

Drinking water evaluation for some wells ground water in Al-madab village, Al-mahweet, Yemen

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ABSTRACT

In this paper we studied of drinking water samples for five water sources wells in the Al-madab village, Al-mahweet city, Yemen. The main purpose was determine the fluoride ion of water from these sources, the values were in the range of $(1.31 \pm 0.08 - 3.61 \pm 0.25)$ mg/L, more than the permissible limits for World Health Organization (WHO). The analysis data were statically treatment with relative standard deviation (RSD) less than 6%. In another side, the measurements of pH, total dissolve salts (TDS), electroconductivity (EC), total hardness (TH), Cl^- , Mg^{2+} , Ca^{2+} , NO_3^- and salinity have been determined.

Key word: Ground water, Al-mahweet city, Yemen, fluoride ion

Introduction

Water is important to the mechanics of the human body, the body water quality is essential for the well being of all people, the quality of water can be affected by different of pollutions, chemical, biological and physical pollution. contaminates such as bacteria, viruses, heavy metals, nitrate and salt have found their way into water supplies, the water pollution occurs when a body of water is adversely affected due to the addition of large amounts of materials to the water [1].

In a recently the WHO lists fluoride as one of the 14 minerals considered essential to good health [2]. According to the Linus Pauling Institute for Micronutrient Research, if one considers the prevention of chronic disease (dental caries) an important criterion in determining essentiality, then fluoride might well be considered an essential trace element [3]. In 1998, the Institute of Medicine of the National Academies of Sciences also declared that fluoride was an important nutrient, owing to its beneficial health effects [4]. Compounds of fluorine are very valuable and extensively utilized in human activities. In addition to skeletal abnormalities high fluoride intake damaging kidney, liver and nervous system [5].

The source of drinking water Al-mahweet city is only ground water, the aim of this study was to investigate the quality of the ground water. Samples were collected from the Al-mahweet wells. Chemical and physical characteristics were determined analytically.

Experimental

2.1. Instruments/Apparatus

UV Vis Spectrophotometer model 1300 analytic jena , pH meter model 720 and digital conductometer from (HACH) has been used for samples analysis.

2.2. Reagents

All chemicals used in this study were of analytical reagent grade and used without further purification. sodium fluoride, ammonium molybdate, disodium hydrogen phosphate, hydroquinone and sulfuric acid, silver nitrate, ethylene diamine tetra acetic acid (EDTA).

2.3. Sampling and sample preparation

Water samples were collected in cleaned polyethylene bottles. Bottles were washed with water to be collected two to three times before sampling. Samples were analyzed immediately after collection otherwise the sample bottles were stored at 4 °C to avoid any losses due to volatilization. A rapid spectrophotometric method is used for the determination of fluoride in the drinking water[7]

Results and discussion

The physical testing of water include temperature, pH, total dissolve salts (TDS)and electroconductivity (EC) in addition the chemical testing of water using the principles of analytical chemistry are shown in tables 1 and 2 .The values of five samples of ground water indicate that the physical measurements pH, EC and TDS were the range (7.50-7.84), (779-970 μScm^{-1}) and (724-924 mg/L) respectively, within the permissible limits given by WHO and YS. In another side the chemical testing of total hardness(TH), Cl^- , Mg^{2+} , Ca^{2+} and NO_3^- were the range(110-160),(140-183),(30-72),(62-88)and(0.1-0.6) within the permissible limits given by WHO and YS, the results of physical and chemical testing give not water pollution of water samples

Table(1): The analytical results of ground water samples in Al- madab Village, Almahweet

Parameters	WHO	YS	wells				
			1	2	3	4	5
T °C	--	--	29	30	30	29	30
E.C μScm^{-1}	--	450-2500	779	881	887	970	933
TDS mg/L	1000	650-1500	724	825	809	924	857
pH	6.5-8.5	6.50-9	7.68	7.82	7.78	7.84	7.50
Cl ⁻ mg/L	250	200-600	172	140	178	183	156
T.H mg/L	500	100-500	142	160	148	150	110
Ca ²⁺ mg/L	200	75-200	62	88	83	88	80
Mg ²⁺ mg/L	--	--	50	72	65	62	30
NO ₃ ⁻ mg/L	50	10-50	0.1	0.2	0.1	0.6	0.5
Salinity	-	--	0.1	0.2	0.3	0.2	0.2

The primal target of this study was determined the fluoride ion concentration in ground water wells, which it consider the source of drinking water for population area. The statically treatment of analytical data through account the standard deviation (SD), relative standard deviation (RSD) and confidence limit (CL) have been carried in this study.

The measurements of fluoride (a mean value of four determinations) for five samples of ground water are shown in table2, these analysis gave rang values(1.31mg/L-3.61mg/L). The highest value of 3.61 mg/l was obtained from the well 5, whereas the lowest value of 1.31 mg/l was obtained from the well 3. All wells have values greater than the permissible limits of WHO, except well (3) which has value 1.31 mg/L showed a close value to the maximum allowable 1.5 mg/L of WHO.

The high concentration of fluoride in drinking water more than 1.5 mg/L, give rise to occurrence the dental mottling , bone fracture, thyroid gland, children intelligence, reproductive effects, birth effects and chronic

renal failure In this study we observed the dental mottling spreading through Al-madab village population, this a pointer a high concentration of fluoride in drinking water. [5].

Table(2): The fluoride ion concentration of ground water samples

Wells/sample	F ⁻ mg/L	SD	RSD	CL
1	2.36±0.21	0.13	5.68	0.21
2	2.09±0.30	0.19	2.76	0.30
3	1.31±0.33	0.21	4.11	0.33
4	2.03±0.40	0.25	4.04	0.40
5	3.61±0.25	0.16	4.38	0.25
WHO	1.5	-	-	-

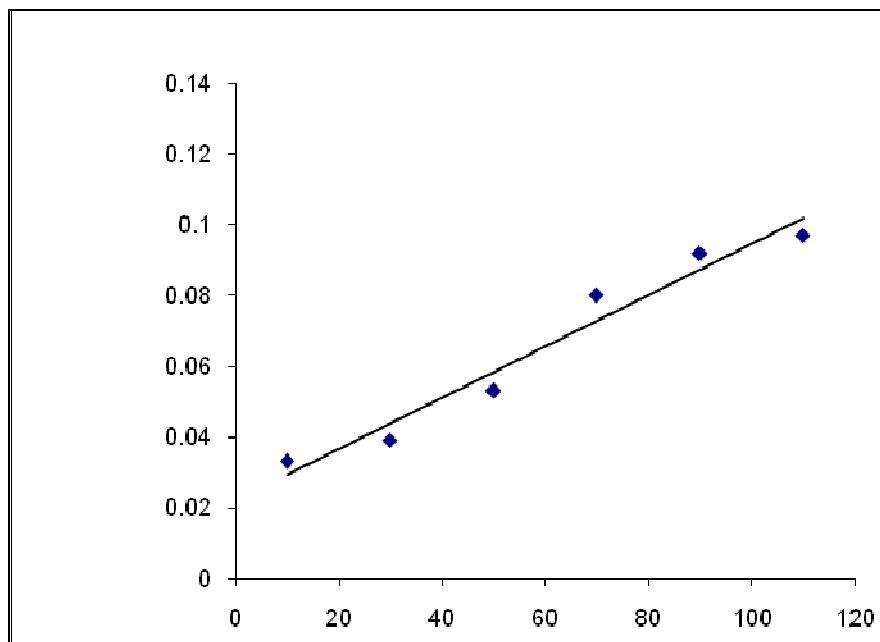


Fig1:Calibration graph for the determination of fluoride under the optimum conditions

Conclusions

- 1- The analytical data of physical and chemical testing of drinking water were the permissible limit by WHO and Y.S.
- 2- The concentration of fluoride ion was a very higher than WHO guide line

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