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RESEARCH ARTICLE

EVALUATION OF THE METALLIC CONTAMINATION (MANGANESE, LEAD, CADMIUM, ARSENIC AND MERCURY) OF THE WATERS OF THE NOUBAGHIYA BRACKISH WATER DESALINATION UNIT IN MAURITANIA.

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Abstract

In the commune of Noubaghiya, characterized by agricultural potential, the feed waters of the reverse osmosis brackish water desalination unit of this village are subject to several possibilities of contamination.In this municipality, desalinated water is an important source of drinking waterThe objective of this work is to evaluate the metallic quality of the waters of the Noubaghiya unit in Mauritania (manganese, lead, cadmium, arsenic and mercury) with reference to the standards of potability.The results obtained (during the month of December of the year 2012) showed that at the level of the station of the water of rejection (ER), the contents in Pb and Cd exceed the norms. While at the level of the station produced water (EP) Mn, Pb, Cd, As and Hg contents are below the standards.However, at the feed water station (EA), the Pb levels exceed the value set by the standards.At the end of this evaluation, it can be concluded that the use of the drinking water of this municipality without prior treatment can constitute a health risk for the population.

Introduction:

Water has long been considered an inexhaustible source. However, and recently, we realize that this is not the case, at least with regard to arid and semi-arid countries like Mauritania.

Indeed, under natural conditions, water is generally free of pathogenic microbes (bacteria, parasites, fungi or viruses) and the chemical elements (mineral salts, organic materials, etc ...) are usually present at acceptable concentrations. for humans. However, our activities (industrial, agricultural or urban pollution) can alter the natural composition of water by rendering it unfit for consumption.

Water pollution is defined by WHO (World Health Organization) as "any change in the physical, chemical or biological properties, or any release of liquid, gaseous or solid substances into the water so as to create a nuisance or to make this water dangerous or detrimental from the point of view of health, safety and public welfare

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This concerns uses for domestic, commercial, industrial, agricultural recreational and other purposes, and wildlife and aquatic "**[1].**

Water contamination is a major concern for the protection of ecosystems and water resources. It is the subject of numerous studies both in groundwater and surface water [2].

Boschet [3] concluded that water resources in Europe did not meet current health requirements.

Contamination by different kinds of pollution varies according to the nature of the waters and their locations.

Chemicals that can cause water quality degradation include heavy metals. Some have high toxicity. They are distinguished from other chemical pollutants by their low biodegradability and their high bioaccumulation power along the trophic chainThis can cause significant ecological damage.In this article, we are interested in the evaluation of the metallic contamination of the waters of the Noubaghiya unit

Medium of study

The commune of Noubaghiya is a rural commune in Mauritania, located 120 km on the axis Nouakchott -Boutilimit of the road of hope with a right turn on the ground of 18 km. The population of Noubaghiya is estimated at 3077 inhabitants over a ten-year period (we take into account an annual population growth of 2.5%).

The main activity of this municipality is the breeding with a herd of 4530 heads.

The water supply is made by drilling brackish water and part of fresh water (groundwater [4] insufficient drilling located 8 km from the town).

It is for this reason that the installation of a brackish water desalination unit was decided with funding from the Spanish Cooperation.

The figure below shows the location of Noubaghiya on the map of Mauritania

Figure 1:-Location of Noubaghiya on the map of Mauritania (the flache indicates the position of Noubaghiya).

Choice of sampling stations

The sampling stations were chosen according to their influence on the metallic characteristics along the water production line in the desalination unit.

Three sampling stations were selected at this desalination unit.

EA: feed water, PE: produced water and ER: reject water from the Noubaghiya brackish water desalination unit.

Material and methods:

To evaluate the metallic quality of brackish desalinated salt water by reverse osmosis. We chose as a study site the Noubaghiya commune in the wilaya of Trarza for the desalination of brackish water, and this for several reasons:

1. The inhabitants of this municipality do not have fresh water in their locality, nor in the near surroundings
2. To avoid the risk to the human health of the inhabitants of this region following the use of salt water unfit for food
3. Establish brackish water treatment processes for sites that are poor in fresh water, in order to bring this water back to levels that meet the drinking water standards.
4. For the evaluation of the metallic contamination of the water of this desalination unit, we chose points of the water production line.

Sampling:

As part of our study, we sampled for the analysis of metals in the water of the brackish water desalination unit (Noubaghiya unit).

Samples were taken in polyethylene bottles (bottles) with a capacity of 1L.

The samples taken were conditioned to the laboratory.

Metals were assayed for the acidified samples using concentrated nitric or hydrochloric acid. The metal concentrations: Mn, Hg, Cd, As and Pb were determined using S.A.A.

The Atomic Absorption Spectrometry (AAS) method was used to determine the concentrations of the other micropollutants.

Table 1: Concentrations of heavy metals in the waters of the Noubaghiya unit

U.Noubaghiya	EA	EP	ER	WHO standard
Mn (µg/L)	0,005	0,002	0,009	50µg/L
Pb (µg/L)	33,118	0	225,765	10µg/L
Cd (µg/L)	1,88	0	30,92	5µg/L
As (µg/L)	0,967	0,809	1,757	50µg/L
Hg (µg/L)	0,668	0,378	0,96	1µg/L

In total, five mineral micropollutants were searched (Mn, Pb, Cd, As and Hg) in the waters of the Noubaghiya desalination unit. The results of the analyzed mineral micropollutants analyzed are shown in the table above.

Manganese (Mn)

Manganese was observed at all sampling stations in the Noubaghiya unit with low concentrations (between 0.009 at ER µg / L and 0.002 µg / L at EP level) still remaining far from the fixed MAC. at 50 µg / L by WHO standards for water intended for human consumption.

The figure 2 shows the variation of manganese in the waters of the Noubaghiya unit.

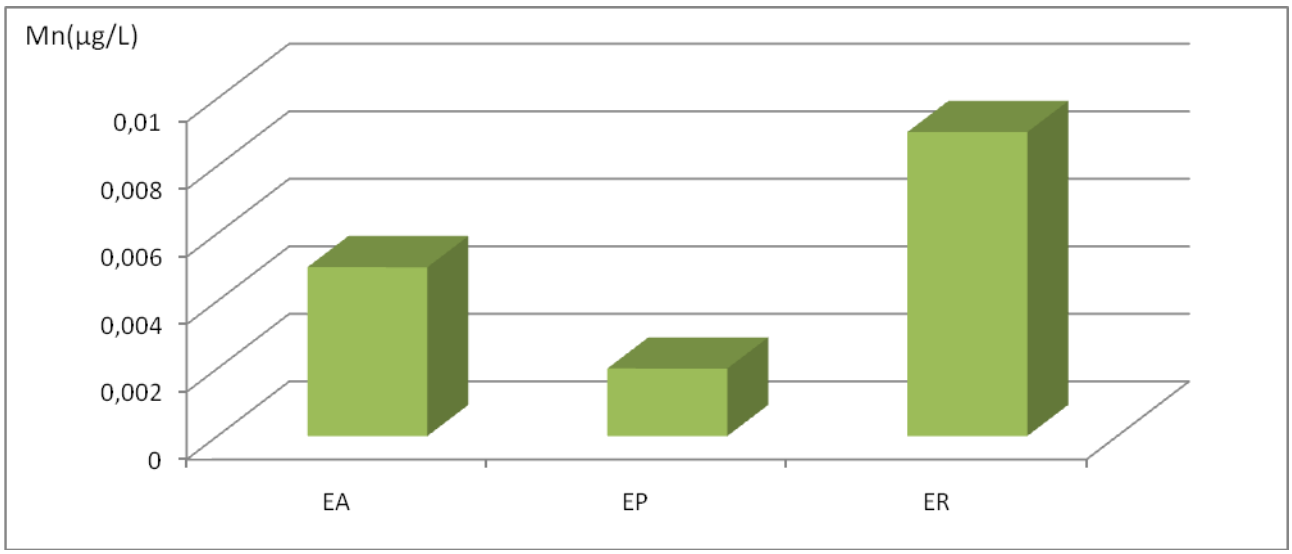

Figure 2: Variation of manganese values in the waters of the Noubaghiya unit

Arsenic (As)

The lowest concentration of arsenic in the waters of the Noubaghiya unit was recorded at the EP station (0.809 µg / L). On the other hand, the arsenic content at the ER station is 1.757 µg / L (table). It is noted that the concentration of arsenic in all EA, EP and ER stations is still lower than the CMA of WHO standards [5] for human drinking water at 10 µg / L (table 1).

Figure 3 shows the variation of arsenic concentrations in the waters of the Noubaghiya unit.

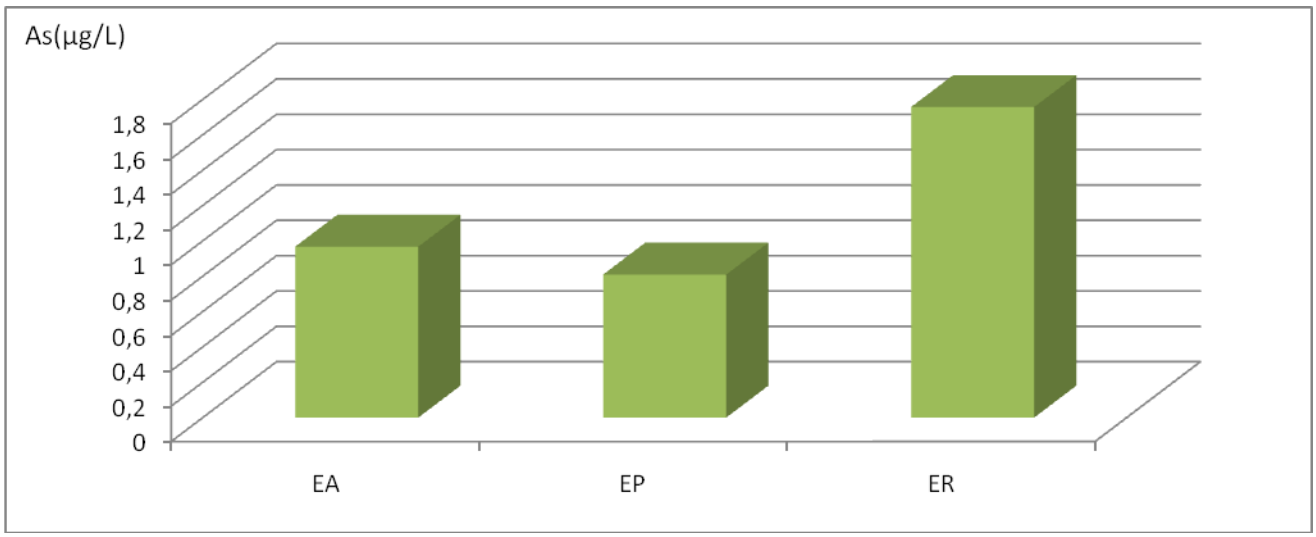

Figure 3:-Variation of Arsenic Values in the Waters of the Noubaghiya Unit

Mercury (Hg)

The results of the Noubaghiya water analyzes for mercury [6] show values between 0.378 µg / L at the EP station and a concentration of 0.96 µg / L at the ER level (board). The concentration of mercury at all the stations of the said unit remains lower than the MAC fixed at 1µg / L by the WHO standards for drinking water

Figure 4 shows the variation of mercury concentrations in the waters of the Noubaghiya unit.

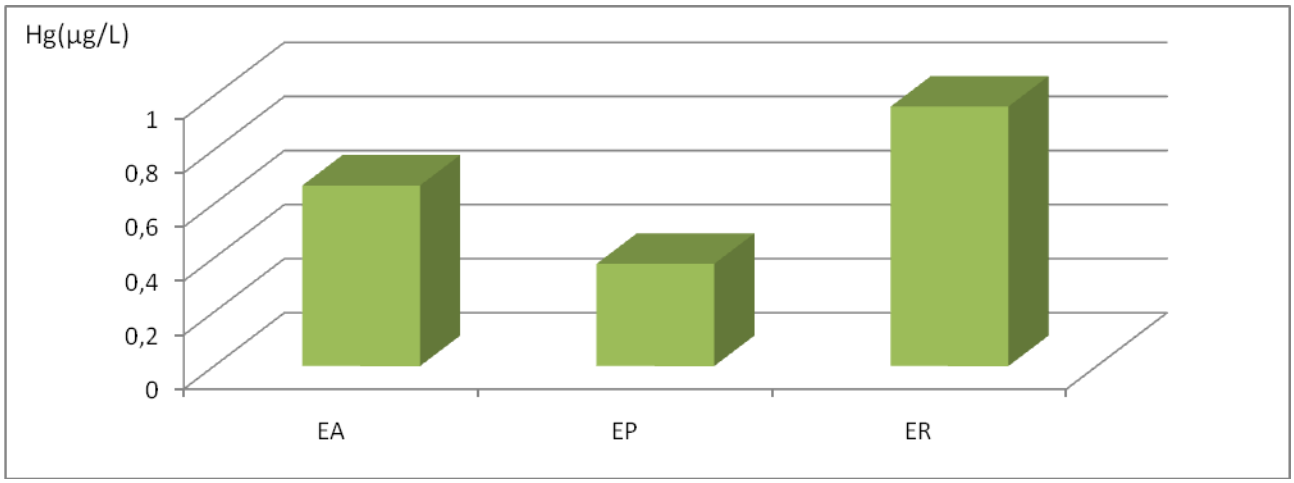

Figure 4: Variation of Mercury values in the waters of the Noubaghiya unit

Lead (Pb)

Lead was not detected at the station of the water produced. However, values of 33.118 and 225.765 µg / L (Table) were recorded at the EA and ER stations, respectively.

Figure 38 shows the variation in lead concentrations in the waters of the Noubaghiya unit

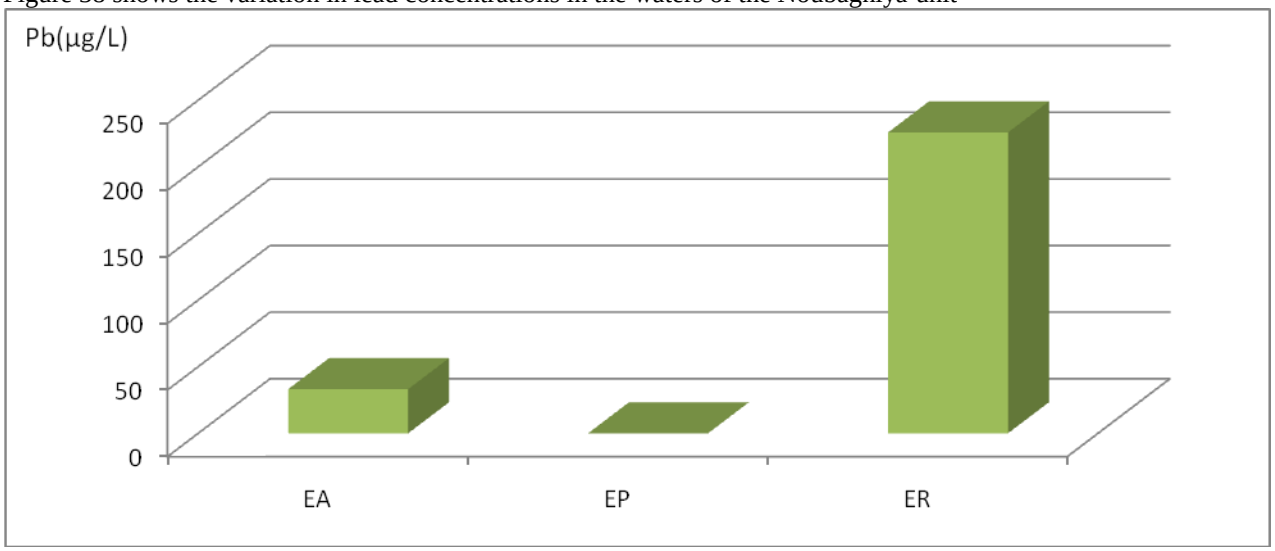

Figure 5: Variation of the values of Lead in the waters of the Noubaghiya unit

Cadmium (Cd)

Cadmium [7] was not detected at the EP station; concentrations of 1.88 µg / L and 30.92 µg / L were recorded at the EA and ER stations of the Noubaghiya (table1).

Figure 6 shows the variation of cadmium concentrations in the waters of the Noubaghiya unit.

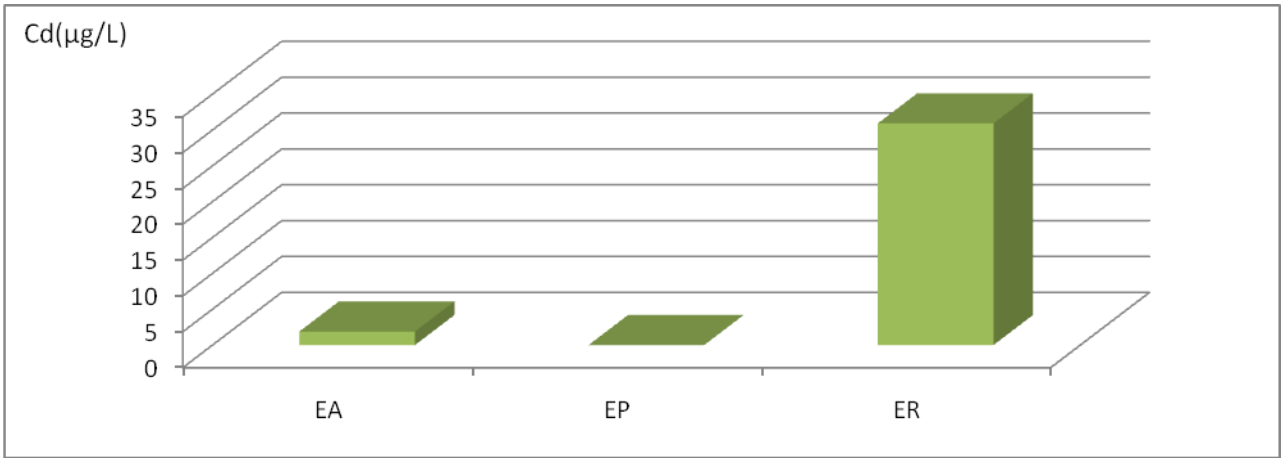

Figure 6: Variation of Cadmium values in the waters of the Noubaghiya unit

Conclusion:-

The present work is part of the assessment of the metallic quality of the waters of the Noubaghiya desalination unit in Mauritania.

The results of the analyzes showed that at the discharge water station (ER), the Pb and Cd contents exceed the standards. Whereas at the level of the produced water station (EP), the Mn, Pb, Cd, As and Hg contents are below the standards.

Nevertheless, at the feed water station (EA), the Pb levels exceed the value set by the standards for drinking water. At the end of this evaluation, it can be concluded that the use of the drinking water of this municipality without prior treatment can constitute a health risk for the population.

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