



Tikrit Journal of Pure Science

ISSN: 1813 – 1662 (Print) --- E-ISSN: 2415 – 1726 (Online)

Journal Homepage: <http://tjps.tu.edu.iq/index.php/j>



Electromagnetic Treatment of Tigris Water samples in Salah-Elden Governorate

Samaher J. Mohammed , Marwah Q. Majeed, Hadeel R. Khatab, Hind S. Mahroz, Marwa J. Mohammed

College of Engineering , Samarra University , Samarra , Iraq

<https://doi.org/10.25130/tjps.v25i3.244>

ARTICLE INFO.

Article history:

-Received: 19 / 8 / 2019

-Accepted: 29 / 8 / 2019

-Available online: / / 2020

Keywords: Electromagnetic field, water treatment, river

Corresponding Author:

Name: Samaher J. Mohammed

E-mail: msamrjasim@yahoo.com

Tel:

ABSTRACT

The technological performance and social acceptance of water treatment in electromagnetic waves were investigated in this paper that studied in samarra university laboratories to detect the effect of electromagnetic field on water properties, it is worth mentioning that magnetic field treatment does not leave any traces of waves in the treated water.

Electromagnetic treatment was applied on water samples using the electromagnetic field with 1.5 tesla intensity and for two continuous hours by a tube with ¾ inch. diameter and 1m length. The chemical and physical properties were studied before and after treatment. It was observed that there was a slight increase in some properties and a decrease in other properties. The reason was either to increase the dissolved oxygen and to dissolve the suspended particles and total hardness. As well as, significant decrease in total count of bacteria.

Introduction

Requirements of water qualities are generally determined from the usage it, Water classified to two types: potable water (drink water) and non-potable, Non-potable water is used for industrial purposes, such as: cleaning, processes of production non-food items and another raw materials, facilities systems like: condensers, boilers, cooling towers, and domestic purposes in garden and public park fountains, swimming pools and garden ponds. Potable water is used for water distribution systems in cities: houses, institutions such as hospitals and schools; The main problem that is identified in water was corrosion, fouling, and bacterial contamination. Therefore; water treatment is important for controlling fouling, bacterial contamination and corrosion. There are many methods of water treatment and they can be essentially classified into type of treatment methods: physical methods, and chemical methods according to techniques and various purposes; One of these water treatment methods using electromagnetic treatment, where has found changing in physical characters specially water temperature, these varying depend on type of treatment and intensity [1, 2, 3].

Many researches and scientists have worked on water treatment in the electromagnetic field such as. [4, 5] the permanent electromagnets field are designed According to Ampere's law, when the electricity

passes through a wire, a magnetized field will be created around it. Some of water chemical and physical characteristic will be changed, these changed included calcium and carbonate ions enter into the magnetic region due to their opposite charges in water sample. In this paper two theories have been developed to address magnetic field effects on (CaCO₃) precipitation: 1st: a direct effect on dissolved ions and 2nd: a magnetic effect on particulates. The first theory postulates a direct effect on dissolved ions. An experimental study prepares a relatively weak magnetic influence (field) increased the viscosity of water, which was interpreted by the stronger hydrogen bonds under this condition [6]. In this experimental research investigated the characteristics of CaCO₃ crystals formed after mixing (magnetically treated), quiescent-filtered solutions of CaCl₂ and NaCO₃. The other mechanism postulates a magnetic effect on particulates present in water rather than on dissolved ions and, further, that changes in the surface charge of particles influence the rate of nucleation and precipitation of CaCO₃ [7].

The main components for effective magnetic treatment are discharge through certain chemical parameters of water and the apparatus, namely; concentration of hydrogenous ions in water at pH > 7.2 and carbonate water Hardness of > 50 mg/L [8,9].

There was a difference in treatment water properties in study that focused on two method silver plate and magnetic field treatment, second method has been sufficient to reduce all water properties significantly: by the cost effectiveness, the field in deposition of all plankton in the water [10]. Magnetized water could improve growth and breeding of common carp in water or in the rivers at mid concentrated salinity (relatively) for increasing magnetized with the time [11].

Area of Study

Water samples of the laboratory tests that were addressed in this research were collected for the period (2017-2018) from the Tigris River in various areas of Salah al-din Governorate in Iraq which far 200 km from Baghdad, including Samarra, Baiji, Al-Dour, Tikrit and Alalam. Water tests were conducted in the laboratories of the University of Tikrit before starting water treatment with electromagnetic field.

Methodology of Electromagnetic Water Treatment

Water samples were taken from different regions in Saladin Governorate. Each water sample was placed in a tube of (3/4 inch) diameter and (1 meter) length after winding it with an electric wire made from copper and connected to an alternating electricity point with 1.5 tesla and left for two hours to complete the treatment process. After that, it was left for a few minutes, then took a sample of water and measured the chemical, physical and biological properties. Compare them with pre-treatment results.

Result and Discussion

Water of many regions was treated by using electromagnetic field. The control sample characteristics measured before treatment in the laboratory and the treated sample characteristics measured after electromagnetic treatment. There were many different in water properties as shown in Fig.1 to Fig.13.

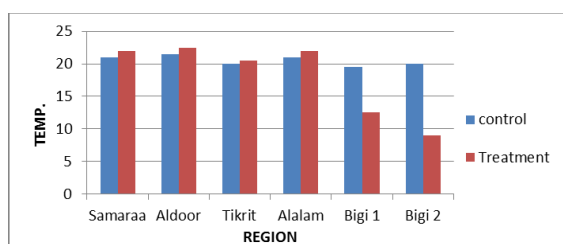


Fig. 1: Variation in temperature before and after treatment

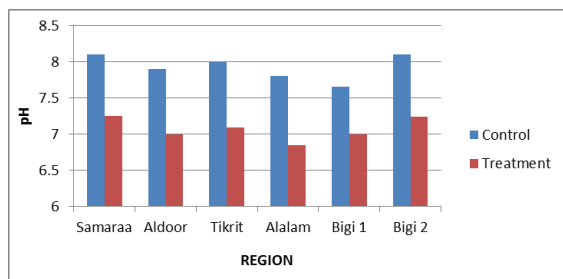


Fig. 2: Variation in pH before and after treatment

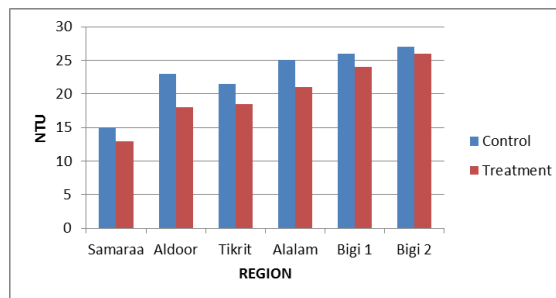


Fig. 3: Variation in NTU before and after treatment

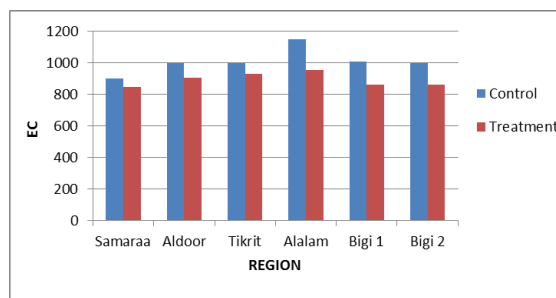


Fig. 4: Variation in EC before and after treatment

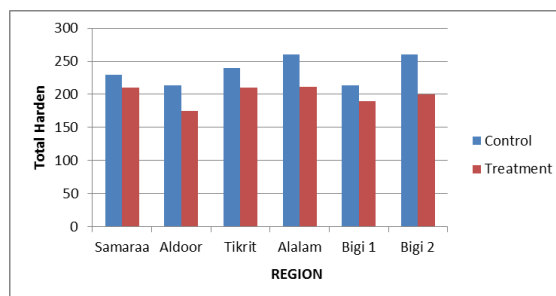


Fig. 5: Variation in Total Hardness before and after treatment

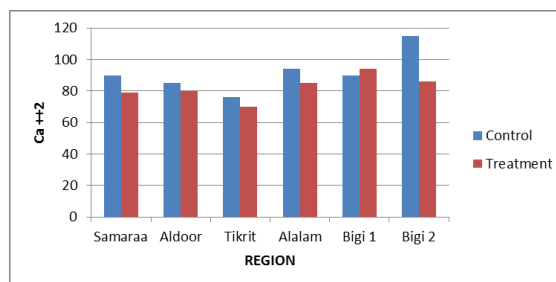


Fig. 6: Variation in Ca^{+2} before and after treatment

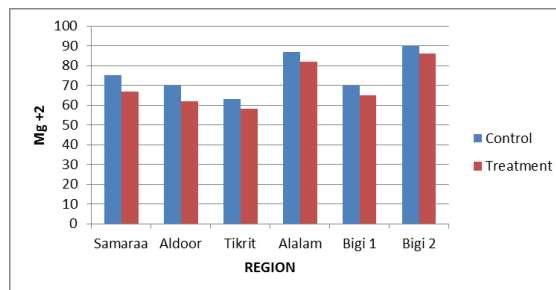


Fig. 7: Variation in Mg^{+2} before and after treatment

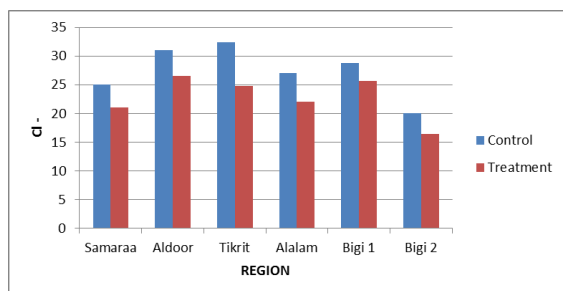
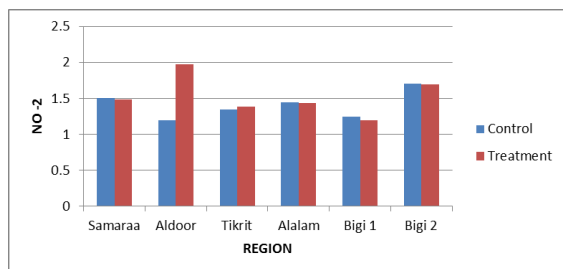
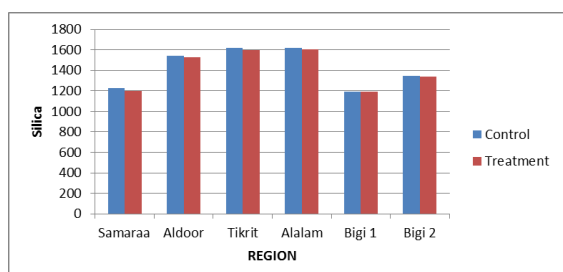
Fig. 8: Variation in Cl⁻ before and after treatmentFig. 9: Variation in NO₂⁻ before and after treatment

Fig. 10: Variation in Silica before and after treatment

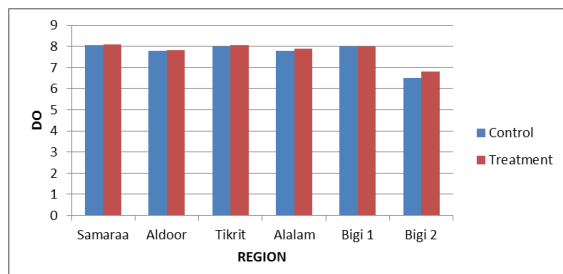


Fig. 11: Variation in DO before and after treatment

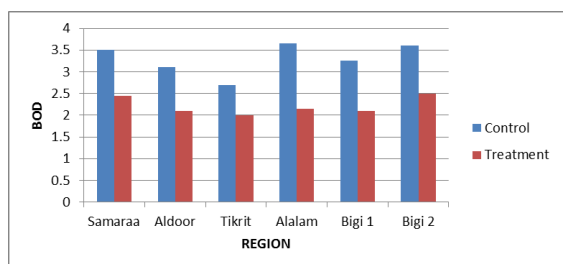


Fig. 12: Variation in BOD before and after treatment

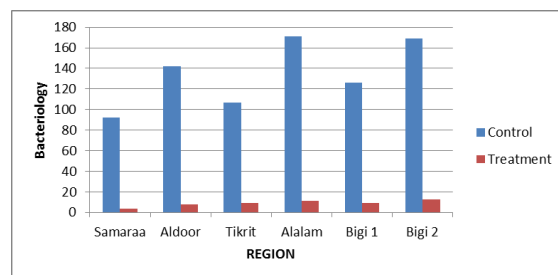


Fig. 13: Variation in Bacteriology before and after treatment

From the previous forms we conclude that there is a difference in the results of treated water, some in increase and the other in a decrease depending on the type of property. For example, there is an increase in temperature for treated water temperature after the application of electromagnetic treatment, reason for this is the swirls of the magnetic field in water samples and when collisions with objects generate heat. This study type of treatment and intensity caused increase in temperature of treatment water [2]. Observed there was decrease in the turbidity values after the treatment, this is due to the effect of the electromagnetic waves that pass through the sample disassociated the suspended particles and transformed them into smaller molecules stuck in water.

There is a reduction in the values of electric conductivity after treatment, which was due to a decrease in concentrations of a number of dissolved salts. For the chemical properties, there was a decrease in properties except dissolved oxygen in water; there was a little increase, which was due to decrease in the concentration of microorganisms consuming oxygen. For BOD, pH, total Hardness, Mg^{+2} , Ca^{+2} , Chloride, NO_2^- and Silica, there were a reduction in properties after treatment, due to either a decrease in microscopic microorganisms as in BOD or the magnetic field cause a correction for the passing water through it as in pH. The treatment worked to decrees the values of Mg^{+2} , Ca^{+2} and Chloride from the original values because the effect of the electromagnetic field and the high temperature worked on the reaction of the dissolved ions and converted to solid deposition molecules. The values of NO_2^- are decreased because the dissolved oxygen is acts on nitrate oxidation, as well as there is an inverse relationship between the Silica and increase the concentration of oxygen. Ionization of water molecules that exposor electromagnetic field due to all these changes in chemical characteristics of treatment water [12, 13].

The bacteriological properties have declined very significantly, especially the concentration of E-coli bacteria because the electromagnetic field kills microorganisms and converts them into suspended objects which easy deposition in water [12, 14].

References

- [1] Ochkova, v.; and Chdova, j. (2013). Magnetic treatment of water: background and current state. 16th international conference on the properties of water and steam. UK.
- [2] Koshoridze, S.I.; and Levin, Yu.K. (2011). Influence of colloidal particle coagulation on scale formation decrease in the process of magnetic water treatment at thermal engineering units. *Thermal Engineering*. No. (7).
- [3] Yahya, Sh.; and Abdul-Razaq, M. (2017). Effect of Irrigation Methods and Magnetization of Water on Quality of Sunflower and Water Use Efficiency. *The Iraqi Journal of Agricultural sciences*. 48 (4):920-929.
- [4] Inaba, H.; Saitou, T.; Tozaki, K.; and Hayashi, H. (2004). Effect of the magnetic field on the melting transition of H₂O and D₂O measured by a high resolution and supersensitive differential scanning calorimeter. *Applied Physics*, 96 (11): 6127- 6132.
- [5] Higashitani, K.; Kage, A.; Katamura, S.; Imai, K.; and Hatade, S. (1993). Effects of a magnetic field on the formation of CaCO₃ particles. *Colloid and Interface Science*, 156 (1): 90-95.
- [6] Ghauri, S.A.; and Ansari, M.S. (2006). Increase of water viscosity under the influence of magnetic field. *Applied Physics*, 100 (2).
- [7] Barrett, R.A.; and Parsons, S.A. (1998). The influence of magnetic fields on calcium carbonate precipitation. *Water Research*, 32 (3): 609-612.
- [8] Bogatin, J.; Bondarenko, N.; Gak, E.Z.; Rokhinson, E.E.; and Ananyev, I.P., (1999). Magnetic treatment of irrigation water: Experimental results and application conditions. *Environmental Science and Technology*, No. 33: 1280-1285.
- [9] Mostafazadeh - Fard, B.; Khoshraresh, M.; Mousavi, S.F.; & Kiani A.R. (2011). Effects of Magnetized Water and Irrigation Water Salinity on Soil Moisture Distribution in Trickle Irrigation. ASCE, *Journal of Irrigation and Drainage Engineering*, American Society of Civil Engineering, 137 (6).
- [10] Mohammed, S.; Majeed, M.; & Ahmed, A. (2019). Water treatment with silver plates and magnetic field: samarra case study. *Journal of Advanced Research in Dynamical and control systems*, 11(01): 1888-1895.
- [11] Alrudainy, A.; & Jumaa, A. (2016). Effect of Magnitized Water on Common Carp Cyprinus Carpio Rearing in Different Salinity Concentrations. *Iraqi Journal of Agricultural Sciences*, 47(2).
- [12] Ebrahim S.; and Azab A. (2017). Biological Effects of Magnetic Water on Human and Animals. *Biomedical Sciences*; 3(4): 78-85.
- [13] Raafat, BM.; and Nabil GM. (2016). Hemoglobin different derivatives concentration enhancement after usage of magnetic treated water as drinking water. *Inter J. Advan. Sci. Tech. Res.*, 6(1):415-424.
- [14] Al-Jack, BH. (2001). The effect of magnetic water on milk properties and bacterial density. *Scientific research DEMO, University of Science and Technology, Sudan*.

معالجة كهرومغناطيسية لعينات من مياه نهر دجلة في محافظة صلاح الدين

سماهر جاسم محمد , مروة قدوري مجيد , هديل رياض خطاب , هند صبار محروز , مروة جاسم محمد

كلية الهندسة , جامعة سامراء , سامراء , العراق

الملخص

استخدمت تقنية الموجات الكهرومغناطيسية كدراسة مختبرية للكشف عن تأثير المجال الكهرومغناطيسي على الخصائص الكيميائية والفيزيائية والبايولوجية لعينات مياه مأخوذة من نهر دجلة بهدف معالجة المياه وتحسين خواصها. تم استخدام مجال مغناطيسي ذي شدة 1.5 تسلا لمدة ساعتين متواصلتين بواسطة انبوب بقطر 3/4 انج وطول 1 متر. وقد لوحظ حدوث زيادة معنوية في بعض الخصائص مثل الاوكسجين المذاب وانخفاض البعض الاخر مثل الاس الهيدروجيني والعكورة والعسرة الكلية, بالإضافة الى انخفاض معنوي واضح في التعداد الكلي للبكتريا.