THE RECYCLING OF FLY ASH IN FITOREMEDIATION PROCESSESS OF SOILS POLLUTED WITH PETROLEUM PRODUCTS

Amanda Izabela Siminic, Dorian-Gabriel Neidoni , Mihaela Dragalina, Smaranda Mâşu

National Research and Development Institute for Industrial Ecology ECOIND, Timisoara Subsidiary, Timisoara, street Bujorilor, no. 115, Romania
e-mail: amanda_izabela@yahoo.ro

Abstract

The purpose of the paper was to implement / produce in situ crops of annual technical plants, of the species. The study was conducted on soils heavily polluted with petroleum products in the vicinity of active railways. In order to attenuate the polluting nature of the soil, adsorbent materials were used: the ascent of the thermal power plant or the indigenous volcanic tuff. For the elaboration of the experimental models, a comparative analytical-synthetic study of a data bank resulting from the installation and development of a crop of annual plantations of inlaid plants on unproduced polluted soil / fertilized soil sludge in the absence / presence of ash thermocentral or indigenous volcanic tuff. The efficiency of installing / maintaining plant crops on experimental soil variants and the TPH (Total Petroleum Hydrocarbon) petroleum products efficiency on polluted and fertilized soil with urban sludge and ash thermal power plants have been compared with the efficiency obtained in in the case of the use of the amendment as an addition to urban sludge, indigenous volcanic tuff.

Introduction

Total Petroleum Hydrocarbon (TPH) comprise a mixture of hydrocarbons that pollute petrochemical areas, petroleum storage areas, petroleum waste areas, refineries, oil extraction wells. TPH are considered persistent hazardous waste that can reach food chains. These substances may have acute and / or chronic toxic effects. Acute toxic substances are benzene, benzoprene. These substances are recognized as having mutagenic and carcinogenic characteristics.The TPH class comprises chemical compounds having different physico-chemical characteristics[1]. It has been divided into two main categories:

1. GRO GROUP (gazoline range organics), boiling in the range of 60 to 170 ° C. Among these are the following very toxic substances: iso pentane, 2-3-dimethylbutane, n-butane and others. In addition to these C6-C10 short chain alkanes in this category are also included monoaromatic hydrocarbons: benzene, toluene, ethylbenzene and xylene (BTEX).
2. The DRO category (diesel range organics) in this category includes the following substances: C10 - C40 long chain alkanes and complex substances such as polycyclic aromatic hydrocarbons HAP.

These chemical compounds (TPHs) are generally released from antopogenic activity and lead to pronounced pollution of soil and deep water. Polluted sites often contain a high concentration of TPH. Pollutants in the BTEX category are highly mobile in the environment, whereas those in the HAP category strongly bind to the soil particles and near the source where they are discharged into the environment and remain there as an organic phase. Phytoremediation of hydrocarbon-contaminated soils: principles and applications [2].

Experimental

The purpose of the experimental work was the recycling of thermal power ash for the optimization of phytoremediation processes of soils polluted with petroleum products. In the case of using technical plants, inulin.

Experimental investigations were conducted in situ on experimental lots located on strongly polluted land with petroleum products (TPH) in the range of 61.1-82.82g / kg s.u.

The objectives pursued in this phase were:

• Determination of the ash influence of the thermal power as an amendment in the phytoremediation of polluted and fertilized soils with urban sludge, compared with another amendment, namely the volcanic tuff

• Evaluation of tolerance characteristics of the annual plant species selected for phytoremediation variants in the absence / presence of ash of thermo-central by the parameters:

• the degree of plant growth,

• Growth rate of plants,

• the degree of vegetation occupation of the sown area,

• plant health

The study was conducted with a crop of annual plant, inulin. Also, comparative studies were carried out on the effect of the ash of the thermal power used as an amendment in the mixture with urban sludge in the phytoremediation process on the development of plants versus urban sludge. the effect of another amendment added to the fertilizer agent, the indigenous volcanic tuff.[3]

The degree of coverage of the cultivated area was determined in accordance with the Braun-Blanquet Scale[4]

Table 1 Braun-Blanquet's assessment scale and completed by Ellenberg

No	Scale of appreciation	Coverage range [%]
1	+ (Very rare individuals)	0.1-1
2	1 (low coverage)	1-10
3	2 (covering 1/20 of the surface)	10-25
4	3 (covering ¼-½ of the surface)	25-50
5	4(covering ½-3/4 of the surface)	50-75
6	5 (covering >3/4 of the surface)	75-100

Results and discussion

1.Biometric parameters of plants

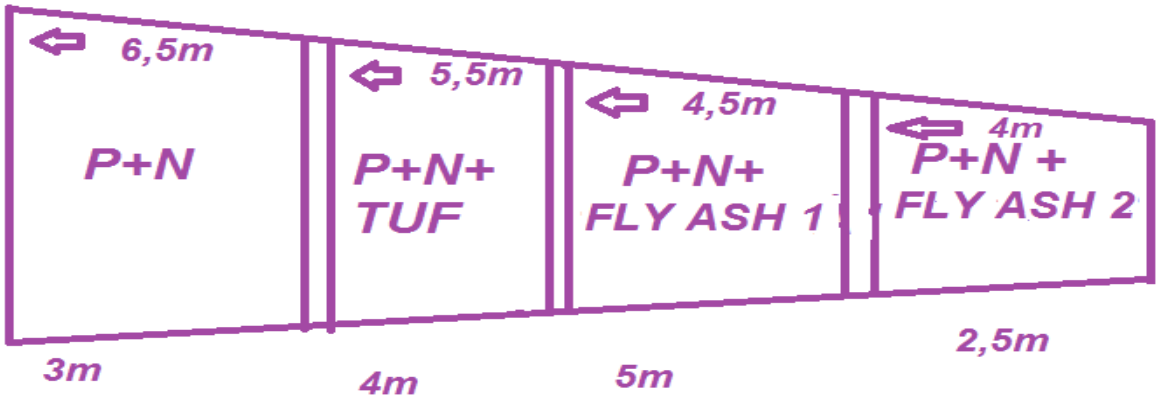
2. Variation of petroleum products in cultivated soils

3. Influence of the ash amendment of the thermal power plant in the process of phytoremediation with technical plants, oil, soils polluted with petroleum products,

4. Comparative studies on the effectiveness of in-situ phytoremediation in fertilized soil variants of fertilized soil in the presence / absence of various amendments used,

5. Develop a phytoremediation model

The experimental block of study
In figure no. 1 experimental groups are presented



Based on the results obtained from the experimental studies and the analytic-synthetic analysis of the parameters of the inland culture characteristics and the variation of the oil content of the soil, experimental models of in situ phytoremediation were developed with annual technical plants
1.experimental model of in situ phytoremediation with annual technical plants on soils polluted with petroleum products 61,1-82,82g / kg s.u .., fertilized with 60 t / ha biological sludge from a municipal wastewater treatment plant;
2.experimental model of in situ phytoremediation with annual technical plants in soils polluted with petroleum products 61,1-82,82g / kg su, fertilized with 60 t / ha biological sludge from a municipal wastewater treatment plant and treated with 50-100 t / hacenus from burning of lignite in thermal power plants;
3.experimental model of in situ phytoremediation with annual technical plants on soils polluted with petroleum products 61,1-82,82g / kg su., Fertilized with 60 t / ha biological sludge from a municipal wastewater treatment plant treated with 5t / ha indigenous volcanic tuff. [5]

Conclusion
- The conclusions of the plant culture monitoring are:
The lot cultivated with plants of the species in which an amendment was used on the basis of indigenous volcanic tuff, as an addition to the organic fertilizer, the sludge resulting from a municipal wastewater treatment plant, shows the highest increase in plant height (50- 60 cm) as well as the highest coverage of the sown area (70%)
The use of an optimal quantity of ash of 60 t / ha as an amendment for the treatment of soils polluted with petroleum products fertilized with urban sludge generated similar effects to the effects obtained on the variant treated with urban sludge mixed with indigenous volcanic tuff
The use of a larger sludge mud mixture (100 t / ha) resulted in inferior results to the urban sludge variant and the optimal dose of the ash of the thermal power plant and of the soil variant in which urban sludge was used in the absence of amendments
• The characterization of crops according to Braun Blanquet's abundance-dominant index led to the following conclusions:

1. When the plant rose, the abundance-dominance index was superior when using indigenous volcanic tuff or ash amendment as an addition to the organic fertilizer;
2. The dominance-abundance indices uniform for all variants of soil cultivated with in after the 4th week of vegetation
3. After 9 weeks of flax cultures vegetation, the abundance-dominant index was slightly reduced in the case of the culture installed on the experimental variant of polluted soil, fertilized and fined with an ash overdose of 100 t / ha compared to the other 3 lots.

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