MONITORING WATER INTAKES OF EL-GEDIA AND EDFINA DRINKING WATER PLANTS AS A RESULT OF ROSETTA BRANCH POLLUTION CASE STUDY EDKU-ROSETTA

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ABSTRACT

River Nile is the most important and principal source of fresh water for Egyptians. Rosetta branch supplies fresh water for the governorates of Western Delta (Giza, Qaliubia, Menofia, Kafr El-Sheikh, Beheira and Alexandria). Rosetta branch receives organic, in-organic pollution and heavy metals through the discharge of municipal sewage and industrial effluents in Elrahawy drain water which is pumped to Rosetta branch. The aim of this work is to investigate pollution loads in Rosetta branch in the path (212-230km); a Case Study (Edku-Rosetta) with special reference to chemical parameters. Water samples were collected monthly during the period from June 2015 to May 2016. Samples from water intakes from Edfina and El-Gedia water drinking plant were collected. Results showed that COD and ammonia recorded 22.0-38.0 ppm and 2.5-4.0 ppm respectively. Also, total nitrogen varied from 5.1-7.1 ppm. The results were out of the permissible levels according to the Egyptian Ministry of Health and the International Standards. It can be concluded that Rosetta branch suffers from pollution loads that should be investigated periodically and controlled.

Key words: industrial pollution - agriculture pollution - domestic - water quality - Edfina - - El-Gedia - water treatment- Rosetta branch

INTRODUCTION

River Nile is the most important source of drinking water in Egypt. Rosetta branch has an average width between 150-200 Meter (Mohamed *et al.*, 2013). There are five water drains discharging polluted water partially treated or untreated to Rosetta branch The drains are (Tala – Elrahawy – Saple – El Sarow – Elrayyeh Elmenofi – **Hadouse**). The main governorates in Delta region (Giza, Qaliubia, Menofia, Kafr El-Sheikh, Beheira and Alexandria) The effluents of some factories, houses and agriculture drains dispose organic and inorganic pollutants at an estimated rate of 3 million m^3/day without treatment or partially treatment,Such condition cause negative effects on living organism especially fish health in Rosetta branch. The estimated flow of industrial wastewater discharge to the Rosetta branch is about 0.05 million m^3/day (Ezzat *et al.*, 2012). Industries were identified as being the major source of water pollution. So that a shortage of dissolved Oxygen where poisoned wastewater, the wastewater treatment plants (WWTPS) Abu Rawash, Zenen discharge 1.90 Million of cubic meters of sewage drainage to Rosetta branch (Ali *et al*; 2011).

Damming of rivers prevents the flood to sweep the accumulated pollutants into the sea, as in the case of the Nile within Egypt after construction of the Aswan High Dam (AHD). However, the Nile is still a mechanism for transportation of suspended matter (SM) and solids into the Mediterranean Sea, although the Nile discharge from the High Dam Lake (HDL) is nearly free from the Nile mud. The (SM) with its adsorbed elements is transported to the Nile at its sides in Egypt from different land-based sources. However, the Nile water discharged to the Rosetta estuary from Edfina Barrage loses a part of its The (SM), due to its deposition in front of this barrage. Some studies were made on

heavy metals in the two Nile branches and some others on the Egyptian coals Mediterranean waters (El-Bouraie *et al.,* 2011). The aim of this work is to investigate pollution loads in Rosetta branch in the path (212-230km) with special reference to chemical parameters of the intakes of drinking water plant Edfina and El-Gedia.

MATERIALS AND METHODS

Water Sampling: Water Samples were collected monthly during the period from June 2015 to May 2016 at a rate of a sample of the same day of the same places, one sample from intake and one from produced water. These samples were analyzed according (APHA, 2012).

Sampling Sites: Water intake samples were collected monthly during the period from June 2015 to may 2016. Samples from water intakes (Edfena and El-Gdiah water drinking plants (in the path from212km-230km) were collected.

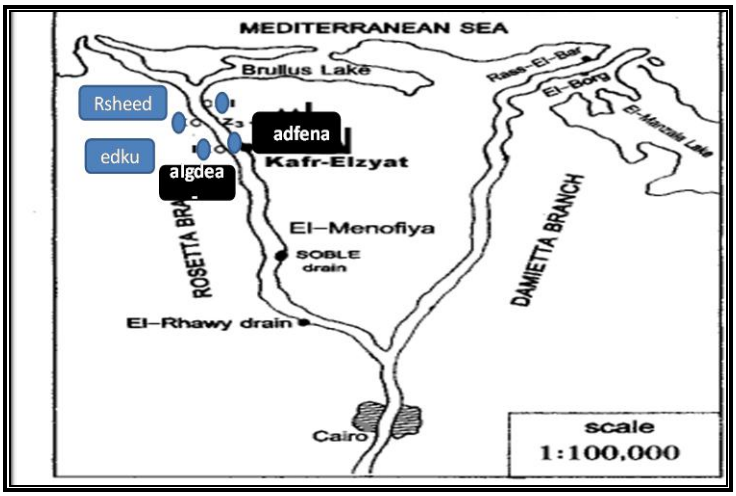

Fig.(1): A Map of the studied location in Rosetta branch from 212.5km to 230km (Edku-Rosetta)

Sampling tools: Samples were drawn in glass bottles of capacity (1-liter) for the environmental monitoring and environmental studies of samples from the watercourse (Nile River) in the analyses.

RESULTS AND DISCUSSION

Results indicated that the amount of pollution already present in the Nile is constant and may increasing, but within the limits allowed by Egyptian and international standards. This may be due to presence of positive and negative interested relations lead to gradual improvement in the end of River branch especially in winter probably due to self-purification of the river and change in the continuous oxygen content associated with run off where the flow rate is about 2.830 m^3/s where the maximum highest is 2.700 of the sea surface at the White Nile to reach zero at the Mediterranean length of 6.740km**.** Results of Edfina intake were tabulated as fallows.

A. Edfina:

Table (1): The chemical analysis of Edfina intake water samples, m g/l .

Item	Jun	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Allowable*	ST DEV
C.O.D	30.3	25.6	24.6	29	19.3	30	10	18.5	16.5	31.5	38	10	10	8.8
T.N	0.1	2.6	1.7	3.2	2.1	4.6	1.8	9.8	5.3	5.6	4.8	0.2	2.5	2.7
NH_3	0.1	1.5	1.5	3	1	3.5	0.4	8	3.5	4	2.8	0	0.5	2.2

***Source:** Article 49 of decree No. 92/2013 from the law No. 48 for 1982

Chemical Oxygen Demand (COD)

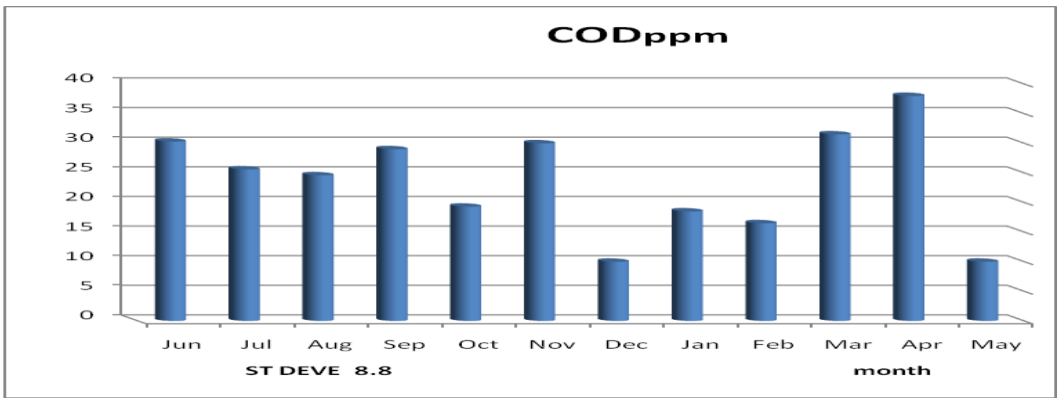

Fig.(2): COD analysis of Edfina intake water samples, (mg/l) .

The values for COD over the period of investigation varied of 10-38.0 ppm with an average of 23.6 ppm, and std deviation was 8.8 ppm.(Table,1and Fig. 2). Only months of Dec. and May recorded the lowest value of COD which comply with the Article 49 of decree No. 92/2013 as COD recorded 10 ppm. The rest of months COD values exceeded the value set by the law as it reached 380% of the value in April. These results are in agreement with the results of El-Bouraie *et al.*, 2010. Who recorded 5.0-30.0 ppm, Mohamed *et al.*, 2013 who recorded 0.3-48 ppm, and Mostafa *et al*., 2003. Who recorded 8.0-15.6 ppm. In kafr el zaeat city, tala and city and rashed at Rosetta branch)

Total nitrogen (TN):

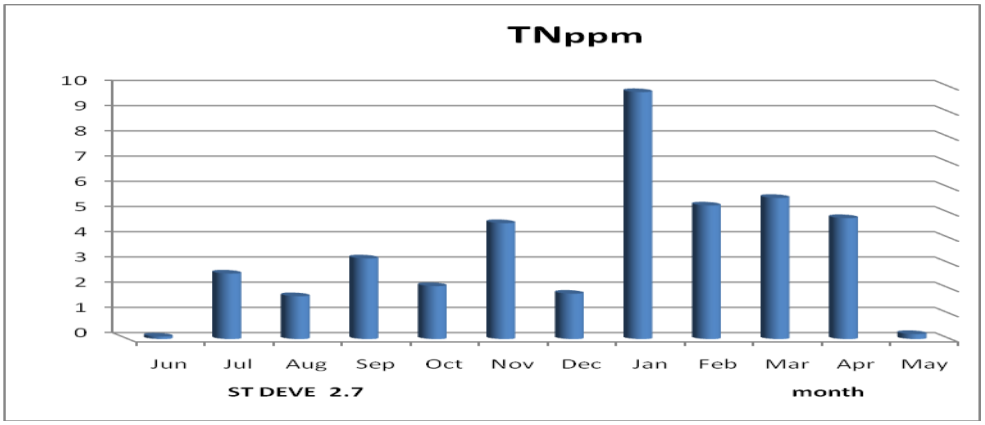

Fig. (3): Total nitrogen analysis of Edfina intake water samples, (mg/l.)

The values for TN over the period of investigation varied from 0.1-9.8ppm with an average of 3.4 ppm with std deviation of 2.7 ppm. (Table,1 and Fig.3). Only months of Dec and May recorded the lowest value of TN which comply with the Article 49 of decree No. 92/2013 as TN recorded 2.5ppm.

The highest value recorded exceeded the set limit 450% as it was 9.8ppm. in the month January. These high levels revealed that water is polluted with domestic sewage. Results are in disagreement with results of Ali *et al.*, 2014. who recorded 0.1-6.5 ppm and El-Bouraie *et al.*, 2011. who recorded 0.2-9.2 ppm Rashid city and Rosetta branch.

Ammonia NH_3: The following figure displayed that. ammonia concentration ranged from 0.1-8.0ppm with an average of 2.4 ppm with std deviation of 2.2 ppm (Table,1 andFig.4) while the Article 49 of decree No. 93/2013 has set a value 0.5 ppm. Only months of Dec. and May recorded the lowest value of NH_3 which comply with the NH_3 set law. The highest value recorded exceeded the set limit 800% as it was 8.0 ppm. Few months have values complying with the law

while the rest months exceeded the value set by law These results were in disagreement with result of Ezzat *et al.*, 2012; Mostafa *et al.*, 2003; Ali *et al.*, 2014 it recorded 0.1-1.0ppm - 1.0-5.5ppm - 5.9-15.3ppm in River Nile, kfr ELzaeat city and rashed city at Rosetta branch. These results lead to a higher consumption of chlorine dose and generate chloramines that may affect palatability of water upon consumption

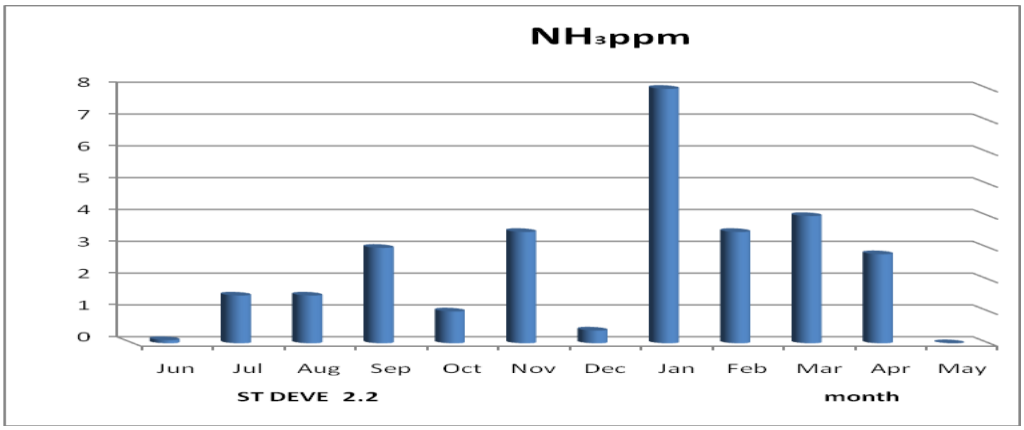

Fig. (4): Ammonia analysis of Edfina intake water samples (mg/l)

B. El-Gedia:

Table (2): Chemical analysis of Edfena intake water samples (mg/l).

Item	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Allowabl*	ST.DEV
C.O.D	22.5	23.3	27.8	21.1	24.7	20.6	21.9	21.9	22.4	18	27	10	10	4.5
T.N	5.1	2.3	2.1	2.6	1.9	0.5	0.2	0.5	3.3	4.3	7.1	0	2.5	2.1
NH_3	4.1	1.2	1	1.5	0.8	0.5	0.2	0.4	1.7	2.5	2.1	0	0.05	1.1

***Source :** Article 49 of decree No. 92/2013 from the law No. 48 for 1982

Chemical Oxygen Demand COD

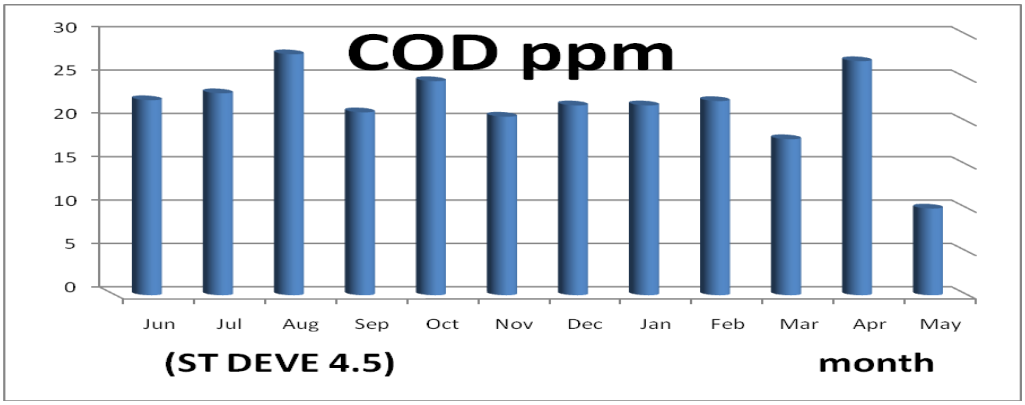

Fig. (5): COD analysis of El-Gedia intake water samples, (mg/l).

The values for COD over the period of investigation varied from 10.0 - 27.0 ppm with an average of 21.7 ppm with std deviation of 4.6 ppm.(Table,2 and Fig.5) Only months of Dec. and May recorded the lowest value of COD which comply with the Article 49 of decree No. 92/2013 as COD recorded 10ppm.the rest of months exceeded the value set by the law as it reached 310% of the value in std deviation 4.5 results are agreement with result of Mostafa *et al.*, 2003; El Bouraie *et al.*, 2011; it recorded 8.0-15.6 ppm and 0.3-48.0 ppm. in River Nile ,kfr ELzaeat city and rashed city at Rosetta branch.

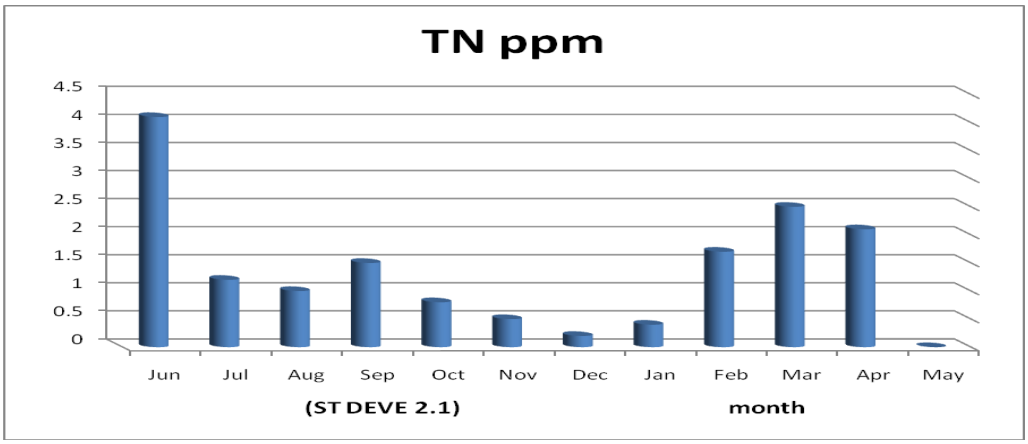

Fig. (6): Total nitrogen analysis of El-Gedia intakewatersamples, (mg /l)

The values for T.N over the period of investigation varied from 0 -7.16 ppm with an average of 2.4 with std deviation 2.1.(Table,2 andFig.6) Only months of Dec and May recorded the lowest value of TN which comply with the low 93/2013 as TN recorded 2.5ppm the highest value recorded exceeded the set limit 710% as it was 7.1 ppm. This high level revealed that water is polluted with domestic sewage These result were in disagreement with results of Ezzat *et al.*, 2012; Mostafa *et al.*, 2003; Ali *et al.*, 2014.

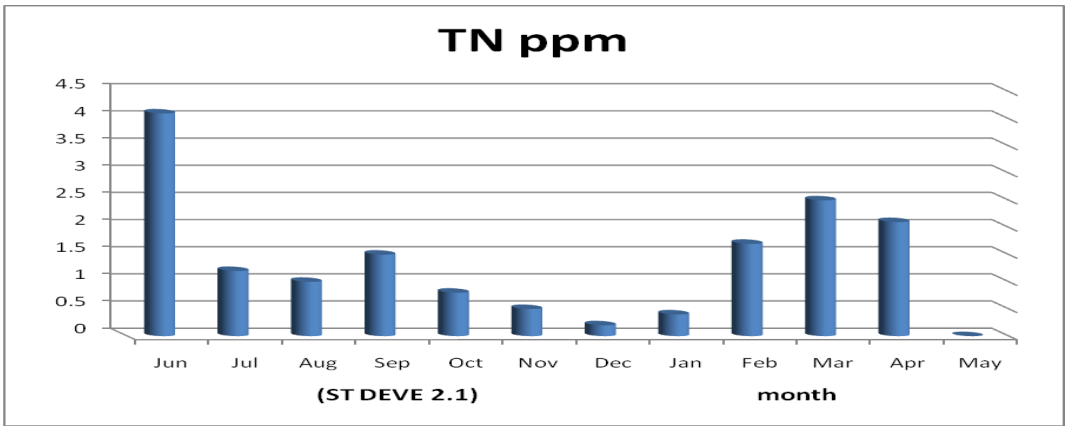

Fig. (7): Ammonia analysis of El-Gedia intake water samples, mg/l

Ammonia Concentration ranged from 0.2-4.1 ppm with an average of 1.0.3.0 ppm with std deviation 1.1 ppm (Table, 2 and Fig.7) law 93/2013 has set a value 0.5 ppm. Only months of Dec and May recorded the lowest value of NH_3 which comply with the NH_3 recorded. the highest value recorded exceeded the set limit 410% as it was 4.1ppm. Few months have values compiling with the low while the rest is exceeding the value set by law These result were agreement with result of Mostafa *et al.*, 2003; Ezzat *et al.*, 2012; Ali *et al.*, 2014. It recorded (5.9: 15.3ppm -1.0:5.5ppm - 0.1-1.0ppm). it in River Nile ,kfr ELzeaat city and rushed city at_Rosetta branch. These values resulted in consumption of high chlorine does and generate chloramines that may effect palatability of water up on consumption.

CONCLUSION

In Conclusion it has been Revealed that COD results in continuously increasing over the years(2015-2016), it was 22.0and29.0 ppm .the year 2015and2016 respectively . The same trend was noticed in case of ammonia as it

recorded 2.5-ppm in 2015 while it increased up to 4.0 ppm in 2016. Also total nitrogen|(TN) recorded 5.13ppm and it increased to 7.16 ppm for the year 2015 and2016 respectively

The water quality of Rosetta branch need continuous monitoring to avoid the This status should be meticulously monitored to follow up water deterioration of the produced drinking water .

REFERENCES

Ali, M.; Dessouki, A.; Soliman,A.;and El Shenawy,S.;(2014): Characterization of Chemical Water Quality in the Nile River, Egypt INTERNATIONAL JOURNAL OF PURE & APPLIED BIOSCIENCE ISSN: 2320 – 7051 Int. J. Pure App. Biosci. 2 (3):35-53

Ali, S. M.; Sabae, S. Z.; Fayez, M.; Monib, M.; and Hegazi, N. A (2011): The influence of agro-industrial effluents on River Nile pollution. J of Advanced Research, (2): 85-95.

Allam., M.N., (2007): Water Resources In Egypt: Future Challenges and Opportunities Water I nternational, 32 (2): 205-218.

American Public Health Association (APHA), (2012): Standard Methods for the Examination of Water andWastewater, 21 Ed. Washington, D.C.

El Bouraie, M.; Motawea. E.; Mohamed G.; Yehia M. (2011): Water quality of Rosetta branch in Nile delta, Egypt. Suoseura - Finnish Peatl and Society, 62(1): 31–37.

El-Bouraie, M.; El Barbary, A.; Yehia, M. and Motawea, E. (2010): Heavy metal concentrations in surface river water and bed sediments at Nile Delta in Egypt. Suoseura - Finnish Peatl and Socie61(1): 1–12 Environmental Science and Development, Vol. 5, No. 6.

Ezzat, S.; Mahdy, H.; Abo-State, M.; Abd El-Shakour, E. and El-Bahnasawy M. (2012): Water Quality Assessment of River Nile at Rosetta Branch: Impact of Drains Discharge. Middle-East Journal of Scientific Research, 12(4): 413-423.

Ezzat, S. M. (2002): Microbial Flora and Chemical Composition of River Nile Water at Different Sites in Egypt. M. Sc. Thesis, Microbiology Dept., Fac. of Sci., Ain Shams Univ., Egypt.

Mohamed, A.G; El Safty AM and Siha, M.S. (2013): Egyptian Journal of Occupational Medicine, 2013; 37 (1): 95-119

Mastafa, S., Hewady,M.,Toulibah,H. and Abdallah,S. (2003): Comparativ Study among Micro flora in EL manzala Lake Water and Rashid(Rosetta) Estuary of Nile River, Egypt. Pakistan.

رصد الملوثات الداخلة لمحطات مياة الشرب ونتائجها في محطات (أدفينا والجدية) بفرع رشيد من الكيلو ٢١٢ حتى الكيلو ٢٣٠ دراسة حالة إدكو رشيد

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المستخلص

نهر النيل هو أهم مصدر للمياه العذبة للمصريين ويمد فرع رشيد المياه العذبة لبعض محافظات الدلتا مثل (الغربية والجيزة والقليوبية والمنوفية وكفر الشيخ والبحيرة والإسكندرية). يتلقى فرع رشيد كثير من التلوث العضوي وغير العضوي والفلزات الثقيلة من خلال إلقاء مياه الصرف الصحي والنفايات السائلة الصناعية من خلال مصرف الرهاوى والتي يتم ضخها إلى فرع رشيد.

يهدف هذا العمل الى رصد أحمال التلوث في فرع رشيد من خلال مراجعة معايير المياه الكيميائية والفيزيائية والميكروبيولوجية من خلال جمع عينات من المياه شهريا خلال الفترة من يونيو ٢٠١٥ إلى مايو ٢٠١٦م. وقد تم جمع عينات من مآخذ المياه في محطتي مياه الشرب المرشحة (أدفينا والجدية) .

وأظهرت النتائج أن تركيز الأكسجين المستهلك كيميائيا فى مآخذ محطة أدفينا تراوح من ١٠– ٣٨ جزء في المليون بمتوسط ٢٣,٦ جزء في المليون أما في محطة الجدية فقد تراوح بين١٠–٢٧ جزء في المليون بمتوسط ٢١,٧ جزء في المليون. واتضح من النتائج المتحصل عليها تلوث مياه المآخذين من مياه الصرف الصحى ما يؤكد ضرورة متابعة الملوثات فى المأخذين.

الكلمات المفتاحية: تلوث فرع رشيد– معايير كيميائية – محطة مياه أدفينا – محطة مياه الجدية – مآخذ محطة مياه.