

Determining the Concentration of Fluoride in some Water Bodies on the Syrian Coast using Fluoride Selective Electrode

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ABSTRACT

This is a study of the concentration of fluoride in some water bodies on the Syrian Coast such as sea water, artesian wells, rivers, dams, wastewater and rain water. It offers a comparison between the concentration of Fluoride (F⁻) standard of the World Health Organization (WHO) and that of the Syrian standard.

All measurements were taken at laboratory temperature. It Measured some of the physical and chemical properties: (Dissolved Oxygen DO, Total Dissolved Solid Substances TDSS, PH, Electrical Conductivity EC, Turbidity TU, Total Alkalinity TA, Fluoride F⁻). It used fluoride selective electrode, pH mater, electrical conductivity and turbidometry. Find all water bodies within the Syrian Specifications for concentration of Fluoride F⁻. Only sea water, Dmsrkho well, Turkmen, Sulayip Artesian Well, Turkmen and Jableh wells were found to be within global standards for concentration of Fluoride F⁻. No correlation between TDSS and concentration of fluoride in fresh water was found. It was expected to find a link between fluoride concentration and TDSS in salt water. However, there was a link between fluoride and the sampling area, the relationship was a positive one.

KEY WORDS: fluoride selective Electrode, Syrian coast, water bodies, DO, TDSS.

1. INTRODUCTION

Electrochemistry plays a very important role in the control and reduction of pollutants, which is instrumental and plays an important role in determining the levels of environmental pollutants where many organic and non-organic environmental contaminants were studied. This has led to increased interest in sensor Electrochemistry with increasing industrial development because high levels of Environmental pollutants, making use of sensor electrochemistry of various kinds, in particular ion-selective, in all areas of environmental, industry, agriculture, and analysis of medical, and other fields. Therefore, this matter puts the researchers of analytical chemistry, at great responsibility for the development and innovation of new sensors, in order of speed, accuracy, and repeatability of the measurement, and selectivity for specific types of ions (Naser, 2015) The fluoride element is found in the environment and constitutes 0.06 – 0.09 % of the earth's crust (Bratovcic, 2011).

Fluoride is a chemical element with significant effects on human health through drinking water. Fluoride enters the human body through foods and drinks (Zoran, 2010), rice (Anbuvel, 2015), dates (Amar, 2007). Tea is rich in fluoride (Dabeka, 1999; Zhu, 2013; Antonija, 2014) especially black, green and herbal teas (Yuwono, 2005). Biochemical studies have shown that the relationship between the concentration of fluoride is vital and effective. One of the philosophers say: Eeverything could be toxic and nothing is toxic, meaning anything taken with high quantities could turn into being toxic, and safe when taken normally. It should be noted that the amount of toxicity is associated with the response time, quantities, age, sex and weight of people (Al-zamel, 2001). The ideal limit of fluoride intake is agreed upon because of different nutritional conditions from one person to another (Al-Hasbani, 2006). In recently published papers a link was observe between fluoride intake and cancer (Micheal, 2012; Ciljanovic, 2012). Thus, attention should be paid by all institutions and research agencies to determine the concentration of fluoride in the environment, especially in water bodies and food, where different technologies with several measuring of fluoride in nature were used especially selective fluoride Electrode. Hence, the objective of this research is to determine the fluoride ratios in some water bodies on the Syrian coast, the different types of areas such as sea water, artesian wells, rivers, dams and wastewater as well as rain water.

The arm and importance of research: Determining the concentration of fluoride in some water bodies of different types of fresh water and salt scattered in various parts of the Syrian coast as well as a comparison between the World Health Organization standard and Syrian standard specifications for drinking water.

2. MATERIALS AND METHODS

Study area: Some of the water bodies on the Syrian Coast.

Study time: Winter 2017

The samples were collected in containers of polyethylene capacity of 1 liter washed by water distillation ten water sample. The sample was Measured directly to some of the physical and chemical properties: (Dissolved Oxygen DO, Total Dissolved Solid Substances TDSS, PH, Electrical Conductivity EC, Turbidity TU, Total Alkalinity TA, Fluoride F⁻).

The study is based on LTP using fluoride selective electrode. Used to calibrate the electrode fluoride solution (TISAB) from a company established, pH, electrical conductivity and turbidometry).

3. RESULTS AND DISCUSSION

Table.1. Measures of some physical and chemical properties of water bodies on the Syrian Coast

Water Bodies	Area sampling	DO	pH	TDSS ppm	EC $\mu\text{s}/\text{cm}$	$^{\circ}\text{C}$	TA ppm	TU NTU
Artesian Well	Sulayip Turkmen	7.72	7.19	208	415	23.8	0.247	2.72
	Mashqita	7.35	7.30	537	1050	25	50	1.03
	Tartous near the beach Maten Al-sahel	3.26	7.09	3.88	449	25	47	2.07
Wells	Dmsrkho	5.58	7.35	134	766	24.5	189.6	8.2
	Kessab Al-samra	5.71	7.31	165.5	343	25	174	17.9
	City Jableh	7.95	7.03	382	785	25	185.6	0.259
	Lattakia	7.58	7.61	457	910	25	350	2.08
River	Alkabir Alshmary	7.82	7.42	2270	436	25	115	1.5
Springs	Slenfeh	7.88	7.44	320.4	562.3	25	135	0.707
	Dwyer Reslan (Dreikish)	8.49	7.71	190	349	25	110.4	0.492
	Mount Al-Nabi Matta (Dreikish)	7.53	7.86	50.5	106.4	25	500	0.563
		8.44	7.02	207	428	25	141.6	0.803
The Mediterranean Sea	Tartous	4.46	7.58	23600	1300	25	155	3929
	Baniyas	7.49	8.15	26200	5750	25	78.5	4500
	Ras Shamra	7.52	7.21	24600	932	25	110	1560
	City Jableh (Mina al-azzi)	7.26	7.40	22400	4650	25	154	2335
	Apamea	7.30	7.72	22700	4310	25	158	1506
	Southern Corniche Lattakia	5.88	7.60	23600	4480	26.7	160	2854
Dam	AL-bassel Alyazdiah	7.15	8.19	178.4	355	25	150	2.80
	City Jableh	7.46	7.10	34.6	360	27.3	110	2.59
Rain	Majdoleen Albahr Village	7.06	7.15	52.8	106	25	16	1.88
	Near oil Refinery Baniyas	6.84	6.31	53	1118	25	29.4	10
Wastewater	Near dam Al-bassel	6.96	7.20	181.3	348	25	152	3.46

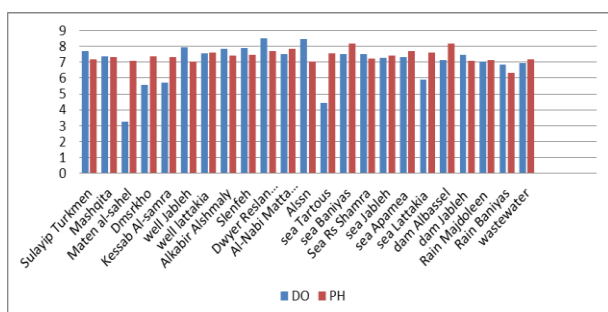


Figure.1. Measurement DO and PH of water samples in some bodies of water on the Syrian Coast

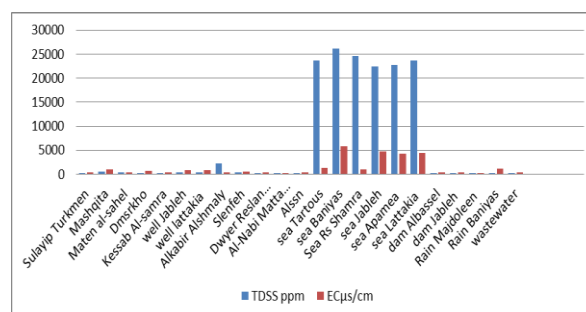


Figure.2. Measurement TDSS and EC of water samples in some bodies of water in the Syrian Coast

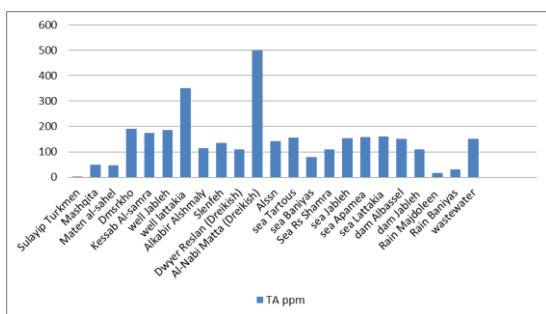


Figure.3. Measurement TA of water samples in some bodies of water on the Syrian Coast

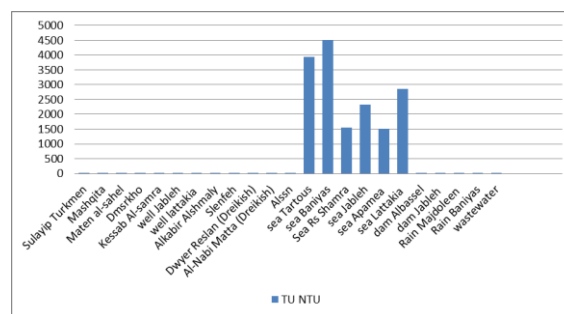


Figure.4. Measurement TU of water samples in some bodies of water in the Syrian Coast

Table.2. World Health Organization (WHO) and Standard Specifications of the Syrian standard for drinking water

According to	DO	PH	TDSS ppm	EC $\mu\text{s/cm}$	$^{\circ}\text{C}$	TA ppm	NTU
World Health Organisation (WHO)	Range 5 – 8	Range 6.5 -8.5	Range 300-1000	Range 1500-2000	25	Maximum 400	Maximum 5
Standard Specifications Syrian	Bigger than 1	Range 6.5 – 9	Range 900-1300	Range 1500- 3000	25	Maximum 600	Range 1 – 5

Through previous measurements show:

- All the measured water bodies was within range of World Health Organisation in order to DO except artesian well Maten Al-sahel aboard and the beaches of Tartous was under the limit but a well spring of Lattakia and Alssn were above the limit.
- All water bodies within limit the Syrian standard for DO.
- All water bodies conform to the World Health Organisation and for TDSS except Mashqita, Jableh and Slenfeh conformity with World Health Organisation but less than Syrian Specifications. Alkabir Alshmary and Mediterranean Sea bigger than limit global specifications and Syrian standard.
- All water bodies have been below the permissible limits of the Syrian standard and World Health Organisation for EC.
- All water bodies have been below the permissible limits Syrian standard and World Health Organisation for TA exception of spring Dreikish was above the allowable limit World Health Organisation.
- All water bodies have been below the permissible limits Syrian standard and World Health Organisation for TU exception Dmsrkho, Kessab al-samra and Mediterranean was above the allowable limit World Health Organization.

Table.3-1. Determining the concentration of fluoride in some water bodies on the Syrian Coast

water bodies	Area sampling	Direct	Indirect
Artesian Well	Sulayip Turkmen	0.640	0.465
	Mashqita	0.273	0.281
	Tartous near the beach Maten Al-sahel	0.285	0.280
Wells	Dmsrkho	0.509	0.501
	Kessab Al-samra	0.202	0.190
	City Jableh	0.747	0.741
	Lattakia	0.309	0.301
River	Alkabir Alshmary	0.270	0.263
Springs	Slenfeh	0.208	0.229
	Dwyer Reslan(Dreikish)	0.248	0.240
	Mount Al-Nabi Matta (Dreikish)	0.245	0.670
	Near Qurfays Village (Alssn)	0.122	0.125

Table.3-2. Determine the concentration of fluoride in some bodies of water in the Syrian Coast

water bodies	Area sampling	Direct	Indirect
The Mediterranean Sea	Tartous	0.611	0.570
	Baniyas	0.574	0.594
	Ras Shamra	0.663	0.590
	City Jableh(Mina al-azzi)	0.599	0.640
	Apamea	0.583	0.570
	Southern Corniche Lattakia	0.59	0.520
Dam	AL-bassel Alyazdiah	0.186	0.194
	City Jableh	0.381	0.390
Rain	Majdoleen Albahr Village	0.085	0.083
	Near oil Refinery Baniyas	0.307	0.301
wastewater	Near dam Al-bassel	0.203	0.204

Table.4. World Health Organisation (WHO) and Standard Specifications Syrian for drinking water

According to	concentrations of fluoride
World Health Organisation (WHO) (Kalanithiana, 2015)	Range (0.5 -1.5)ppm
Standard Specifications Syrian	Maximum 1.5 ppm

According to previous measurements of all water bodies within the Syrian Specifications.

Only sea water and protoplasm wells and wells Dmsrkho Cross Turkmen within World Health Organisation.

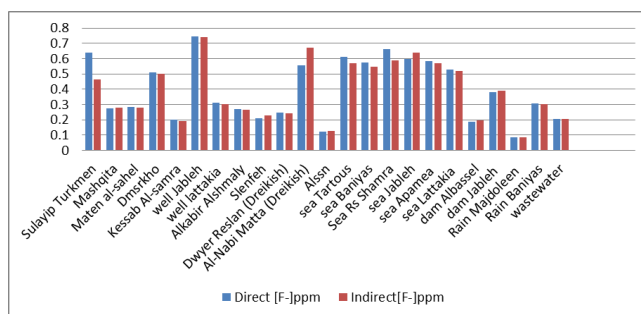


Figure.5. Measurement F⁻ of water samples in some bodies of water in the Syrian Coast

4. CONCLUSION

This research didn't see any correlation between TDSS and DO the concentration of fluoride in fresh water.

It is expected to be a link between fluoride concentration and TDSS in salt water.

There is a link between fluoride and area sampling, the relationship was a positive.

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