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Parasites taxa in some sites of Euphrates River in Al-Najaf Province, Iraq

Feryal Ameen Merza[1], Harth Rajab Haider[1], Hind Mhammed Mhammed Ali[2], Ali Hassan Abood[1]*

1. Department of Biology, Faculty of Sciences, University of Kufa, Iraq
2. Najaf Education Directorate, Najaf, Iraq

** Corresponding author's E-mail: aliha.alkhafaji@uokufa.edu.iq*

ABSTRACT

This parasite investigation has been carried out at three different places along the Euphrates River. Water and parasite samples were collected at half-monthly intervals between November 2021 and January 2022, with samples taken every two weeks. Some chemical and physical factors of water were examined. The results showed that total dissolved solids (TDS) ranged from 460 to 1212 mg L^{-1}, total suspended solids (TSS) 5 to 450 mg L^{-1}, salinity (S‰) 0.37 ppt to 1.5 ppt, electrical conductivity (EC) 1120 µs cm^{-1} to 3050 µs cm^{-1}, and pH 6.5 to 9. In the case of parasites, 12 taxa were identified. According to the Shannon–Wiener index, parasite species diversity ranged from 0.2 to 0.76 bits/individual, depending on the parasite type. According to Jaccard similarity index, the highest degree of similarity was found between site one and site two, with 0.75% of the total.

Keywords: Euphrates river, Parasite, Chemical, Physical factors.
Article type: Short Communication.

INTRODUCTION

Waters are a vital source for beings, domestic use, processes of industry, and agriculture. There is considerable interest in the quality of water. Parasitic diseases have remained a public health concern in many regions of the world, particularly in underdeveloped countries, despite recent advances in public health and improved lifestyles. Some pathogenic agents are acquired as parasites primarily through the use of water. These living agents can be conveyed via non-sanitized waters. About 60% of the individuals in developing countries, do not have access to safe waters and up to 2.2 million children die yearly due to diarrhoea (Dura *et al*. 2006, Ayaz *et al.* 2011 & Lv *et al*. 2013). Some parasites, such as *Cryptosporidium* and *Giardia*, are not destroyed by ordinary quantities of chlorine disinfection; as a result, epidemics of these parasites may emerge (Athari 1996; Markell *et al.* 1999). It is believed that waterborne protozoan pathogens are responsible for sickness, primarily in children. In underdeveloped nations, these pathogens are the most common public health reasons for infection in the world (Curry & Smith 1998; Tanyuksel *et al.* 2001; Sattari 2004; O'Ryan *et al.* 2005; Khara, 2011; Daghigh Roohi *et al.* 2015). Infections caused by contaminated water include *Cryptosporidium parvum, Entamoeba histolytica, Giardia lamblia,* and *Microsporidium.* Contaminated waters also produce considerable numbers of *Giardia lamblia* and *Cryptosporidium parvum* illnesses globally (Odikamnoro *et al.* 2014; Smith & Lloyd 1996). So, this study determined some environmental factors and indexes as Jaccard similarity and detected the distribution of parasite taxa in some sites in Euphrates River.

MATERIALS AND METHODS

Samples were collected from the surface waters of Euphrates River from three sites (Fig. 1):
Site 1: 32.084378, 44.387120

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Site 2: 32.026274, 44.415745

Site 3: 31.933147, 44.486276

Site one is around 1 km north of Al-Emam Ali Bridge, site two is where sewage and drainage water have been discharged, and site three is at the meeting place before separating Al-Kufa River in Dabbat's region with a lot of organic garbage. The samples were taken from each site using polyethylene containers, at half-monthly intervals from November 2021 to January 2022 during the morning hours. The water samples were delivered to Biology Department, Faculty of Science, and left for 24 h at room temperature before being sucked and extracted (Zarlenga & Trout 2004; Bouzid *et al.* 2008; Khouja *et al.* 2010). Each sample sediment was analysed under a microscope for parasite cysts and helminth eggs (Bakir *et al* 2003; Ayaz *et al.* 2011). A multi-parameter system was used to measure salinity (S‰: ppt), electrical conductivity (EC: µs cm^{-1}), and total dissolved solids (TDS: mg L^{-1}; multi 340 I meter). A pH meter was used to determine the pH. The devices were calibrated before using via using standard buffer solutions. Total suspended solids (TSS) were measured according to the method described in APHA (1999). Shannon–Wiener index and Jaccard equation described by Stilling (1999) were used to calculate the diversity and similarity.

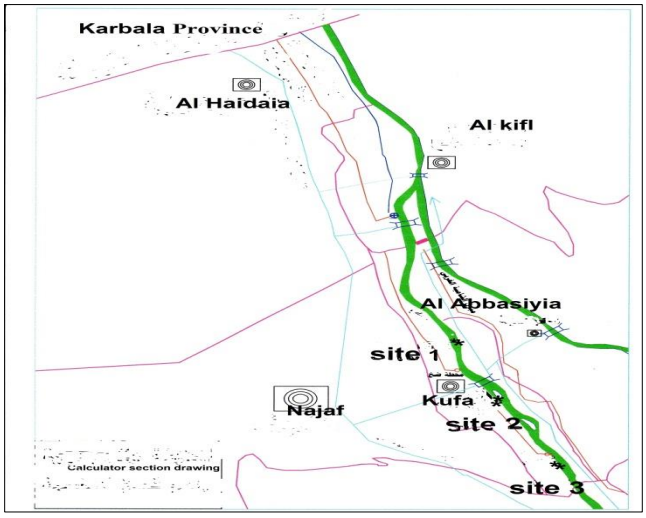

Fig. 1. Map represents the study of sites on Al-Kufa River.

RESULTS AND DISSCUSSION

In this study, the physicochemical characteristics were depicted in Table 1 and Figs. 2-6. TDS are a quantity of the chemical constituents dissolved in waters. The lowest value of TDS (460 mg L^{-1}) was recorded in Site 1, while the highest value (1212 mg L^{-1}) in Site 2. In most cases, the value of TDS is controlled by the concentration of main ions such as bicarbonate, chloride, sulphate, or magnesium in the water, and it is related to electrical conductivity in the water (Shareef *et al.* 2009). The lower concentration of TSS (5 mg L^{-1}) was recorded at Site 3, while highest concentration (450 mg L^{-1}) at Site 2 which may be due to the release of large wastewater at the site. A similar conclusion was obtained by Merza (2017). The electrical conductivity (EC) is a way to measure dissolved salt ions and a fit indication of salts dissolved in water and has a close relation with total soluble solids (Wetzel 2001). EC is based on the entire concentration of salts, chemicals and temperature of water (Ramachandra & Ahalya 2001). Site 2, characterized by high values of electrical conductivity may be attributed to what is discharged into the river from waste and due to high values of TDS in this site (Shareef *et al.* 2009). The highest salinity value (1.5‰) was at site two, while the lowest concentration (0.37‰) was recorded at site one because the dissolved ions were diluted by an increase of freshwater input. It is usual for Iraqi inland waters to have pH readings that are mildly alkaline. Iraqi natural water has a strong buffering capability due to its high calcium bicarbonate content. The findings were consistent with previous research in this area (Merza 2013; Merza 2018). According to the Shannon–Wiener index, site two had the most diversity in November, whereas site one had the least diversity in January (Fig. 7). Sites one and two had a Jaccared similarity value of 75% and sites 2 and 3 exhibited a similarity index of 40%. These taxa may have been shared between the two locations, due to

originating these sites from the same place. Table 2 depicts that the types of taxa of parasites were examined in two stages cysts and eggs. A total of 12 taxa were identified. These taxa belong to helminths and protozoa, some of them including *Ascaris lumbricoides*, *Cryptosporidium parvum*, *Entamoeba coli*, *E. Histolytica*, *Enterobius vermicularis* and *Gairdia lamblia* appeared in all sites. The number of taxa recorded during the present study is similar to those recorded in many Iraqi studies of various waters, such as the results obtained by Merza & Hadi (2020) who recorded 12 taxa in Al- Abbaseya rivers. All the identified taxa in the present study were found in Site 2 which receives the drainage water and sewage, definitely the occurrence of human enteric parasites such as *Cryptosporidium* and *Giardia.* Among parasites, *Ascaris lumbricoides*, *Cryptosporidium parvum*, *Entamoeba coli*, *E. Histolytica*, *Enterobius vermicularis* and *Gairdia lamblia* appeared at the three sites. Communal parasites like *Ascaris lumbricoides*, *Taenia saginata*, and *Trichuris trichura* are transmitted to humans by water which is dependent on the number of distribution stages, the abundance of diseased animals, agricultural methods, status of the host and habits, etc., hence, the environment is contaminated with the stages of parasites and zoonotics life cycles (Fallah *et al.* 1992; Dorny *et al.* 2009).

Table 1. Values of range of factors in the sites.

Factor	Range
Salinity	0.37 - 1.5 ppt
EC	1120 - 3050 µs cm^{-1}
TDS	460 - 1212 mg L^{-1}
TSS	5 – 450 mg L^{-1}
pH	6.5 - 9

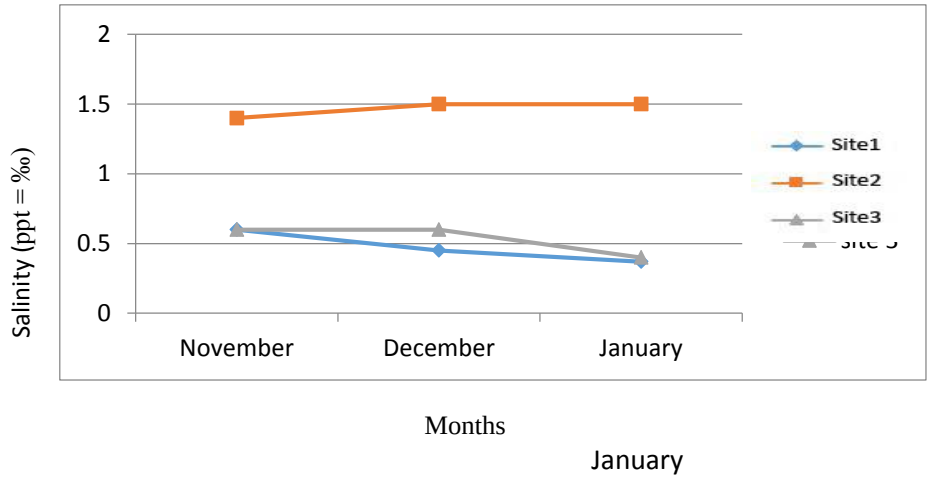

Fig. 2. Salinity (S‰) recorded in Al-Kufa River sites during the time of study.

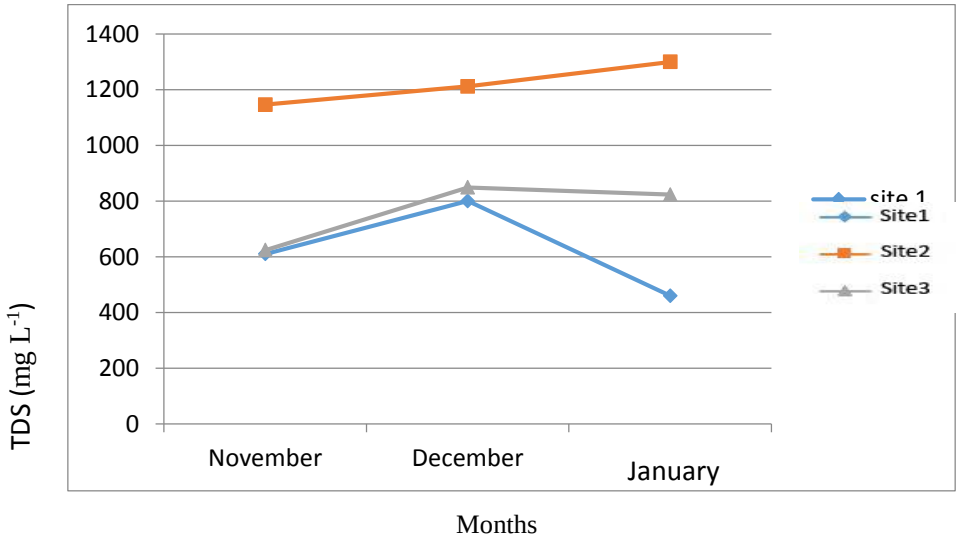

Fig. 3. TDS recorded in Al-Kufa River sites during the time of study.

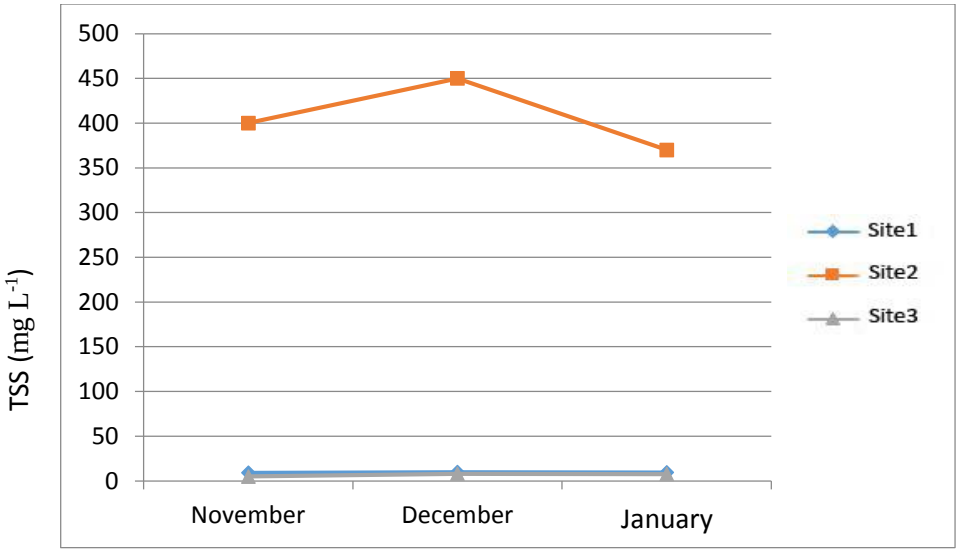

Fig. 4. TSS recorded in Al-Kufa River sites during the time of study.

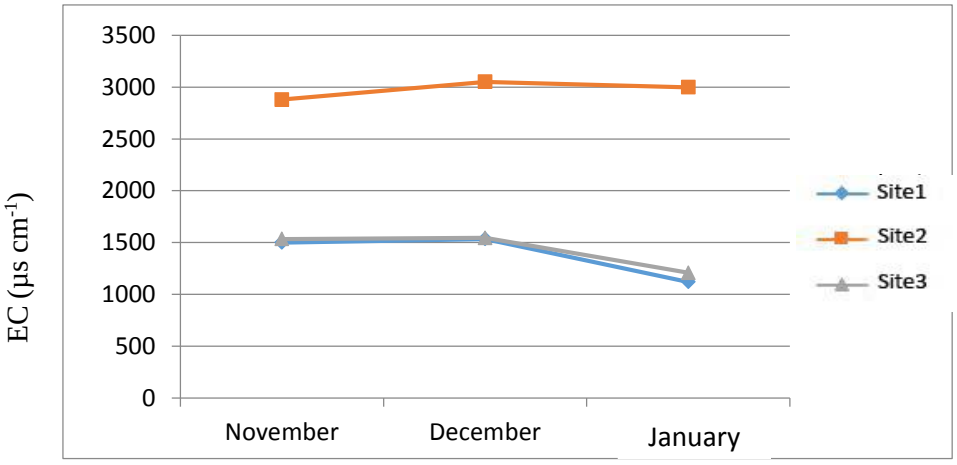

Fig. 5. EC (µs cm^{-1}) recorded in Al-Kufa River sites during the time of study.

Table 2. List of parasite taxa identified in sites of study: (+) present, (–) absent.

Parasite types	Stage	Site 1	Site 2	Site 3
Ascaris lumbricoides	egg	+	+	+
Ancylostoma uodenale	egg	+	+	-
Balantidium coli	Cyst	-	+	+
Cryptosporidium parvum	Oocyst	+	+	+
Entamoeba coli	Cyst	+	+	+
E. histolytica	Cyst	+	+	+
Enterobius vermicularis	egg	+	+	+
Fasiola hepatica	egg	-	+	-
Gairdia lamblia	Cyst	+	+	+
Schistosoma Mansoni	egg	-	+	+
Trichuris trichiura	egg	+	+	-
Taenia saginata	egg	+	+	-

Table 3. Jaccared similarity index of parasite group in this investigation.

Sites	S2	S3
S1	75%	40%
S2		72.7%

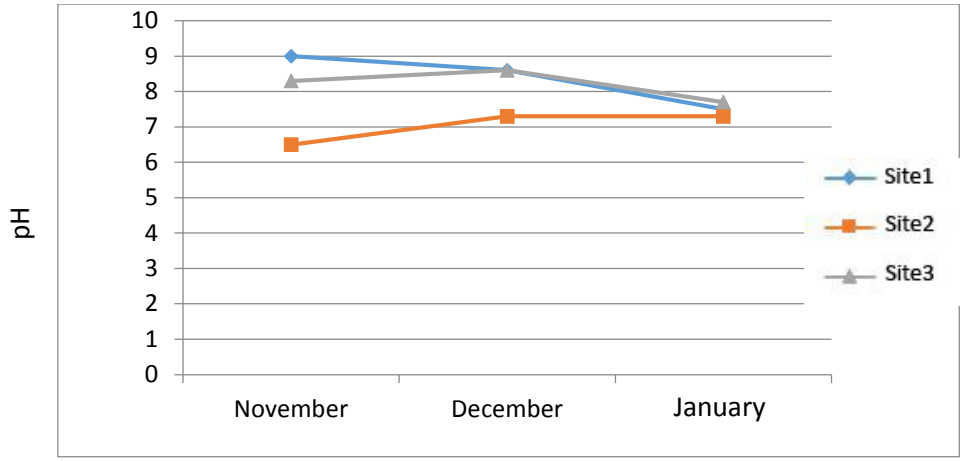

Fig. 6. pH recorded in Al-Kufa River sites during the time of study.

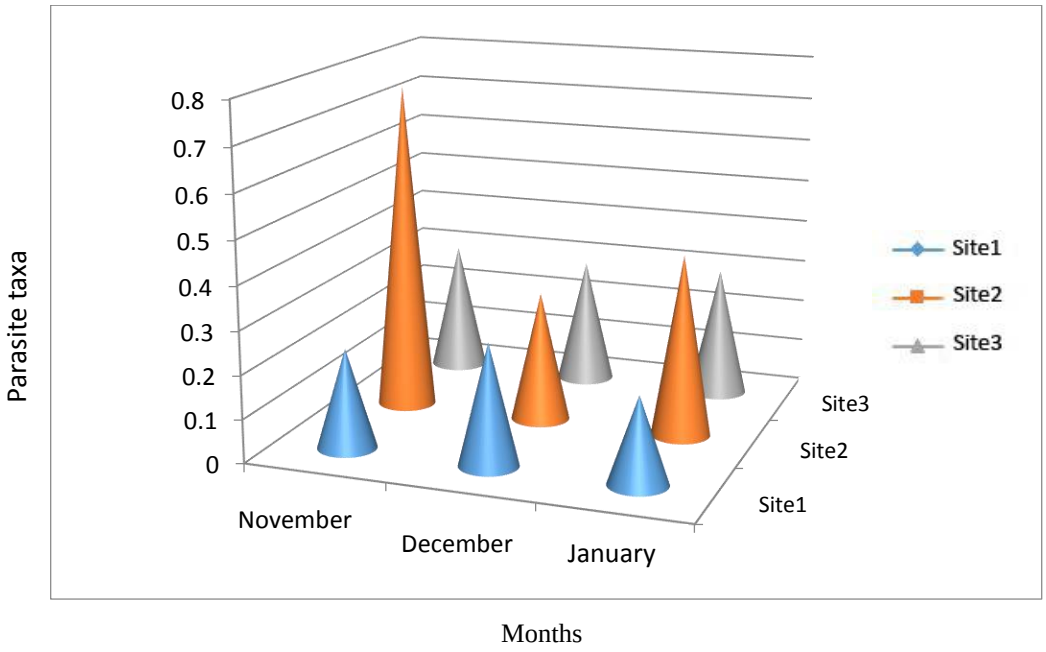

Fig. 7. Parasite taxa diversity during the time of study according to Shannon–Wiener index.

CONCLUSION

The water quality of Al-Kufa River in this study was considered to be slightly alkaline, and concentrations of some environmental factors were in some months exceeded the permissible limits. *Ascaris lumbricoides*, *Cryptosporidium parvum*, *Entamoeba coli*, *E. Histolytica*, *Enterobius vermicularis* and *Gairdia lamblia* appeared in all sites. All the identified species were found in Site 2. Certain parasites have been recognized as waterborne pathogens. The population of these parasites, in turn supports contamination of the environment.

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