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FULL PAPER

Biological treatment of contaminated soil by some heavy elements by using vegetable and fruit waste

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The present study tested three types of waste (orang crusts, pomegranate crusts, banana crusts) for repairing some lab ecosystems through their ability to treat contaminated soil with some pollutants metals produced from some laboratory equipment. C = contaminated soil only that considered being a control test. Both plants were exposed to heavy elements (Pb, Cd, Cr) for three weeks and recorded the tolerance range weekly. All data recorded was triplicate. An atomic absorption spectrometer was used to estimate the metals concentrations. The results show primarily significant differences at each mineral concentration towards treatments during the tested period. This work aimed to find a friendly and straightforward way to limit contamination in the aqua ecosystem.

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Introduction

Substantial metals are normal parts of the Earth's outside layer, some of which are naturally significant and have extremely low focus and assume a significant part in human wellbeing [1]. The two fundamental wellsprings of weighty soil components are the foundation to the Earth's regular science and contamination from different human exercises, which can happen using compost, sewage ooze, air minute affidavit, and creature squander minimal [2]. The gathering of substantial components in farming soil is a developing concern in light of its relationship with sanitation or its connection through draining to groundwater, just as the surface water of neighboring waterways and water bodies, which might prompt potential wellbeing chances. Unsafe substantial metals may likewise come from rocks shaping similar soil anthropogenic sources like strong or fluid stores, agrarian exercises, or modern and metropolitan emissions [3].

Soil pollution by substantial metals is the consequence of different human exercises, like transport methods, horticultural practices, modern exercises, and garbage removal techniques. The complete convergence of weighty components in the dirt might allude to the all-out metals, yet it does not confine us to any data on their compound nature or bio profit [4]. Weighty components contaminate agricultural soil through the expansion of synthetic manures, pesticides, and untreated or, to some degree, treated sewage, which is among the main soil contamination factors worldwide. The vehicle and destiny of substantial soil components vigorously on their synthetic structure and metal separation. The underlying fast response that happens in minutes or hours is consumed into the dirt. Afterward, the lethargic adsorption responses that require whatever or even a long time are rearranged into various synthetic structures through their different natural accessibility transport and harmfulness [5]. Substantial components ingest and gather in various plant species and assortments and can amass in certain plants in a considerable sum without showing side effects of harmfulness. In contrast, lead components enter plant tissues rapidly and aggregate in green parts [6].

Soil pollution with substantial components like Pb, Cr, Cd, Ni, Cu, Zn, Fe is perhaps the most genuine ecological problem worldwide. The continuous removal of the collection of unsafe materials in the dirt, the removal of metropolitan and modern waste, regular farming practices, and the utilization of composts and pesticides have added to the aggregation of numerous substantial components in the dirt. Notwithstanding the utilization of inorganic composts containing a great extent of debasements, like phosphate manures, nitrates, and potassium salts [7, 8]. The conveyance of weighty components in the dirt is constrained by numerous collaborations, including metal statement and breaking down, ingestion of particle trade and its cerebrums, trap and water intricacy, development, and absence of shortage of organic development, lastly by plant retention [9].

Weighty metals may adversely influence the dirt climate, horticultural creation or item quality, water quality and eventually harm the soundness of the area through the natural way of life. These impacts are firmly identified with natural accessibility, constrained by soil metal particle types, so deciding the free metal particle focus in the dirt arrangement is significant. The free metal particle fixation does not rely exclusively upon the complete metal substance [10]. Contamination by weighty components is a genuine ecological issue since they are non-degradable. Some display bioaccumulation, the vast majority of which affects creatures when they surpass a specific level in the dirt, some of which are fixed because of their reasonably normal standard development. At the same time, some of which are portable along these lines will probably take the chance of their vehicle through the dirt layers into the spring or through the assimilation of vegetation [11]. Weighty specialists cause genuine medical issues like growths from disease and different illnesses. Subsequently, a consciousness of the well-being hazards related to ecological synthetic substances has prompted a massive change in worldwide consideration towards forestalling the amassing of substantial metals in soil, food and different environments. It is of concern regarding their non-degradable nature and long-haul organic life span [12,13].

The point of this review is to treat the defiled soil (lead, cadmium, chromium) by exploiting the misuse of certain leafy foods (orang crusts, pomegranate crusts, banana crusts).

Scientists give a great significant interest in environmental (water, soil, and air) pollution. So they concentrate their work on a different process for removing metals from water, such as limiting the toxicity of some heavy metals that cause harm to plants. Another way is by using plants as bio filters for polluted water and biomonitoring of many metals in the ecosystems [14]. The dangers of these elements and minerals are because of their harmful and lethal effects on organism's life. For example, they can quickly enter the human body by contaminated water and food. Some heavy elements that interfere with gene expression causing damage to DNA repair systems, include oxidative stress that will negatively affect body organs and metabolic cells [15].

Plants and their residues show high removal efficiency also adsorption of some heavy metals from polluted or contaminated water. New studies revealed that many plants such as *Arunda sp.* may be used for phytoremediation purposes. Giant reed

(*Arundo donax* L.) has received un attention for remediation soils and water polluted by multi-metals due to its capacity of rapid growth and high yields [16,17]. There are new research shows the remarkable ability of plants to accumulate minerals. A study by [18] on (*Sambucus nigra* L.) shows that a higher concentration of some toxic elements was found in leaves than in the roots, many plants take a role in limiting and removing some heavy elements such as *Acalypha wilkesiana, Asclepias curassavica, Dodonaea viscosa, and Tabernaemontana divarigata,* also other plants like *Aptenia cordifolia, Carpobrotus edulis and Bryophyllum tubiflorum* [19]. A study was done on *Chlorophytum comosum*, and a study on *Euphorbia milii*, ensures that plants can be a suitable biotreatment [20]. Also, a recent study on *Helianthus annuus* and *Hydrangea paniculata* reported that these species might accumulate significant amounts of Cu and Pb [21].

Materials and methods

I- Plants samples collecting and preparing three samples were chosen and the collection was done randomly from many regions of Baghdad city at the beginning of seasons. Clean, fresh Leaves were first washed by tap water and then by dilute water. Then they were cut into small pieces and dried, and crushed to be a powder [22].

II- soil samples collecting and preparing the contaminated water samples were taken from the wastewater was produced from an atomic absorption spectrometer at some laboratories in Baghdad. Water contaminated samples were collected in clean plastic containers well closed.

III- Treatments preparing three treatments were prepared and tested (orang crusts, pomegranate crusts, banana crusts). These treatments were added to a specific volume of contaminated water in the soil. However, the treatment [C= contaminated water only is considered a control test].

TABLE 1 The contents of prepared treatments

N	Treatments	The Weight of Crusts in gm
1	o/ orang crusts	2.5
2	b/ banana crusts	2.5
3	P/ pomegranate crusts	2.5
4	C	control test(Contaminated water without plants mixed)

IV- Mineral elements measuring

Shimadzu's AA-7000 series features 3-D optical system, which is capable of producing a maximum performance for both flame detection (Pb 0.015 ppm) and furnace detection (Pb 0.00005 ppm). This is achieved by optimizing the light beam and digital filter and using optical components that restrict light loss. The optical double-beam photometric system is automatically set for flame measurements, and the high-throughput, single-beam photometric system is automatic.

Samples of mixed plants and contaminated soil were subjected to be analyzed by the atomic absorption spectrophotometer (AAS-7000) for measuring the concentrations of (Pb, Cd, and Cr) [10]. Minerals were measured weekly for one month. All the data were triplicate, and all tests were in the market research and consumer protection center/ the University of Baghdad.

Result and discussion

This study tested a new strategy for bio-treatment through some Vegetable and Fruit waste. This can be a step for getting a friendly way for repairing some lab ecosystems using three crusts (orange, pomegranate, and banana) for their ability to treat lab water of soil before throwing it into the environment [23]. Four treatments were prepared in this study one is the control treatment, and the three others are a mixture of, the efficiency of the three plants were tested for the limitation the concentrations of some contaminated minerals such as (Pb, Cd, and Cr) that cause pollution to soil ecosystem in the laboratory and farther to the aqua system and the minerals assay in the study as shown:

TABLE 2 Minerals concentration (ppm) at first week

Treatments	Pb	Cd	Cr
Control	50	50	50
b	5.7200	13.8520	16.0907
o	1.1400	2.5550	15.7784
p	5.3800	6.7969	15.6817

Table 2 reveals significant differences among all data through the experiment for each polluted mineral tested except the Cr element for all treatment used (orang crusts, pomegranate crusts, and banana crusts).In contrast, the concentration of the minerals (Pb, Cd, and Cr) decreased from 50 ppm to a lower concentration for orang in Pb element, and the same in Cd but no significant differences in Cr.

TABLE 3 Minerals concentration (ppm) at second week

Treatments	Pb	Cd	Cr
Control	50	50	50
b	5.7263	8.3780	14.4669
o	6.1193	11.2992	13.6967
p	4.4491	7.6273	15.5703

In Table (3), the results display no significant differences in Pb, like in the first week by banana or pomegranate, there were no significant differences in Cr for all treatment, Pb, Cd is increased by treatment with orang.

TABLE 4 Minerals concentration (ppm) at third week

Treatments	Pb	Cd	Cr
Control	50	50	50
b	4.5474	5.7477	14.3420
o	4.4000	3.7155	6.4937
p	1.2070	0.1969	6.8059

Table 4 displays significant differences in Cr for all treatment and by pomegranate for Pb, Cd respectively and for orang. We have different data in this week with the second week.

Biological treatment activity

The importance of the synergistic activity of plants has emerged as antibiotics towards some pathogenic microbes [24,25]. While research based on the synergy between one or more plants to reduce or remove some chemical pollutants from the environment were few. So this activity had to be tried against some chemical pollutants released into the environment, causing severe problems that are difficult to deal with, so the treatments used in the current study were a mixture of the studied plants in different proportions to treat soil contaminated with some minerals. The concentrations of these minerals were recorded in the laboratory during the experiment.

The treatment contained more concentrations of the crusts than the other crusts, so the strength and effectiveness of its decontamination will be more significant in the studied and polluted water samples. These results agreed with other research on the efficacy of treating pollution in the aquatic environment [26]. The treatment results revealed significant differences in some of the minerals under experiment conditions. The effect of some crusts is more significant than others because the first concentration is greater than the second. It is noted that there are results of studies compatible with the current results in support of the effect of some plants in removing pollutants such as some heavy metals from the environment and according to what was mentioned from some source [27]. The results obtained from this treatment supported the published results on the effect of some plants to clean the environment from some causes of pollution, such as minerals [28]. Aqua system pollution due to an increase in technology creates excellent attention. A significant pollutant can refer to toxic metals, which lastingly increase due to the increased industrial activity that led to harmful effects. Nowadays, approaches for bioremediation can be dealing with biomineralization which means the synthesis of minerals by living organisms or a biological substance [29]. Heavy metals are observed in aquatic plants in Lakes, for example. The critical role that aquatic plants have in the food chain of lake ecosystems can be relative to high levels of heavy metals in the aquatic system [30].

Conclusion

The conclusion of this study refers to synergistic activity formed between *Arunda sp.* and *Dodonaea sp.* reduced pollution due to the decrease in concentrations of mineral elements polluting the water gradually during different weeks in the experiment. The most prominent and essential effect was reducing and removing lead, cadmium, and copper.

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Ethical issues

Name the ethics committee that has approved the study:
Scientific Committee for Chemistry

Competing interests:

We have no conflicts of interest to disclose.

Authors' contributions: in Chemistry field

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