

STUDY REGARDING BIOLOGICAL CONTAMINATION OF SOIL WITH MUNICIPAL SOLID WASTES

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Abstract: The municipal solid waste represent an actual problem as through the quantity and diversity of them and through a danger for environment and population healthy. This paper presents a study regarding biological contamination of soil around waste dump from Bacau. For determinate of soil contamination was effectuated a series of experiments were cropped and analyzed soil samples at different distances and depths of waste dump.

For the obtained results the conclusions are : a significant pollution of the soil at 500 m distance at 0-10 cm and 10-20 cm depth, a decrease of total number of germs at 1000 m distance. Effectuated study has permitted the establishment a pollution causes, a impact an environment and the measures that needed in order to reduce pollution.

Keywords: municipal solid wastes, biological contamination, soil, pollution, environment

1. INTRODUCTION

Any municipal solid wastes resulted from multiple human activities, represent an actual problem, due both to the continuous growth of the quantities and their nature (which through degradation and infection in natural habitat and represents a danger for environment and population's health), and to the considerable quantities of raw materials, recovery materials and energy that can be recovered and introduced in the economical circuit.[1,2]

Urban and industrial development of countries and the general growth of the living standard of population, trained the production of quantities of garbage that get bigger and bigger, through the variety of the organic and inorganic substances contained by the solid wastes, make the process of the aerobian and anaerobian degradation of the microorganisms difficult to manage provoking - in the case of uncontrolled evacuation and storage - the air and water pollution, and create in the same time problems with the appearance of the pathogenic microorganisms, rodents and others, with injurious effects on public hygiene.[3,4,5]

Through municipal solid wastes collection it is understood the effectuation of the gathering, processing and transportation operations for their neutralization and valorization. The variety of the organic and inorganic substances existing in the municipal wastes makes the aerobian and anaerobian degradation process by the microorganisms is fast and difficult to survey, provoking, in case of a late and not hygienic collection, the pollution of water, soil and air. Simultaneously appear multiplication problems of the pathogenic microorganisms, rodents and other centers of contamination and maladies that are injurious to public health.[6,7]

The problem of soil pollution can not be simplistically approached or in the outside of its ecosystem, according to the production and perspectives of evolution, can not be torn from the systematic landing of the geographic cover. The fragilities that the planetary space presents are many and diverse, and by tearing some natural stability, goes to biocenosis notable effects, strongly amplified by the antropichal factor. The quality of the

environment and, especially, of the soil, seen as a life support, has to suffer many transformations, from which some are irreversible or hard to correct.[3,4,5]

The microbial pollution of soil is described through the appearance of pathogenically germs on soil alongside the diverse soil wastes. The survival on soil of these germs is variable and it depends both on the microbial species and on the soil qualities and weather conditions. Generally the own microbial flora of the soil has antibacterial quality face to the impurifying microbial flora, contributing in this way to the destruction of the pathogenically germs. However the viability time is very different from a microbial species to another. In this way, a series of germs that are presented exclusively in a vegetative form resists only for little time in soil (from few days and few weeks). Other species of germs have resistant forms through sporogenesis and can sometimes survive a very long time (from some weeks to some years), in these conditions the danger of bacterial pollution of the soil is very big.

From the point of view of the source and the transmission path, the pathogenically germs from the soil can be divided in two groups:

1. pathogenically germs made by human and transmitted through soil or the human-soil-human contamination. Germs like: Salmonella, Escherichia, Vibrio (polioviruses, viruses with content DNA, viruses with content NRA) take part from this category, etc. All these germs have little resistance on soil. Usually, these germs recognize an indirect transmission through water or nutriment that gets polluted on soil. Most of the time, the role of the soil in disease transmission is neglected and therefore, the measures of soil protection.
2. pathogenically germs made by animals and transmitted through soil or animal-soil-human contamination. From this category take part: clostridium botulinum, clostridium perfringens. [8]

The microbiological investigation of the soil has the purpose of the sanitary-hygienically knowledge and the measure in which it can reverberate over other environment factors (water, air). This paper presents a study regarding the biological contamination of the soil around the garbage waste dump Bacau.

2. MATERIALS AND METHODS

For determine the biological contamination of soil there has been unwanted a series of experiments in which there have been gathered soil samples at certain distances and depth from the waste dump. Microbiota of the soil includes all the known microorganisms groups, representing at the same time a source of spreading in other environments. The most microorganisms are met in the superior layer of the soil, their number decreasing with the depth.

The sanitary indicators used in present to trace the degree of soil pollution can be divided into:

- direct indicators (represented by the number of mesophyle germs whose presence attests illness danger, but requires arduous methods);
- indirect indicators (represented by the number of mesophyle germs, total coliforms, fecal coliforms.)

For this reason, in our laboratory we've been realized a series of bacteriological analyses of the soil, especially in areas considered a risky illness. Such an area is the soil around the garbage waste dump of Bacau town, taking into consideration that parts of this soil is destined to agriculture. The gathering of samples was made according to the actual standards. Test drawing location is presented in the table number 1.

Drawing soil test points. Table1.

Sample no.	Distance, cardinal point	Depth	Sample no.	Distance, cardinal point	Depth
P1	500 m West	0-10 cm	P9	500 m East	0-10 cm
P2	500 m West	10-20 cm	P10	500 m East	10-20 cm
P3	1000 m West	0-10 cm	P11	1000 m East	0-10 cm
P4	1000 m West	10-20 cm	P12	1000 m East	10-20 cm
P5	500 m South	0-10 cm	P13	500 m North	0-10 cm
P6	500 m South	10-20 cm	P14	500 m North	10-20 cm
P7	1000 m South	0-10 cm	P15	1000 m North	0-10 cm
P8	1000 m South	10-20 cm	P16	1000 m North	10-20 cm

The processing of the soil sample. Taking into consideration the difficulty of seeding in totality of the sample, there are imposed some preliminary preparations for the seeding. The first is homogenizing the sample, in a mortar from which are then measured 100g soil and are introduced in a sterile vessel with glass pearls, with 1000 cm³ sterile water and it's intermittently shaken at least 30 minutes, resulting a suspension of germs from which we make impregnations. The preparation of the decimal fraction dilutions, is another work stage, knowing that the number of germs in the soil is big even in the absence of pollution.[10]. There have been investigated four indirect indicators of bacteriological pollution of the soil, precisely:

- total number of germs (TNG) , or more exactly the number of mesophile germs (that growing at 35-37°C). Their number is influenced by a series of factors like: humidity, texture and the degree of the soil harvest;
- total coliforms(TC);
- fecal coliforms (FC)
- fecal streptococci (FS)

The soil humidity has also been determinate, because this humidity percentage is used to discover the correction factor **K**, with what we correct the results of the micro-biological analyze. This gives us the possibility of a standard expression making possible to compare the results, both for the soil samples taken from different areas and points, but for the samples gathered from the same area or point, but in different periods. The **K** factor is established with the help of this formula:

$K = 100 / 100 - u\%$, were: $u\%$ - the percentage for the samples humidity;

$u\% = (m - m_1) \cdot 100 / m$, were: m - the weight of the sample before drying(g)

- m_1 - the weight of the sample after drying (g) For the determination of the bacteriological indicators there have been used methods presented in standards.

The maximum concentrations admissible and the degree of pollution are presented in table number 2.

The maximum concentrations admissible and the pollution degree. Table 2.

No.	Maximum admissible concentration Number of germs/ g. soil	Pollution degree
1	< 10 000	Sol curat (I)
2	10 000 – 100 000	Sol slab poluat (II)
3	100 000 – 1 000 000	Sol poluat (III)
4	> 1 000 000	Sol foarte poluat (IV)

3. OBTAINED RESULTS

The values of bacteriological and physical indicators obtained from the analysis are presented in table 3.

Values of bacteriological and physical indicators. Table 3.

Sample no.	TNG/ g. soil	TC/ g. soil	FC/ g. soil	FS/ g. soil	u%	K
P1	585800	343300	217400	102800	12,20	1,14
P2	536800	314600	198000	91200	12,32	1,14
P3	348000	264000	129300	22800	14,51	1,17
P4	300000	204000	76760	9600	14,53	1,17
P5	492000	97200	52800	15900	18,68	1,23
P6	324000	54000	29400	8800	15,81	1,20
P7	372000	132000	51600	11300	18,65	1,23
P8	312000	108000	43860	9600	16,59	1,20
P9	408000	252000	185600	21600	19,56	1,25
P10	372000	182200	134300	15700	15,57	1,19
P11	324000	26400	16200	2080	16,61	1,20
P12	252000	20400	12500	1600	17,11	1,21
P13	468000	306000	82680	39780	15,55	1,19
P14	336000	219600	59400	28500	12,14	1,14
P15	324000	180000	71400	14280	18,97	1,23
P16	276000	144000	57200	8400	18,03	1,22

TNG –total number of germs; TC-total coliforms; FC-fecal coliforms; FS-fecal streptococci; u- humidity; K- correction factor

4. CONCLUSIONS

The conclusions were drawn after evaluating the pollution degree, after analyzing the obtained results and finding the actions that are necessarily for avoiding further pollution. Concerning the pollution degree determined from the analysis of the obtained results we can conclude the following:

- around the waste dump, at the distance of 500 m (west, east, south, north) the soil is polluted from a bacteriological point of view. The soil is placed in the III-rd category with limits between 100 000 and 1 000 000 germs/g soil;
- at the distance of 1000 m (west, east, south, north) the soil is polluted from a bacteriological point of view. The soil is placed in the III-rd category with limits between 100 000 and 1 000 000 germs/g soil;
- we find out a considerable diminution of germ number at the distance of 1000 m from the waste dump, comparative with the distance of 500 m;
- around the waste dump, at the depth of 0-10 cm (west, east, south, north), the soil is polluted from a bacteriological point of view. The soil is placed in the III-rd quality category with limits between 100 000 and 1 000 000 germs/g soil;
- the same thing happens with the samples gathered from the depth of 10-20 cm (west, east, south, north).

This bacteriological pollution of the soil from the searched area is due to the hasty arrangement of the deposit platform of the waste, without surrounding fences which limit the property, advantaging the spreading of light materials; also an uncontrolled leak of the liquid part is present and we establish the drillings absence for monitoring the quality of the underground water.

The main deficiencies in house holding the municipal solid waste Bacau that contributes to the pollution of the environment are: the wrong placement of platforms; the absence of impermeability, of a monitoring system; inadequate exploitation and the maintenance; the ending of the storage capacity; the absence of an organized washing and disinfecting system of machines and containers; the absence of an organized selective collection with leads to the growth of the waste quantity deposited and to the loss of a significant quantity of reuse full materials; the storage of a significant quantity of industrial wastes beside the waste dump

The measure which imposes for the ending of microbial pollution of the investigated area consists in the correct arrangement of the urban waste dump, according to the standards in force and the permanent monitoring of the quality, from a bacteriological point of view, of the soil and ground water.

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