Journal of Novel Applied Sciences
Available online at www.jnasci.org
©2013 JNAS Journal-2013-2-11/554-558
ISSN 2322-5149 ©2013 JNAS

The Appraisal of Magnesium Absorption in Different Soil Depths Using Compost Leachate

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ABSTRACT: Urban development and wrong patterns of consumption have increased the household and garbage. Their potential in producing compost leachate is so high due to high moisture found in them. It has floating organic materials and nutrients. This study in order to evaluate the effect of using Compost leachate on the density of soil Magnesium 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 W treatments include: irrigation using well water as a blank treatment and the main L treatments include: irrigation using leachate and well water concurrently. Some subsidiary treatments were S0 (Drop Irrigation) and S1 (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 is a significant difference between blank treatments and rotation treatments regarding the pH in the first level of Duncan test. Also there was an increase in Magnesium absorbency of the soil which was in regard to the added amount of Leachate. Later on after using leachate the average pH was decreased equal to 0.46 and also the average of Mn in the soil show an increase in the range of 10.29 mg/kg. Anyway the density of soil Mn in each period was more than past periods. By using leachate and a decrease in the soil pH, there was a significant increase in the soil Magnesium absorbency relation to blank treatment.

***Keywords*:** Compost leachate, Drop Irrigation, Soil Magnesium Absorption.

INTRODUCTION

One of the side effects of producing Compost in Iran is the existence of too much moisture within the urban household which leads to formation of compost leachate. Using compost leachate can increase the amounts of nitrate, phosphor, potassium, sodium, calcium, magnesium, and Magnesium within the soil. The concentration of zinc, lead and Magnesium will increase dramatically too (Rasavi Tousi and Karimian, 2001).
The produced compost leachate includes significant amounts of organic minerals which can enhance the soil intake and its structure. It has nitrogen, phosphor, potassium, Magnesium, magnesium, Magnesium and molybdenum which all plants need (Mohamadinia, 1995).

It is doubtless that artificial waste is inevitable. The existence of household has complicated the process of producing them in one hand and in the other hand it is one of the most important problems nowadays. It is vivid that our current management of urban household is in a very critical condition (Abdali, 2005).

Although it has some benefits, its uncontrollable negative effects outweigh. Not much is known about its effects on chemical and physical properties of the soil. Meanwhile its quality differs from factory to factory which might leads to different consequences (Tabatabaie, 2001).

With its 164 million hectares of farming lands, Iran is one of the vast areas in the globe. A major part of Iran has a dry and semi dry climate. 80 percent of our farms is located in such areas which are poor in soil organic minerals.in some parts it goes below one percent. Knowing this and also the fact that the food for almost 80 percent of people is produced inside the country, the use of scientific methods in agriculture is something inevitable. Promoting the soil minerals is one of these steps. Since the local resources (manure and green fertilizer) are so limited, they are not sufficient to meet the needs in this area. It is inevitable to use every kind of organic

minerals found in Iran to improve the soil quality. Fortunately there has been much recycling in Isfahan, Tehran, and Mashhad using local resources of the organic minerals. Fertilizer produced in this way is abundant, available and also reliable. Considering the rate of producing compost in the factories, a comprehensive plan can be devised. Based on the above information, it is vital to use any source of organic minerals (like manures, ooze, and household) to stabilize the agriculture sand to increase the corps (Ebrahimi et al., 2008).The aim of this research is to irrigate using compost leachate and water rich in magnesium.

MATERIALS AND METHODS

Study area

This study was conducted on a field in the eastern part of Isfahan on the longitude of 32°, 38' and latitude of 51°, 48'. The height from the sea level was 1555 meters. The average rainfall is about 120 ml and the average temperature is +16°^{c}. The soil is from Golshahr series and belonged to Aridisols order. The soil texture is loamy, based on the Ayers and Wescat guidelines the water quality in this area is considered to be of the average type (Shirani, 2008).

Methods

First a suitable part of the farm was chosen for doing the Selection Pilot. The study was done based on the Split Plat design. 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 (L) was 150 liters per month. The irrigation period lasted 2 hours and it was 0.17 liter per minute. The major treatments were irrigation using the water from the wells as instance (W) and rotation irrigation in which EC reached to 4 ds/m. there was also one round using well water (L). The subsidiary treatments were drop irrigation, sub surface drop irrigation in which the dropping tubes were located in the depth of 30 cm.

The Procedures and Data Analysis

The Electrical Conductivity (EC) of the leachate was measured by a conductivity evaluating device (Consort K620) and its Soil Reaction was measured using a pH calculator (Metrohm632*)* (APHA, 1998).The density of Magnesium in the leachate was measured by an atomic absorption device known as Perkin – Elmer type model 3030 which did it using specific waves (Nelson and Sommers, 1987). pH in the mud was calculated using a pH calculator and its electrical conductivity was measured by a conductivity evaluating device called Consort K620 (Page and Keeney, 1986).The Magnesium absorbency of the soil was measured by extracting using DTPA (0.005 M) which was read by the atomic absorbency device known as Perkin - Elmer type model 3030 in specific waves (Lindsay and Norvell, 1978). This statistical analysis of the data and the correlation ratios were gained using MSTATC software. Duncan test was also conducted to show the meaningful variations and the Excel software was used to sketch the diagrams.

RESULTS AND DISCUSSION

The present study seeks to evaluate the impact of using leachate on Magnesium absorbency in the soil under the drop like irrigation. By using a well-balanced formula, leachate can be regarded as organic manure in farming, especially in dry and semi-dry regions suffering from the lack of the organic materials. The results showed that the electrical conductivity was 24 ds/m which shows the high amount of salt in the area. pH in the leachate was 5 due to the presence of the organic and mineral acids. The Magnesium concentration was 47.63 mg/liter.

3.1. Effects of treatments on Magnesium concentration within the soil

Figures 1- 6 reveal the significant effects of using household based compost leachate on absorbable magnesium within the soil. As it is obvious, the average concentration of magnesium was 7.21 units at the beginning of the study and it reached 8.31 ml/kg at the end of the first phase (as much as 1.1 unit increase). At the end of the second phase, it reached 8.84 units (an increase as much as 0.4 unit increase). At the end of the 3rd phase, it reached 9.66 ml/kg (an increase as much as 0.82 units compared to the preceding phase). Passage of the time and using compost leachate led to an increase in the concentration of absorbable magnesium within the soil. The average concentration of the absorbable magnesium is higher on the surface if compared to the beneath layers.

Khoshgoftarmanesh (1998) reported that by adding 600 tons of compost leachate in each hectare the concentration of absorbable magnesium on the surface would reach 96.5 ml/gr.The average concentration of absorbable magnesium was 7.26 ml/kg which was increased to 10.92 ml/gr as the result of using regular irrigation. Knowing the fact that the normal amount of magnesium within the soil is about 9 – 25 ml/kg, both of these treatments had me the need but the one in the depth of 0 – 30 cm was the most efficient one.

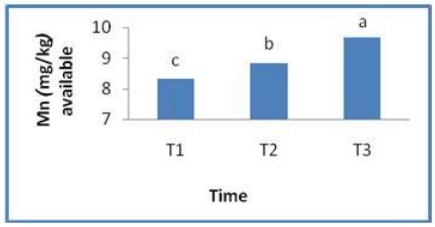

Figure 1. The effect of time on soil Magnesium absorbency

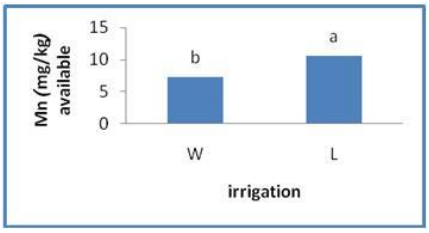

Figure 2. The impact of different irrigation treatments on soil Magnesium absorbency

Comparing the mutual effects of using different water and time treatments (figure 3), it was found that the regular one had increased the amount of absorbable magnesium within the soil significantly (if compared to the placebo).

Comparing the mutual effects of different treatments of depth and watering (figure 5), it is observed that there is a significant difference between the surface and beneath layers in regard to amount of magnesium. There is also a meaningful difference between these two treatments and the placebo. Following the regular treatment, the amount of absorbable magnesium increased in both surface and underneath, but much more on the surface.

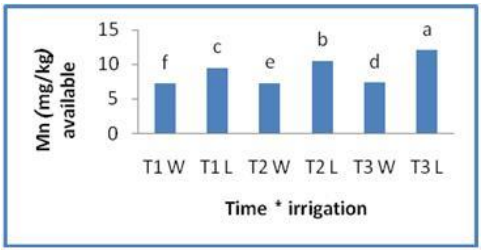

Figure 3. The mutual interaction between different irrigation treatments and time and their possible effects on soil Magnesium absorbency

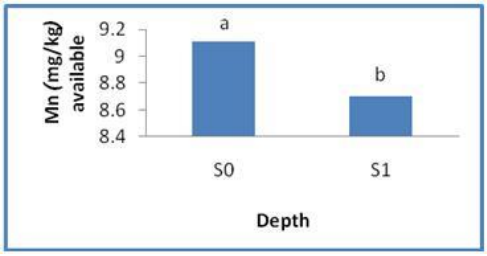

Figure 4. The effect of using leachate in different depths on soil Magnesium absorbency

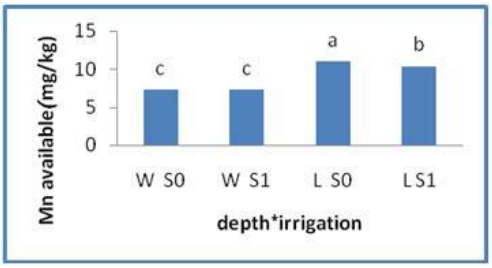

Figure 5. The mutual interaction between depth and irrigation treatments on soil Magnesium absorbency

Comparing the mutual effects of different treatments of depth and time (figure 6), it is clear that time and using compost leachate in two depths cannot increase the amount of absorbable magnesium (if compared to the placebo).

At times of full irrigation, increased amount of co2 and decreased PH, the concentration of absorbable magnesium (by plant) would increase. Because of its high acidity and low PH, household based compost leachate can increase the concentration of absorbable magnesium within the soil (Khoshgoftrarmanesh, 1998).

Reports by Mohamadinia, (1995) and Gandomkar, (1996) showed that using household and compost can increase the amount of absorbable magnesium within the soil based on the amount of the consumed compost leachate. Based on the same reports, time and wash can reduce the ability of soil to intake magnesium. If acidity increases, time and wash can reduce the ability of soil to intake magnesium. An increase in acidity will intensify the activities of Magnesium, magnesium, and aluminum ions (Panahpour, 2009). The difference between the different irrigation treatments reveals that in cycling treatment the Magnesium absorbency has been increased compared to the instance (Well irrigation). So the average leachate in Magnesium absorbency has increased from 22.63 in instance to 66.53 mg/kg in the alternation treatment.

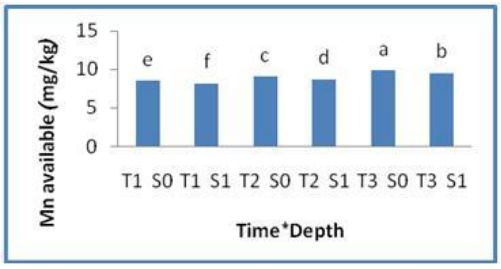

Figure 6. The effect of different treatments of time and depth on soil Magnesium absorbency

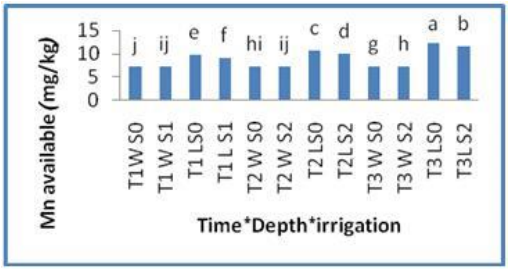

Figure 7. The effect of different treatments of time, depth, and irrigation on soil Magnesium absorbency

The difference between the irrigation treatments and the depth, time and depth, time, irrigation, and depth (figures 4 to 6) shows that the alternation treatment could not increase the Magnesium absorbency significantly compared to the instance, therefore, the Magnesium absorbency in soil and its underneath was not meaningfully different. Magnesium is one of the essential nutrients for plants and it is not consumed much. In some plants it is needed more.

CONCLUTION AND RECOMMENDATIONS

Keeping the soil fertile and clean is a vital if the long term growth of the crops is an aim. Use of waste and compost leachate can keep the soil fertile since it includes about 35 – 85 percent of organic minerals and a high acidity which increases the intake of small nutrients. Through the time, the intake of Magnesium showed an increase. Due to the high evaporation and climate in the region under the study, the concentration of materials was evaluated at depths of 0 -30 and 30 – 60 cm. regarding the limitations and the acceptable level of Magnesium within the soil, the treatment including household based compost leachate and water in the spot which was 30 cm deep was the most efficient one. Household based compost leachate is currently a waste extracted from compost which can pollute environment and underneath water resources. Since it is needed for the plant it is recommended that more studies be done to eliminate its negative side effects. It is suggested it be used as a natural fertilizer. It is needed to say that since the chemical combination of garbage from cities and compost leachate from it might differ through the time, a full control of its chemical particles is really vital. It is recommended that drop irrigation be used accompanying other watering patterns. In this study, the compost leachate was diluted (1 to 4). Other concentration s of compost leachate should be tested too to determine the best ratio of water and compost leachate regarding the water quality in the area. It is recommended that the same test be conducted for other species as well.

REFERENCES

Abdali MA. 2005. Recycling the Urban Waste. Tehran university publication. P.257.

APHA. 1998. Standard method for the examination of water and wastewater, American Public Health Association, Washington, D.C., 1566 PP.

Ebrahimi AH, Pouralaghebandan SH, Khazaeli A, Shahsavari Salehi A. 2008. Comprehensive reference for quality control in producing organic fertilizers, Danesh Pazhohan Publication, P.52.

Gandomkar A. 1996. The Effect of Compost on the Soil Features and the Growth of the Corn. Agricultural College, Isfahan University. P.158.

Khoshgoftarmanesh AH. 1998. Leachate and Rice Growth and Its Remnants on Wheat. M.Sc. Thesis. Isfahan Agricultural University.

Lindsay WL, Norvell WA. 1978. Development of a DTPA soil test a for zinc, Magnesium, and manganese capper. Soil Sci. A.M.J.42: 421-428.

Malekouti MJ, Homaie M. 2004. Soil Fertility in Dry and Semi – dry lands: Problems And Solutions, Teacher Training University, 2nd Edition, P. 494.

Mohammadinia A. 1995. The Household waste materials-Compost Composition on Soil and Plant. Ma. Thesis. . Agricultural College, Isfahan University.p.187.

Nelson DW, Sommers LE. 1987. Total Carbon, Organic Carbon and Organic Matter, pp. 539-577. In: A.L. Page, R.H. Miller and D.R. Microbiological properties, Agronomy 9.

Page AL, Miiler RH, Keeney DR. 1986. Method of Soil Analysis, part 2: chemical and microbiological, Second Edition, Soil Sci. SOC. Am. Inc., 1159p.

Panahpour A. 2009. The Study of The Compost Leachate on Soil Quality and the Ways to Improve its Salt Movement, PhD Dissertation, Department of Soil Science, Science and Research Branch, Islamic Azad University, khouzestan, Iran, p.220.

Razavetousi AN, Karimian J. 2001. Effects of Using Compost Compost Leachate on Chemical Features of Spinach and Ice. a series of short articles. The 7th congregation on Iran soil science. P.27.

Shirani M. 2008. Effects of Using Irrigation Patterns and Systems Using Household Based Compost Leachate Produced in Isfahan on Soil Pollution. M.Sc. Thesis. Islamic Azad University of Khorasgan.p.173.

Tabatabaei HS. 2001. Remove of Trace Elements in Municipal Wastewater by Using Iranian National Zeolites, Ph. D. Seminar, Tehran University, Agriculture Faculty, Department of Irrigation and Reclamation. P. 123.