Abstract — This study in order to evaluate the effect of using Compost leachate on the density of soil iron in form of a statistical pattern called "Split Plot" by using two main treatments, one subsidiary treatment and three repetitions of the pattern in a three month period. The main N treatments include: irrigation using well water as a blank treatments and the main I treatments include: irrigation using leachate and well water concurrently. Some subsidiary treatments were DI (Drop Irrigation) and SDI (Sub Drop Irrigation). Then in the established plots, 36 biannual pine and cypress shrubs were randomly grown. Two months later the treatment begins. The results revealed that there was a significant variation between the main treatment and the instance regarding pH decline and Cadmium increase in the soil which was related to the amount of leachate injected into the soil. After some time and using leachate the pH level fell, as much as 0.46 and also due to the great amounts of leachate, the average cd in the soil show a 0.12 mg/kg increase.

Keywords — Cadmium Absorption, Compost Leachate, Environmental Effects

I. INTRODUCTION

REGARDING their toxic effects and in accordance with some measures to recycle the water resources especially in the sewage systems, Compost leachate is a potential source of water rich in the nutrients. It compensates for the water shortage in farming and prevents the chemical pollutions. Taking these measures, their entering the nature and spreading the diseases in human food chain can be avoided [1]. Using sewage as a water resource in farming is very widespread and it started long time ago since it contains the substances essential for the plants [2, 3 and 4]. Adding household leachate and Compost to the soil as much as the added leachate would increase absorbable Cadmium, but after some time, it showed a decline [5]. It was shown that using Compost from the ooze for 6 years would increase the amount of copper, chrome, nickel, Cadmium, lead and zinc to 100% in the depth range 0-30 cm[6]. It was also reported that using ooze to irrigate for 30 years would increase the amount of solid metals in the soil surface, therefore, Cadmium, nickel, lead and chrome density in plants would increase in comparison to the plants watered by normal water[7]. Studies in Shiraz show that a unsystematic and uncontrolled use of ooze would increase the solid metals density in the soil over a long time [4]. The studies revealed that using ooze over a long time would increase the amount of Cadmium and other solid metals in the soil which increase the plant's intake and consequently cause such poisonous metals to enter the humans' food chain [8].

II. MATERIALS AND METHODS

A. Study area

The present study is conducted in east Isfahan. The height from the sea level was 1555 meters, the average rainfall 120 ml, and the average annual temperature 16 Celsius. The soil is of Golshahr type and belonged to Aridisols class in soil taxonomy 2010. The soil texture in the selected region is Loamy, and base on guidelines for evaluating the water quality, the water amount is considered to be average [9].

B. Methods

Number First a suitable areas was selected for Pilot Performance and the research conducted using Factorial – Split plat including two major treatments, and two subsidiary ones in a three month period and was repeated three times. The treatments include; N; irrigating using well water as an instance, I; irrigating using leachate and well water, DI (Drop Irrigation), and SDI (Sub Drop Irrigation) as an underneath drop irrigation. Before that, two types of trees; cypress and pine two year old shrubs were planted. About 200 liters of leachate was transferred to a 1000 liters tank and was diluted by the well water after that the EC reached 4 ds/m. This leachate was the main one used in the treatments. The average output from the dropping tube was 10 liters per hour and the irrigation was performed every two days. In each round about 20 liters of leachate was injected to the tree. So the amount of the consumed leachate for the rotation treatment (I) was 150 liters per month. The irrigation period lasted 2 hours and it was 0.17 liter per minute.
C. The Analysis Procedures:
- Density of Cadmium Heavy Metal:
First 5 grams of soil was poured into a glass then 100 ml DPTA (0.005 Molar) was added and stirred for 30 minutes. It was filtered using Wattman paper type 42 and reached 50 cc in a balloon with the capacity of 50 ml. each substance was read and analyzed by Elmer-Perkin Atomic Device model 3030.

- Data Analysis
The study was done in a form of Factorial–Split plat design. The results were calculated using MSTATC software. Duncan test was applied to determine if the changes were meaningful and Excel software was used to draw the diagrams.

III. RESULTS AND DISCUSSION
Amount of Cadmium in the leachate samples under the study was 0.01 mg/liter. Based on Iran Environment Organization's standard and FAO standard the amount is less than the allowed amount of this substance in the sewage. If its density reaches 0.1 mg/liter over the time, irrigation should be done cautiously due to its capability to pile up in the plant and the soil.

The Effects of treatments on Cadmium Density Variations in Cadmium density:
Using The average density of the absorbable Cadmium at first was 0.17 mg/liter and it reached 0.21 mg/liter at the end of the first period (a 0.04 degree increase), at the end of the 2nd period it was 0.25 mg/liter (as much as 0.04 unit increase), and at the end of the 3rd period 0.29 mg/liter (0.04 more compared to the previous period). The average density regarding the absorbable Cadmium in the surface was more than the underlying texture due to the using leachate. In relation to different irrigating treatments the average Cadmium density was 0.153 which reached 0.354 mg/kg in the rotation treatment. The comparison between different irrigation methods (figure3) revealed that the rotation treatment has increased the density of Cadmium very significantly. Again the comparison between the irrigating methods and the depth (in figure 6) revealed that there is a meaningful difference regarding the absorbable Cadmium density within the soil. The difference between the treatments and instance is meaningful. The absorbable Cadmium density has increased both on and under the ground but it was more in the surface. The difference between depth and time (figure 7) showed that due to use of leachate and the passage of time, the Cadmium density in instance and the main treatment is not the same.

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Fig. 2 Time Effect on Absorbable Cadmium within the Soil

Fig. 3 Impacts of using different irrigation systems on Absorbable Cadmium

Fig. 4 Time and Irrigation and their effects on Absorbable Cadmium

Fig. 5 Effects of Using Leachate in Different Depth on Absorbable Cadmium
Adding ooze would significantly increase Cadmium density in the soil [10]. In one research studied the heavy metals movements for 16 years and after applying ooze and the sewage in different depth ranges arrived at the conclusion that Cadmium, Chrome, and Lead are densely populated in depth ranges lower than 30 cm and they were the least congregated in depth ranges between 35–45 cm [11]. Esteki came to the conclusion that irrigating using ooze would lower the pH level and increases the Cadmium amount significantly in the soil. This amount of Cadmium does not limit the green spaces and some of his findings are in accordance with the ones here. Cadmium amount in depth ranger of 60 to 90 cm showed an increase much as 175%, but in the present study the amount of Cadmium was more in the depth range of 0 to 30 cm in the soil [12]. Due to the high buffering capability in lime after adding leachate, the pH level would be restored. Adding Compost Manure to some types of soil in Isfahan showed that the pH decreased and after some time it again showed an increase [13].

IV. CONCLUSION AND RECOMMENDATIONS

- The Cadmium amount is in an acceptable range and is not considered as a limiting factor for the plants.
- After adding household leachate to the soil, its density increases as the leachate amount increases.
- By using household leachate in the soil the pH level would decrease and absorbable amount of Cadmium would increase [14].
- Findings revealed that solid metals in the soil can be managed using irrigation and the meaningful difference between the irrigating methods is indicative of this fact, therefore, by applying underneath watering and lowering the evaporation, it would be possible to control their intake by the soil and also It would be possible to maintain the soil wetness and consequently water can be consumed more logically. This would provide the necessary nutrients for the plants and also it would improve the soil quality and allow for creating forests around the cities.

The household leachate from the process of making Compost is an unnecessary thing which pollutes the underground watersheds and the environment as well. It is suggested that a study be conducted to turn it into a more useful liquid manure rich in nutrients for plants. In the present study, two treatments including alternation irrigation and instance in two the depth ranges were applied and the availability of the underground watersheds was also investigated. It is recommended that different densities of leachate should be investigated to get the best water – leachate combination regarding the regional water quality. In the prospective studies, it is suggested that a mathematical model which evaluates the relationship between the involved factors be devised. Reasons for using leachate as a substitute for Compost, chemical, and manure from an economic point of view should be studied. Using leachate and ooze in irrigation of the lands with low underground water resources is recommended.

REFERENCES


Dr. Ali Gholami (19 February 1976) born in city of Tehran - Iran. He was graduated with bachelor degree in Agriculture Engineering-soil science on 2000 and in Master of Science in soil science on 2005 from Islamic Azad University, Science and Research Branch, Tehran, Iran. He was accepted as PhD student in Faculty of Agriculture and Natural Resources, Department of soil science, Islamic Azad university, science and research Branch in Tehran on 2006 and academic member of Islamic Azad university, Khuzestan Science and Research Branch in Ahwaz city of Khuzestan province) on 2007 and he studied his dissertation in field of "land use changes and its influence on soil physical, chemical and mineralogy characteristics". He has studied 15 university research design, and 50 printed papers in national and international conferences and journals. Mr. Ali Gholami has graduated with first grade in M.Sc. degree and PhD coarse book. He was selected as the manager of soil science department and research office in Islamic Azad University, Khuzestan Science and Research Branch in 2009 and it now. Also he is assistant professor in department of soil science now.