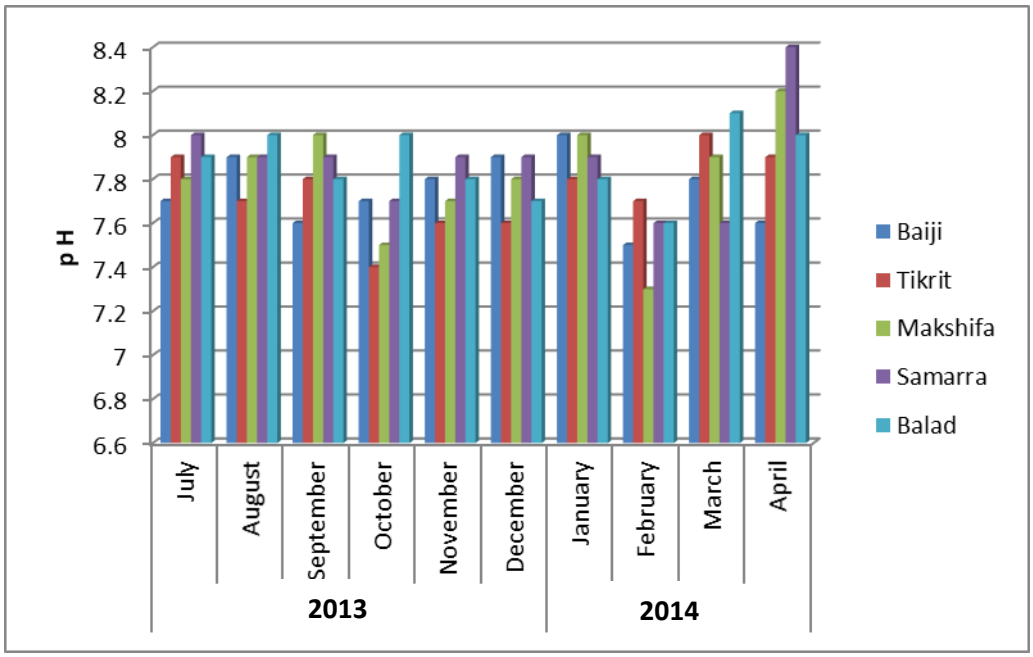

Figure No. (5) Monthly variable aspect in location and time for Hydrogen Rate during the period of the study.

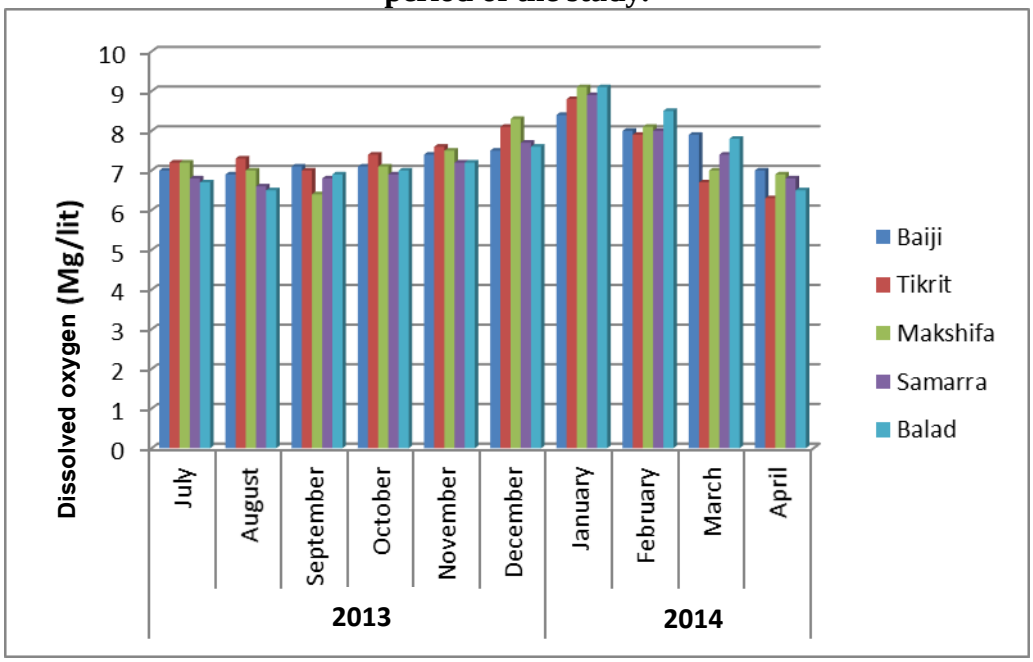

Figure No. (6) Monthly variable aspect in location and time for Dissolved Oxygen during the period of the study.

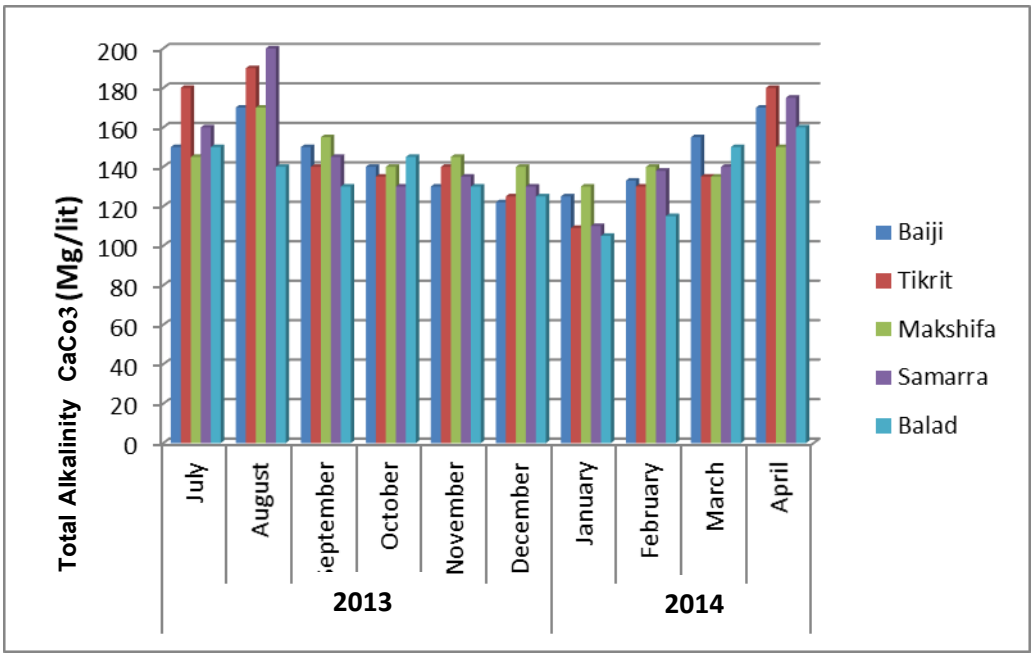

Figure No. (7) Monthly variable aspect in location and time for total Al Kalinity based on $CaCo_3$ during the period of the study.

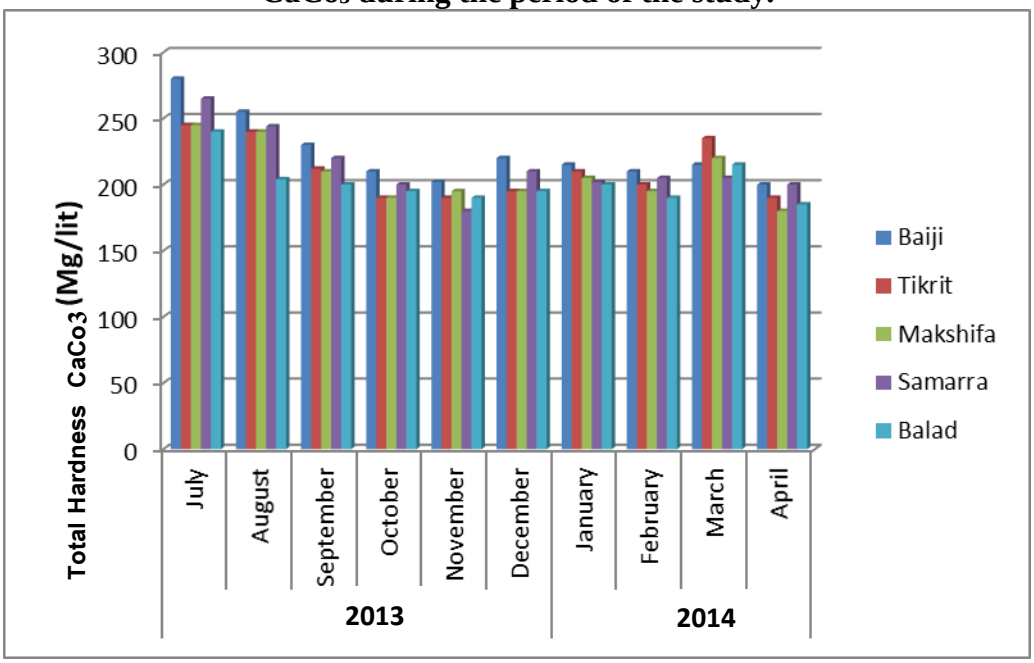

Figure No. (8) Monthly variable aspect in location and time for total Hardness based on $CaCo_3$ during the period of the study.

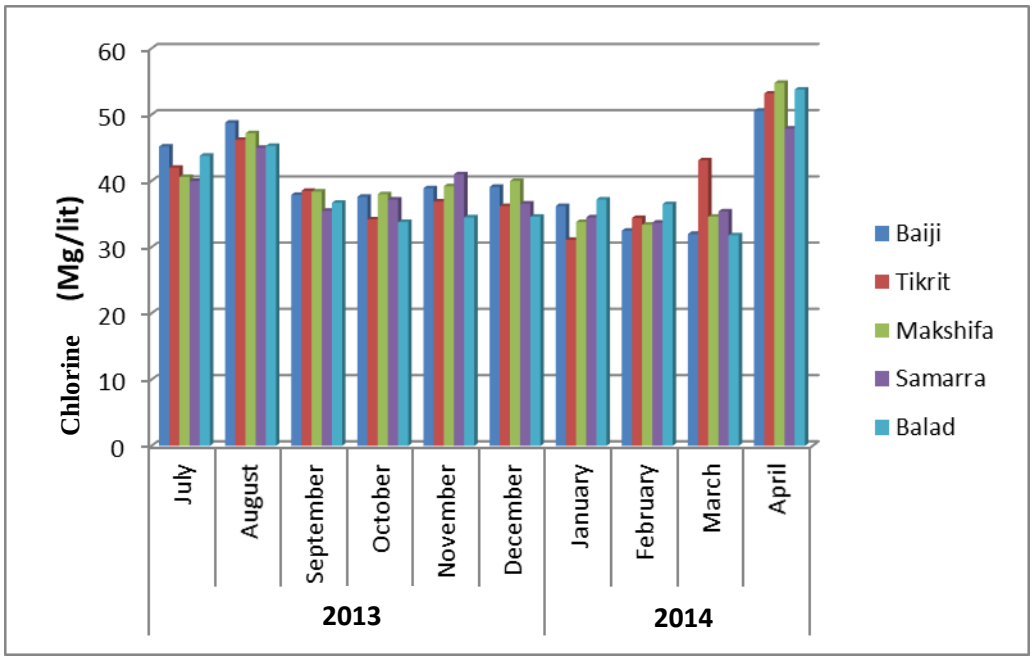

Figure No. (9) Monthly variable aspect in location and time for Chloride during the period of the study.

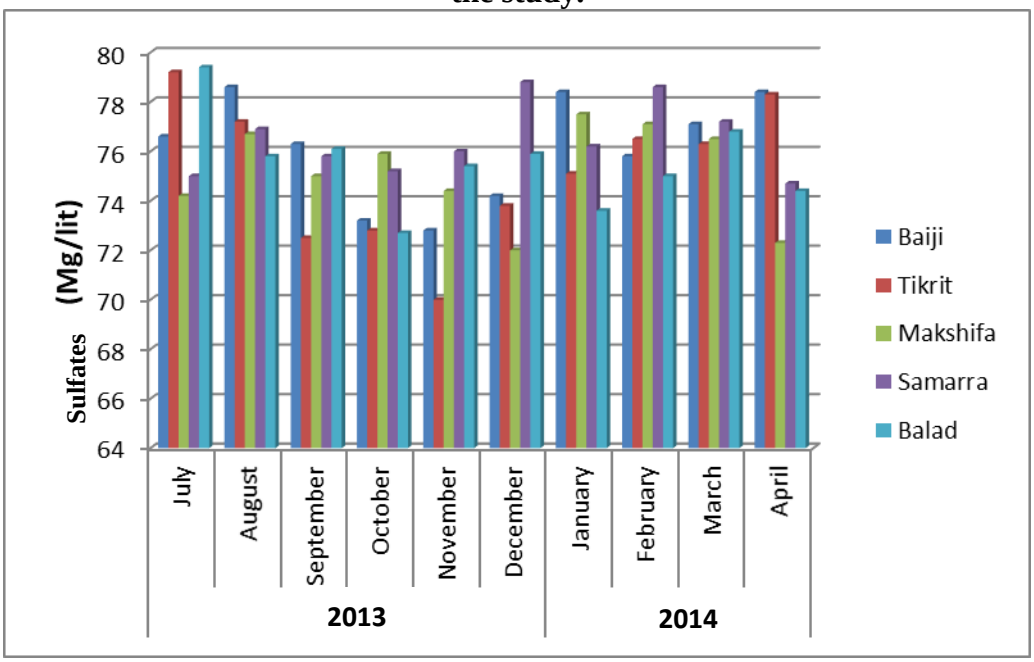

Figure No. (10) Monthly variable aspect in location and time for Sulfate during the period of the study.

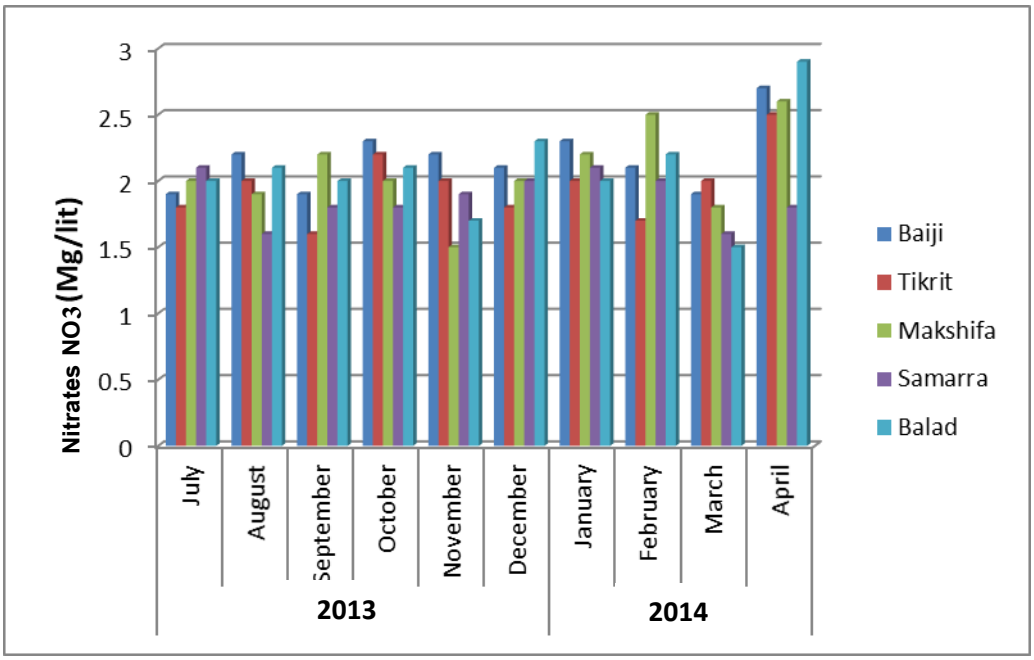

Figure No. (11) Monthly variable aspect in location and time for No_3 during the period of the study.

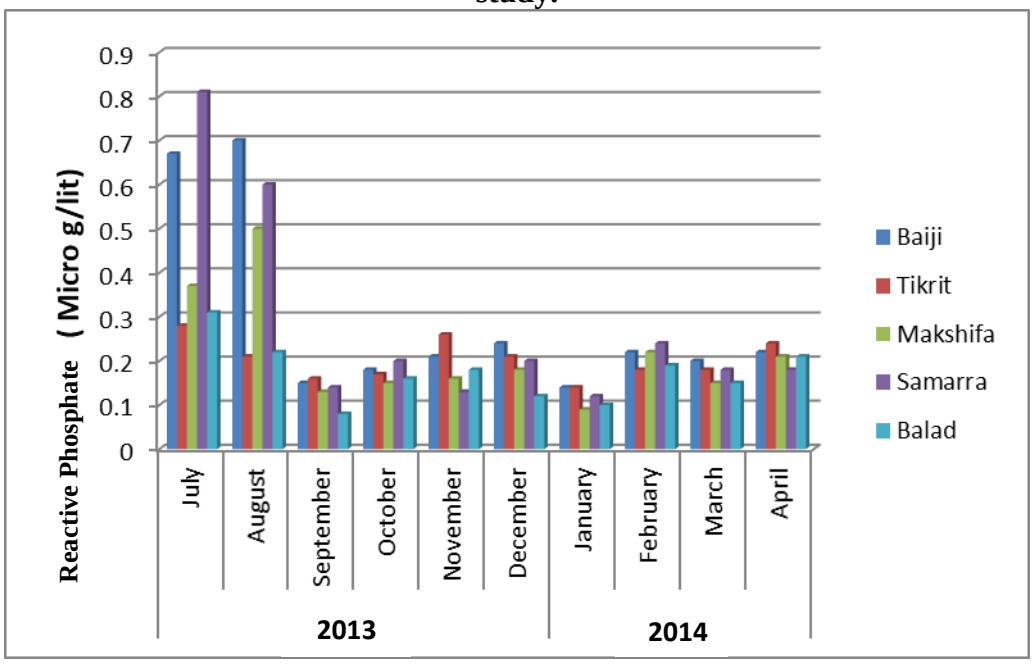

Figure No. (12) Monthly variable aspect in location and time for Reactive Phosphate during the period of the study.

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