
Study of Sludge at the Beni Messous Purification Station (Algeria)

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Wastewater treatment • Sewage sludge • Fertilizers • Heavy metals

1 Introduction

Organic soil reserves in Algeria have undergone several transformations under the constraint of intensive use of natural resources.

Carbon storage in the soil reduces greenhouse gas emissions and improves the soil fertility.

The lack of farm manure leads us to seek new sources of organic matter whose sludge can provide an appreciable fraction.

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Sewage sludge provides the soil with organic matter and nutrients.

Our aim was to study the fertilizing value of sewage sludge taking into account the heavy metals toxicity.

We set the limit values of the sludge not to be exceeded in the soil.

2 Materials and Methods

The sewage sludge, the subject of our study, comes from La STEP de Beni Messous, 50 km west of Algiers, which treats urban wastewater, including domestic waste water, industrial water and waste water Of runoff.

The sludge from the wastewater treatment plant in Beni Messous, with a purification capacity of 250,000 Eq.Hab, is derived from the biological treatment of urban wastewater.

The chemical and agronomic parameters of the sewage sludge were analyzed in the laboratory of the wastewater treatment plant of Beni Messous and the national polytechnic school of Algiers.

3 Results and Discussion

The use of sewage sludge on agricultural soil allows, besides its fertilizer input, preserving the ecological fragility of Algerian soils already subjected to intense degradation.

Sewage sludge is a potential source of organic matter and fertilizer, but it can also be a source of pollution.

The study should estimate the fertilizer power, the organic matter richness of the sludge and the risks associated with heavy metals, setting the limiting doses not to exceed to protect the environment.

The soils in the region are low in limestone, generally neutral, but with some basic samples, due to the predominance of the Ca^{++} cation in the adsorbent complex.

The carbon content of the soils in the region gives rise to relatively low levels of organic matter. The average organic matter content of the soil is 1.3% and the minimum value of 0.2% reinforces our approach for an input of organic matter by an external source: sewage sludge.

Some experiments have shown that an improvement of the permeability and the structural stability would be obtained after a supply of 10 T/ha of dry matter of sludge for several years.

The sludge contains appreciable quantities of nutrients:

The quantity of organic matter introduced for a dose of 10T/ha of sludge provides: 4.8 ton of MO, 230 kg of nitrogen, 280 kg of phosphorus and 6 kg of potassium which is very soluble in purified water.

Potentially, the sewage treatment plant should be able to treat 1204 tonnes of sludge to meet the organic matter requirement of about 120 ha with a dose of 10 T/ha/year.

The amount of organic matter introduced for a dose of 10T/ha of mud exceeds that of the compost, which is therefore a plus for the life of the soil.

The heavy metal content of the sewage sludge in the Beni Messous treatment plant is very high and often exceeds the NF U44-051 standard.

Our study shows that cadmium is the most restrictive limiting factor for the use of sewage sludge in agriculture.

Cadmium limits the use of sludge to 6.43 T/ha.an and this dose represents only 60% of the amount needed to improve the soil, since the use of another source of organic amendment is essential.

To compensate for this deficit, we recommend to use sludge mixed with urban compost or farm manure.

Indeed, the composition of urban waste at the level of the region is very favorable to this type of practice (high water content, high organic matter content, PCI (low calorific value).

This will allow us to come up with a more balanced and better adapted formula in the context of the organic amendment where humus plays an inescapable role in soil fertility with a view to respecting the environment.

4 Conclusion

Spreading constraints are most often linked to the excessively high acidity of the soil or to its low thickness, which increase the potential leakage of potentially toxic elements into groundwater. The pH with a basic tendency of the sludge has the advantage of limiting the risks of toxicity due to the re-dissolution of the trace metallic elements.

To compensate for this deficit, we recommend using sludge mixed with urban compost or farm manure. The proportions will be calculated according to the composition of each product, taking into account the criteria for controlling the pollution of the environment as well as the needs of soils and plants in organic matter and fertilizing elements.

This will allow us to come up with a more balanced and better adapted formula in the context of the organic amendment where humus plays an inescapable role in soil fertility with a view to respecting the environment.

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