

## Evaluation of Phosphor Changes in Wastewater Application in Different Depths of Soil

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**Abstract:** Water scarcity is one of the most important barriers to the preservation and development of agriculture in arid and semi-arid in Iran the problem has also been exacerbated by drought in recent Inserts. However, limited studies have assessed this issue. The present study evaluated changes in elements of the soil irrigated with wastewater. For this purpose, an experiment was conducted as a randomized complete block design with three replications. Soil samples were collected from the studied regions at two depths of 0-30 cm and 30-60 cm. Studied parameter included phosphor of the soil. Three studied regions (no irrigation, irrigation with treated wastewater, irrigation with river waters) were considered. The results showed an increase in phosphor of the effluent from Zahedan Wastewater Treatment Plant compared to control.

[Shojaei S. Asghari, A. Podine Z. Asghari, B. **Evaluation of Phosphor Changes in Wastewater Application in Different Depths of Soil.** *Stem Cell* 2016;7(3):36-39]. ISSN: 1945-4570 (print); ISSN: 1945-4732 (online). <http://www.sciencepub.net/stem>. 7. doi:[10.7537/marsscj070316.07](https://doi.org/10.7537/marsscj070316.07).

**Keywords:** restoring biological, wastewater, soil, arid.

### 1. Introduction

Insufficient resources of water in most regions in addition to decreased quality of water will result in considerable concerns for urban societies, agricultural section and natural resources. Usage of unconventional waters is a unique occasion and may increase capacity of traditional water supply (Payandeh et al., 2010).

About 15 to 25% of water used in domestic and urban consumptions will discharge to environment as wastewater. Considering required nutrients for plants, usage of urban wastewater as a resource of supplying sustainable water to eliminate agricultural demands is inevitable (Oron et al., 2007; Scott et al., 2002).

Considering geographical conditions and water crisis in Iran, it is necessary to employ improvement methods including usage of low quality irrigation resources (wastewater, saline water and brackish water) in agriculture (Soleymani et al., 2008). Moreover, most irrigating waters are low qualified with varied degrees of salinity that may be used for agriculture too (Feizi, 2002). In addition, the volume of waste water produced in very large cities and the need for its disposal, has increased the need for wastewater re-use (Najafi et al, 2015).

The wastewater affects the nutrient availability in soils in two ways: (i) by containing and adding these to soil and (ii) by contributing constitutes of sewage effluent (i.e. soluble organic and inorganic legends) that can alter soil and solution composition and processes that affect solubility, mobility, and bioavailability of nutrients (Bar-Tal et al., 2015).

They investigated chemical specifications of soil and revealed that increase of nitrogen-nitrate, phosphor-phosphate in different depth of soil profile was caused by repeated usage of wastewater. Researches indicated that using wastewater in irrigation of lettuce, carrot and tomato will increase the performance. Moreover, s study performed on wheat, broad bean, cotton and rice revealed that using wastewater may cause in higher performance in comparison with drinking water enriched with nitrogen, potassium and phosphor fertilizers (Bina, 1993).

This study was performed in order to assess impact of using unconventional waters (wastewater, saline and brackish waters) on chemical specifications of soil phosphor in development of resistant agriculture.

### 2. Materials and Methods

His research lasted in which the effects of wastewater application on levels of phosphor of soil were determined. Zahedan Water Treatment Plant was selected as a case study. Three sites were selected where following treatments were applied to: no irrigation, irrigation with treated wastewater, irrigation with river water (Lar River). The area without irrigation (control) was the pasture around the Water Treatment Plant the experiment was conducted as a randomized complete block design with three replications by drilling soil profiles. Two samples were collected from each profile at two shallow depths

(0-30cm) and deeper depths (30-60cm). Soil samples were dried in the open air before being transferred to the laboratory. The samples were screened using a 2mm sieve and transferred to the laboratory.

### 2.1 Laboratory Operations

Chemical experiments included phosphor. Soil phosphor value was also calculated by spectrophotometer and Olsen method.

### 2.2 Statistical Analysis

After performance of required tests and determination of related parameters in soil samples, statistical analyses were done in factorial form by SPSS software with linear ordination. Firstly, the data

was normalized (Kolmogorov-Smirnov) which indicated that data have general normal distribution. Then the data was analyzed in factorial design by employing Duncan test.

### 3. Results and Discussion

ANOVA results at various depths for the first depth showed a significant difference between level and phosphor of the soil at 1% significance level (Table 1). Table 1 shows results of analysis of variance relevant to the effect of applied treatment sat different depths in the second depths. The results showed that all parameter phosphor were significant at 1% significance level.

Table 1. Results of analysis of variance relevant to the effect of applied treatments at different depths

	Parameter	Sum of squares	Mean of squares	Statistical F	Sig.
the first depths	phosphor	12479.27	2247.41	312.13*	0.00
the second depths	phosphor	12856.26	2349.88	399.03*	0.00

\* Significance in probability of 1%.

Phosphor is the other element which impact soil's fertility. This element along with nitrogen and potassium are highly required for plants' growth. As per the results of one-way analysis (tables 1) and comparing Tukey mean (figures 1& 2), there were

significant differences in value of phosphor in all treatments. Significant differences were observed in depth of 30-60 cm of all treatment. Phosphor value was decreased from surface to deep layers in treatments irrigated with wastewater and water.

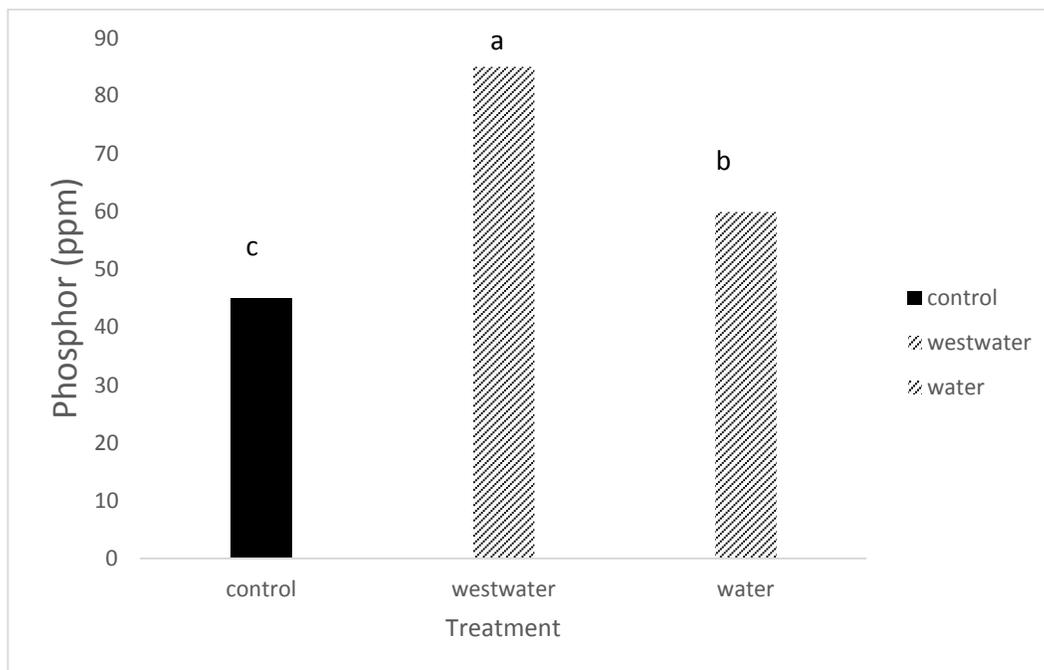


Figure 1. Soil Phosphor in Depth of 0-30 cm

Irrigation with wastewaters increases soil's Phosphor percentage (in comparison with control area). Presence of Phosphor is irrevocable specification of wastewaters which cause increase of this element in areas irrigated with mentioned water source. Phosphor is the most important nutrients in wastewaters (Scott et al., 2002) which is the main reason of suing unconventional waters. He observed that values of nitrogen, phosphor and potassium in wastewater which is used for irrigation of green pepper were more than well water. Other researchers also stated: in general there was increase soil organic carbon and available N and P in soils. Long term application of recommended NP fertilisers in the region has earlier been reported to result in

improvements in the soil organic carbon and available NPK status due to rhizo-depositions, additions of root biomass and the above ground stubbles etc (Brar et al., 2013).

Abegunrin et al (2016) Reported that wastewater resources are valuable because of improvement of soil fertility and enhanced crop growth compared with rainwater, however they need to be managed with caution, preferably treatment, before reused in relation to soil functions and crop quality. Akbarnezhad et al. (2012) investigated impacts of urban wastewater and sewage sludge compost on chemical specifications of soil. The results of this study revealed that irrigation with urban wastewaters will increase Phosphor value in treated lands.

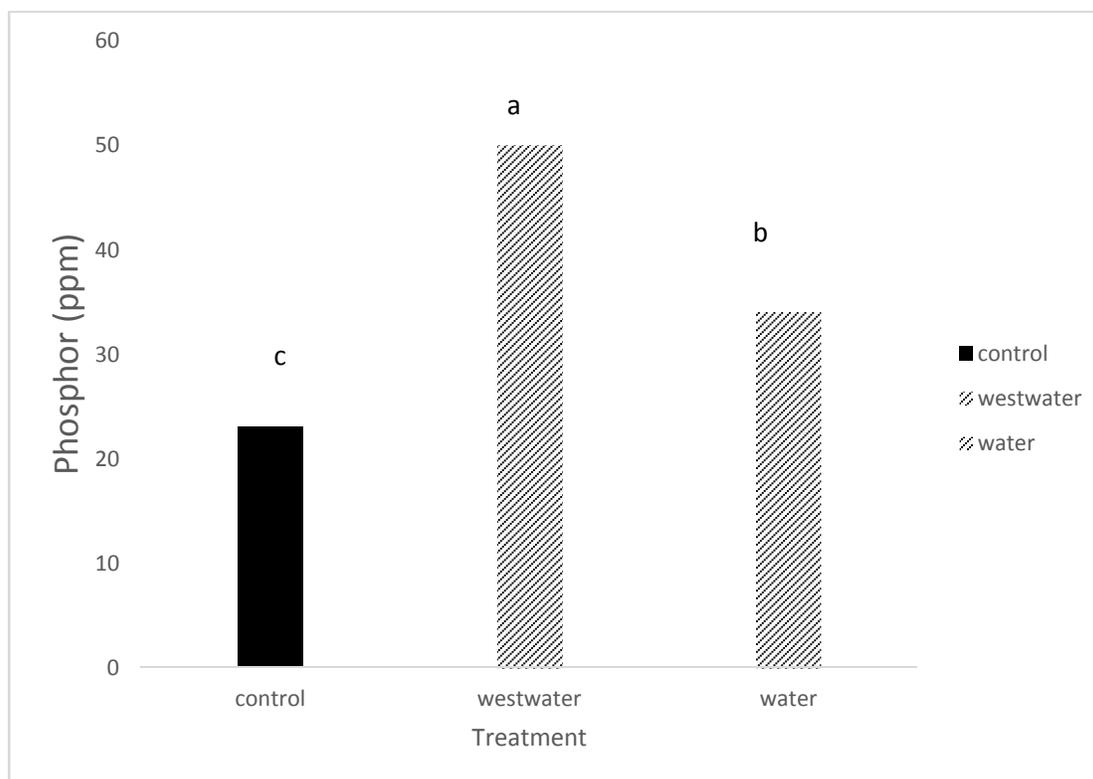


Figure 2. Soil Phosphor in Depth of 30-60 cm

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9/16/2016