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INSPECTION OF THE DISTRIBUTION OF THE BORON ELEMENT IN THE WATER AND TYPHA DOMINGENSIS OF AL-TAYEB RESERVE / FIELD STUDY TO REACH A NATURAL BIOLOGICAL TREATMENT

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Abstract
The analysis of surface water quality in Al-Tayeb Reserve is very important given that it is considered in particular as a resource for tourism and reserves. The current study used the study of the concentration of boron in water and Typha domingensis plant in eight main stations of Nahr al-Tayyib located in the city of Maysan, Iraq. The experiments were carried out on boron concentration. The mechanical biological treatment of minerals such as boron in polluted water takes less time because the minerals cannot decompose easily, and therefore effective cleaning to reduce or remove toxicity requires the use of plants to remove toxins or reduce environmental pollutants, natural, biological, chemical or physical activities in urban soil, especially for some reserves, if conducted The current study to determine the effect of water pollution with heavy elements (Boron B) and plant uptake of pollutants. Eight sites were identified in the Tayeb River. There was a relationship between plant uptake of the element depending on the level of pollution in the river (0.033), respectively. Boron compounds can be dissolved in water through its transfer to the plant, and it is considered environmentally friendly and a good bioprocessor for metal pollutants.

Keywords: Al-Tayeb Reserve, Boron , Natural reserve.

1- INTRODUCTION :

Al-Tayeb Reserve is located in the Al-Tayeb district, northeast of Maysan Governorate, in southeastern Iraq, adjacent to the Iraqi-Iranian border, in the alluvial salt marshes of the Tigris and Euphrates, in the territory of fresh internal waters at the bottom of the Tigris and Euphrates rivers. Its area is 1192 square kilometers. The two rivers “Al-Tayyib River and the Dwerij River”. Seasonal marshes arise in the winter and dry up in the summer. In the reserve there are animals threatened with extinction, such as the reem deer and the spiny-tailed lizard. The Al-Tayeb Reserve is in the district of Al-Tayyib. It includes 14 villages, with a population of about 1400 residents until the year 2020 AD, and most of the residents of those villages They work in raising sheep and buffaloes, farming, grazing, and extracting gravel (Al-Shablaq and Ammar,1998). On April 21, 2022, the Maysan Environment Directorate announced that “the first steps were taken to demarcate the borders of the Al-Tayyib Reserve, where the status of the reserve and logistical matters on the ground were discussed by reviewing the plans and maps prepared for that.” They stated that the Al-Tayyib area has witnessed a significant decrease in Water imports in the Aldürg River (Altoviski, 1962). Typha domingensis is an herbaceous perennial plant that grows from a

rapidly spreading root all year round. Very wide range of modern, traditional and medical applications (Awni, et al. 2008). To decontaminate aquatic ecosystems, several techniques such as incomplete removal of minerals, high reagent and energy requirements, toxic sludge generation or agriculture are used as bioremediation (Barwary, 1993). Various studies have been examined for demineralization and boron specification, such as (Budy and Jassim, 1980).

The natural purification of water in liquid form is based on chemical absorption and uptake by water molecules and organic matter, uptake by organisms of nutrients, and decomposition processes by organisms in soil and water environments. It appears that the initial concentration of heavy metals affects the bio-absorption process (Davis and Dewiest, 1966). It appears to be critical to determine the maximum saturation potential of biosorbents with which to work at higher concentrations of heavy metals (Drever, 1997; Enad, 2007). The boron element has a wide range of functions in the plant, the most important of which are: It controls the percentage of water inside the plant, as well as the absorption of water from the soil. It has to do with the movement of sugars to their storage places because it reduces the polarization of sugar and reduces the effort required for its transfer. It has a role in pollen germination (Jassim, et al. 1984; Hamza, et al. 1989). The symptoms of boron deficiency begin to appear with the collapse of the meristematic tissue cells in which active divisions occur, which are the developing peaks and cambium regions, and the vascular bundles are affected by the roots and stems, and the transmission of water in them is disrupted, so wilting occurs, which is often the beginning of the appearance of the deficiency of the element, and death occurs to the terminal bud of the stems (Hamza, et al. 1989). The carbohydrate content of the roots and stems of the plant that suffers from a boron deficiency is little because of the disruption of the transport of carbohydrates and an increase in their concentration in the leaves. In severe cases, the growing tops die, and the young leaves become deformed. Brown or black corky spots appear in the storage organs of roots and tubers and because the edges of the leaves split when the leaves increase in size, the lack of boron sometimes leads to yellow or brown leaves (Pedro and Evan, 2007). The size of the plant that suffers from a lack of boron is smaller than the normal size, and the growing tops of the roots and stems die(Jassim, et al. 1984). The symptoms of deficiency of the element increase when there is a lack of ground moisture, and in cases of high temperature and high lighting, which are conditions that do not encourage the transfer of boron from the leaves to the other parts of the plant (WHO, 2004).

Boron deficiency leads to the appearance of brown or corky black spots scattered on the surface of the roots, or close to the growth rings in beets, and in Swedish turnip large brown areas appear near the center of the root, and in cauliflower the discs are colored brown, and in broccoli the flower buds are colored brown, Watery areas appear on the stems of cauliflower, broccoli, and cabbage, which later develop into horizontal cracks (Wynn, 2022) . Dissolved brown lines appear on the petioles of celery leaves from the outside, and from the inside the epidermal cells decompose. In chard, colored lines sometimes appear, with cracks on the inner side of the leaf petioles. In grapes, terminal buds do not grow, side

branches abound, and yellow spots and holes appear on the leaves, especially on the edges (Jeff and Bangeman, 20220). This research used innovative facile treatment techniques and focused attention on the use of natural bioactive materials of Typha domingensis plant to reduce boron and try to remove it in Nahr El-Tayeb as effective natural biomarkers.

2. Experimental

2.1. Sampling

Eight main stations were chosen in this study in Al-Tayeb Reserve, and three main locations the beginning, the middle, and the end) were chosen for each area for the purpose of the study, and they were named according to the coordinates, and these locations were determined by (GPS). / Geko 201, Taiwan)

2.2 Sample collection:

Water samples were collected from surface waters (about 30 cm below the surface) as well as Typha domengensis (Class: angiosperms, Family: Typhaceae) (Linnaeus, 1758).

2.3 Determination of boron element

According to (Stavridou, et al. 2020) by use of an atomic spectrometer 700, and it was examined in the Quality Control Division of the Ministry of Commerce's General Company for Foodstuff Trade. The substance to be measured must be a liquid, thus samples of solids that are to be turned into solutions must be organized and melted in a precise way in order to estimate the element's concentration. Jena. All species' samples were weighed out at 50 mg each, and the digesting vessel was then filled with 5 ml of nitric acid HNO3 65%. The mixture was then thoroughly shaken or agitated with a clean glass rod as necessary, and we waited at least 20 minutes before sealing the jar, heating with the following microwave program Wait until the containers are approximately the same room temperature to prevent foaming and splattering (20 minutes). The digesting jar was cautiously opened in a fume hood while wearing eye and body protection. Quantitatively transferred into Falcon tubes, the gas was then diluted to 15 mL with deionized water. For a quality control test, 0.250 g was put into a Teflon container, reconstituted with 2 ml of deionized water, and then 4 ml of HNO3 were added. Five repetitions were carried out for each sample digestion the same digestion procedure was used to obtain calibration blanks from 2.0 ml of deionized water. In this investigation, the limits of detection for the metal were determined as three times the standard deviation of the mean of five blank measurements for techniques based on a single test (Bachmann-Pfabe, et al. 2020).

PH: Using a pH meter, the pH levels of a water suspension were determined. Take 50 cc of a water sample to prepare the suspension. Add 50 milliliters of distilled water. After thoroughly blending, the solution was set aside for 30 minutes while being stirred every few minutes. A whole hour had passed after the solution was allowed to hang before being completely mixed (Ali, et al. 2020).

3-Statistical Method

According to Sigma Plot, 2020, the statistical analysis was completed. Using various statistical coefficient of determination, concordance correlation coefficient, interclass correlation coefficient, and mean prediction error metrics, it was evaluated. The Principal Components Analysis of Element Normality Test (Henze-Zinkler), Normality Test, is used to compare the concentration with information from their label and suggested criteria released by WHO and USEPA (Shapiro-Wilk and Mann-Whitney Rank Sum Test). N is the total number of paired observations, and r2 is the coefficient of determination. When r2 is equal to 1, the approaches' overall predictions are 100% accurate. To evaluate how well the methods predicted outcomes and to contrast them with the conventional approach, the mean prediction error (Pe) was calculated ,data plotting method by used to analyses the agreement between the standard methods and according WHO and USEPA (WHO, 2004; Grigoriou, et al. 2020).

4. Results and Discussion

4.1 PH Properties of water :

The findings demonstrated that alkaline water samples had PH values that ranged from (7.05-7.90) and had an average of (7.66). Fig. 1 and Table 1 illustrate the PH concentrations in the study locations. This result is comparable to that of (Mai,et al. 2020), who found that alkaline components in the atmosphere can be deposited but that heavy metals bind with carbonates and thus limits their movement (Zhang, et al. 2020). In plantsIncreased negatively charged water causes slower or more deliberate mineral movement in the water, which results in higher uptake of heavy metals. Moreover, the water's high pH According to certain studies, irrigation water enhances a plant's alkalinity, salinity, and nutrients (Neggaz, Nassima, 2021). Under conditions when the pH of the water is equivalent to that of the base, water's ability to limit the migration of heavy metals improves with elevation of the pH. Compared to cadmium, zinc, and nickel, which are each medium to non-moving, boron is very mobile (UNEP-WCMC. 2019). More mineral retention results in a greater impact of water acidity on the solubility of plants and solubility occurs when water pH is higher (32) .

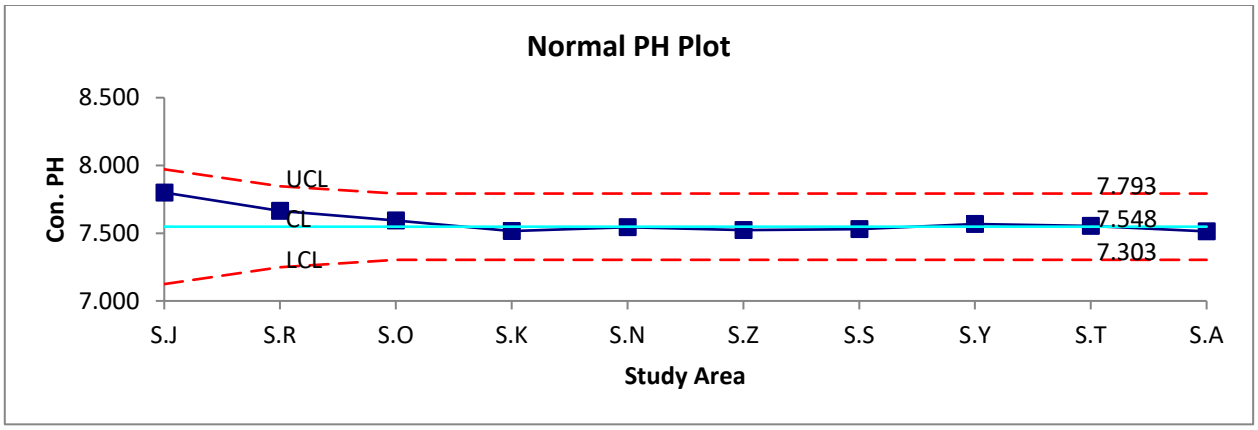

Fig (1) showing PH concentrations in the study areas

Table (1) Shows PH concentrations in water and Typha domengensis the study areas

Station	PH in Water	PH in Typha domengensis
1	7.8	8.7.5
2	7.53	6.4
3	7.45	7.7
4	7.57	7.1
5	7.61	8.1
6	7.39	7.5
7	7.59	6.5
8	7.72	5.1

4.2Boron (B) Concentrations in Plant and Water:

According to the average results of the plants, there is a relationship between plants that varies from one to the next depending on the plant species' content and ability to absorb boron (0.033). Table (2) displays the variation of boron concentration in plants, which indicates that variables with positive correlation coefficients and P values below 0.050 tend to increase together.

Table (2) shows the variation of Boron concentration in water and plant

Samples	Average ppm	SD	M
Typha domengensis	0.033	0.039	0.039
Water Near the plant	0.282	0.314	0.125
water Far the plant	0.280	0.315	0.183
water Control	0.026	0.053	0.002

The proximity of the water to the plant and the water farther away from it affects the differential in concentration of this element in the two. Findings were examined and contrasted with information from their published label and suggested guidelines (Reyam, 2018) . There is no significant association between the two variables water and plants in any of the sites, as indicated by negative correlation coefficients P values more than 0.050, with P=0.425.

Table (3) Concentration boron in Water, and Typha domingensis

Station	Water near mg µgL-1	Water control mg µgL-1	Water far µgL-1	Typha domingensis mg kg−1
S1	2.4	1	1.76	3.82
S2	2.29	1.2	1.56	4.95
S3	3.94	1	1.93	3.94
S4	2.49	2	2	4.94

S5	2.83	1.4	1.83	4.99
S6	2.03	1	0.99	3.84
S7	3.94	1.3	1.82	3.65
S8	3.04	1.2	2.91	4.05
Mean	3.12	1	1.85	4.27
SD	2.6	1	1.49	0.5
P value	2.03	1.4	1.01	0.01
r2	0.003	0.001	0.002	

This metal has an excessive number of simultaneous chemical reactions, making its chemistry extremely complicated. The environmental issue, with the need to reduce global CO2 emissions, is advantageous for the use of biomass because, when this is burned, CO2 is released into the atmosphere; however, boron deficiency causes the emergence of brown or corky black spots scattered on the surface of the roots, or close to the growth rings, which used an indicator innovative simple treatment techniques and focused attention on the use of natural bioactive materials (Ati, et al. 2022a,b).

Conclusion and Recommendation

Environmental biodiversity is used to define environmental limits with any changes in climate change through periodic assessment and identification of reserves types to control vegetation cover, organisms and prevailing water flow, especially the physical and chemical properties in study areas and to develop new data necessary for effective control and monitoring to achieve biodiversity goals. In addition, there are difficulties that stem from the use of global indicators, as the dominant plant species provide information about the high density of vegetation and its characteristics, which indicates that protected lands are managed by limiting human activity to preserve public spaces, and that the evaluation of plant species in the region is In response to environmental climate change, which has an impact on the plant diversity of the reserve. Therefore, it can be concluded that the level of plant absorption of the element was more than the required limit, and it is good as an environmentally friendly plant and biologically treated alive for it to preserve the organisms in that reserve

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