БИОЛОГИЯ ПОЧВ

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MICROORGANIZM DYNAMICS AND AN INFLUENCE OF THE EROSION PROCESS ON THEM IN PSEUDOPODZOLIZATED YELLOW SOILS

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Abstract. The microorganisms activity on seasons in noneroded and medium-eroded sorts of the pseudopodzolizated yellow soils utilized in the plain and foot-hill agricultural zone of the Lankaran province has been comparatively studied in the article. It was known that an activity of the microorganisms' sorts was restricted in connection with the deterioration of the water physical regime of soil in a leaching kind of the pseudopodzolizated yellow soils. A good condition for the microorganisms activity and plant development in soil appears in the spring and autumn months. Weakening of the biological process is observed as a result of the high temperature and aridity influence for a long summer period.

Key words: Lankaran province, soil, erosion, microorganisms.

INTRODUCTION

The microorganisms realize very important and many-sided functions in connection with the substance and energy transformation in soilforming process. They participate in organic residue transformation, diferent ordinary salts formation from organic and mineral combination components, soil minerals decomposition and reconstruction, soil-formation crops accumulation. The microorganisms activity is a necessary ring in biological circulation of the substances. Biochemical-nourishment, oxidation-reduction of soil, air regimes formation and dynamics are also directly bound up with the microorganisms action. All these prove a special role of microorganisms in soilforming procecses and soil fertility formation [1-3].

The microb groupping fix biochemical features of soil and it is a unity of the various organism kinds, forms a definite ecological troph unit. The microb groupping in comparison with all the components of ecosystem is sensible against an ecological change during an existense of assimilation of ecosystem in agriculture, other antropoghenic effect including pollutants.

The microorganisms exposes to structural-functional change against growing antropoghenic pressures. An antropoghenic interference in microb groupping, reconstruction of their content and organisation can effect from diferent positive to neutral and negative, removing of acid by the whitewashing method, creates a condition for nitrogen fixing microflora development [4-6].

An application of mineral fertilizers on average stimulates microorganisms' activity to surplus degree. This is characteristic for the soils rich in plant remnants in which C:N ratio is higher.

The atmospheric precipitations polluted by mineral mixtures cause seriously destruction of the microb groupping.

It was adopted that an upper layer of soil consists of mineral substrate (93 %) and organic substrances (7 %). Dead organic matters (85 %), plant roots (1 %) and edaphon (5 %) include in organic matters. The bacteria and actinomicets (40 %), fungus and water-plant (40 %), earthworms (12 %), other microfauna (5 %) and mezofauna (3 %) include in edaphon structure.

Participation of microorganisms in humification (humus formation) shows itself in components formation and their transformation (biochemica oxidation) and in resynthesis of these components from the simplest combinations for the

humus substance synthesis during decomposition of organic residues. Generally one of the necessary condition for transformation of maternal rock into soil is settlement of microorganisms and green plants in the rock. Appearing of two organism groups causes organic residues gathering and creation of humus – a special group of organic substances.

The factors which influence on a role of microorganisms energy and its increase-decrease in soil must be investigated. We should note that a great part of microorganisms in soil is bacteria, fungi and ray-fungi. These microorganisms breathe and absorb oxygen, leave carbon (CO_2). They from different chemical combinations, including ammonium and organic acids and this affects the soil environment reaction.

Majority of cultured plants and land microorganisms develop well in weak acid or neutral reactions (pH 6-7). Alkaline and more acid reaction negatively affect them. While the acidity is high, a life activity of nitrificating and nitrogen collecting microorganisms weakens, while p His less than 4-4,5 , some of them can't develop. Therefore the nitrogen fixation of air weakens very much or wholly stops, the organic substances mineralization slows, ammonification and nitrification processes weaken and plant nourishing with nitrogen deteriorates strongly. A main reason of the biological activity weakness related to the more acidity of the soil environment as a result of ammonium-sulphate application in the soils where old tea plantations are grown. Undoubtedly, it isn't possible to get a high and qualitative crop from tea plant by an application of ammonium-sulphate in such soil environment. It shows that rational methods which will provide a normal life activity of useful microorganisms to get high product from the same plantations.

OBJECTS AND METHODS

The pseudopodzolizated yellow soils widely spreaded in the plain and foothill zone of the Lankaran province have been taken as a research object. The soil sections have been put, and the analyses have been performed according to the required method.

Two sections have been applied during the research.

Section 1 (one) – in the Avrora village of the Lankaran district, in the ancient river plantation with 2^0 inclination. The erosion process wasn't observed.

AY_{vg} 0-10 cm – grey-brownish, heaplike-nutlike structural, hardlike, heavy loamy, dense, small rootlets, whitish spots, transition is felt.

$AYEL_g$ – 10-20 cm – in whitish-brownish background rust stains, tightened, heaplike-small clodlike structural, roots, heavy loamy, manganese- ferrum concretion (in pea grain size), transition i sin tongue shape. It is light colored in the strong podzol soils, doesn't boil.

BT_g – 20-40 cm – Light-yellow (stubble)- brown, compacted, loamy, fissurelike- thin fissure is narrower than 3 mm, clodlike-prismatic, silicified reproductions, coloured with humus and greyish-blue spots, manganese-ferrum concretion (in pea size), roots are met, gradual transition, doesn't boil.

Section 2 (two) – in the Khanbulan village of the Lankaran district, from north-west to south-east 6^0 inclined, eroded to an average degree at the foothill zone.

AY_{vg} 0-10 cm – light-whitish yellow, high clayey, humus flows on the surface, not distinctly blue spots in the lower part, point-shaped manganese-ferrum concretions, clodlike in little cases, structure is hard, many tree roots, granulometric composition is heavy, mainly clayey, transition is clear, doesn't boil.

$AYEL_g$ – 10-20 cm – ligh-yellow, reddish, the surface is whitish, gleyish spots, yellow manganese-ferrum concretions (in pea size), heaplike-nutlike, or clody-prizmashaped, humus flows on the edges of the structural aggregates, many tree roots, many gravels and coarse sand mixture clayey, transition is gradual.

BTg -20-40 cm – yellowish-brown, few roots, many gravels and rock crumbs, ferrum-manganese spots and points, devided into yellow spots on cracks, the structure isn't distinquished, doesn't boil.

The researches have been performed on the basis of the field and laboratorial investigation methods.

RESULTS AND DISCUSSION

It is known that microorganisms play an important role in soil fertility and plants nourishment. Taking it into consideration their activity on seasons was comparatively investigated in noneroded and medium-eroded sorts of pseudopodzolizated yellow soils which are widely used in agriculture of the Lankaran province. More unfit soil environment was created for a normal life activity of more soil microorganisms, soil ferments gathering and action during an erodible process of the soils under the tea plant for a long time.As a result a biological and biochemical activity level of these soils diminished to an important degree, and this requires its scientific-theoretical and farming solution.

The soil difference is various in the diferent seasons of the year. This depends on agricultural plants nourishment with the nutrient in a diferent rule, climate changeability, humidity condition of soil, its provision with the air, temperature regime and microorganisms' life activity.

Decrease of the microorganisms' life activity in soil is considered an indication of the biological degradation. If the increase secondary of the permissible concentration in soil pollutants is more, it is necessary to evaluate them according to their gross forms. Therefore the microorganisms Dynamics which plays an active role in collection of the assimilated nutrient on seasons has been studied in the pseudopodzolizated yellow soils.

It was determined by the observations performed in the pseudopodzolizated yellow soils used under the tea plant that a total number of the microorganisms , and separate kinds change depending on seasons, hydrothermic regime, erosion degree, an application of the physiological nitrogen fertilizer for a long time. More activity of microorganisms on seasons is observed in spring, but the less one is observed in summer (Table 1). The activity grows somewhat in autumn, and the microorganisms action rose considerably at the expense of mineral-organic fertilizers (manure and phosphorus) application, including microscopic fungi development in summer [7, 8].

We should note that more parts of microorganisms gather at 0-10 cm layer of soil, so, a total quantity of microorganisms at 0-10 cm layer of nonerodible soils on seasons was 2588-2878 thousand at one gram of soil in spring, 2088-2436 thousand in summer, 2301-2657 thousand in autumn (Table 1, figure 1). The bacteria changed in 1720-2026000, the sporic bacteria in 410-466000, radiant fungus in 680-804000 interval (Figure 2). This is observed in the medium-eroded soils. So, a total number of microorganisms at 0-10 cm layer of the medium-eroded soils was 1240-1344 thousand in one gram of soil in the spring of 2009-2010, 966-1098 thousand/g in the summer, 1116-1139 thousand/g in the autumn [7, 9].

As it is seen from Table 1 a total number of microorganisms reduced towards depth along profile either in non-eroded or in medium-eroded pseudopodzolizated yellow soils. That is to say at 20-40 cm layer of non-eroded

soils a total quantity of microorganisms was 1956-1812 thousand/grams in spring, 1813-1422 thousand/grams in summer, 1933-1559 thousand/grams in autumn but it was 834-748 thousand/grams in spring, 520-691 in summer, 664-661 thousand/grams diminished in comparison with the medium-eroded soils (Table 1).

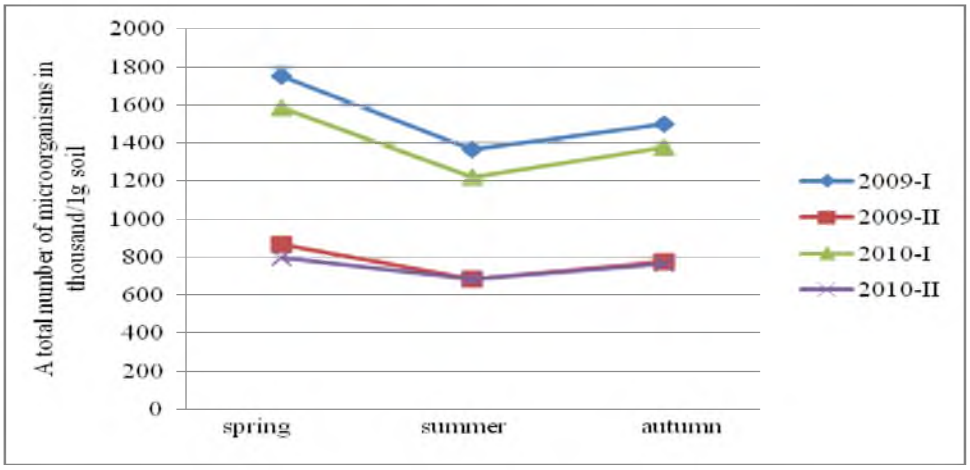

Figure 1 - Change dynamics of microorganisms on seasons in the pseudopodzolizated yellow soils (I - non-eroded, II – medium-eroded)

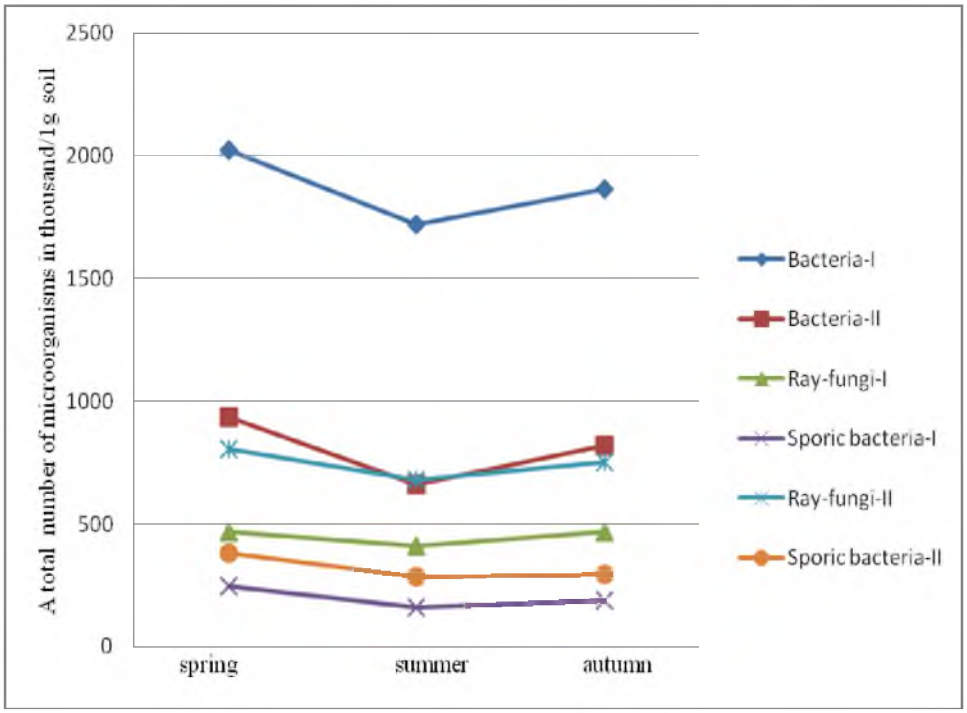

Figure 2 - Microorganisms activity in the pseudopodzolizated yellow soils on seasons (1000/in an absolute dry soil) (I - non-eroded, II – medium-eroded)

It is seen from the consequences that the erosion process diminishes microorganisms mass and negatively affects the sun energy collection, generally the balance.

Table 1 - Microorganisms activity in the pseudopodzolizated yellow soils on seasons (1000/in an absolute dry soil)

Number of the sections	Eroded degree	Depth, cm	Spring					Summer					Autumn				
			A total number of microorganisms	Bacteria	Sporic bacteria	Ray-fungi	Microscopic fungi	A total number of microorganisms	Bacteria	Sporic bacteria	Ray-fungi	Microscopic fungi	A total number of microorganisms	Bacteria	Sporic bacteria	Ray-fungi	Microscopic fungi
2009																	
39	Non-eroded	0-10	2878	2026	466	804	48	2436	1720	410	680	36	2657	1864	466	750	43
		10-20	1456	880	185	540	36	1036	568	150	440	28	1126	718	160	375	33
		20-40	922	509	128	386	27	623	398	85	203	22	724	446	95	253	25
		0-40	1752	1138	260	576	37	1365	895	215	441	29	1502	1009	240	459	34
40	Medium-eroded	0-10	1344	933	245	382	29	966	660	158	285	21	1139	820	190	295	24
		10-20	740	434	105	285	21	640	362	76	262	16	709	413	110	278	18
		20-40	510	338	92	155	17	446	298	60	136	12	475	318	80	142	15
		0-40	865	568	147	274	22	684	440	98	228	16	774	517	127	238	19
2010																	
41	Non-eroded	0-10	2588	1822	420	730	36	2088	1448	390	610	30	2301	1596	430	672	33
		10-20	1389	916	230	440	33	914	508	122	380	26	1095	643	180	424	28
		20-40	776	448	94	304	24	666	362	72	285	19	742	430	95	290	22
		0-40	1584	1062	248	491	31	1223	773	195	425	25	1379	890	235	462	28
42	Medium-eroded	0-10	1240	908	218	310	22	1098	785	188	295	18	1116	788	212	308	20
		10-20	653	408	92	230	15	549	335	82	202	12	722	488	122	220	14
		20-40	492	346	70	130	16	407	275	57	122	10	455	315	72	125	15
		0-40	795	554	127	223	18	685	465	109	206	13	764	530	135	218	16

An optimum condition was created for the microorganisms action activity and agricultural plants development because of presence of comparatively average humidity and middle temperature phase in the spring and autumn seasons in 2009-2010 as it is seen from the table. The plants in this phase release many organic residues and they are strongly broken by microfloras and creation process of new humus matters happen. But we should note that strong heavy rains characteristic for the district in the autumn season of the research years caused higher humidity of soil. As a result the soil temperature decreased and the plant remnants splintered under an anaerob condition. The oxidized organic substances on the upper layers of the soil enter the deep stratums ora re leached from the soil layers. Mostly drying of the soil in the şumer season caused strongly decreasing of the plant mass supply. pH mostly gets reduced in the soil as a result of oxidization condition superiority, biological process weakening in psevdopodzolic yellow soils under river. The substrances solved in soil crops dry up on soil cracks and are collected in a salt crust form.

CONCLUSION

1. The conclusions of the researches show that a quantity structure of microorganisms strongly changes depending on nutrient quantity, soils spreading over vertical zonality, eroding degrees, seasons of the year, hydrothermic condition, humus supply, soils cultivating, plant cover, climate condition.

2. A total number of microorganisms was 49,37 % in medium-eroded soils in comparison with non-eroded soils (at 0-40 cm along profile) in the spring of 2009, but it diminished 49,81 % in 2010, while comparing according to eroded degrees.

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ТҮЙІН

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ПСЕВДООДЗОЛИДТАЛҒАН САРЫ ЖЕРЛЕРДЕГІ МИКРООРГАНИЗМДЕРДІҢ ДИНАМИКАСЫ ЖӘНЕ ОЛАРҒА ЭРОЗИЯ ПРОЦЕСІНІҢ ӘСЕРІ

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Мақалада Ленкоран облысының жазық және тау бөктеріндегі ауыл шаруашылық аймағында пайдаланылатын, бүлінбеген және орташа эрозияға ұшыраған жалған подзолды сары топырақтың маусым бойынша микроорганизмдердің салыстырмалы белсенділігі зерттелді. Микроағзалар түрлерінің белсенділігі топырақтың сулы-физикалық режимінің нашарлауына байланысты, жарылған псевдозольді сары топырақтың шектелгені белгілі. Микроорганизмдердің белсенділігі мен топырақта өсімдіктердің дамуы үшін жақсы жағдай көктемгі және күзгі айларда туындайды. Биологиялық процестің әлсіреуі жоғары температура мен ұзақ жазғы кезең ішінде құрғақшылық әсерінің нәтижесінде байқалады.

Түйін сөздер: Лянкяран облысы, жер, эрозия, микроорганизмдер.

РЕЗЮМЕ

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ДИНАМИКА МИКРООРГАНИЗМОВ В ПСЕВДОПОДЗОЛИСТЫХ ЖЁЛТОЗЕМАХ И ВЛИЯНИЕ НА НИХ ПРОЦЕССА ЭРОЗИИ

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В статье изучена сравнительная активность микроорганизмов по сезонам в неэродированных и среднеэродированных псевдоподзолистых желтоземах, используемых в равнинной и предгорной сельскохозяйственной зоне Ленкоранской области. Известно, что активность видов микроорганизмов ограничена в связи с ухудшением водно-физического режима почвы в выщелоченных псевдоподзолистых желтоземах. Хороши условия для активности микроорганизмов и развития растений в почве появляется в весенние и осенние месяцы. Ослабление биологического процесса наблюдается в результате воздействия высокой температуры и засушливости в течение длительного летнего периода.

Ключевые слова: Лянкяранская область, земля, эррозия, микроорганизмы