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BIO - ECOLOGICAL FEATURES OF PLANT RESISTANCE IN ANTHROPOGENIC CONTAMINATED SOILS

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Abstract

Absheron peninsula is an industrial Azerbaijan region. It has unique industrial features. Here have functioned plenty industrial facilities, practically in oil production association, which activity results has occurred the soil, water and air pollutions. The whole territory of Absheron peninsula is 584.7 thousand hectares or 6.8% of total area of whole Republic. As a result of industrial productivity has polluted soil and other natural resources. Assimilation oil fields soil is highly relevant in the current environmental situation. Increasing scale of human activities and the rapid development of scientific and technological revolution intensified negative impact on the environment, has led to the disruption of the ecological balance of the planet. The scientific and technological progress has complicated significantly the relationship between society and nature. People have the inflected opportunity access to natural code processes, began to acquire almost all available recovery and not restoration natural resources, but at the same time to pollute and destroy the environment. Today the world is faced with serious problems in the relation to ecosystem conservation and the creation of conditions for its continued functioning. Nowadays, the environmental situation is at an extremely low level in worldwide, in every country, in every city, it has near crucial situation.

Keywords: *Contaminated soil, indicator microorganisms and resistant plants.*

Introduction

Soil pollution with raw oil has occurred by intelligence works; as well as by borehole drilling works, therefore it has occurred to territory devastation. As a result, the soil has become contaminated, and flora in it has extinct, or ephemeral, the number of microorganisms is reduced and various representatives of fauna have been killed, especially invertebrates inhabitants in it.

During borehole drilling has overflowed raw oil to soil surface and thereby has complicated respiratory processes in flora and fauna samples, also they have fallen under destruction. There has increased territory radiation background, in which there have negative influences on living natural systems.

Absheron peninsula Soil is mostly gray-brown and brown, has dominated sandy soils. There were existed an operating oil-producing organizations in peninsula soil territory for a long time, especially in Sabunchu, Binagadi, Garadag and in other areas [1]. Just in these areas has occurred pollution of soils with raw oil during borehole drilling and oil extraction works. As a result of it the contaminated soil [picture 1]. Upper limit of oil products safe concentration depends on a combination of many factors, such as the kind, composition and properties of soils, climatic conditions, kind and land using etc. We have identified some aspects according to polluted soil and Absheron subtropical dry climate through of many years of researches of oil contaminated soil of Absheron peninsula. For example, it was found that the temperature is an important factor that determines the intensity of self-purification of soil in arid conditions of Absheron. Soil self support in wet climate condition is one of the agronomic management practices and biological activity effectively influences to putrefy tempo of oil and petroleum products.

Experimental Procedures

As a research work has selected technogenic contaminated areas, like as Khazar, Surakhani, Binagadi regions where the soil is tough polluted with raw oil and petroleum products. There are selected soil samples from depths of 0-5 cm and to 6 - 30 cm in order to determine the quantity and degree of contaminated land territory with oil ingredients. Petroleum ingredients quantity in contaminated territories has been defined by Azerbaijan Oil Academy analytical laboratory employees and there has identified the quantity of cycloparaffins, cyclohexanes, naften acids, cyclic sulfur compounds, oxides of various metals. etc. The quantity of anions and cations determined by using inductive photometer 7100 (Palintest, England), soil acidity (User S. Guide, PH -200) and hydrotestometr (PH-80), the presence of background radiation areas with radiometric detector (SPER-mkR / h) and echotestometr SOECS. We have used spectrometric microscopic and analytical methods. Oil pollutions have differed from many other anthropogenic impacts, which have not given constant, but as a rule they have given "volley" burden to environment, causing to rapid reverse responding.

To determine the stability of ingredient degree in various plants oil contaminated soils has been used ephemeral, ephemeroidic, herbaceous, shrubs – as example in sagebrush, petrosimonia, camel thorn bushes, oleander bush and in ordinary European olive, woody species of Eldarica pine trees and Italy pine trees.

Results

Nowadays, most biologists, ecologists, physiologists and biochemists have accepted the lack of universal resistance

mechanisms against various wicked environmental factors. Drought resistance, salinity resistance and other characteristics of plants are interconnected with a biological characteristic of each species and the mechanism has enclosed genetically after a long time. Natural plants can hardly withstand drought attack and salinity of soil with their bright lighting, etc., there are produced certain mechanisms of anti pollutants, particularly of petroleum pollutants. However it is important to consider the degree of soils contamination with oil. Also it should be considered of oil components. Common and light oil components have exposed to decay under direct sunlight influences, but polymer components has a long life. For high-molecular oil components decay are needed many years and it depends on soil microorganism's activity also. Anti pollution methodology development is extremely complex matter. Soil reactivity to oil contaminated land and their sensitivity to these pollutants are differing according soils areas; also join with in conjugate landscapes.

There are selected natural resistant plants, as well as cultural decorative species to use them as reclamation and recovery matter in Absheron contaminated soils full of waste raw oil. The process of natural fractionation and oil decomposition begins from it's proceed to soil surface. Many researchers have stressed the light fraction strong toxic effects on soil microbial communities and animals. Light fraction has migrated in soil profile and aquifers, sometimes expands significantly the area of the initial contaminations. Primarily the fraction has exposed to physical and chemical degradation processes on surface, hydrocarbons in its component fastest processed by microorganisms. A significant portion of light fractions petroleum has decomposes and volatilize even at the soil surface or washed away by water currents. By evaporation has removed from soil with 20 up 40% of light fractions.

Soil pollution in Absheron has begun its history from raw oil production in oil settlement. Originally has performed the technical production, later manual, which contributed to contaminate large areas.

For experimental researches we have used the typical heat lover ordinary Oleander bush species, olive tree, salinity and drought -resistant European Eldarica pine tree. Morphological needle and leaf growth data has shown in Table 1.

As there are shown in Table 1, in low contaminated areas growth and leaves formation close to benchmarks (Sample copies growing in Institute of Dendrology of ANAS). By moderate contaminated soils conditions leaves growth are stopped, by plants testing has shown decrease of leaf blade and in some cases detected leaf necrosis or early fallen. In this connection has been slowed down function of the photosynthetic apparatus. In summer period has detected deformation of needles and leaves, twist of petioles etc. A plant, whose rapid growth is observed, has detected various burns as view of black spots (in needles).

Seasonal and long-term observations have suggested that succession of vegetations didn't occur in oil-polluted areas. In these and adjacent areas were absent in recent years early ephemeral and ephemerides, herbaceous plants were rare. Fibrous root system of herbaceous and some ephemeris has destroyed rapidly, root system of monocots are not able to reflect the onset of toxic oil components.

Another pollution source with oil wastes is deep-water eruption to earth surface and oil boreholes water. Therefore there are happened here primary and secondary pollution. Spilled feedstock oil and wells oily water have complicated the direct oxidation of oil with aerobic microorganisms, there has begun photochemical reactions, delayed decay of simple hydrocarbon components, has contributed to formation of toxic intermediate compounds, has occurred anaerobic digestion of oil. There has appeared the transformation of chemical substances under direct sunlight, high temperature and wind speeds influences on hot summer days, also large components in Comogen shape and they settled at bottom or at soil depth. Light fractions are vaporized [2, 3, 4, 5, and 6].

Discussion of Results

There is observed slowdown in halophytes growth (salinity-tolerance), particularly in Petrosimonia, during camel-thorn and wormwood have showed relative stability. (Table 2)

To relative trees and shrubs species we could show Ordinary Oleander, European olive, Eldarica pine and Italy pine. It should also be noted, that plants with rapid growth have manifested some necrotic signs. Strong root system and slow growth in some point of growth compensates the resistance manifestation mechanism and general adaptation.

From Table 2 data has showed that researched wormwood, camel thorn and Petrosimoniya wild species are more stable than the cultural Oleander, Eldarica pine and Italy pine. From rod root systems of wormwood and Camel Thorn components have used their selective toxic component features, put them to exchange process. Real active microorganism is particularly- O_2. Marked species of Pasterianium in Rizosphere hold a positive influence to raw oil components and promotes their use as a food product for plant roots [5,6].

The technogenic contaminated soil results are divided into the following groups according to above mentioned researches: a) low polluted; b) medium contaminated and c) high contaminated. According to the preliminary data we have purposed to develop and low and medium irrigation of polluted area territory; near 2,600 hectares to plant resistance species there and give green appearance to the abandoned places.

Determination of radiation areas background has showed that in general it is close to total sanitary norms. The indicators have exceeded in natural background in 8-10 times on raw oil areas, which has a negative impact on vegetation.

Conclusions

1. Some Halophyte Plants have ability to reclamation in contaminated soil space. They are effective as in plant compositions, as in landscape design.
2. Microorganisms of Clastridium class and wild plants have slow impact to decay of raw oil components.
3. Resistant trees and shrubs species have slightly endured of attack of polluted soil raw oil.
4. For use of contaminated raw oil soils has requested the regular irrigation of soil with mineral and organic fertilizers.

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Annexure

Figures:

Figure 1: Contaminated soil in Absheron peninsula

Tables:

Table 1: Comparative growth and development of Eldarica pine tree leaves and European olives in contaminated Absheron Peninsula soil (seasonal dynamics), (look at).

N	Plant Species	Measurement's Quantity	Pollution's Degree		
			low	moderate	high
			Average growth of leaves	Average growth of leaves	Average growth of leaves
1.	Eldarica pine tree	4	8.0	4.0	3.0
2.	----------	4	8.8	3.0	2.8
3.	----------	4	7.5	3.5	3.4
4.	----------	4	8.5	3.8	2.5
5.	----------	4	7.8	3.9	2.8
6.	----------	4	8.0	3.9	2.0
7.	----------	4	8.3	3.5	2.3
8.	----------	4	9.0	3.5	1.9
9.	----------	4	9.8	3.0	1.8
10.	----------	4	10.5	3.3	1.5
1.	European Olive tree	4	2.7	1.8	1.7
2.	----------	4	3.0	1.7	1.5
3.	----------	4	2.7	1.9	1.3
4.	----------	4	2.8	1.8	1.0
5.	----------	4	2.5	1.9	1.5
6.	----------	4	3.0	2.0	1.7
7.	----------	4	3.0	1.6	1.3
8.	----------	4	2.8	1.7	1.4
9.	----------	4	2.7	1.9	1.3
10.	----------	4	2.7	1.5	1.0

Table 2: Relative resistance of plants in raw oil contaminated soil, their point of system

Series	Plant species	Pollutions degree and sustainability		
		low	average	high
		stable	Half stable	unstable
1.	Motley grass	10	5	2
2.	Ephemera	10	4	0
3.	Ephemeroids	10	4	1
4.	Wormwood	10	8	7
5.	Petrosimonia	10	7	5
6.	Ordinary Oleander Bush	10	9	8
7.	Camel-thorn	10	8	6
8.	European Olive	10	9	7
9.	Eldar pine	10	8	7
10.	Italy pine	10	7	6