

Effect of different levels of sewage sludge on chemical properties of soil grow with cereal crops

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ABSTRACT: The sewage sludge produced by treat of municipal product on sewage plant treatment, it's came with highly toxic, therefore, will by a danger product to use, in this study, we tried to study effect the sewage sludge on the soil. The experiment was applied on Environmental Science filed on SHIATS. Were the effect the different level of sewage sludge on the soil were applied to examination the effects on soil, Therefore, this study was carried out to determine the effects of different sewage sludge application rates, which were 0, 4, 8, and 12 t/h, the cereal crop (Barley *Hordeum vulgare L* & wheat *Triticum aestivum*) was grow on the soil with random block design using the physical slicing with three replications for two seasons, the samples were taken after harvest from depth of soil (0-15).the results was showed a significant effect on most soil chemical properties .

Keywords: sewage sludge, cereal crop, wheat, barley, soil.

INTRODUCTION

In this day the important thing is how we can be sure that food supply will continue to prevent famine on the world, So the use and reuse all of human west with perfect way, one of the good way is using this waste material in agriculture to get as much as benefits. Sewage sludge represents the solid sediments accumulated at the urban wastewater sewage treatment plants through the sewage system.(Nicolae, 2011)1 . the sewage sludge is rich with nitrogen and phosphorus similar to the manure. Therefore should know the sewage sludge and it's properties to us it increase soil fertilizer and same time environmental protections. Composted sewage sludge can be supply nutrients to cropland (Yongjie Wei,et al 2005)2. The soil will get many advantages when the application of composts to agricultural which include providing a whole array of nutrients. One of the major pathways by which land applied sewage sludge contaminants enters the food chain is plant uptake (Laternus et al, 2007)3. Use of wastes has been increasingly identified as an important issue for soil fertility, conservation and residual disposal in agriculture, forestry and land reclamation

(Antolín et al., 2005)4. Sewage sludge contains not only major plant nutrients, but also trace elements that are essential for plant growth (Anonymous, 1996)⁵

Many studies have been conducted to determine the effects of sewage sludge application on crop and plant yield and soil properties (Navas et al., 1998; Aggelides⁶ & Holz et al., 20007; Tsadilas et al., 20058; Cheng et al., 20079).lastly, the apply of sewage sludge as fertilizer sources is the major factor in the maintenance of soil fertility, and use of sewage sludge in agriculture as a partial substitute of mineral fertilizers (Mona et, al, 201316)

MATERIALS AND METHODS:

The study was carried from October 2012 to April 2014 on filed of school of forestry and Environment, Sam Higginbottom Institute of Agriculture & Technology Sciences –Deemed to be- University, Allahabad. The samples of sewage sludge were collect from the aerobic waste-water treatment plant in the town of Naini Allahabad. The experimental field prepared by ploughing twice with a tractor drawn disc plough followed by cross harrowing after one irrigation to give the soil sufficient

moisture required for the germination of the crop. Two crops were growing on the experimental (wheat & barley)

Experimental Sites:

The study was carried during two seasons on field of school of Forestry and Environment, SHIATS, Allahabad.

Chemical analysis of soil: The chemical analysis of soil done for various parameters. The soil pH, EC, % O.C., Available Nitrogen, Available Phosphorus, Available Potassium of soil.

Physical and chemical analysis of per and post-harvest soil.

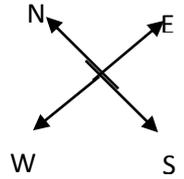
S. No	Particulars	Method
1	Soil pH (1:2) soil water suspension w/v	digital pH meter
2	Soil EC mill Mho/cm at 25 °C of 1:2 soil water suspension w/v	digital conductivity meter,
3	(%) Organic Carbon	Walkley and Black (1947) Method
4	Available Nitrogen (kg/ha)	Kjeldhal method, (Subbaih and Asija, 1956)
5	Available Phosphorus (kg/ha)	Olsen Spectrophotometer Method (Olsen et. al., 1954)
6	Available Potassium (kg/ha)	Flame Photometric Method (Toth and Price method, 1949)

Chemical sludge characteristics:

The sewage sludge was analysis for chemical characteristics such as pH, EC, % O.C., Available Nitrogen, Available Phosphorus, and Available Potassium of sewage sludge.and heavy metals.

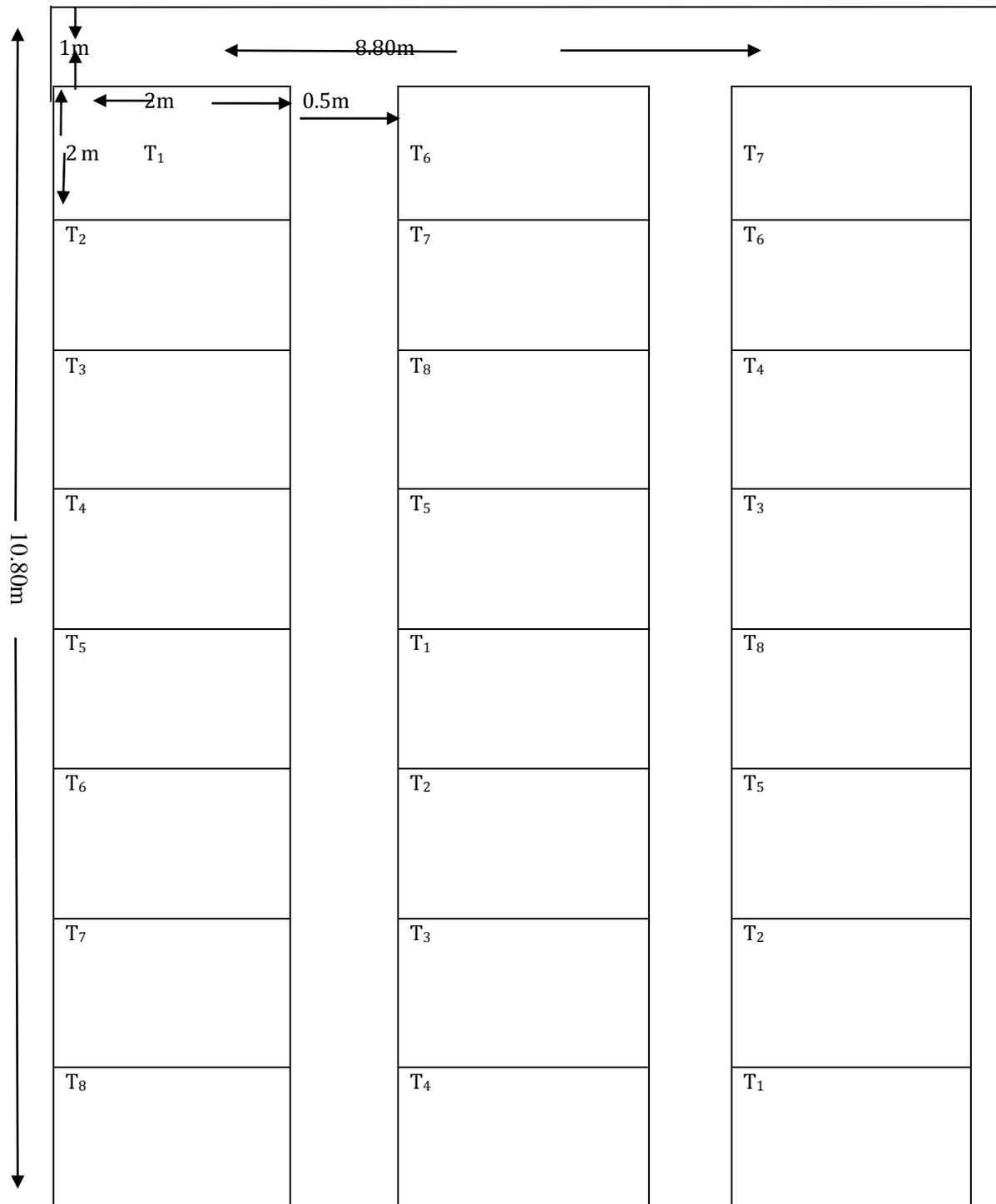
Statistical Analysis:

The experiment will be conducted in Randomized block design having eight treatments and three replications. For the two different crop (Wheat, Barley).



Plan of Layout

Figure: - 1



RESULTS AND DISCUSSIONS:

The applied of sewage sludge on the soil effect the soil on several parameters, as the disposal of

sewage sludge on agricultural lands may will an increase of the pollutants levels in soil, the optimum in the quantity and frequency of application to debar an overload of contamination and the health and

environmental hazards deduced (Passuello et al., 2012¹⁰).

pH:

The Figure (1) showed the effect of different level of sewage sludge on the pH on post-harvest soil at 0-15 cm soil depth. Were the figure showed clearly the effect the pH was decrease with increase of sewage sludge and the pH is decrease on the second season. And in the second season the effect was more clear that because the sewage added to soil for two seasons. That was agree with (Neus, et.al.,2012¹¹) pH decrease effect of long-term sewage sludge application was also observable in soils (Enwall et al., 2007¹²).

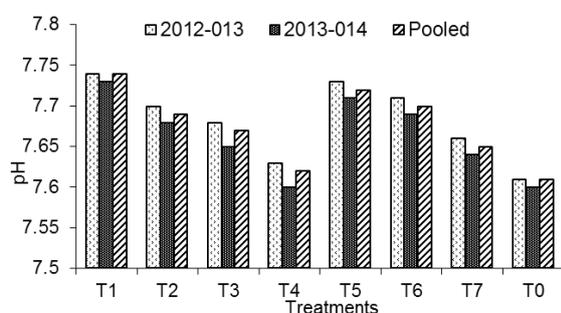


Figure (1) Effect of sewage sludge on pH of past-harvest soil at 0-15 soil depth.

% organic carbon:

The effect of apply the sewage sludge on the present of organic carbon on the soil of study area is clear and the figure (2) shown the % O.C is increasing with increase of sewage sludge ranges from (0.66 % to 0.73 %) ,there is significant differences between different level of sewage sludge, (Neus, et.al.,2012¹¹)

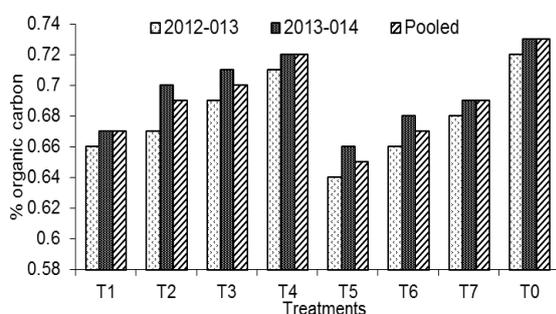


Figure (2) Effect of sewage sludge on % organic carbon of past-harvest soil at 0-15 soil depth.

Nitrogen (kg^{ha}⁻¹) : According to the figure (3) the effect of the increase of sewage levels is clear that significant effect was happen when the sewage sludge is increase were the range was between (125 to 142 kg/ha), (Lerch, et. Al.1990¹³)

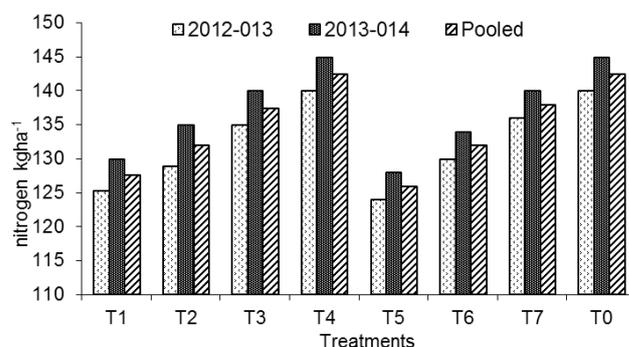


Figure. (3) Effect of sewage sludge on available nitrogen kg^{ha}⁻¹ of past-harvest soil at 0-15 on depth

Phosphorus (kg^{ha}⁻¹) :the sewage sludge is rich with the same of nutrients are make soil good to plant environment growth such as Phosphorus and nitrogen (Mohamed,et.al. 2012¹⁴),the figure show clearly the correlation between the sewage levels and increase phosphorus concentration were the high rate in the high level sewage sludge applied in soil.(MuhammedAlii Khan.2007¹⁵)

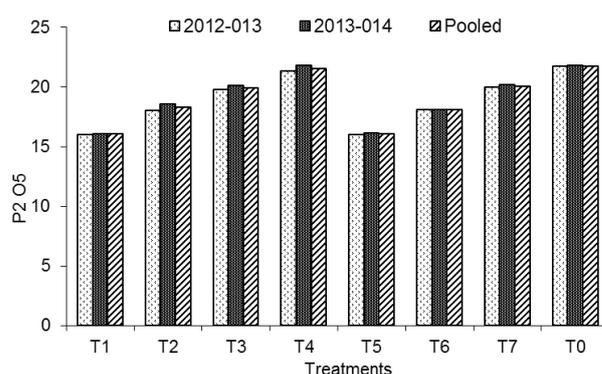


Figure (4) Effect of sewage sludge on P₂O₅ of past-harvest soil at 0-15 of soil depth.

Conclusions:

The aim of the study to study effect of different level of sewage sludge on chemical soil prosperities, the results present clearly that the upper of soil (0-15 cm) is effect on several prosperities that included in the study were the

pH is decrease with increase on sewage sludge rate and % organic carbon Nitrogen Phosphorus Potassium were increase with increase sewage sludge rate. And all the parameter have same behavior on two seasons, the results shown that the treatment 4 was the highest effect on both seasons.

References:

1. Anonymous, 1996. Use of Reclaimed Water and Sludge in Food Crop Production. *National Academy Press, Washington, DC*
2. Antolin, M.C., I. Pascual, C. Garcia, A. Polo and M. Sanchez-Diaz, 2005. Growth, yield and solute content of barley in soils treated with sewage sludge under semiarid Mediterranean conditions. *Field Crop Res.*, 94: 224-237
3. Cheng, H., W. Xu, J. Liu, Q. Zhao, Y. He and G. Chen, 2007. Application of composted sewage sludge (CSS) as a soil amendment for turf grass growth. *Ecol. Eng.*, 29: 96-104
4. Enwall, K., Nyberg, K., Bertilsson, S., Cederlund, H., Stenström, J., Hallin, S., 2007. Long-term impact of fertilization on activity and composition of bacterial communities and metabolic guilds in agricultural soil. *Soil Biol. Biochem.* 39, 106-115.
5. Holz, S.C., F. Ingelmo and R. Canet, 2000. Long term effects of the application of sewage sludge and vegetal cover on some physical and physicochemical properties of a degraded arid soil. *Agrochimica*, 44:133-139
6. Killmer, V. J. and D. C. Nearpass (1960) Microestimation of Sulphur in plant material, soil and irrigation water. *Anal. Chem.* 24: 736- 742.
7. Laturnus, F., K. von Arnold and C. Gron, 2007. Organic contaminants from sewage sludge applied to agricultural soils. *Environ. Sci. Pollut. Res.*,14: 53-60
8. Mohamed Hafidi^{1*}, Soumia Amir², Abdelilah Meddich³, Abdelmajid Jouraiphy¹, Peter Winterton⁴, Mohamed El Gharous⁵ and Robin Duponnois.2012, Impact of applying composted biosolids on wheat growth and yield parameters on a calcimagnesian soil in a semi-arid region, *African Journal of Biotechnology Vol. 11(41), pp. 9805-9815.*
9. Mona Fawzy Abd El-Ghany, 2M. Attia and 3Khaled, S.M.2013, Positive Effects Of Organic Matter And Nutrients On Soil Properties, Microbial Diversity And Accumulation Of Trace Elements On Crops Grown On Sludge Amended Soil. *Journal of Applied Sciences Research*, 9(3): 2244-2251, 2013 ISSN 1819-544X
10. Muhammad Ali Khan, T.G. Kazi, R. Ansari, S.M. Mujtaba, B. Khanzada, M.A. Khan, M.U. Shirazi and S. Mumt .2007, Effect of Un-treated sewage sludge on wheat, metal uptake by grain and accumulation in the soil. *Pak. J. Bot.*, 39(7): 2511-2517
11. Navas, A., F. Bermudez and J. Machin, 1998. Influence of sewage sludge application on physical and chemical properties of Gypsisols. *Geoderma*, 87: 123-135
12. Nicolae Dimo 2011 **properties** of sewage sludge resulted from urban wastewater treatment in the republic of Moldova. *Scientific Papers, UASVM Bucharest, Series A, Vol. LIV, 2011, ISSN 1222-5339.*
13. Passuello, A., Cadiach, O., Perez, Y., Schuhmacher, M., 2012. A spatial multicriteria decision making tool to define the best agricultural areas for sewage sludge amendment. *Environ. Int.* 38, 1-9
14. R. N. Lerch, K. A. Barbarick, D. G. Westfall, R. H. Follett, T. M. McBride, and W. F. Owen.,1999. Sustainable Rates of

Sewage Sludge for Dryland Winter Wheat Production Production and Income. *Joud of Production Agricultrve* Volume 3, no. 1

15. Toth, SJ. And Prince, AL(1949) Estimation of cation exchange capacity and exchangeable CaK and Na content of soil by flamephotometric techniques. *Soil sci*,67:439-445
16. Tsadilas, C.D., I.K. Mitsios and E. Golia, 2005. Influence of biosolids application on some soil physical properties. *Commun. Soil Sci.Plant Anal.*, 36: 709-716
17. Walkley, A and Black, C. A. (1934) An Examination of the Degtareff Method for Determining soil organic Matter and a Proposed Modification of the Chromic Acid Titration Method. *Soil sci.* 37, 29-38