Study of Monthly and Annual Changes for Concentration of Elements (Phosphate and Nitrate) Within Stream Tigris River in Some Regions of Wassit Governorate

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Abstract

This study was conducted to study the monthly and annual changes of the phosphate and nitrate concentrations in the water of the regions of (Essaouira, Numania, Kut, Muwafaqia and Dujaila) in Wasit governorate by measuring the concentrations of phosphates and nitrates and measuring the elements (Ec, pH, TDS, Ca, Mg, K, Na) and the samples were taken at the beginning of the month and mid-month and then took the rate of these samples over the full year (for the years 2013, 2014) The results were compared with the Iraqi Standard for Water . Then, statistical models were used to find the correlation values for the knowledge of phosphate and nitrate values (dependent variables) based on time during the months of the year, and depend on (pH,EC,TDS, Ca,Mg, K and Na) (Independent variables). The results showed that the value of Phosphate (Po_4) during the year 2013 exceeded the limit allowed during the month of December in the regions (Numaniyah, Kut upstream barrage, Muwafaqiy and Dujaili) and during the month of January in the regions (Muwafaqiya, Dujaili, Kut upstream barrage), while the Nitrates all values within allowable limit of water. During the year 2014, the concentration of the phosphate value exceeded the limit allowed during the month of February in the region of Suwiara and during the month of August in the regions (Muwafaqiya, Kut upstream barrage), while the Nitrates all values within allowable limit of water. While the results of the statistical model showed that there was a high correlation for coefficient of determination (R^2) except for the statistical model WQMD for NO_3 equal to 0.581 and WQMM for NO_3 equal to 0.603 and coefficient of determination (R^2) for 2014 range between (0.790-0.373), through value of correlation matrix showed that the values of phosphates and nitrates have a high correlation with the elements (TDS, pH, EC, Na) than other elements

Keyword: Nitrate, Phosphate, Water quality, Tigris River, Ec, PH, TDS, Calcium, Magnesium, Potassium, Sodium, Statistical model.

1-Introduction

Phosphates are chemical compounds that contain a high amount of phosphorus. Phosphorus is a non-metallic compound, which is important for plant, animals and human and is found in rock as inorganic phosphates. As water runs through rocks it carries off small quantity of minerals such as magnesium, calcium and phosphates. Inorganic phosphates are a plant nutrient and are taken in by plants with water and incorporated into organic phosphate compounds. Animals obtain their essential phosphorus from phosphates in water and plant material.

The Nitrate ion (NO_3) is the stable form of combined nitrogen for oxygenated systems. Although chemically unreactive, it can be lowered by microbial work. The Nitrate concentration in surface water is normally low (0–18 mg/l) but can reach high concentration as a result of agricultural runoff, refuse dump runoff or pollution with human or animal wastes**[1]. [2]** studied The concentration of total phosphate in selected groundwater bodies and surface water from Manzini and Lubombo regions of Swaziland was determined using a UV spectroscopic method. Samples were collected from three rivers (upstream and downstream of each), three industrial effluents, one pond, one reservoir, one tap water and fifteen boreholes. Mean phosphate levels varied between 0.08-0.09 mg/L in the tap water and reservoir while for the river samples, the range was 0.11-0.37 and for the industrial discharge it was 0.11-1.60 mg/L PO4–P. For the ground water systems it ranged between 0.10-0.49 mg/L PO4–P. **[3]** showing concentration of nitrate anion from selected wells and points along the Kimondi River using UV-Visible spectrophotometric method . The regions selected were Sitatunga swamp, Tulon, Kimondi Bridge, Sironoi, kipchabo tea factory and Samoo these researches were to determine whether nitrate anions in water are beyond the threshold limit which is harmful to both animal and plant life. **[4]** studied of bladder cancer in Spain that show cases from 1998-2001 reported an increased danger of bladder cancer among subjects with the longest exposure to high concentration of nitrate (above 9.5 mg/L) in drinking water. Lower levels of nitrate in drinking water were found to be concerned with risk of bladder cancer. **[5]** Studied of 3,300 case mothers and 1,121 control mothers in Texas and Iowa from 1997-2005 found that prenatal nitrate intake in the mother's drinking water was safely positively connected with offspring diagnosed with neural tube defects of the spinal cord and brain, including spina bifida, some oral cleft defects and limb deficiencies**. [6]** Showing in Taiwan investigated the relation between bladder cancer mortality and nitrate exposure from drinking water. Those with high nitrate concentrations in their drinking water were 1.76 to 1.96 more probable to die from bladder cancer than those who had the lowest exposure. **[7]** Studied to compare the concentrations of total ammonia nitrogen (TAN) , nitrate nitrogen (NO2-N) and soluble reactive phosphorus (SRP) in the surface intertidal waters of Kuala Gula Bird Sanctuary over a four-month period (June to September, 2007) Three sampling stations were determined in the Gula river estuary, classified as Station 1, Station 2 and Station 3. The highest concentrations of SRP (55.92±7.88 μg/L), nitrate-N (85.68±24.33 μg/L) and TAN (85.91±6.54 μg/L) were recorded in the months of June, July and August, respectively. **[8]** Showing the results of 'clean-up' efforts of Gombak River which passes through the City of Kuala Lumpur and some industrial regions. The trends in the concentrations of nitrates, phosphates and chlorides present in the river water were observed .The water quality index was also used to evaluate the general water quality of the river, the results of efforts for the period between from 1997 to 2005 which included public participation, engineering, river works and strict statutory regulations by the government had shown success in improving the river water quality, **[9]** show The increase in the percentage of phosphate impact on human health such as myocardial infarction, blood poisoning, liver and kidney toxicity and skin sensitivity . The aim of this study is studied the change annual and monthly for concentration Phosphate and Nitrate in Tiger rivers.

2-Material and Methods

The work was conducted in five regions related to five districts of Wasit province, Fig. (1) map of Iraq show samples locations. The area is characterised mainly by large agricultural activities with minor industrial works .Tigris is the main source of water for the agricultural and domestic uses .Water samples were collected from Tigris river for regions (Suwaira, Numaniyah, Kut upstream barrage, Kut downstream barrage, Muwafaqiya and Dujaili), and chemically analyses for (Ec, pH, TDS, Ca, Mg, K and Na), Phosphate and Nitrate in the chemical laboratories of an Environmental directory of Wasit province the samples were taken at the beginning of the month and mid-month and then took the rate of these samples over the full year (for the years, 2013, 2014)

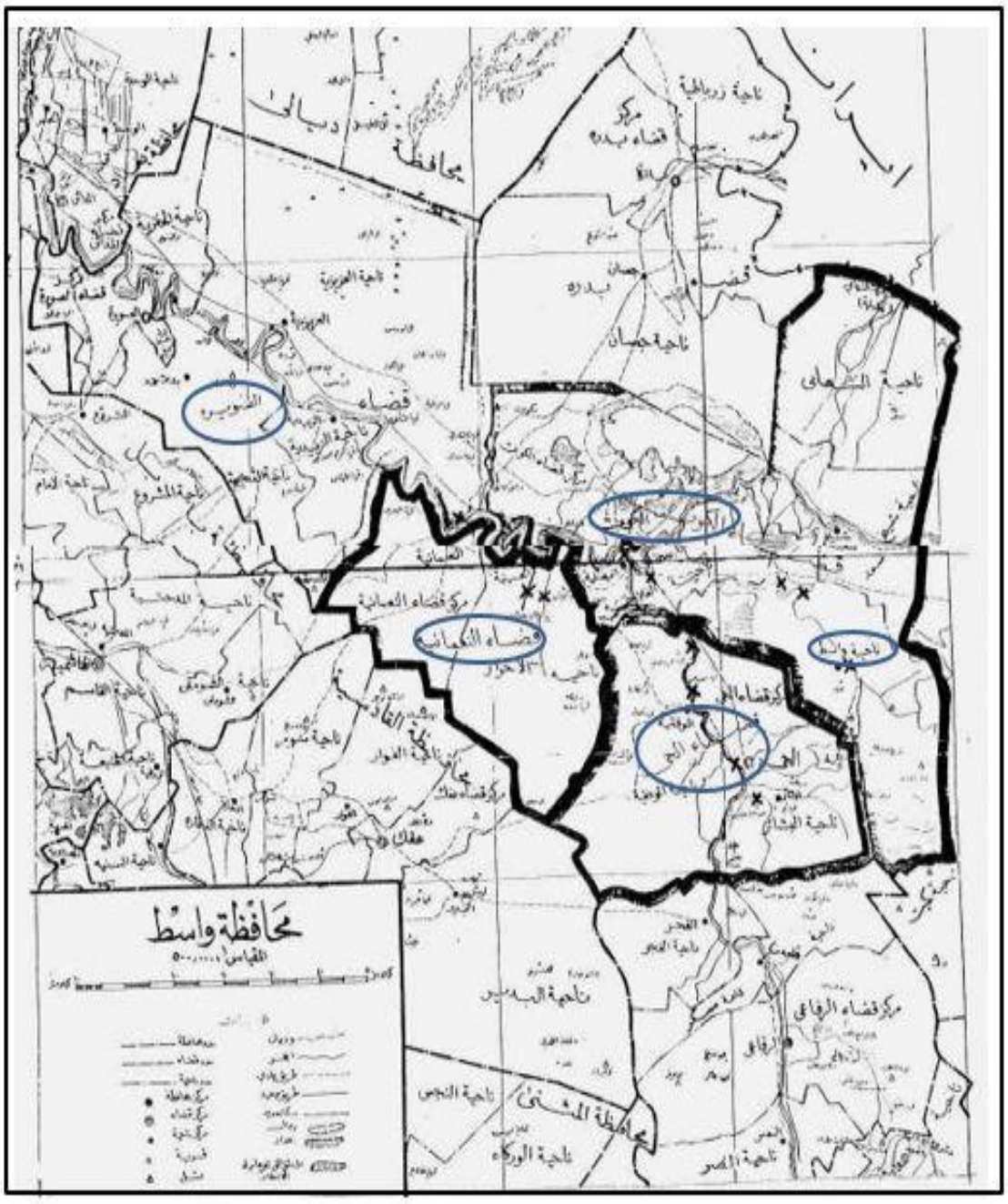

Fig. (1) Map of Iraq show samples locations

3-Results and Discussion

The value of phosphate (PO_4) during the months of the year 2013 ranged between (0.075- 0.455)mg/l in district of Suwiara, range between (0.075- 0.525) mg/l in the district of Numaniyah, range between (0.07- 0.55) mg/l in district kut upstream barrage, range between (0.1-0.4) mg/l in district kut downstream barrage , range between (0.125- 0.55) mg/l in region of Muwafaqiya and range between (0.14-0.5)mg/l in region of Dujaili, through this value it found high rise in concentration of PO_4 in December month in regions (Numaniyah, kut upstream barrage, Muwafaqiya, Dujaili), high rise in concentration of PO_4 in January month in regions (Muwafaqiya, Dujaili, kut upstream barrage) and high rise in concentration of PO_4 in December month in region of Suwiara with exceeding (0.4mg/l). As for the value of nitrates (NO_3) during the months of the year 2013 ranged between (5.05-8.95)mg/l in the district of Suwiara , range between (2.25-8.9)mg /l in the district of Numaniyah ,range between (5.15-8.15)mg/l in the district of kut upstream barrage, (6.25-9) mg/l in the region of kut downstream barrage, range between (4.25-8.3)mg/l in the region of Muwafaqiya and range between (4.75-9.2) mg/l in the region of Dujaili. All the numbers within the Iraqi standard for Nitrate, which does not exceed 50 mg/l, table 1 show laboratory tests for pH, Ec, the range pH between(7.55 in suwiara and Numaniyah) to (8.20 in Kut upstream barrage) and Ec between(3577-887) μS.cm-1 in suwiara, table 2 show laboratory tests for Ca, Mg, Ca range between(44.5 mg/l in Muwafaqiya) to (233mg/l in suwiara), Mg range between (28.25mg/l in Muwafaqiya)to (59.91 mg/l in Dujaili), table 3 show laboratory tests for K,Na,K range between (2.7-8.98)mg/l in Suwiara, Na range between (64-320.4)mg/l in Suwiara and table 4 show laboratory tests for PO_4 and NO_3 in Water Provinces Wassit for 2013 years. Table 5 show laboratory tests for TDS in Water Provinces Wassit for 2013 years, TDS range between (539mg/l in Muwafaqiya to 2520mg/l in Suwiara) and then work statistical models for each region, table 6 show statistical models (by using Data fit program and using non-linear equations)for each region for 2013 years for (PO_4, NO_3) show water quality models(WQM) with PO_4, model 1 (for suwiara (WQMs), model 2 for Numaniyah (WQMN), model 3 for Kut upstream barrage (WQMK up), model 4 for Kut downstream barrage (WQMK down),model 5 for Muwafaqiya (WQMM), model 6 for Dujaili (WQMD) between (PO_4) dependent variables, with (Ec, PH, time, TDS,Ca and Mg) Independent variables, and (NO_3) dependent variables with (Time,EC,PH,Ca,Mg,K,Na and TDS) Independent variables, table 7 show coefficients of constructed models for each region for 2013 years for PO_4,NO_3, as table 7 show coefficient of determination (R^2), it is very low in the model (WQMM) for NO_3 equal to 0.603 and equal to 0.581 in the model (WQMD) for NO_3, Table (8) Correlation metrics of the studied chemical properties for Tigris water for PO_4,NO_3, with other elements, the height (positive) correlation coefficient between (PO_4, Ec),their coefficient were (0.863, 0.749, 0.897) in Kut upstream barrage, Muwafaqiya, Dujaili respectively , between (PO_4, Time) equal to 0.585 in Suwiara, between (PO_4,pH) equal to (0.582) in Numaniyah, between (PO_4,TDS) equal to 0.669 in kut downstream barrage between (NO_3 ,pH) equal to 0.425 in Dujaili ,between (NO_3,Mg) equal to (0.564,0.579, 0.467) in Suwaira, Numaniyah ,kut downstream barrage respectively, between (NO_3, K) equal to (0.865,0.307) in kut downstream barrage, Muwafaqiya respectively, the height (negative)correlation coefficient between (PO_4,Time) equal to (-0.151, -0.435 ,-0.252) in kut upstream barrage, Muwafaqiya,Dujaili respectively, between (PO_4, pH) equal to (-0.037, -0.012) in Suwaira, kut downstream barrage respectively ,between (PO_4,Mg) equal to -

0.147 in Numaniyah, the height negative correlation coefficient (NO_3 ,pH) equal to (-0.109) in kut downstream barrage, between (NO_3,TDS) equal to -0.660 in Numaniyah, between (NO_3,Time) equal to (-0.231, -0.569, -0.279, -0.579)in suwaira, kut upstream barrage, Muwafaqiya, Duijili respectively, Table (9,10) Measured and Estimated PO_4, NO_3 values from chemical test and Data fit software program for all Region for 2013 year, residual (negative) for PO_4 range (-0.001) to(-0.068)for (WQMM), (WQMN) respectively,residual (positive) for PO_4 range (0.000)to(0.089) (WQMS), (WQMN) respectively, residual (negative) for NO_3 range (-0.018) to (-1.309)for (WQMK up), (WQMM), (WQMM) respectively ,residual (positive) for NO_3 range(0.014)to(1.333) (WQMK up) , (WQMM) respectively. Figures (2-7) show relationship between PO_4, NO_3 and Months for Suwiara, Numaniayah, Kut upstream barrage, Kut downstream barrage, Muwafaqiya and Dujaili respectively for 2013 year.

Table 1: Laboratory tests for pH and Ec (µS.cm-1) in Water Provinces Wassit for 2013 years

range / month	Suwiara		Numaniyah		Kut upstream barrage		Kut downstream barrage		Muwafaqiya		Dujaili	
	pH	EC	pH	EC	pH	EC	pH	EC	pH	EC	pH	EC
1	8	3577	8.15	1250	8.2	1309.5	8.15	1309	8.15	1274.5	8.1	1329.5
2	8	1393.5	8.15	1250	8.1	1267.5	8.1	1531.5	8	1267	8.1	1302.5
3	7.7	887	7.35	1057.5	7.55	914.5	7.7	907	7.85	912.5	7.65	898
4	7.75	1063	7.65	1110.5	7.55	1065	7.7	1103	7.85	1137.5	7.75	1170.5
5	7.85	1250	7.75	1223	7.75	1269.5	7.7	1331.5	7.75	1269.5	7.95	1241.5
6	7.85	984	7.7	1146.5	7.65	1184.5	7.75	1323.5	7.8	1257	7.65	1249.5
7	7.55	1144.5	7.85	1186	7.75	1117.5	7.85	1200	7.8	1188.5	7.65	1202
8	7.8	1194.5	7.65	1324.5	7.7	1147	7.75	1237.5	7.7	1254.5	7.7	1249.5
9	7.6	1146.5	7.55	1176.5	7.7	1206	7.75	1216	7.8	1212	7.7	1173
10	7.85	1177.5	7.85	1159.5	7.6	1252.5	7.7	1293	7.7	1229	7.6	1220.5
11	7.7	1189.5	7.65	1184.5	7.7	1182.5	7.85	1251.5	7.6	1196.5	7.7	1205.5
12	7.8	1469.5	7.855	1225.5	7.785	1231	7.825	1245.5	7.88	1208.5	7.875	1236

Table 2: Laboratory tests for Ca (mg/l) and Mg (mg/l) in Water Provinces Wassit for 2013 years

range / month	Suwiara		Numaniyah		Kut upstream barrage		Kut downstreamr barrage		Muwafaqiya		Dujaili	
	Ca	Mg	Ca	Mg	Ca	Mg	Ca	Mg	Ca	Mg	Ca	Mg
1	233	48.5	89	42	89	48.5	87.5	43.5	95	42.5	89	43
2	90.5	43	89	42	89	40	100	38	91.5	38	90.5	40.5
3	72.5	30	82.5	37	75.5	36	75	34.5	75.5	38	78.5	35
4	65,75	55.58	72.15	58.51	69.5	56.88	80.5	59.045	78	55.78	80.25	59.91
5	109.5	48.34	93	53.38	98.6	54.11	105.75	56.805	98.75	55.28	103.5	50.42
6	80	39.04	96	45.14	100	43.92	124	47.58	112	45.14	112	45.14
7	84	34	82.5	36.5	91	30	84	39.5	84	37.5	85	36.5
8	84	36.5	86	38.5	83.5	37	85.5	40	87	36.5	89	38.5
9	80	28.5	89.6	34.5	88	36	96.8	38	87.2	33	84	30
10	87	36.5	87	41	88	39	88	42.5	44.5	38.5	84.5	36
11	91.4	29	83.15	33.25	90.15	29.9	91.25	32.6	86.8	29.4	86.45	30.45
12	97	34.9	90.5	34.15	89.75	36.5	93	38.1	90.5	28.25	90.5	37.5

Table 3: Laboratory tests for K (mg/l) and Na (mg/l) in Water Provinces Wassit for 2013 years

range / month	Suwiara		Numaniyah		Kut upstream barrage		Kut downstream barrage		Muwafaqiya		Dujaili	
	k	Na	k	Na	k	Na	k	Na	k	Na	k	Na
1	3.05	320.4	4	87.35	4.25	92.5	4.1	91.85	4.35	92.65	4.4	97.3
2	5.25	100.85	4	87.35	4.65	98	6.5	126.8	4.75	99.6	4.75	95.6
3	2.7	49.95	3.2	68.7	2.85	54.3	2.75	54.55	3.25	55.25	2.95	52.25
4	3.69	81.75	3.82	91.7	3.91	95.2	4.96	114	4.62	115.65	4.81	116
5	5.4	90	5.2	93.5	5.2	102.5	6.9	113	4.9	98.5	4.85	97.5
6	4.2	71.2	6.8	85.5	6.5	88.5	8.85	102.5	7.65	98	7.35	93.5
7	4.4	64	4.8	67	4.05	67.5	6	67	4.95	72	5.1	73
8	4.95	77.2	5.1	77.3	5.55	72.8	6.1	79	5.9	76.8	5.8	76.1
9	4.01	76	5.9	89	5.7	92	6.3	100	3.3	88	4.7	87
10	8.95	107.5	7.3	130	6.8	133	8.1	142	6.9	125.5	6.3	109
11	5.6	108.75	4.475	106	4.825	108.75	4.9	116.25	4.15	106.25	4.8	118.25
12	5.95	96.7	5.925	89.6	6.1	93.75	6.625	102.75	6.4	91.75	5.925	96.75

Table4: Laboratory tests for Po_4 (mg/l) and No_3 (mg/l) in Water Provinces Wassit for 2013 year

range / month	Suwiara		Numaniyah		Kut upstream barrage		Kut downstream barrage		Muwafaqiya		Dujaili	
	Po_4	No_3	Po4	No3	Po4	No3	Po4	No3	Po4	No3	Po4	No3
1	0.335	6.05	0.525	6.6	0.55	7.75	0.25	7.3	0.55	6	0.5	6.15
2	0.25	7.7	0.53	6.4	0.45	8.15	0.395	7.65	0.525	8.15	0.5	9.2
3	0.075	6.2	0.075	6.6	0.07	6.35	0.1	7	0.125	7.3	0.14	6.8
4	0.335	8.95	0.26	8.15	0.235	7.6	0.375	6.25	0.31	5.35	0.345	7.7
5	0.4	14.8	0.33	8.4	0.31	5.6	0.36	7.5	0.38	6.4	0.38	6.2
6	0.34	7.15	0.33	8.9	0.26	7.6	0.375	8.25	0.36	7.6	0.37	7.2
7	0.37	7.55	0.37	7.85	0.32	5.15	0.39	7.35	0.36	6.3	0.35	6.3
8	0.36	6	0.37	7.4	0.31	6.4	0.355	7.9	0.325	5.4	0.325	5.6
9	0.345	6.35	0.39	7.1	0.28	7.3	0.34	7.9	0.32	6.5	0.28	5.6
10	0.33	7.1	0.39	7.6	0.37	6.45	0.4	9	0.4	8.3	0.3	6
11	0.4	5.05	0.4	2.25	0.3	5.2	0.32	6.5	0.23	4.25	0.355	4.75
12	0.455	7	0.38	5.95	0.33	6	0.39	6.9	0.26	6	0.39	6.7

Table 5: Laboratory tests for TDS (mg/l) in Water Provinces Wassit for 2013 years

region / month	Suwiara	Numaniyah	Kut upstream barrage	Kut downstream barrage	Muwafaqiya	Dujaili
1	2520	777	821	780	810.5	855
2	848.5	788	757	939	785.5	839
3	544.5	620	567	546	539	563
4	650.5	668	649	715	689	719.5
5	706	724	749	774	759	727
6	576	658	692	802	745	732
7	667.5	699.5	664.5	713	707.5	708
8	739	733	716	738	735.5	735
9	694	749	755	804	739	713
10	789	824	824	890	820	800
11	869	871.5	875	907.5	857.5	874
12	987	844	825	842.5	804	837.5

Table (6) Models constructed to characterize the relation between Time(T) ,pH, Ec ,Ca, Mg ,TDS with PO_4 and between Time(T) ,pH, Ec ,Ca, Mg,K,Na ,TDS with NO_3 for Tigris water for 2013 years

Model 1 (WQMs) : $PO_4 = a_1*T+a_2*pH+a_3*Ec+a_4*Ca+a_5*Mg+a_6*TDS+a_7$
$NO_3 = EXP(a_1*T+a_2*pH+a_3*Ec+a_4*Ca+a_5*Mg+a_6*K+a_7*Na+a_8*TDS+a_9)$
Model 2(WQMN) : $PO_4 = a_1*T+a_2*pH+a_3*Ec+a_4*Ca+a_5*Mg+a_6*TDS+a_7$
$NO3 = a_1*T+a_2*pH+a_3*Ec+a_4*Ca+a_5*Mg+a_6*K+a_7*Na+a_8*TDS+a_9$
Model 3 (WQMK up) : $PO4 = a_1*T+a_2*pH+a_3*Ec+a_4*Ca+a_5*Mg+a_6*TDS+a_7$
NO3 = EXP(a1*T+a2*pH+a3*Ec+a4*Ca+a5*Mg+a6*K+a7*Na+a8*TDS+a9)
Model 4(WQMK down) : $PO4 = a_1*T+a_2*pH+a_3*Ec+a_4*Ca+a_5*Mg+a_6*TDS+a_7$
$No3 = EXP(a_1*T\ a_2*pH+a_3*Ec+a_4*Ca+a_5*Mg+a_6*K+a_7*Na+a_8*TDS+a_9)$
Model 5(WQMM) : $PO4 = a_1*T+a_2*pH+a_3*Ec+a_4*Ca+a_5*Mg+a_6*TDS+a_7$
$NO_3 = EXP(a_1*T+a_2*pH+a_3*Ec+a_4*Ca+a_5*Mg+a_6*K+a_7*Na+a_8*TDS+a_9)$
Model 6(WQMD) : $PO4 = EXP(a_1*T+a_2*pH+a_3*Ec+a_4*Ca+a_5*Mg+a_6*TDS+a_7)$
$NO_3 = EXP(a_1*T+a_2*pH+a_3*Ec+a_4*Ca+a_5*Mg+a_6*K+a_7*Na+a_8*TDS)$

Table (7) Coefficients of constructed models for (PO_4, NO_3) for Tigris water for 2013 years

coefficients	Model 1 for		Model2 for		Model3 for		Model 4 for		Model5 for		Model6 for	
	PO4	NO3	PO4	NO3	PO4	NO3	PO4	NO3	PO4	NO3	PO4	NO3
a_1	3.358E-02	-4.102E-03	-3.801E-04	-0.268	-4.627E-03	-2.931E-02	1.619E-02	1.120E-02	-1.844E-02	-3.957E-02	-0.006	-0.257
a_2	-7.968E-02	-0.381	0.291	0.154	0.171	0.786	-2.271E-02	0.282	0.1700	6.725E-02	0.121	1.389
a_3	4.470E-04	2.162E-04	4.271E-04	3.230E-03	1.033E-03	-1.345E-03	5.876E-04	8.865E-04	1.118E-03	1.310E-03	0.0004	-0.008
a_4	9.675E-04	1.602E-02	1.007E-03	-9.385E-02	-4.316E-03	-9.358E-03	-1.597E-03	-7.835E-04	-2.403E-03	-3.117E-03	0.0004	-0.035
a_5	6.993E-03	2.896E-02	-5.239E-04	6.768E-02	-2.532E-03	2.513E-03	5.006E-03	-1.364E-02	-1.628E-03	-2.142E-02	0.0005	0.036
a_6	-5.966E-04	6.476E-02	3.976E-04	1.597	-6.082E-05	0.184	-1.915E-04	6.567E-02	-3.338E-05	7.298E-02	0.0004	0.904
a_7	0.283	-6.738E-03	-2.768	-4.370E-02	-1.675	2.194E-03	-0.236	7.496E-03	-1.911	7.555E-03	-1.412	-0.013
$a8$	-	-8.812E-04	-	-6.247E-03	-	-4.205E-04	-	-3.218E-03	-	-3.174E-03	-	0.007
$a9$	-	3.148	-	9.485	-	-2.542	-	0.661	-	2.435	-	-
coefficient of determination R^2	0.880	0.959	0.871	0.926	0.930	0.827	0.831	0.826	0.981	0.603	0.962	0.581
Standard Error of the Estimate (S.E)	4.880	0.978	6.295	0.896	4.535	0.822	5.231	0.608	0.024	1.462	2.755	1.234

Table (8) Correlation metrics of the studied chemical properties for Tigris water for PO_4, $NO_3$with other elements for 2013 years

Suwaira Region for PO4

	Time	pH	Ec	Ca	Mg	TDS	PO4
Time	1						
pH	-0.460	1					
Ec	-0.400	0.549	1				
Ca	-0.400	0.546	0.983	1			
Mg	-0.596	0.567	0.371	0.352	1		
TDS	-0.346	0.532	0.995	0.975	0.325	1	
PO4	0.585	-0.037	0.135	0.139	0.125	0.138	1

Numaniyah Region for PO4

	Time	pH	Ec	Ca	Mg	TDS	PO4
Time	1						
pH	-0.268	1					
Ec	0.095	0.567	1				
Ca	0.098	0.279	0.381	1			
Mg	-0.502	0.078	-0.157	-0.214	1		
TDS	0.549	0.474	0.484	0.196	-0.426	1	
PO4	0.027	0.852	0.728	0.366	-0.147	0.674	1

Kut upstream barrage region for PO4

	Time	pH	Ec	Ca	Mg	TDS	PO4
Time	1						
pH	-0.445	1					
Ec	0.117	0.647	1				
Ca	0.214	0.319	0.663	1			
Mg	-0.541	0.090	0.179	-0.122	1		
TDS	0.471	0.428	0.809	0.458	-0.143	1	
PO4	-0.151	0.851	0.863	0.391	0.135	0.679	1

Kut downstream barrage region for PO4

	Time	pH	Ec	Ca	Mg	TDS	PO4
Time	1						
pH	-0.435	1					
Ec	-0.031	0.554	1				
Ca	0.052	0.029	0.623	1			
Mg	-0.331	-0.283	0.074	0.243	1		
TDS	0.365	0.389	0.837	0.463	-0.129	1	
PO4	0.411	-0.012	0.655	0.429	0.312	0.669	1

Muwafaqiya region for PO4

	Time	pH	Ec	Ca	Mg	TDS	PO4
Time	1						
pH	-0.669	1					
Ec	0.141	0.072	1				
Ca	-0.254	0.271	0.331	1			
Mg	-0.589	0.153	0.067	0.147	1		
TDS	0.411	-0.063	0.813	0.062	-0.251	1	
PO4	-0.435	0.570	0.749	0.165	0.267	0.513	1

Dijuli region for PO4

	Time	pH	Ec	Ca	Mg	TDS	PO4
Time	1						
pH	-0.528	1					
Ec	0.040	0.532	1				
Ca	-0.039	0.196	0.475	1			
Mg	-0.502	0.295	0.198	0.281	1		
TDS	0.253	0.495	0.799	0.166	-0.090	1	
PO4	-0.252	0.784	0.897	0.398	0.300	0.784	1

Suwaira Region for NO3

	Time	pH	Ec	Ca	Mg	K	Na	TDS	NO3
Time	**1**								
pH	**-0.460**	**1**							
Ec	**-0.400**	**0.549**	**1**						
Ca	**-0.397**	**0.545**	**0.982**	**1**					
Mg	**-0.596**	**0.566**	**0.371**	**0.347**	**1**				
K	**0.609**	**0.159**	**-0.228**	**-0.210**	**-0.140**	**1**			
Na	**-0.368**	**0.578**	**0.982**	**0.970**	**0.384**	**-0.147**	**1**		
TDS	**-0.346**	**0.532**	**0.995**	**0.974**	**0.325**	**-0.199**	**0.989**	**1**	
NO3	**-0.231**	**0.156**	**-0.141**	**-0.048**	**0.564**	**-0.106**	**-0.157**	**-0.206**	**1**

Numaniyah Region for NO3

	Time	pH	Ec	Ca	Mg	K	Na	TDS	NO3
Time	**1**								
pH	**-0.268**	**1**							
Ec	**0.095**	**0.567**	**1**						
Ca	**0.098**	**0.279**	**0.381**	**1**					
Mg	**-0.502**	**0.078**	**-0.157**	**-0.214**	**1**				
K	**0.628**	**0.035**	**0.111**	**0.560**	**-0.123**	**1**			
Na	**0.409**	**0.192**	**-0.018**	**0.079**	**0.110**	**0.526**	**1**		
TDS	**0.549**	**0.474**	**0.484**	**0.196**	**-0.426**	**0.278**	**0.631**	**1**	
NO3	**-0.344**	**0.002**	**-0.086**	**0.160**	**0.579**	**0.295**	**-0.214**	**-0.660**	**1**

Kut upstream barrage Region for NO3

	Time	pH	Ec	Ca	Mg	K	Na	TDS	NO3
Time	**1**								
pH	**-0.445**	**1**							
Ec	**0.117**	**0.647**	**1**						
Ca	**0.214**	**0.319**	**0.663**	**1**					
Mg	**-0.542**	**0.090**	**0.179**	**-0.122**	**1**				
K	**0.618**	**-0.096**	**0.603**	**0.573**	**-0.059**	**1**			
Na	**0.333**	**0.081**	**0.678**	**0.284**	**0.225**	**0.606**	**1**		
TDS	**0.471**	**0.428**	**0.809**	**0.458**	**-0.143**	**0.549**	**0.749**	**1**	
NO3	**-0.569**	**0.374**	**0.180**	**-0.193**	**0.467**	**0.030**	**0.075**	**-0.113**	**1**

Kut downstream barrage Region for NO3

	Time	pH	Ec	Ca	Mg	K	Na	TDS	NO3
Time	**1**								
pH	**-0.435**	**1**							
Ec	**-0.031**	**0.554**	**1**						
Ca	**0.052**	**0.029**	**0.623**	**1**					
Mg	**-0.331**	**-0. 283**	**0.074**	**0.243**	**1**				
K	**0.395**	**-0.209**	**0.611**	**0.743**	**0.256**	**1**			
Na	**0.281**	**0.067**	**0.636**	**0.377**	**0.287**	**0.551**	**1**		
TDS	**0.365**	**0.389**	**0.837**	**0.463**	**-0.129**	**0.566**	**0.825**	**1**	
NO3	**0.129**	**-0.109**	**0.399**	**0.404**	**-0.052**	**0.685**	**0.264**	**0.277**	**1**

Muwafaqiya Region for NO3

	Time	pH	Ec	Ca	Mg	K	Na	TDS	NO3
Time	**1**								
pH	**-0.699**	**1**							
Ec	**0.141**	**0.072**	**1**						
Ca	**-0.254**	**0.271**	**0.331**	**1**					
Mg	**-0.588**	**0.153**	**0.067**	**0.147**	**1**				
K	**0.335**	**-0.185**	**0.470**	**0.031**	**0.055**	**1**			
Na	**0.207**	**-0.142**	**0.513**	**-0.258**	**0.272**	**0.390**	**1**		
TDS	**0.411**	**-0.063**	**0.813**	**0.062**	**-0.251**	**0.367**	**0.673**	**1**	
NO3	**-0.279**	**0.258**	**-0.023**	**-0.219**	**0.095**	**0.307**	**0.045**	**-0.179**	**1**

Dijuli Region for NO3

	Time	pH	Ec	Ca	Mg	K	Na	TDS	NO3
Time	**1**								
pH	**-0.528**	**1**							
Ec	**0.041**	**0.532**	**1**						
Ca	**-0.039**	**0.196**	**0.475**	**1**					
Mg	**-0.502**	**0.294**	**0.198**	**0.281**	**1**				
K	**0.467**	**-0.244**	**0.558**	**0.618**	**0.102**	**1**			
Na	**0.246**	**0.203**	**0.566**	**0.147**	**0.324**	**0.364**	**1**		
TDS	**0.253**	**0.495**	**0.798**	**0.166**	**-0.090**	**0.347**	**0.728**	**1**	
NO3	**-0.579**	**0.425**	**0.068**	**0.119**	**0.488**	**-0.017**	**-0.029**	**-0.060**	**1**

Table (9) Measured and Estimated PO_4 values from chemical test and Data fit software program for all Region for 2013

Time	Model 1 (WQMS)				Model 2 (WQMNN)				Model 3 (WQMK up)			
	PO4 from chemical test	PO4 from data fit	Residuals	Error %	PO4 from chemical analysis	PO4 from data fit	Residuals	Error %	PO4 from chemical test	PO4 from data fit	Residuals	Error%
January	0.335	0.339	-0.004	-1.218	0.525	0.516	0.008	1.588	0.55	0.522	0.028	5.102
February	0.25	0.218	0.032	12.10	0.53	0.520	0.009	1.763	0.45	0.482	-0.032	-7.153
March	0.075	0.122	-0.047	-62.163	0.075	0.134	-0.059	-78.978	0.07	0.099	-0.029	-40.749
April	0.335	0.340	-0.005	-1.485	0.26	0.241	0.018	7.195	0.235	0.217	0.018	7.474
May	0.4	0.401	-0.007	-1.698	0.33	0.364	-0.034	-10.319	0.31	0.334	-0.024	-7.648
June	0.34	0.305	0.035	10.160	0.33	0.297	0.032	9.840	0.26	0.247	0.013	4.869
July	0.37	0.349	0.021	5.751	0.37	0.365	0.004	1.309	0.32	0.266	0.054	16.752
August	0.36	0.360	0.000	0.123	0.37	0.381	-0.011	-3.095	0.31	0.295	0.015	4.778
September	0.345	0.355	-0.010	-2.796	0.39	0.300	0.089	22.870	0.28	0.332	-0.052	-18.662
October	0.33	0.388	-0.058	-17.639	0.39	0.404	-0.014	-3.685	0.37	0.347	0.023	6.287
November	0.4	0.343	0.057	14.202	0.4	0.375	0.024	6.133	0.3	0.298	0.002	0.804
December	0.455	0.470	-0.015	-3.349	0.38	0.448	-0.068	-17.980	0.33	0.346	-0.015	-4.757
Time	Model 4 (WQMK down)				Model 5 (WQMM)				Model 6 (WQMD)			
	PO4 from chemical test	PO4 from data fit	Residuals	Error %	PO4 from chemical analysis	PO4 from data fit	Residuals	Error %	PO4 from chemical	PO4 from data fit	Residuals	Error%
January	0.25	0.293	-0.043	-17.064	0.55	0.557	-0.007	-1.229	0.5	0.511	-0.011	-2.245
February	0.395	0.363	0.032	8.158	0.525	0.521	0.004	0.764	0.5	0.487	0.012	2.510
March	0.1	0.119	-0.019	-18.778	0.125	0.127	-0.002	-1.976	0.14	0.143	-0.004	-2.595
April	0.375	0.332	0.043	11.505	0.31	0.321	-0.011	-3.404	0.345	0.339	0.006	1.634
May	0.36	0.419	-0.059	-16.518	0.38	0.381	-0.001	-0.332	0.38	0.396	-0.017	-4.388
June	0.375	0.349	0.026	6.897	0.36	0.342	0.0175	4.863	0.37	0.361	0.009	2.423
July	0.39	0.331	0.059	15.138	0.36	0.328	0.031	8.764	0.35	0.309	0.041	11.579
August	0.355	0.367	-0.012	-3.317	0.325	0.360	-0.035	-10.846	0.325	0.343	-0.018	-5.598
September	0.34	0.330	0.010	3.048	0.32	0.316	0.003	1.120	0.28	0.289	-0.010	-3.439
October	0.4	0.412	-0.012	-3.078	0.4	0.391	0.009	2.276	0.3	0.327	-0.028	-9.194
November	0.32	0.343	-0.023	-7.066	0.23	0.231	-0.001	-0.457	0.355	0.352	0.003	0.767
December	0.39	0.393	-0.003	-0.777	0.26	0.268	-0.008	-3.236	0.39	0.373	0.017	4.239

Table (10) Measured and Estimated NO3 values from chemical test and Data fit software program for all Region for 2013

Time	Model 1 (WQMS)				Model 2 (WQMNN)				Model 3 (WQMK up)			
	NO3 from chemical test	NO3 from data fit	Residuals	Error%	NO3 from chemical analysis	NO3 from data fit	Residuals	Error %	NO3 from chemical test	NO3 from data fit	Residuals	Error%
January	6.05	6.174	-0.124	-2.062	6.6	6.722	-0.122	-1.858	7.75	7.768	-0.018	-0.244
February	7.7	7.370	0.329	4.279	6.4	6.385	0.014	0.229	8.15	8.086	0.063	0.775
March	6.2	5.925	0.274	4.427	6.6	6.229	0.370	5.612	6.35	6.492	-0.142	-2.239
April	8.95	8.875	0.074	0.837	8.15	8.290	-0.140	-1.729	7.6	7.379	0.220	2.902
May	14.8	14.566	0.233	1.580	8.4	7.872	0.527	6.275	5.6	5.958	-0.358	-6.396
June	7.15	7.681	-0.531	-7.434	8.9	9.827	-0.927	-10.423	7.6	7.286	0.313	4.124
July	7.55	8.026	-0.476	-6.314	7.85	7.746	0.1030	1.313	5.15	5.404	-0.254	-4.945
August	6	7.030	-1.030	-17.168	7.4	7.521	-0.121	-1.641	6.4	6.917	-0.517	-8.081
September	6.35	5.491	0.858	13.525	7.1	6.817	0.282	3.985	7.3	6.259	1.040	14.247
October	7.1	7.229	-0.129	-1.817	7.6	7.199	0.400	5.270	6.45	6.927	-0.477	-7.403
November	5.05	4.909	0.140	2.775	2.25	3.057	-0.807	-35.887	5.2	4.934	0.265	5.109
December	7	6.487	0.512	7.315	5.95	5.528	0.421	7.080	6	6.12	-0.126	-2.115
Time	Model 4 (WQMK down)				Model 5 (WQMM)				model 6 (WQMD)			
	NO3 from chemical test	NO3 from data fit	Residuals	Error%	NO3 from chemical analysis	NO3 from data fit	Residuals	Error %	NO3 from chemical test	NO3 from data fit	Residuals	Error%
January	7.3	6.791	0.508	6.962	6	6.373	-0.373	-6.220	6.15	7.163	-1.013	-16.470
February	7.65	8.029	-0.379	-4.964	8.15	7.853	0.296	3.636	9.2	8.291	0.909	9.876
March	7	7.187	-0.187	-2.675	7.3	6.920	0.379	5.201	6.8	6.970	-0.170	-2.503
April	6.25	6.455	-0.205	-3.289	5.35	6.561	-1.211	-22.649	7.7	7.514	0.186	2.417
May	7.5	7.534	-0.034	-0.460	6.4	5.066	1.333	20.835	6.2	6.358	-0.152	-2.447
June	8.25	8.235	0.014	0.172	7.6	7.296	0.303	3.998	7.2	7.155	0.045	0.628
July	7.35	7.486	-0.136	-1.861	6.3	6.262	0.037	0.601	6.3	5.416	0.884	14.035
August	7.9	7.671	0.228	2.896	5.4	6.709	-1.309	-24.246	5.6	5.922	-0.322	-5.752
September	7.9	7.434	0.465	5.888	6.5	5.889	0.610	9.399	5.6	5.772	-0.172	-3.073
October	9	8.787	0.212	2.363	8.3	7.793	0.506	6.100	6	6.488	-0.488	-8.135
November	6.5	6.443	0.056	0.873	4.25	4.770	-0.520	-12.240	4.75	4.341	0.409	8.610
December	6.9	7.439	-0.539	-7.811	6	6.018	-0.018	-0.316	6.7	6.751	-0.051	-0.764

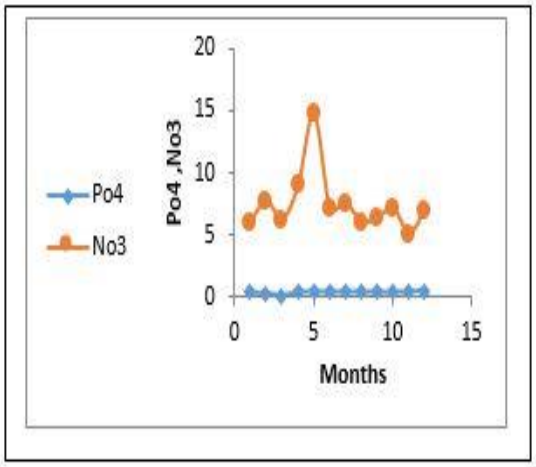

Figure 2: Relation between months and Po4, No3 for Suwiara region for 2013 year

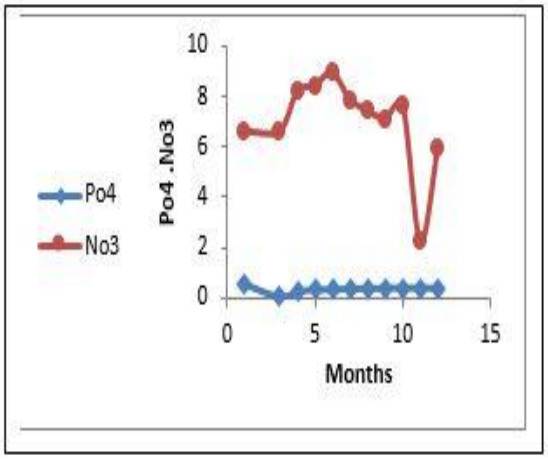

Figure3: Relation between months and Po4, No3 for Numaniyah region for 2013year

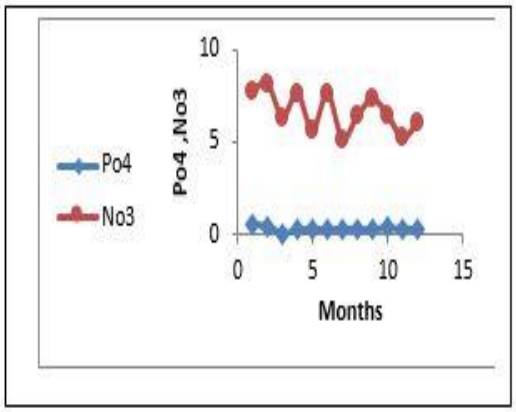

Figure 4: Relation between months and Po4, No3 for Kut upstream Barrage region for 2013 year

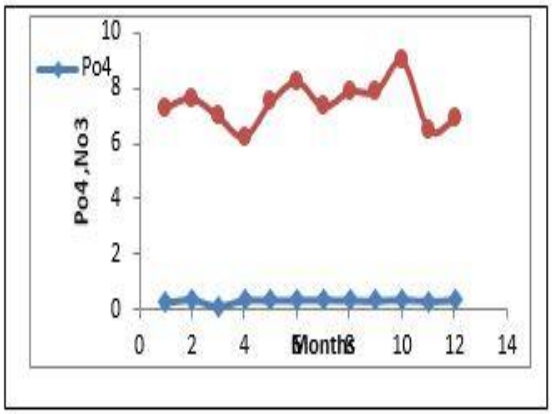

Figure 5: Relation between months and Po4, No3 for Kut downstream Barrage region for 2013 year

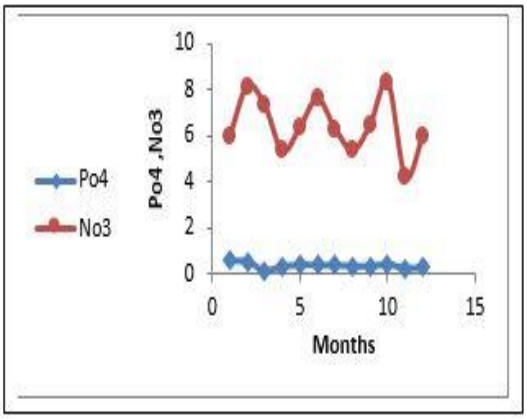

Figure 6: Relation between months and Po4, No3 for Muwafaqiya region for 2013 years

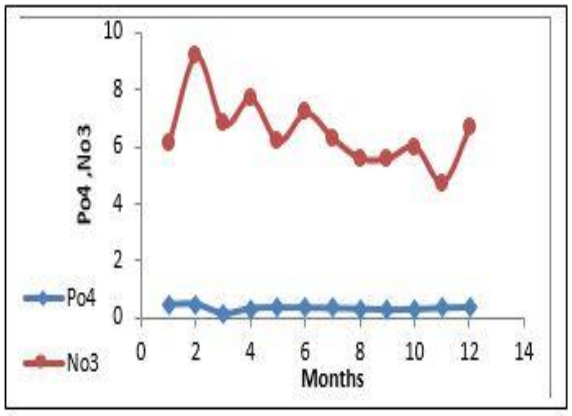

Figure 7: Relation between months and Po4, No3 for Duajili region for 2013 year

While the value of phosphate (PO_4) during the months of the year 2014 ranged between (0.265- 0.42) mg/l in district of Suwiara, range between (0.279- 0.425) mg/l in the district of Numaniyah, range between (0.2565-0.4) mg/l in district kut upstream barrage, range between (0.2865-0.44) mg/l in district kut downstream barrage, range between (0.23- 0.38) mg/l in region of Muwafaqiya and range between (0.29- 0.4)mg/l in region of Dujaili, through this value it found high rise in concentration of PO_4 in February month in regions (Suwiara), high rise in concentration of PO_4 in July month in regions (Muwafaqiya, kut upstream barrage) the reason for the increase of phosphate is the fertilizers found in soil that drift in the water as well as waste from factories near the Tigris River led to the increase in the proportion of phosphate in some months. As for the value of nitrates (NO_3) during the months of the year 2014 ranged between (2.885-10.225)mg/l in the district of Suwiara, the range between (3.53-9.975)mg /l in the district of Numaniyah ,range between (2.745-10.325) mg/l in the district of kut upstream barrage, (3.23-10.45) mg/l in the region of kut downstream barrage, range between (2.765-9.95)mg/l in the region of Muwafaqiya and range between (3.3575-10.05) mg/l in the region of Dujaili. All the numbers within the Iraqi standard for nitrate, which does not exceed 50 mg/l, table 11 show laboratory tests for pH, Ec, the range pH between 7.31 in suwaira to 7.85 in Dujali, Ec(µS.cm-1) range between 1121µS.cm-1 in suwaira to 1748µS.cm-1 in kut downstream barrage, table12 show laboratory tests for Ca, Mg, the range Ca between 65.75Mg/l in kut downstream barrage to 105mg/l in Numaniyah, Mg range between 22.05mg/l in kut upstream barrage to 49.4mg/l in kut downstream barrage, table 13 show laboratory tests for K, Na, the range K between 2.95mg/l in muwafaqiya to 7.25mg/l in Numaniyah, Na range between (76.75- 108.5) mg/l in Suwaria and table 14 show laboratory tests for Po_4 and No_3 in Water Provinces Wassit for 2014 years. Table 15 show laboratory tests for TDS in Water Provinces Wassit for 2014years TDS range between (655mg/l in suwaria to 1095mg/l in kut downstream barrage), table16 show statistical models for each region for 2014 years for PO_4,NO_3 and then work statistical models for each region show water quality models(WQM) with Po_4(by using Data fit program and using non-linear equations), model 1 (for suwiara (WQMs), model 2 for Numaniyah (WQMN), model 3 for Kut upstream barrage (WQMKup), model 4 for Kut downstream barrage (WQMK down), model 5 for Muwafaqiya (WQMM), model 6 for Dujaili (WQMD) between (PO_4) dependent variables, with (Ec, PH, time, TDS, Ca, Mg) Independent variables, and (NO_3) dependent variables with (Time, EC, PH, Ca, Mg, K, Na and TDS) Independent variables., table 17 show coefficients of constructed models for each region for 2014 years for PO_4, NO_3, coefficient of determination (R^2) is very low in all region and ranges between (0.789-0.373), 0.789 in model 6 for No_3 to 0.373 in model 5 for PO_4. Table (18) Correlation metrics of the studied chemical properties of Tigris water for PO_4, NO_3, with other elements, the height (positive) correlation coefficient between (PO_4, TDS) equal to (0.484, 0.430, 0.386) in suwiara, Numaniyah and kut upstream barrage respectively, between (PO_4, Ec) equal to (0.366, 0.230, 0.168) in kut downstream barrage, Muwafaqiya and Dujaili respectively, between (NO_3, Na) equal to (0.175, 0.575, 0.354, 0.497) in suwiara, kut upstream barrage, kut downstream barrage and Dujaili respectively, between (NO_3,K) equal to (0.407, 0.559) in (Numaniyah, Muwafqiyh), the height (negative) correlation coefficient between (PO_4, Time) equal to (-0.470, -0.331, -0.566, -0.254) in suwiara, Numaniyah, kut upstream barrage, Muwafqiyh respectively, between (PO_4, Mg) equal to (-0.371) in kut downstream barrage, between (PO_4, Ca) equal to (-0.335) in Dujaili, between (NO_3, pH) equal to (-0.321, -0.386, -0.338) in suwiara, Numaniyah and kut

downstream barrage) respectively, between (NO_3, Time) equal to (-0.294, -0.248, -0.273) in kut upstream barrage, Muwafaqiya and Dujaili) respectively ,Table (19-20) Measured and Estimated PO_4, NO_3 values from chemical test and Data fit software program for all Region, residual (positive) for PO_4 range between (0.001 in model 2 ,model 4, model 6 to 0.077 in model 5) and for NO_3 between (0.018 in model 5 to 3.155 in model 4) residual (negative) for PO_4 range (-0.007 in model 1 to 0.063 in model 5), for NO_3 (-0.099 in model3 to -2.343 in model 1). Figures (8-13) show relationship between PO_4, NO_3 and Months for Suwiara, Numaniayah, Kut upstream barrage, Kut downstream barrage, Muwafaqiya and Dujaili respectively for 2014 years.

Table 11: Laboratory tests for pH and Ec (µS.cm-1) in Water Provinces Wassit for 2014 years

range / month	Suwiara		Numaniyah		Kut upstream barrage		Kut downstream barrage		Muwafaqiya		Dujaili	
	pH	EC	pH	EC	pH	EC	pH	EC	pH	EC	pH	EC
1	7.55	1210.5	7.45	1189	7.50	1164.5	7.54	1164.5	7.45	1151	7.43	1157
2	7.7	1220	7.6	1195	7.55	1217	7.65	1253.5	7.5	1157.5	7.6	1204.5
3	7.4	1196	7.35	1257	7.55	1303	7.4	1304	7.45	1243.5	7.6	1303.5
4	7.64	1198	7.62	1130	7.78	1180	7.73	1199	7.6	1211.5	7.85	1178.5
5	7.8	1121	7.7	1187.5	7.75	1161	7.7	1195	7.75	1151	7.7	1166
6	7.72	1450.5	7.64	1483	7.68	1483.5	7.66	1526.5	7.65	1468	7.65	1491.5
7	7.31	1530.5	7.46	1534	7.47	1682.5	7.52	1748	7.50	1665.5	7.49	1648
8	7.37	1403.5	7.50	1388.5	7.52	1364	7.49	1437	7.61	1415	7.54	1452.5
9	7.39	1280.5	7.44	1358.5	7.68	1340	7.64	1376.5	7.59	1330	7.53	1319
10	7.7	1226	7.7	1252	7.45	1242	7.75	1260	7.65	1229	7.65	1245
11	7.46	1207.5	7.52	1195	7.52	1250	7.6	1211.5	7.36	1352	7.45	1263
12	7.48	1250	7.56	1335	7.61	1325	7.72	1341	7.65	1288.5	7.57	1263

Table 12: Laboratory tests for Ca (mg/l) and Mg (mg/l) in Water Provinces Wassit for 2014 years

range / month	Suwiara		Numaniyah		Kut upstream barrage		Kut downstream barrage		Muwafaqiya		Dujaili	
	Ca	Mg	Ca	Mg	Ca	Mg	Ca	Mg	Ca	Mg	Ca	Mg
1	88.5	35.5	86	34.5	86	32.5	90.25	36.5	85.5	31.9	87.5	33.5
2	84.75	44.8	85	44	88	43.35	91.25	43.75	87	36.85	87.5	39.85
3	82.5	34.9	87	34	85.5	32	90.5	40	88	35	87.5	33
4	76.25	35.9	79.7	39	75.4	22.05	86.8	26.45	77.1	24.4	89.2	25.37
5	73.75	30.4	73.25	33.15	72.5	32.6	74	34.15	75.5	33.55	73.5	34.2
6	83.5	44.70	84.35	47	83.35	45.3	87	49.4	87.55	41.2	85.3	47.75
7	84.05	41.2	86.55	42.1	91.7	39.5	92.25	41.9	87.8	38.3	84.65	38.75
8	77.8	31.5	82.65	31.5	81.5	31.5	84.7	34.55	81	33.4	81	34
9	73	30.15	77	32.5	78	30.5	83.5	31.9	78.5	29.3	83.5	30.1
10	66.75	33.5	68.65	32.7	65.75	34.2	70.25	37	68.5	34.8	71.25	35.5
11	80.1	35.5	84.25	35.3	85.5	37.1	87	36.9	89.9	37	93.5	35.7
12	98.75	40.3	105	41.5	102	41	104	41	93	35	91	35

Table 13: Laboratory tests for K (mg/l) and Na (mg/l) in Water Provinces Wassit for 2014 years

range / month	Suwiara		Numaniyah		Kut upstream barrage		Kut downstream barrage		Muwafaqiya		Dujaili	
	k	Na	k	Na	k	Na	k	Na	k	Na	k	Na
1	5.03	93	4.93	93	4.88	87	5.03	88	4.55	82	4.98	85
2	5.03	91.4	5.15	86.4	5.13	88.5	6.03	92	5.2	77.75	5.75	90.8
3	5.13	95.5	7.25	106.5	5.35	97	6.23	108	6.95	93.5	5.4	99
4	4.28	108.5	4.2	103.45	4.25	101.05	4.7	104.85	3.95	99.25	4.9	97.35
5	4	86.05	4.1	89	4.3	94.5	4.15	100.5	4.1	96.75	3.98	99.75
6	4.9	89	5.28	88.6	5.13	92.8	5.4	105.3	5.2	87.25	5.03	92.5
7	4.28	99.5	4.7	100.7	5.25	104.75	5.2	107	5.8	102.55	5	103.35
8	4.3	88	4.25	92.9	4	90.6	4	96	4.35	99.1	4.2	90.5
9	4.4	86.05	4.55	95.25	4.7	94.5	5.25	93.25	4.9	91.75	4.85	92.35
10	3.83	96.5	3.7	99.5	3.23	94.15	4.1	99.9	2.95	92.3	3.25	101.7
11	5.25	76.75	4.55	77.75	4.84	81.95	5.26	89.25	5.53	93.6	5.61	88.7
12	4.15	86.25	4.45	97	4.1	92.6	4.4	93.25	4.5	94.75	4.15	96

Table 14: Laboratory tests for Po_4 (mg/l) and No_3 (mg/l) in Water Provinces Wassit for 2014

range / month	Suwiara		Numaniyah		Kut upstream barrage		Kut downstream barrage		Muwafaqiya		Dujaili	
	Po_4 mg/l	No_3 mg/l	Po4 mg/l	No3 mg/l	Po4 mg/l	No3 mg/l	Po4 mg/l	No3 mg/l	Po4 mg/l	No3 mg/l	Po4 mg/l	No3 mg/l
1	0.43	5.45	0.37	5.5	0.38	5.2	0.35	5.5	0.35	4.6	0.35	5.6
2	0.42	5.425	0.36	5.055	0.36	5.01	0.32	5.245	0.23	4.95	0.33	5.02
3	0.295	7.55	0.365	8.05	0.3	5.75	0.35	7	0.32	7.1	0.32	6.65
4	0.36	4.31	0.345	4.875	0.355	5.33	0.38	5.85	0.28	4.74	0.345	6.86
5	0.31	7.8	0.34	7.55	0.27	7.45	0.34	7.95	0.38	7.2	0.36	7.225
6	0.346	3.515	0.279	4.51	0.2565	2.96	0.2865	3.23	0.283	3.5	0.29	3.3575
7	0.395	10.225	0.425	9.975	0.4	10.325	0.44	10.45	0.38	9.95	0.4	10.05
8	0.265	3.44	0.285	3.87	0.295	4.04	0.36	4.65	0.32	4.01	0.34	4.1
9	0.295	6.32	0.285	5.305	0.255	5.19	0.34	5.87	0.27	5.11	0.295	5.355
10	0.32	2.885	0.31	3.53	0.3	2.745	0.365	4.105	0.3	2.765	0.35	3.76
11	0.36	4.225	0.325	4	0.265	4.2	0.34	5.4	0.295	4.9	0.32	5.2
12	0.325	4.05	0.36	4.92	0.275	3.7	0.325	5.2	0.23	4	0.31	4.6

Table 15: Laboratory tests for TDS (mg/l) in Water Provinces Wassit for 2014 years

region / month	Suwiara	Numaniyah	Kut upstream barrage	Kut downstream barrage	Muwafaqiya	Dujaili
1	838	837	821.5	827.5	788.5	801
2	929.5	922	923	933	846	906.5
3	798	865.5	881	890	873.5	872.5
4	809	783	781	813	807	818
5	655	691	709.8	733	733.5	716
6	911.5	904.5	911.6	947.8	858	913
7	995.5	998.5	1042	1095	1007.5	1004
8	841.5	846.5	864.5	893	877	888
9	809.5	822	816	853	817.5	822
10	745	747	740	771	731	773
11	799	814	796	818	878	870
12	887	934	932	917	913	897

Table (16) Models constructed to characterize the relation between Time(T) ,pH, Ec,Ca, Mg ,TDS with PO_4 and between Time(T), pH, Ec, Ca, Mg, K, Na ,TDS with NO_3 for Tigris water for 2014 years

Model 1 (WQMs) : $PO_4 = a_1*T+a_2*pH+a_3*Ec+a_4*Ca+a_5*Mg+a_6*TDS+a_7$ **$NO_3 = XP(a_1*T+a_2*pH+a_3*Ec+a_4*Ca+a_5*Mg+a_6*K+a_7*Na+a_8*TDS+a_9)$**
Model 2(WQMN) : $PO_4 = a_1*T+a_2*pH+a_3*Ec+a_4*Ca+a_5*Mg+a_6*TDS+a_7$ **$NO3=EXP(a_1*T+a_2*pH+a_3*Ec+a_4*Ca+a_5*Mg+a_6*K+a_7*Na+a_8*TDS+a_9)$**
Model 3 (WQMKup) : $PO4=EXP(a_1*T+a_2*pH+a_3*Ec+a_4*Ca+a_5*Mg+a_6*TDS+a_7)$ **$NO_3 = EXP(a_1*T+a_2*pH+a_3*Ec+a_4*Ca+a_5*Mg+a_6*K+a_7*Na+a_8*TDS+a_9)$**
Model 4(WQMK down) :$PO4=EXP(a_1*T+a_2*pH+a_3*Ec+a_4*Ca+a_5*Mg+a_6*TDS+a_7)$ **$No3 = EXP(a_1*T\ a_2*pH+a_3*Ec+a_4*Ca+a_5*Mg+a_6*K+a_7*Na+a_8*TDS+a_9)$**
Model 5(WQMM) : $PO4= EXP(a_1*T+a_2*pH+a_3*Ec+a_4*Ca+a_5*Mg+a_6*TDS+a_7)$ **$NO_3 =EXP(a_1*T+a_2*pH+a_3*Ec+a_4*Ca+a_5*Mg+a_6*K+a_7*Na+a_8*TDS+a_9)$**
Model 6(WQMD) : $PO4 =EXP(a_1*T+a_2*pH+a_3*Ec+a_4*Ca+a_5*Mg+a_6*TDS+a_7)$ **$NO_3= a_1*T+a_2*pH+a_3*Ec+a_4*Ca+a_5*Mg+a_6*K+a_7*Na+a_8*TDS+a_9$**

Table (17) Coefficients of constructed models for (PO_4, NO3) for Tigris water for 2014 years

coefficients	Model 1 for		Model2 for		Model3 for		Model 4 for		Model5 for		Model6 for	
	PO4	NO3	PO4	NO3	PO4	NO3	PO4	NO3	PO4	NO3	PO4	NO3
a_1	-3.032E-03	-0.197	-3.451E-03	-3.685E-02	-1.750E-02	-0.053	4.254E-03	-6.384E-03	-0.023	-5.476E-02	-8.946E-03	-0.229
a_2	0.129	-5.631	0.106	-0.727	-0.508	-1.109	-0.129	-0.410	-0.294	-8.158E-02	-0.147	-7.538
a_3	-2.614E-04	-7.272E-04	-1.536E-04	9.318E-04	-3.956E-04	2.736E-03	-3.485E-04	-9.504E-05	8.179E-04	-5.988E-04	-1.223E-04	5.464E-03
a_4	-4.474E-04	-3.230E-02	3.195E-04	-2.832E-03	-5.803E-03	4.846E-02	-8.564E-03	-6.958E-03	-0.009	-1.581E-02	-1.257E-02	0.101
a_5	-2.468E-03	0.201	-3.800E-03	4.241E-03	-1.126E-02	3.330E-03	-1.548E-02	-2.668E-02	2.532E-03	0.030	-9.066E-03	-0.116
a_6	7.669E-04	-1.356	5.581E-04	-1.822E-02	1.920E-03	0.146	1.863E-03	3.176E-02	-7.590E-04	8.375E-02	1.082E-03	0.681
a_7	-0.794	-4.896E-02	-0.602	0.015	2.549	5.515E-02	6.517E-02	8.287E-03	1.391	3.461E-02	0.691	0.312
a_8	-	-7.618E-03	-	4.259E-04	-	-8.525E-03	-	2.450E-03	-	2.178E-03	-	-1.057E-02
a_9	-	58.590	-	4.507	-	4.071	-	3.534	-	-1.785	-	29.041
coefficient of determination R^2	0.630	0.758	0.426	0.471	0.691	0.690	0.695	0.450	0.373	0.713	0.460	0.789
Standard Error of the Estimate (S.E)	4.664	2.060	4.840	2.702	4.213	2.210	0.030	2.689	5.862	2.017	3.310	1.619

Table (18) Correlation metrics of the studied chemical properties for Tigris water for PO_4, $NO_3$with other elements for 2014 years

Suwaira Region for PO_4

	Time	pH	Ec	Ca	Mg	TDS	PO_4
Time	1						
pH	-0.290	1					
Ec	0.193	-0.441	1				
Ca	-0.065	-0.245	0.157	1			
Mg	-0.171	0.158	0.407	0.601	1		
TDS	-0.050	-0.398	0.734	0.595	0.787	1	
PO_4	-0.470	0.194	0.024	0.386	0.605	0.484	1

Numaniyah Region for PO_4

	Time	pH	Ec	Ca	Mg	TDS	PO_4
Time	1						
pH	0.144	1					
Ec	0.332	-0.219	1				
Ca	0.128	-0.385	0.238	1			
Mg	-0.127	0.227	0.354	0.475	1		
TDS	0.003	-0.441	0.639	0.716	0.675	1	
PO_4	-0.331	-0.287	-0.054	0.389	0.253	0.430	1

Kut upstream barrage region for PO_4

	Time	pH	Ec	Ca	Mg	TDS	PO_4
Time	1						
pH	-0.133	1					
Ec	0.271	-0.261	1				
Ca	0.085	-0.213	0.385	1			
Mg	0.168	-0.322	0.449	0.529	1		
TDS	-0.020	-0.336	0.783	0.779	0.588	1	
PO_4	-0.566	-0.346	0.118	0.183	-0.098	0.386	1

Kut downstream barrage region for PO_4

	Time	pH	Ec	Ca	Mg	TDS	PO_4
Time	1						
pH	0.320	1					
Ec	0.230	-0.301	1				
Ca	-0.012	-0.265	0.247	1			
Mg	-0.025	-0.161	0.472	0.344	1		
TDS	-0.007	-0.403	0.856	0.622	0.598	1	
PO_4	0.008	-0.265	0.366	-0.055	-0.371	0.291	1

Muwafaqiya region for PO_4

	Time	pH	Ec	Ca	Mg	TDS	PO_4
Time	1						
pH	0.195	1					
Ec	0.390	-0.100	1				
Ca	-0.007	-0.523	0.316	1			
Mg	0.160	-0.140	0.463	0.482	1		
TDS	0.212	-0.405	0.772	0.749	0.420	1	
PO_4	-0.254	-0.012	0.230	-0.224	0.053	-0.027	1

Dijuli region for PO_4

	Time	pH	Ec	Ca	Mg	TDS	PO_4
Time	1						
pH	-0.184	1					
Ec	0.252	-0.279	1				
Ca	-0.053	-0.274	-0.000	1			
Mg	0.025	-0.238	0.495	-0.035	1		
TDS	0.110	-0.356	0.764	0.522	0.476	1	
PO_4	-0.216	-0.021	0.168	-0. 335	-0.150	0.036	1

Suwaira Region for NO_3

	Time	pH	Ec	Ca	Mg	K	Na	TDS	NO_3
Time	**1**								
pH	**-0.291**	**1**							
Ec	**0.194**	**-0.441**	**1**						
Ca	**-0.065**	**-0.246**	**0.158**	**1**					
Mg	**-0.171**	**0.159**	**0.408**	**0.601**	**1**				
K	**-0.411**	**-0.144**	**-0.061**	**0.362**	**0.357**	**1**			
Na	**-0.460**	**0.079**	**0.104**	**-0.140**	**0.139**	**-0.271**	**1**		
TDS	**-0.051**	**-0.398**	**0.734**	**0.596**	**0.788**	**0.283**	**0.177**	**1**	
NO_3	**-0.318**	**-0.321**	**0.147**	**0.067**	**-0.020**	**0.015**	**0.175**	**0.145**	**1**

Numaniyah Region for NO_3

	Time	pH	Ec	Ca	Mg	K	Na	TDS	NO_3
Time	**1**								
pH	**0.144**	**1**							
Ec	**0.332**	**-0.219**	**1**						
Ca	**0.128**	**-0.385**	**0.238**	**1**					
Mg	**-0.127**	**0.227**	**0.354**	**0.475**	**1**				
K	**-0.47**	**-0.628**	**0.069**	**0.334**	**0.162**	**1**			
Na	**-0.157**	**-0.276**	**0.128**	**0.316**	**-0.114**	**0.248**	**1**		
TDS	**0.003**	**-0.441**	**0.639**	**0.716**	**0.675**	**0.383**	**0.102**	**1**	
NO_3	**-0.331**	**-0.386**	**0.280**	**0.110**	**0.098**	**0.407**	**0.395**	**0.306**	**1**

Kut before upstream Region for NO_3

	Time	pH	Ec	Ca	Mg	K	Na	TDS	NO_3
Time	**1**								
pH	**-0.133**	**1**							
Ec	**0.271**	**-0.261**	**1**						
Ca	**0.085**	**-0.213**	**0.385**	**1**					
Mg	**0.168**	**-0.322**	**0.449**	**0.529**	**1**				
K	**-0.490**	**-0.007**	**0.354**	**0.491**	**0.343**	**1**			
Na	**-0.103**	**0.246**	**0.478**	**-0.101**	**-0.270**	**0.018**	**1**		
TDS	**-0.020**	**-0.336**	**0.784**	**0.779**	**0.588**	**0.560**	**0.287**	**1**	
NO_3	**-0. 294**	**0.007**	**0.385**	**0.152**	**-0.104**	**0.437**	**0.575**	**0.335**	**1**

Kut downstream barrage Region for NO_3

	Time	pH	Ec	Ca	Mg	K	Na	TDS	NO_3
Time	**1**								
pH	**0.320**	**1**							
Ec	**0.230**	**-0.301**	**1**						
Ca	**-0.012**	**-0.265**	**0..247**	**1**					
Mg	**-0.026**	**-0.161**	**0.472**	**0.344**	**1**				
K	**-0.460**	**-0.451**	**0.097**	**0.391**	**0.439**	**1**			
Na	**-0.166**	**-0.132**	**0.472**	**-0.149**	**0.128**	**0.106**	**1**		
TDS	**-0.007**	**-0.403**	**0.856**	**0.622**	**0.598**	**0.416**	**0.292**	**1**	
NO_3	**-0.165**	**-0.338**	**0.352**	**0.100**	**-0.131**	**0.126**	**0.354**	**0.342**	**1**

Muwafaqiya Region for NO_3

	Time	pH	Ec	Ca	Mg	K	Na	TDS	NO_3
Time	**1**								
pH	**0.195**	**1**							
Ec	**0.390**	**-0.100**	**1**						
Ca	**-0.007**	**-0.528**	**0.316**	**1**					
Mg	**0.160**	**-0.140**	**0.468**	**0.482**	**1**				
K	**-0.241**	**-0.627**	**0.344**	**0.720**	**0.401**	**1**			
Na	**0.454**	**0.249**	**0.489**	**-0.184**	**-0.218**	**-0.056**	**1**		
TDS	**0.212**	**-0.405**	**0.772**	**0.749**	**0.420**	**0.639**	**0.310**	**1**	
NO_3	**-0.248**	**-0.222**	**0.373**	**0.217**	**0.118**	**0.559**	**0.408**	**0.471**	**1**

Dijuli Region for NO_3

	Time	pH	Ec	Ca	Mg	K	Na	TDS	NO_3
Time	**1**								
pH	**-0.184**	**1**							
Ec	**0.252**	**-0.279**	**1**						
Ca	**-0.053**	**-0.274**	**-0.0004**	**1**					
Mg	**0.025**	**-0.238**	**0.495**	**-0.035**	**1**				
K	**-0.432**	**-0.268**	**0.074**	**0.762**	**0.155**	**1**			
Na	**0.177**	**0.470**	**0.264**	**-0.469**	**-0.069**	**-0.432**	**1**		
TDS	**0.110**	**-0.356**	**0.764**	**0.522**	**0.476**	**0.483**	**0.019**	**1**	
NO_3	**-0.273**	**-0.005**	**0.237**	**0.060**	**-0.262**	**0.225**	**0.497**	**0.202**	**1**

Table (19) Measured and Estimated PO4 values from chemical test and Data fit software program for all Region for 2014

Time	Model 1 (WQMS)				Model 2 (WQMNN)				Model 3 (WQMKup)			
	PO4 from chemical test	PO4 from data fit	Residuals	Error%	PO4 from chemical analysis	PO4 from data fit	Residuals	Error%	PO4 from chemical test	PO4 from data fit	Residuals	Error%
January	0.43	0.379	0.051	11.819	0.37	0.367	0.002	0.571	0.38	0.357	0.022	6.011
February	0.42	0.442	-0.022	-5.232	0.36	0.390	-0.030	-8.470	0.36	0.356	0.003	1.049
March	0.295	0.331	-0.036	-12.194	0.365	0.358	0.006	1.911	0.3	0.359	-0.059	-19.954
April	0.36	0.367	-0.007	-2.014	0.345	0.335	0.009	2.773	0.355	0.323	0.031	8.921
May	0.31	0.302	0.008	2.696	0.34	0.300	0.039	11.621	0.27	0.256	0.013	5.176
June	0.346	0.360	-0.013	-3.813	0.279	0.315	-0.036	-13.022	0.2565	0.275	-0.018	-7.256
July	0.395	0.355	0.040	10.127	0.425	0.356	0.068	16.074	0.4	0.363	0.036	9.204
August	0.265	0.301	-0.036	-13.79	0.285	0.334	-0.049	-17.206	0.295	0.325	-0.030	-10.467
September	0.295	0.314	-0.019	-6.507	0.285	0.309	-0.024	-8.607	0.255	0.280	-0.025	-9.899
October	0.32	0.310	0.009	2.937	0.31	0.304	0.005	1.671	0.3	0.286	0.013	4.535
November	0.36	0.311	0.048	13.377	0.325	0.323	0.001	0.4719	0.265	0.260	0.004	1.819
December	0.325	0.347	-0.022	-6.950	0.36	0.352	0.007	1.997	0.275	0.267	0.007	2.654
Time	Model 4 (WQMK down)				Model 5 (WQMM)				Model 6 (WQMD)			
	PO4 from chemical test	PO4 from data fit	Residuals	Error%	PO4 from chemical analysis	PO4 from data fit	Residuals	Error%	PO4 from chemical	PO4 from data fit	Residuals	Error%
January	0.35	0.331	0.018	5.391	0.35	0.317	0.032	9.354	0.35	0.336	0.013	3.746
February	0.32	0.342	-0.022	-7.150	0.23	0.293	-0.063	-27.767	0.33	0.342	-0.012	-3.821
March	0.35	0.343	0.006	1.715	0.32	0.302	0.017	5.581	0.32	0.344	-0.024	-7.523
April	0.38	0.378	0.001	0.338	0.28	0.309	-0.029	-10.669	0.345	0.330	0.015	4.325
May	0.34	0.326	0.013	4.043	0.38	0.302	0.077	20.369	0.36	0.337	0.022	6.318
June	0.2865	0.309	-0.022	-7.979	0.283	0.329	-0.046	-16.475	0.29	0.305	-0.015	-5.288
July	0.44	0.413	0.026	5.984	0.38	0.349	0.030	7.920	0.4	0.366	0.033	8.278
August	0.36	0.381	-0.021	-5.912	0.32	0.312	0.007	2.473	0.34	0.356	-0.016	-4.828
September	0.34	0.374	-0.034	-10.221	0.27	0.302	-0.032	-12.161	0.295	0.336	-0.041	-13.941
October	0.365	0.343	0.021	5.939	0.3	0.316	-0.016	-5.428	0.35	0.347	0.002	0.597
November	0.34	0.338	0.001	0.407	0.295	0.277	0.017	5.812	0.32	0.296	0.023	7.191
December	0.325	0.312	0.012	3.908	0.23	0.223	0.006	2.955	0.31	0.309	0.001	0.247

Table (20) Measured and Estimated NO3 values from chemical test and Data fit software program for all Region for 2014

Time	Model 1 (WQMS)				Model 2 (WQMNN)				Model 3 (WQMKup)			
	NO3 from chemical test	NO3 from data fit	Resid uals	Error %	NO3 from chemical analysis	NO3 from data fit	Resid uals	Error %	NO3 from chemical test	NO3 from data fit	Resid uals	Error%
January	5.45	4.544	0.905	16.613	5.5	6.135	-0.635	-11.555	5.2	5.299	-0.099	-1.908
February	5.425	6.267	-0.842	-15.536	5.055	5.173	-0.118	-2.338	5.01	2.973	2.036	40.647
March	7.55	8.119	-0.569	-7.540	8.05	7.824	0.225	2.800	5.75	7.185	-1.435	-24.972
April	4.31	3.969	0.340	7.897	4.875	5.579	-0.704	-14.459	5.33	5.583	-0.253	-4.762
May	7.8	7.129	0.670	8.593	7.55	4.066	3.483	46.140	7.45	6.024	1.425	19.132
June	3.515	3.375	0.139	3.968	4.51	5.901	-1.391	-30.860	2.96	4.846	-1.886	-63.727
July	10.225	9.349	0.875	8.566	9.975	8.448	1.526	15.306	10.325	9.515	0.809	7.844
August	3.44	5.783	-2.343	-68.114	3.87	5.569	-1.699	-43.906	4.04	3.677	0.362	8.982
September	6.32	5.062	1.257	19.894	5.305	5.686	-0.381	-7.182	5.19	4.777	0.412	7.9470
October	2.885	3.840	-0.955	-33.133	3.53	4.431	-0.901	-25.536	2.745	3.782	-1.037	-37.787
November	4.225	3.047	1.177	27.877	4	3.195	0.8040	20.101	4.2	3.573	0.626	14.925
December	4.05	4.439	-0.389	-9.628	4.92	4.733	0.187	3.796	3.7	4.297	-0.597	-16.146
Time	Model 4 (WQMK down)				Model 5 (WQMM)				Model 6 (WQMD)			
	NO3 from chemical test	NO3 from data fit	Resid uals	Error %	NO3 from chemical analysis	NO3 from data fit	Resid uals	Error %	NO3 from chemical test	NO3 from data fit	Resid uals	Error%
January	5.5	5.162	0.337	6.131	4.6	4.056	0.543	11.806	5.6	5.472	0.127	2.276
February	5.245	5.498	-0.253	-4.829	4.95	4.456	0.493	9.976	5.02	4.702	0.317	6.319
March	7	6.921	0.078	1.122	7.1	7.946	-0.846	-11.917	6.65	8.483	-1.833	-27.571
April	5.85	6.869	-1.019	-17.422	4.74	5.385	-0.645	-13.619	6.86	6.462	0.397	5.796
May	7.95	4.794	3.155	39.695	7.2	5.569	1.630	22.648	7.225	5.892	1.332	18.449
June	3.23	5.228	-1.998	-61.868	3.5	4.726	-1.226	-35.040	3.3575	3.811	-0.453	-13.515
July	10.45	9.170	1.279	12.2447	9.95	9.091	0.858	8.629	10.05	9.018	1.031	10.268
August	4.65	6.527	-1.877	-40.381	4.01	5.639	-1.629	-40.628	4.1	4.202	-0.102	-2.510
September	5.87	6.122	-0.252	-4.301	5.11	3.694	1.415	27.709	5.355	5.739	-0.384	-7.175
October	4.105	4.689	-0.584	-14.244	2.765	3.658	-0.893	-32.323	3.76	4.684	-0.924	-24.588
November	5.4	4.734	0.665	12.321	4.9	4.485	0.414	8.450	5.2	4.808	0.391	7.521
December	5.2	4.516	0.683	13.150	4	3.981	0.018	0.467	4.6	4.499	0.100	2.186

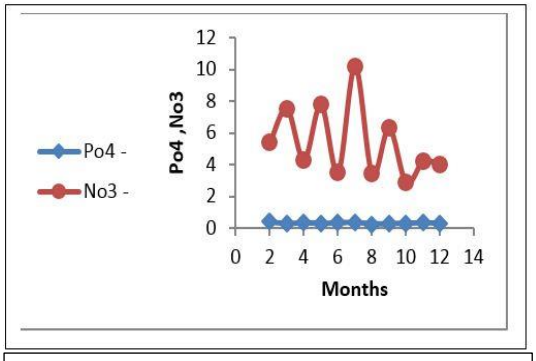

Figure 8: Relation between months and Po4, No3 for Suwiara region for 2014 year

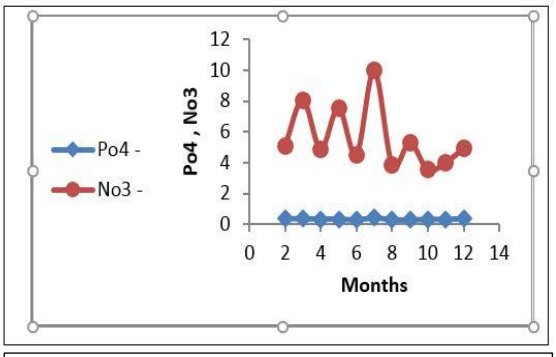

Figure 9: Relation between months and Po4, No3 for Numaniyah region for 2014year

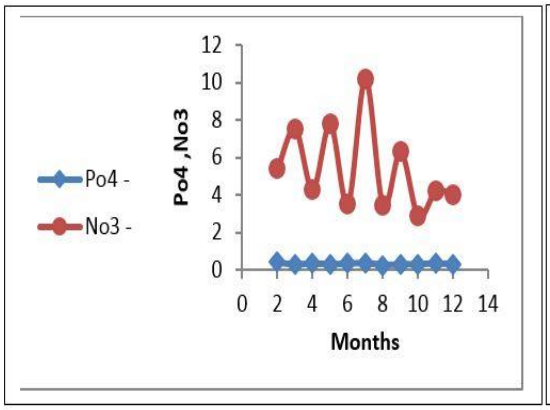

Figure 10: Relation between months and Po_4, No3 for Kut upstream Barrage region for 2014 year

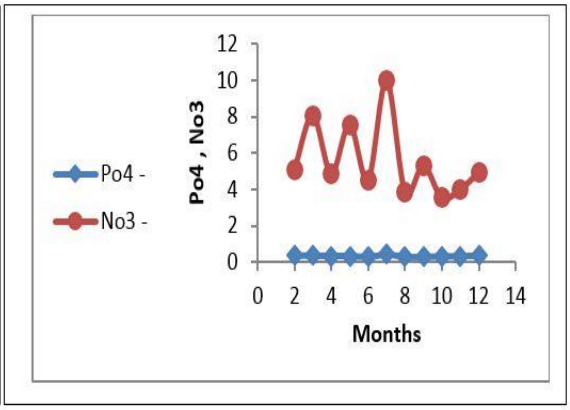

Figure 11: Relation between months and Po4, No3 for Kut downstream Barrage region for 2014 year

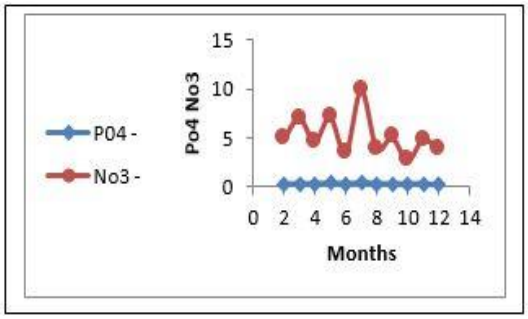

Figure 12: Relation between months and Po_4, No3 for Muwafaqiah region for 2014 year

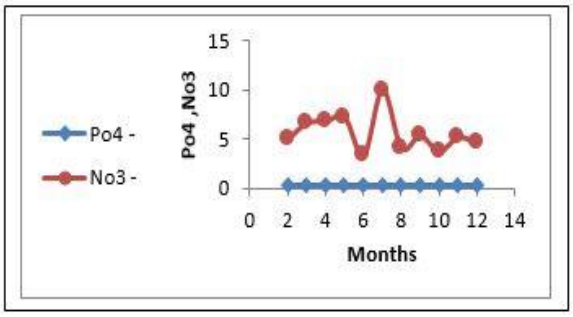

Figure 13: Relation between months and Po4, No3 for Duajili region for 2014 year

4- Conclusion

1 -The values of phosphates and Nitrates have a high correlation with the elements (TDS, pH, EC, Na) than other elements.

2 - Coefficient of determination (R^2) for models in 2013 years is high except the statistical model WQMM, WQMD for NO_3 equal to 0.603 and 0.581 respectively and coefficient of determination (R^2) for 2014 is very low and range between (0.790-0.373).

3 -Tigers river is pollution with PO_4 but the Nitrates all values within allowable limit of water that value does not exceed 50 mg/l.

4 -The reason for the increase of phosphate is the fertilizers found in soil that drift to the water as well as waste from factories near the Tigris River led to the increase in the proportion of phosphate in some months.

5 - Change in concentration of phosphate value through months of years range between (0.075-0.55)mg/l in 2013 year in suwaira and Kut upstream Barrage respectively and between (0.23-0.44) mg/l in 2014 year in Muwafaqiah and Kut downstream Barrage respectively.

6- The increase in phosphate ratio effect on human health such as blood poisoning, liver and kidney toxicity and skin sensitivity.

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دراسة التغيرات الشهرية والسنوية لتراكيز العناصر (الفوسفات والنترات) داخل مجرى نهر دجلة لبعض مناطق محافظة واسط

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الخلاصة

جرى هذا البحث لدراسة التغيرات الشهرية والسنوية لتراكيز عنصري الفوسفات والنترات في مياه مناطق(الصويرة والنعمانية والكوت والموفقيه والدجيله) في محافظة واسط وذلك عن طريق قياس تراكيز الفوسفات والنترات وقياس العناصر Ca (Mg, K, Na, Ec, pH, TDS) في مديريه بيئة محافظه واسط وتم احذ العينات في بداية الشهر ومنتصف الشهر ثم اخذ المعدل لهذه النماذج وعلى مدى سنه كامله (للسنين2013 , 2014) وتم مقارنه النتائج مع المواصفة العراقية القياسية للمياه ومن ثم عمل موديلات إحصائية لإيجاد قيم الترابط لمعرفه قيم الفوسفات والنترات (كمتغيرات معتمدة) بالاعتماد على الزمن خلال اشهر السنه وبالاعتماد على (TDS, Ca, Mg, K, Na وEc، PH) (كمتغيرات مستقلة) ومن خلال الدراسة بينت النتائج ان قيم تركيز عنصر الفوسفات خلال سنه 2013 يزداد عن الحد المسموح به خلال شهر كانون الاول في مناطق (النعمانيه، الكوت قبل السدة، الموفقيه، الدجيلي) وخلال شهر كانون الثاني في مناطق (الموفقيه، الدجيلي، الكوت قبل السدة) اما بالنسبة للنترات فجميع القيم ضمن الحدود المسموح بها اما خلال سنه 2014 فان قيم تركيز عنصري الفوسفات يزداد عن الحد المسموح به خلال شهر شباط في منطقه الصويرة وخلال شهرتموز في مناطق (الموفقية، الكوت قبل السدة) اما بالنسبة للنترات فجميع القيم ضمن الحدود المسموح بها. اما نتائج الموديل الاحصائي فقد أظهرت وجود ارتباط عالي لمعامل التحديد (R^2) ماعدا الموديل الاحصائي (WQMD) بالنسبة النترات لسنه 2013فقد كانت القيمة هي 0.581 والموديل الاحصائي (WQMM)) بالنسبة النترات لسنه 2013 فقد كانت القيمة هي 0.603 ومعامل التحديد لموديلات لسنة 2014 كانت جدا قليله تتراوح ما بين ((0.373-0.790 ومن خلال قيم مصفوفة الارتباط بينت ان قيم الفوسفات والنترات لها ارتباط عالي مع العناصر (TDS, pH, EC, Na) أكثر من العناصر الأخرى.

الكلمات المفتاحية: النترات، الفوسفات، نوعيه المياه، نهر دجلة، الايصالية الكهربائية، الاس الهيدروجيني، المواد الصلبة الذائبة، الكالسيوم، المغنيسيوم، البوتاسيوم، الصوديوم، الموديل الإحصائي.