Propriety of Drinking water in some refinery units in najaf governorate

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Abstract

The physico – chemical properties of water samples from some refinery units in najaf governorate studied during six month are (May, June, July, August, September & October) of 2007 . The current study included measurements of (pH ,EC ,temperature , Turbidity, Total alkalinity, dissolved oxygen, T.D.S, Total hardness, Chloride in addition to nutrients such as nitrate) in seven stations (Manadira,Heara,Najaf city ,Kufa city ,Qadisiah,Abbassai and Hereia). The results revealed that the averages of pH values of all stations ranged between (6.5-8.0) and consider within normal value for internationalism limits (U S EPA,1981) as (6.5-8.5) . mean while values of turbidity were increased in station in which the highest value during August was (57) NTU in Qadisiah and decrease in Manadira station in which the lowers value during May was (2.8) NTU comparing for internationalism limits (WHO,1984) are as (5) NTU . Total hardness were increased in Abbassai station in which the highest value of hardness during June was ٥٤٦ mg/l comparing Iraq limits ,1986 as (500) mg/l .In addition the Electrical conductivity values averages of all stations ranged between(1100-1467) µs/cm while the Dissolved oxygen averages of all stations ranged between (3.6-7.8) mg/l , the TDS averages of both stations ranged between (535-734) mg/l comparing for internationalism limits (U S EPA,1981) as (500) mg/l. The highest concentrations of Nitrate in Kufa station were ٤٨ mg/l during August and 0.92 mg/l. during June in Manadira station comparing for internationalism limits (WHO,1984) as (10) mg/l. The highest value of Total alkalinity was 385 mg/l in the Heara station during June comparing Iraq limits ,1986 as (200) mg/l and increased the chloride value in Abbassai station during May as 280 mg/l for internationalism limits (WHO,1984) as(250) mg/l .

الخلاصة

تضمنت هذه الدراسة قياس بعض الصفات الفيزيائية والكيميائية لمياه الشرب لبعض محطات التصفية في محافظة النجف لمدة ستة اشهر (أيار ، حزيران، تموز ، آب ، أيلول، تشرين الاول) للعام ٢٠٠٧. وتناولت الدراسة قياس(الأس الهيدروجيني pH والتوصيلية الكهربائية Ec ودرجة الحرارة Temperature و والعكورة والقاعدية الكلية والاوكسجين الذائب والمواد الذائبة الكلية والعسرة الكلية والكلورايد بالاضافة الى المغذيات وتمثلت بالنترات) في سبعة محطات تصفية هي (المناذرة ، الحيرة و تقوية النجف ، الكوفة ، القادسية ، العباسية ، الحرية) اظهرت النتائج أن معدلات قيمِ pH لكل المحطات تَراوحت بين (٦,٥-٠.٨) وهي ضمن الحدود الطبيعية للمحددات الدولية (U S EPA) لسنة ١٩٨١ وهي (٨,٥-٦,٥) . بينما سجلت قيم العكورة زيادة في محطة تصفية القادسية حيث سجلت اعلى قيمة لها خلال شهر آب وكَانت (٥٧ NTU) واقل قيمة في محطةِ تصفية المناذرة خلال شهر ايار وكَانت (٢,٨ NTU) مقارنة بالمحددات الدولية(WHO) لسنة ١٩٨٤ وهي (٥ NTU). سجلت اعلى قيمة للعسرة الكلية في محطة العباسية خلال شهر حزيرانِ وكَانت ٥٤٦ ملغم / لتر مقارنة بالمحددات العراقية لسنة ١٩٨٦ وهي (٥٠٠) ملغم / لتر، بالإضافة الى ان معدلات قيم التوصيلة الكهربائية لكل المحطات تَراوحت بين (١٤٦٧-١١٠٠) مايكروسيمنز /سم بينما معدلات الأوكسجينِ المذاب لكل المحطات تَراوحت بين (٧,٨-٣,٦) ملغم / لتر ، وتراوحت معدلات المواد الذائبة الكلية بين (٧٣٤-٥٣٥) ملغم / لتر مقارنة بالمحددات الدولية (U S EPA) لسنة ١٩٨١ وهي (٥٠٠) ملغم / لتر. وسجلت اعلى قيمة للنترات في محطة تصفية الكوفة وكَانت ٤٨ ملغم / لتر خلال آب واقل قيمة كانت ٠,٩٢ ملغم / لتر خلال حزيرانِ في محطةِ المناذرة مقارنة بالمحددات الدولية(WHO) لسنة ١٩٨٤ وهي (١٠) ملغم / لتر. اعلى قيمة للقاعدية الكلية كَانت ٣٨٥ ملغم / لتر في محطة الحيرة خلال حزيرانِ مقارنة بالمحددات العراقية لسنة ١٩٨٦ وهي (٢٠٠) ملغم / لتر ، بينما سجلت قيم الكلورايد في محطة العباسية خلال ايار كانت ٢٨٠ ملغم / لترمقارنة بالمحددات الدولية(WHO) لسنة ١٩٨٤ هي (٢٥٠) ملغم /لتر .

Introduction

Water is a common chemical substance that is essential to all known forms of life(Laurence ,*et al* 1997**)**. Drinking water plays an important role in the bodily intake of true element by human, such as man. Such as elevated levels of essential as well as non essential element can cause morphological abnormalities reduce growth, increase mortality and mutagenic effects (Nkono and Asubiojo, 1998; Adeyeye, 2000). Safe drinking-water is a basic need for human development, health and well-being, and because of this it is an internationally accepted human right (WHO,2001). Contamination of drinking-water is a significant concern for public health throughout the world. Microbial hazards make the largest contribution to waterborne disease in developed and developing countries. Nevertheless, chemicals in water supplies can cause serious health problems - whether the chemicals are naturally occurring or derive from sources of pollution. Often, identification and assessment of risks to health from drinking-water relies excessively on analysis of water samples. Chemical contaminants of drinking- water are often considered a lower priority than microbial contaminants, because adverse health effects from chemical contaminants are generally associated with long-term exposures, whereas the effects from microbial contaminants are usually immediate. Nonetheless, chemicals in water supplies can cause very serious problems (WHO,2004).Temperature is one of major factors that effects in distribution of organisms in habitat also the change in water temperature cause soluble most poisonous materials(Hodges,1989).Many organic molecules as well as salts, sugars, acids, alkalis, and some gases (especially oxygen), are soluble in water.(Dawn,*et al* 2006). Many recent studies for physical and chemical properties such as study of Taha *et al* ,2003 on refinery units in Kerbala governorate showed that the values of Nitrate(NO_3), NO_2,total hardness and phosphorus was higher that normal values whereas the study of Al-Hadrawy,(2003) on refinery units in najaf governorate showed the presence of bacterial pollution in the steps of purification and sterilization of drinking water,and study Jezrawi and Alhindawi (1986) on drinking water supplies in Baghdad city , and study Naoom (1998) in compare for pollution the river water and drinking water of three stations returner to Baghdad city. Because of the importance of drinking water to human ,the aim of our study is determination Propriety of drinking water in refinery units in najaf governorate.

Methods& Materials

7 stations of drinking water refinery unit in Najaf governorate were include in this study as the following :

1- Manadira water refinery unit.(A)
2- Heara water refinery unit.(B)
3- Najaf water refinery unit.(C)
4- Kufa water refinery unit.(D)
5- Qadisiah water refinery unit. (E)
6- Abbassai water refinery unit.(F)
7- Hereia water refinery unit. (G)

The samples were collected from these stations monthly ,from May–October 2007.The physico-chemical properties(Temperature,pH, Electric conductivity (EC),Turbidity ,Total dissolved salts (T.D.S), dissolved oxygen (DO) , Total hardness , Total alkalinity ,Chloride ion ,Nitrate) were determined immediately according to (APHA,2003)

The air Temperature was measured by mercuric thermometer which was divided (0-100) °C. The water temperature was measured

directly in the field by Digimeter pH 21. pH was measured with a pH meter (digital pH 21) and conductivity measured with Portable Conductivty Meter Bischofi17 unity by (µS/cm) after standardizing with KCL and NaCl solutions.

Water Turbidity was measured in the laboratory by the turbidity meter (type Hana, made in Italy).

DO was measured according to Azide modification of Winkler method ,Total hardness by EDTA titration using erichrome Black (T) indicator.

The reactive nitrate was measured according to cadmium column procedure.

Results and Discussion

The variation of water temperature among stations are shown in (figure 1). Which was the between 24.7 to 32.8 C° in kufa and Heara station during September & October respectively. This variation may due to high heat capacity and lower frequency of water to valuation temperature (Lampert and Sommer, 1997). No significant variation found between temperature values and the sites during the study period.pH values were ranged from 6.5 to 8.0 at Kufa and Qadisiah site in May respectively (figure 2). These values situate in normal value of water and control it through relationship between hydrogen ion separated from carbonic acid and hydroxyl radical that produced from bicarbonate lyses (Wetzel, 2001) . The highest desirable level of pH was within the range of 7.0-8.5 (WHO,1990). Conductivity values were ranged from 1100 µs/cm recorded in June at Najaf site ,to 1467 µs/cm at Heara site in September (figure 3).It depends on the presence of ions, their total concentration and temperature (Jorma and Arjen ,2007). Electrical conductivity (EC) is a measure of the ions present in water, as the conductivity increases with the number of ions: it is also effectively a surrogate for total dissolved solids (TDS) (Metcalf and Eddy 2003). Weiner (2000) Refer that the Electrical conductivity associated with the TDS& TSS. There was significant difference between the sites at ($L.S.D_{0.05}$= 36.28) .There was negative significant relation between electric conductivity values and water temperature(r=-0,68601) and positive significant relation between electric conductivity and water T.D.S (r= 0,984). show (figure 4) presence significant variation at ($L.S.D_{0.05}$ =18.414) between months and station of TDS , the lowers value was 535 mg/l in Najaf station during August and recorded highest value was 734 mg/l in Heara station during September.

Water has been classified on the basis of hardness as follows (Adeyeye and Abulude , 2004). water has 0-75mg CaCO3 L-1 as soft, 75-150mg CaCO3 L-1 as hard while samples having total hardness of over 300mg CaCO3 L-1 was hard. Based on these, water samples in this study fell under hard water, if reach the high value 546 mg/l in Abbassai station during June 2007 and low value was 250 mg/l in Najaf station during July (figure 5) The degree of hardness of water was low and this might encourage the dissolution of heavy metals(Adeyeye and Ayejuyo ,2002).A significant difference was recorded between site Abbassai and other site . high carbonate cause calcium and magnesium ions to form insoluble minerals leaving sodium as the dominant ion in solution (Bauder *et al*. 2004). Turbidity is caused by materials suspended in the water and consequently it is an indirect measurement of total suspended solids (Jorma and Arjen ,2007). The turbidity in water samples in this study of was (2.8 & 57) NTU in Manadira station during May & in Qadisiah station during August respectively (figure 6) if observe the highest value no situate included normal value of drinking water. The normal value of drinking water turbidity less 5 NTU (WHO,1990). the increase of turbidity may due to clay and silt particles or presence of high number of microorganism in this station.A significant difference

was recorded between the months in one site also between stations in one month so interaction between the months and stations.figure (7) showed the values of Dissolved oxygen which ranged from (3.6-7.8) mg/l .The dissolved oxygen concentration of the samples showed that the samples were oxygen –rich although. The variation of dissolved oxygen values may be associated with temperature variation (Howard , 1998), pressure and concentration of different ions in water (Wetzel and Linkens , 2000). The highest value of Total alkalinity was 385 mg/l in the Heara station during June and increased the chloride value in Abbassai station during May 2007 as 280 mg/l(figure 8 and 9) respectively. The statistical analysis showed a significant difference between site Heara and other sites.

Water alkalinity is was higher than the normal value as 200 mg/l (WHO,1990). Recorded the highest concentrations of Nitrate in Kufa station were ٤٨ mg/l during August and 0.92 mg/l (figure 10). during June in Manadira station, the increase of Nitrate concentrations during summer may be lead to increase of evaporation due to high temperature that cause increase dissolved salts and high organic decomposition(Al - Lami *etal*.,1999).And these increasing which that high normal value may be acute toxin to infants under six months of age. In infants, it causes a condition known as methemoglobinemia**,** or "blue-baby syndrome," which can be fatal. Because when bacteria in the digestive tract of infants change the nitrate into nitrite, a much more harmful substance. The nitrite then enters the bloodstream, where it can lower the blood's ability to carry oxygen to the body, causing a blueness to the skin.(EPA,2005)

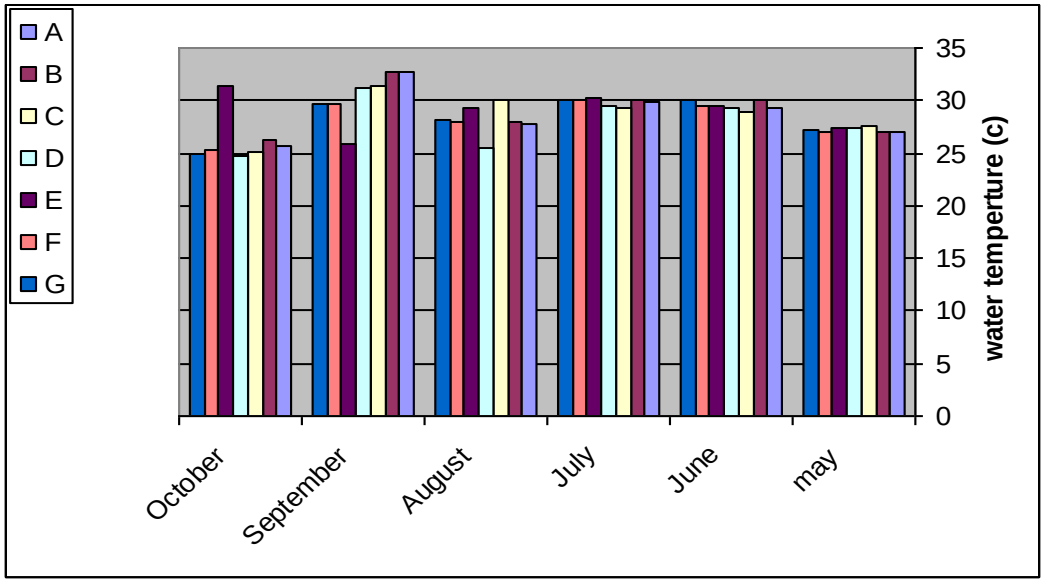

Figure (1) Monthly Water Temperatur Variations(L.S.D.$_{0.05}$=0.7)

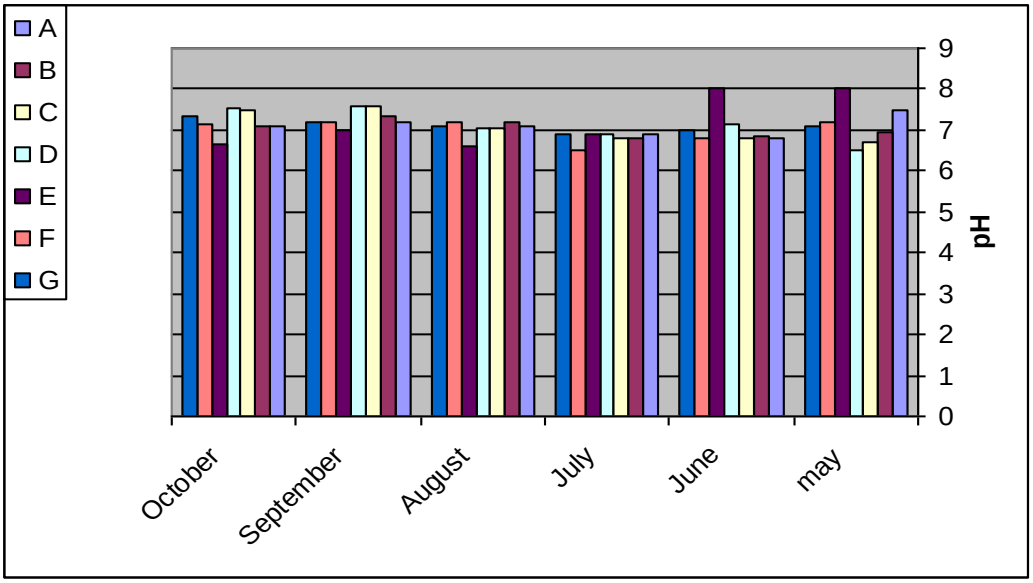

Figure (2) Monthly Water pH Variations (L.S.D.$_{0.05}$=0.157)

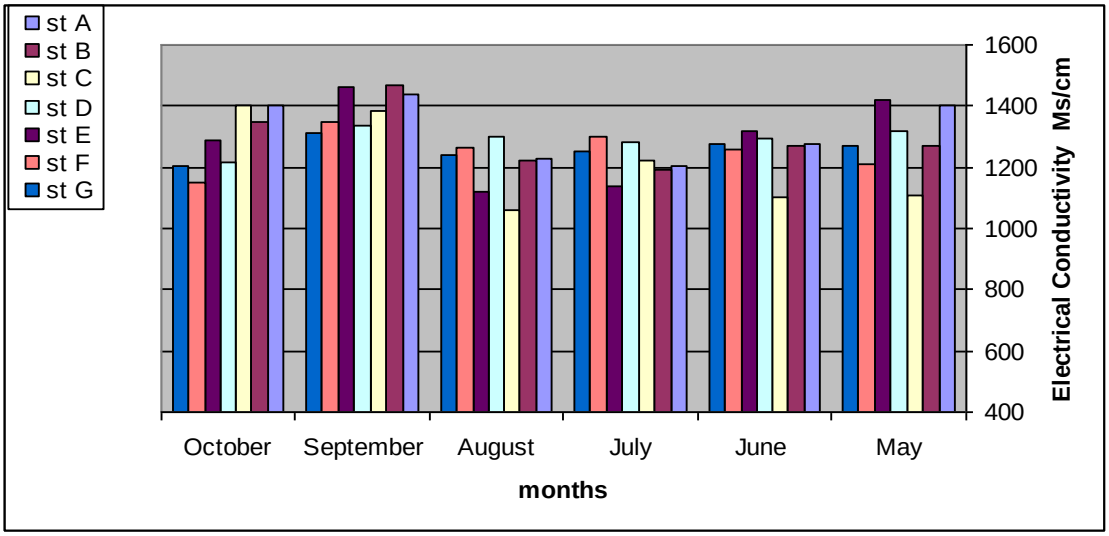

Figure (3) Monthly Electrical Conductivity Variations(L.S.D.$_{0.05}$=36.28)

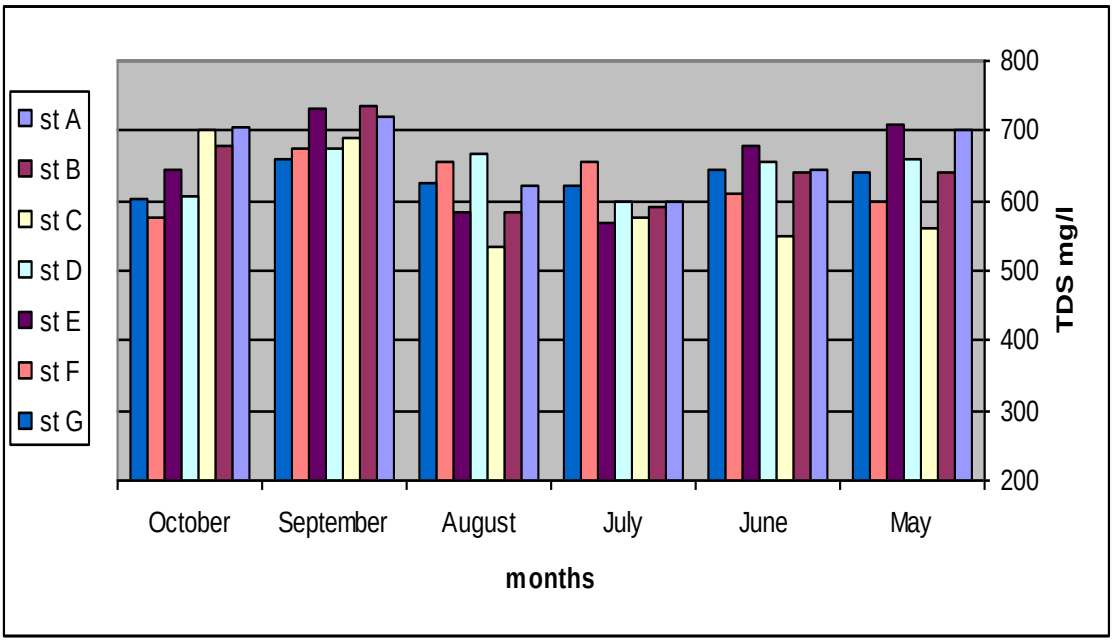

Figure (4) Monthly Total Dissolved Solids Variations(L.S.D.$_{0.05}$=18.414)

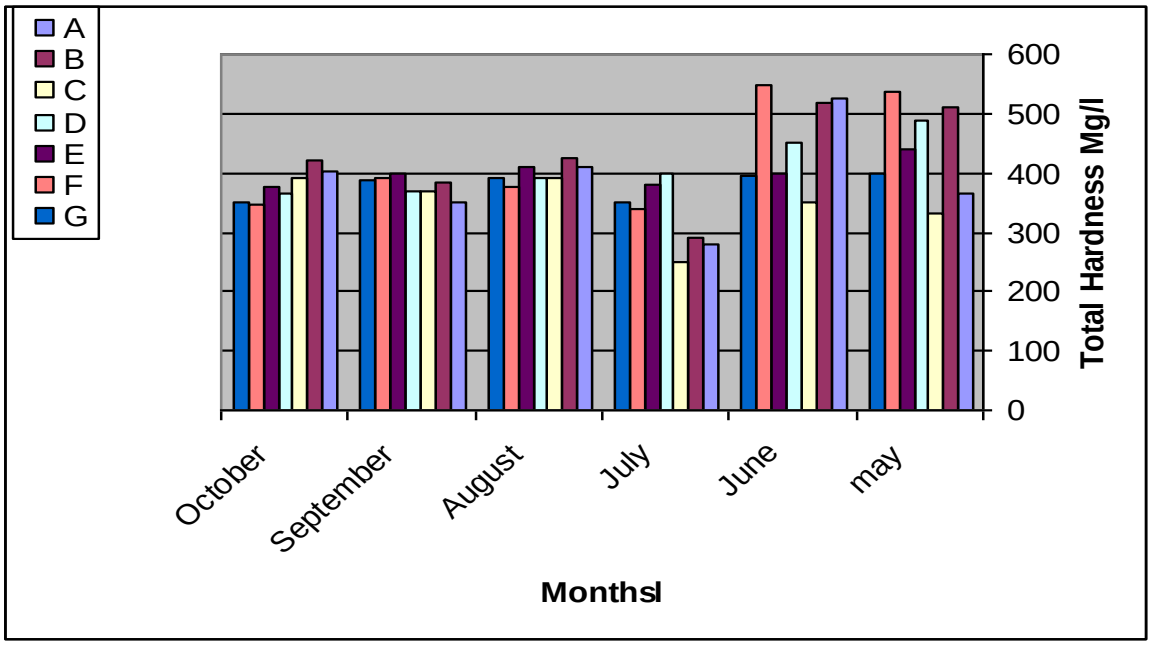

Figure (5) Monthly Total Hardness Values Variations(L.S.D.$_{0.05}$=221.198)

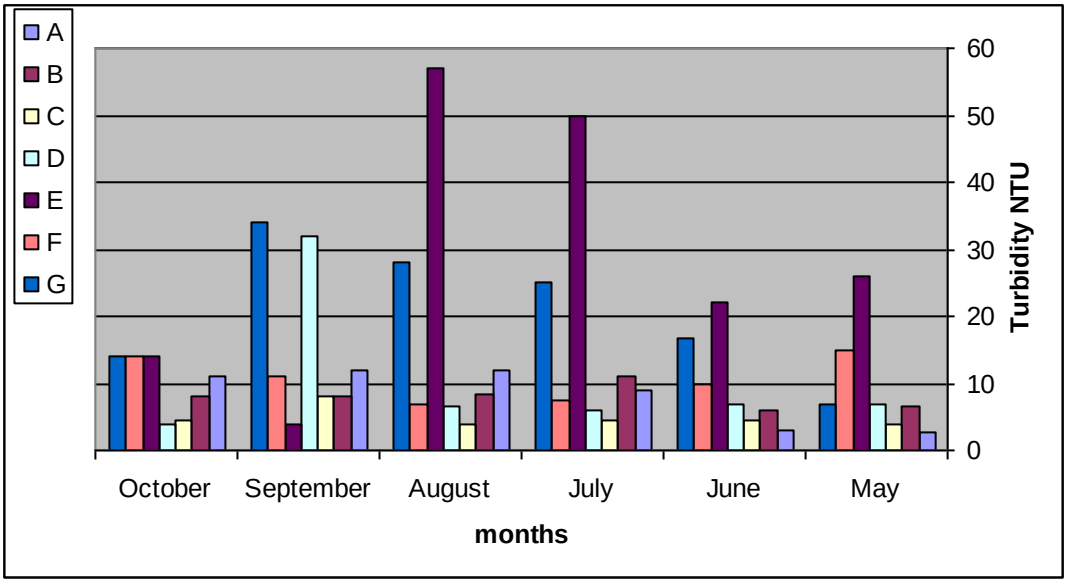

Figure (6) Monthly Turbidity Variations(L.S.D.$_{0.05}$=4.37)

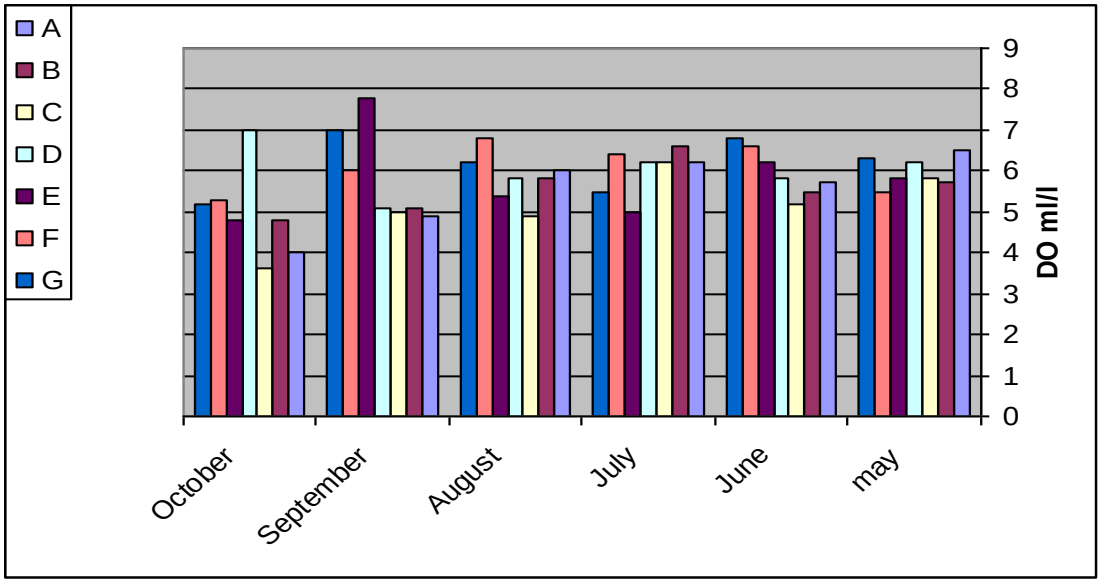

Figure (7) Monthly Dissolved oxygen Variations(L.S.D.$_{0.05}$=0.334)

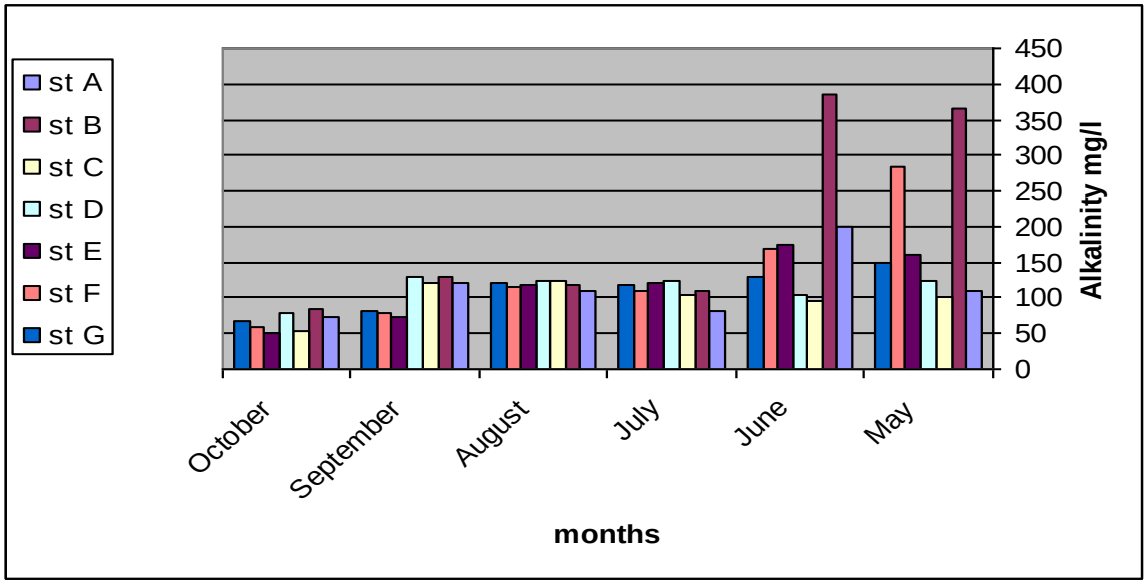

Figure (8) Monthly Alkalinity Variations(L.S.D.$_{0.05}$=23.75)

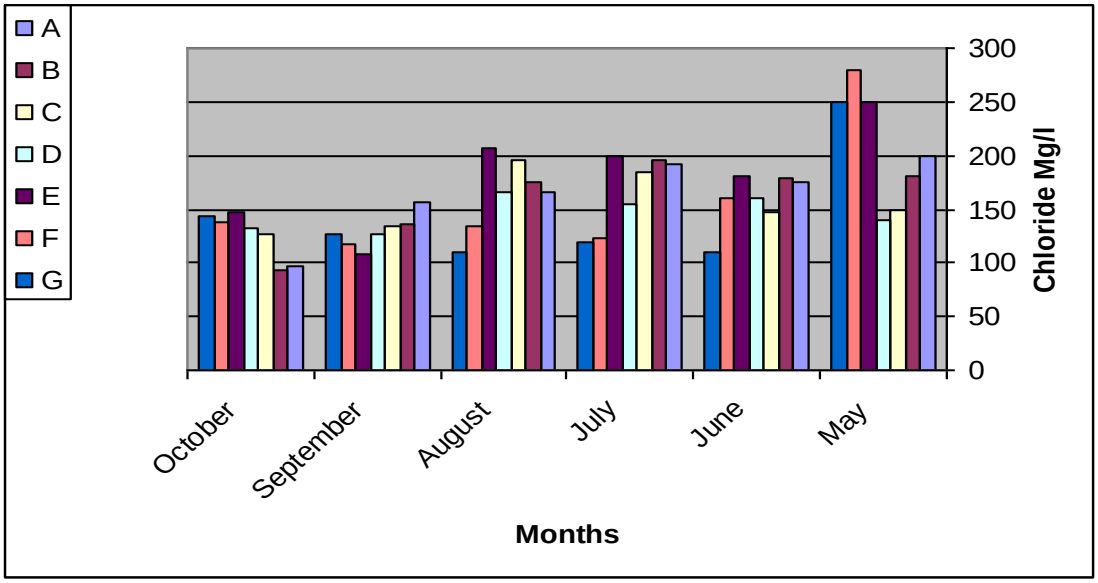

Figure (9) Monthly Chloride Values Variations(L.S.D.$_{0.05}$=14.87)

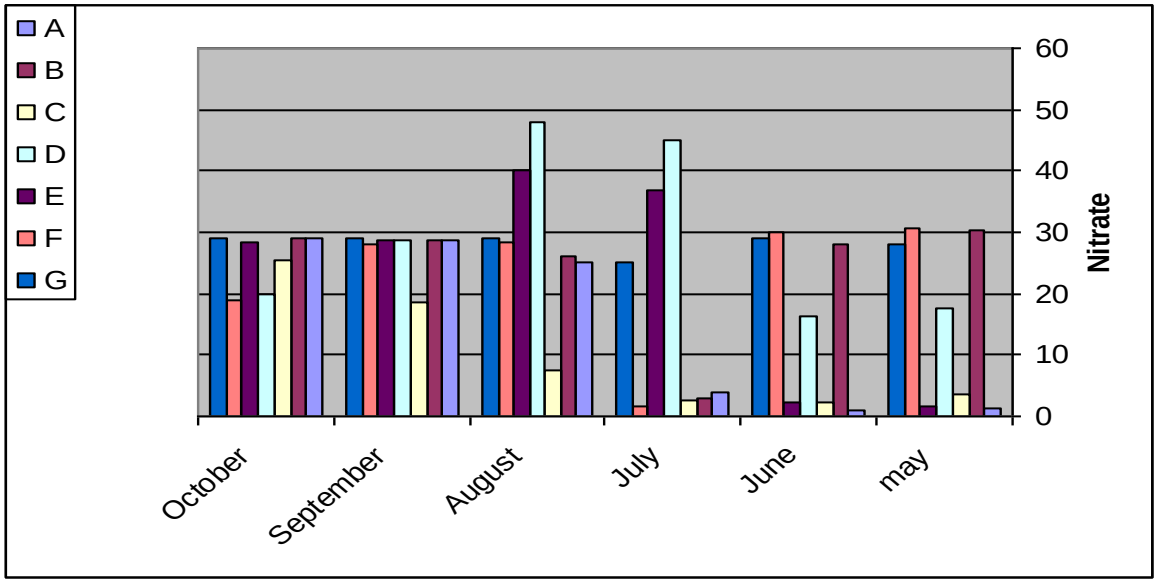

Figure (10) Monthly Nitrate Values Variations(L.S.D.$_{0.05}$=4.97)

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