

# **Biomorfogenetic Diagnostics of the Irrigative Soils Suitable for Vegetable in the Azerbaijan Subtropic Zone**

Orudzheva Naila Hidayat  
Babayev Maharram Pirverdi



Science Publishing Group



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## **Introduction**

The great volte-faces have happened in the public-political and social-economic life from the period of the restoration of the Azerbaijan Republic state independence up to now. The Azerbaijan National leader mister Haydar Aliyev's expedient policy created a chance for fulfillment of agrarian reforms and market economy. Intended for 2009-2013 years by respectable President Ilham Aliyev entering the “State Program about social-economic development of the Azerbaijan Republic regions” and the research objects as Absheron, Aran, Guba-Khachmaz and Lankaran economic districts possess a great economic potential for agricultural development from this view point. At present some vegetable plants of agricultural importance are grown in these regions. At the period of fulfillment of the agrarian reforms an antropogen influence on ecological environment and soil cover rises. As a result of the human's long economical activity an intensive growing, especially irrigating, disturbing of agrotechnical measures are a reason for strong change of the soil initial morphogenetic parameters, decrease of the fertility parameters, reduction of productivity.

Last decades an influence of the human's economic activity on natural ecosystems, including the soil ecosystem got a character on the largest scale. One of the main directions of the man's economic activity is a formation of new antropogen agrosystems distinguishing from natural ecosystems according to all the sings. During intensive use from soils one of the main problems remains as their fertility management in soil science and agriculture. The man has an influence on microorganisms quantity, biodiversion, ferments activity and intensity of biochemical process by rising bioproductivity. The soils develop-

ment from antropogen effect and occurring changes there are more intensive than natural factors.

The directed biological overturning plays an important role from an effect of physical, chemical, biological and biochemical process in increase of soil fertility restoration and productivity. From this view point in order to use from irrigative soils studying objective laws of change of biological activity, intensity of biochemical process and microorganisms quantity depending on ecological condition of soilforming process, increase of the soils fruiting ability as a result of crop rotation application being grounded from scientific point of view in Food Safety provision, getting ecological pure crop, preservation of soil ecosystem balance attain great urgency.

Agrotechnical, meliorative, fertilization and other measures are agroecological factors in use of the agricultural soils, and they form, contemporary soilformation process. While being a change of agroecological factors purposely, it is possible to manage intensity of biochemical process, an activity of microflora and ferments. A main purpose of the intensive agriculture is to achieve high fertile soilformation for increase of agricultural plants productivity and restoration of soil fertility.

Complex study of biological activity and agrochemical parameters exposed to the man's economic activity for a long time gives a chance to tell an exact idea about an investigation of soilformation process direction, their origin diagnostics, fertility and production ability and gives a basis to the preparation of agromeliorative measures system for complex management of the process.

So, study of the irrigative soils biological activity of the subtropic zone at a contemporary period and a research work conducting on the management field of the soil fertility are important problems and attain a great importance on both

theoretic and practice side from soil fertility management standpoint by scientific bases.

A great role of the biochemical process and microorganisms in formation of soil elements and soil fertility is noted in the classical references. The soil fertility is created as a result of a mutual effect of natural and artificial that is antropogen factors. The soil fertility is determined by a character of soilformation process and local ecological condition depending on physical, chemical and biological process (Mamedzade, 2004).

A new stage-soils ecological estimation is formed in pedobiology development by using of complex biological parameters as geobotanics, microbiological, biochemical, zoological in soil science.

An available balance is disturbed in the soil as a result of change till external factors-abiotic factors, antropogen effect, technogenezis and other extremal state and instead of it an adequate balance, is formed corresponding to the new condition. The man disturbs a dynamical balance between soil and plant by replacing natural biosenoz with agrosenoz, from this period a necessity is created for studying an intensity and direction of the changes happening in soil formation process.

Increase of soil fertility and agricultural products, using of soils in a rational and high quality, protection of the environment pollution are main fields of agriculture and soil science. The main kinds of the antropogen effect on soils and soilforming process: 1) replacement of natural biota, fito-and zoosenoz with the new one; 2) mechanical working of soil; 3) application of fertilizers, chemical substances; 4) irrigation; 5) drying; 6) relief change from antropogen effect (Ivanov and et. al., 1997). Widening of negative process effect is a reason for normal biological period disturbing. The antropogen effect prevails over an

influence of natural process on soil cover, as a result it is a reason for loss of regulation of biosphere by itself.

As a result of soils use under agricultural plants its main characters transformation can change in the negative and positive direction, at this time different physical-chemical and biological process occurs, these are connected on behalf of “restoration by itself”. High agricultural and agricultural production intensification must serve the soils protection, fertility increase, improvement of soil chemical, physical-chemical characters. The organic substances quantity of agrosenoz entering the soil approach the plant biomass in natural senoz under high fruiting condition. The soil is determined by a general ecological state of agrolandscape and nitrogen-carbon period as a system of regulating by itself. One of the main parameters effecting on soilforming process is biofil element which enters the plant from soil and atmosphere, as a result overturns the plant biomass and enters the soil and biological period after plant perishing.

S. P. Kravkov (1978) shows an important problem of studying of biochemical process dynamics occurring in the soil, a main and interesting problem of soil science in soil genesis research, in investigation of soil fertility increase methods. The soil physical and chemical characters reflect the soil conservative peculiarities, the soil biology reflects dynamical process occurring in the soil. A main character of the soil biological activity is to be varieties in the period and place frame considerably, this requires majority of repetitions quantity and conduction of variation-statistical calculations (Zvyaginsev, 1978; Kazeyev and et.al, 2004). The soil potential activity is the best diagnostic parameter in definition of soil potential fertility, fertilizing degree, cultivation level and pollution with any chemical substance, actual activity -reflects natural-real activity (under field condition) (Kazeyev and et. al., 2003). Biological activity

of soils defines microorganisms activity joining complex process in itself, and overturning, mineralizing and transformation of the plant residues and reflects the soil fertility parameters in itself (Shakuri, 2004). The biological characters of the soils of different type formed under available ecological condition can be estimated objectively while studying the process occurring in the soil complexly (Hajiyev, 2000; Gasimova, 1985; Orudzheva, 2009; Aliyev, 1978).

The biological activity plays an important role in forming, restoring of soil fertility and investigating of the degradation in time. From the antropogen influence the duration of the biological process in the soils depends, on their genetic characters, sum of absorbed cations, organic substances quantity, oxidizing condition, pH and others (Kazeyev and et. al., 2003). The soil biological activity gives a chance to define the antropogen effect character and degree.

The biological indicators possess some superiorities in comparison with other parameters: the first-they are the most sensible against the external environment effects; the second-gives a chance to give diagnostics in the initial stages of the negative process; the third, we can only speak about the soil material composition which exposed to the changes by it to an important degree (Khaziyev, 2005).

The soil biological characters can be formed up with the following sequences according to the duration for antropogen effect: catalase activity > invertase activity > uerase activity = phosphatase activity shattering velocity of urea essence > shattering ability of cellulose > shattering intensity of amino acids > phytotoxicity > microscopic fungus quantity > actinomisets quantity > sporforming bacteria quantity (Kaziyev and et. al., 2004). Estimation of the soil biological activity level is near the soil fertility evaluation (Valkov, 2001).

The ferment activities are applied more than biological methods. Catalizator of biochemical process occurring in the soil is ferment collect in the soil and enter the soil by the alive organisms, this defines its unique character-fermentative activity. Non-assimilating forms of organic and inorganic substances in the soil overturn into the assimilating forms by plants and microorganisms under different ferments effect, this plays an important role in agricultural plants feeding and productivity forming.

Why studying the objective laws and functions of the ferments activity formation in soil rouses interest for preparation of the theoretic problems and solution of the practical problems in soil science. The complex humusforming process by a participation of the different ferments forms a foundation of soil and its fertility formation. N. L. Radyukin speaks (2001) with his like-minded authors that the soil ferments take part in only shattering reactions, the initial organic combinations are shattered under an effect of microorganisms and ferments, the monomer condensation being formed in humusforming process occurs by abiotic method. The ferments collecting in the soil are indispensable components of the soil ecosystem. The fermentative reactions role is great as catalyst in soil process; ferments are the most valuable rich system for difference and activity (Kuprevich, 1974). The ferments entering the soil fulfill shattering of different organic residues by biogeochemical and biochemical method incessantly, they are important biocatalyst of the soil and they fulfill important functions as shattering of the initial organic matters between “soil-microorganism”, becoming rich of soil with biogen elements and humus. The soil ferments take part in all the stages of transformation of organic substance entering the soil (including microorganisms and being secreted by plants). In spite of heterogen soil there are stable homeostaz-organic matters in

some quantity (polysakharides, amino acids, ferments, organic matters, vitamins and etc.), pH which is characteristic for the same soil, nutrient and others.

The available experiments show that the ferments activity determines an intensity and direction of the biochemical process occurring in the soil (Kuprevich and and et. al., 1966; Popova and et. al., 2006). The ferments activity in the soil depends on ecological factors and soil characters. The soil physical characters influence on ferments activity directly or indirectly. On the soil surface the catalytic activity is fulfilled by ferments, but on the low layers it is fulfilled by abiotic catalysts, the soil ferments differ from abiotic catalysts by its specificity, they catalyze reactions with a high velocity comparatively. A quantity of ferments entering the soil depends on biota biomass and metabolic activity; this is also defined by the mutual effect of the main components of the ecological factors. The ferments activity reflects the soil genetic characters in itself (Kazeyev and et. al., 2003).

The use of ferments activity in biodiagnostics gives objective information about the process occurring in the soil in comparison with microbiological activity (Kazeyev and et. al., 2004). Elevation of upper soil biogen and main microorganism groups which are ferments source is characterized by organic substances density, majority of soil animals and plant roots (Kazeyev and et. al., 2003). The ferments activity is densely closed to the soil ecological parameters as microorganisms quantity and activity, the highest plants biomass, especially a root part, soil characters, hydrothermic condition and ect. The soil microflora rises according to the ferments activity in the soil (Kozlov, 1970).

L. A. Murdam, P. Kh Rakhno, O. O. Rins and others (1978) show that a temperature, humidity and abiotic factors influence on ferments activity indirectly, their effect depends on quantity and composition of the substances being

secreted from soil microorganisms and the highest plants. A control to the direction of the fermentative activity dynamics plays an important role in diagnostics, prognosis and in preservation of the meliorated soils bioproductivity, prevention of the negative changes in time. The ferments activity is a diagnostic indicator in estimation of soils fertility and cultural level, definition of biochemical process level, in definition of the cultural plants effect degree and pollution different agronomic measures, erodibility (Abduyev, 1987; Babayev, 1984; Hajivev, 1997; Kuprevich, 1974).

An activity of invertase ferment in the soil can be used in a solution of the theoretic and practice problems of soil science, soil classification, definition of the genetic characters. An activity of invertase, phosphatase and dehydrogenase ferments characterizes mineralization of the organic combinations by nitrogen, carbon and phosphorus origin. Overturning process of organic carbon, mainly carbohydrates in the soil characterizes an activity of invertase and catalase (Belousov, 1973). The oxyreductaz ferments are characterized more dynamically than hydrolithic ferments and are sensible for ecological condition change (Aliyev, 1978). Transformation of the organic substances which is fulfilled by hydrolithic and oxidizing-reducing ferments founds humus substances and soilformation and gas structure of soil atmosphere depends on activity of oxidizing-reducing ferments (Kazeyev and et. al., 2003).

The first of the complex agrotechnical measures directed to increase of soil fertility and ferments activity is alternation of plants in the sowing rotation being grounded on scientific side. The plant alternation in the sowing rotation should be paid attention as biodiversion change in agrosystem at times. A direction of soilforming process in agrocenoz depends on the influence of the growing plants on soil physical-chemical, biological characters. The constant sowing gives an opportunity to learn changes occurring in soil, to understand an

importance of the sowing rotation in comparison very deeply, to prognosticate an increase of fertility and getting high crop. The researches carried out under different soil-climate condition show that the ferments activity in the soil under vegetable plants in sowing rotation is higher than constant sowing (Abbasov, 1980; Aliyev, 1978; Mustafayeva, 2005).

The soil is an inseparable part of biogeosenoz and biosphere and it fulfils global ecological problems, provides biosphere stability and life availability on the land. The biological period is preserved at the expense of organic matters synthesis and shattering, the main destructors of ecosystem, the main leaders of the plant remnants shattering are microscopic fungus. A relation between the plants and microorganisms in soil isn't wholly studied, and it is lightened in the few works (Kuzyakov, 2001). Some works are dedicated to evaluation of the biotan effect on soil and pedosphere to an important degree at present (Aristovskaya, 1980). Change of microorganisms quantity and composition a long the soil profile, straight proportionality with humus absorption capacity, biogen elements and other's quantity forms dependence (Khashrum, 2005).

The microflora quantity changes in a large interval in time and space. E. N. Mishustin (1972) shows that the soils of the different zones don't differ for microorganisms quantity, they differ for sporforming bacteria quantity, basils can be used as a depth indicator of the soilforming process development. G. A. Zavarzin (1994) says that there is no geographic graduality (isolation) among microorganisms. A quantity of different bacteria changes in the samples which differ from each other according to biogeosenoz (desert and swamp) in  $10^2$ - $10^{10}$  of large interval and depends not on geographical zoning, depends on biotan type and time of the taken sample (Dobrovolskaya and et. al., 1997). The geographic factor shows itself after complex ecological factors as humidity,

substrate type, acidity, temperature, salinity in microorganisms widening (Zvyaginsev, 1987).

Microorganisms play an important role in soil forming process. Microorganisms develop, breed and perish in soil continuously. The perished cells are rich in spare nutrient and bacterial biomass mineralizes faster than plant remnants. Microbe biomass is a main source of nutrient, there is 10-12% nitrogen, 3% of phosphorus and 22% of potassium in its structure, easily assimilating substances and ash elements create for plants in their shattering, a rest part of biomass overturn into humus matter of soil (Shakuri, 2004).

The microorganisms quantity in soil and their activity depend on carbon gas quantity being separated from soil and nitrogen period. The microorganisms quantity, their life products influence on soil biological activity and fertility directly or indirectly. Some scientists (Kizilova and et. al., 2006) estimate a total quantity of microorganisms as soil biological activity criterion. A quantity of microorganisms biomass in soil is very sensible against antropogen effects and environment factors and it is a man diagnostic indicator in change of organic matter by quality, definition soilforming process (Demkina and et. al., 2004). Microzoning depends on organic remnants entering the soil, secretion of the plant root system, temperature, humidity, pH change interval, Eh, mineral elements residue and etc. depending on local condition. Depending on microzoning the different and sometimes incompatible with each other aerob, anaerob, avtotroph and heterotroph process can occur in low and high values of pH at the same time (Dobrovolskaya and et. al., 1996).

The soil fertility forms under an influence of antropogen and natural factors, microorganisms, biochemical activity stands on its basis Immobilization of nitrogen by microorganisms influences on a quantity of organic and inorganic

combinations of nitrogen in soil, plants feeding and productivity. A quantity of all the ecological-trophic microorganisms groups in soil rises for the first year of entering of new organic substances in the soil (Shapova, 2004).

The bacteria quantity being planted in weak alkaline soil is more but it is little in acid, boggy or torphy soils (Gasimova, 1985), an activity of much microorganism becomes limited while pH is 4.7 (Hajiyev, 1997).

Some authors note that the soils cultural level regulates microbiological activity in agrosenoze and raises the microorganism quantity (Orudzheva, 2009; 2011; 2012). The bacterium cells are absorbed by soil particles, this process occurs intensively in acid soils, the bacteria are desorbed under convenient condition; this process is biologically characterized (Voynova-Roykova, 1986). The convenient structural soils are rich in microorganisms very much, the soils porosity is necessary for their activity. As a result of microorganisms continuous activity the shattering of synthesis-organic substances and formation of new substances occur in soil. Bacteria provide shattering of albumen and other organic combinations, influence on soil fertility development and crop creation. Fungus participate mainly in mineralization of organic substances, they start shattering of plant remnants initially and continue their activity to an end (Kononova, 1963). Actinomycetes use of different organic combinations as carbon and nitrogen source, they take part on the last stage of plant remnants shattering and humification process (Krasilnikov, 1958).

Soil microflora plays an important role in plant life, they form biological active layer around plant root, provide its feeding, protect from diseases and etc. The microorganisms quantity depends on chemical structure of the plant remnants entering the soil. Simplifying the combinations which are difficult by microorganisms for plants and some works are dedicated to an influence of

plants on microflora (Guliyeva, 2005; Abbasov, 1980; Jumshidova, 1987; Mamedzade, 2004).

Some authors show many microorganisms in rizosphere and Gilther called it “rizosphere effect” for the first time in 1904, then some investigators approved this idea (Krasilnikov, 1958). An influence of rizosphere effect of different plants isn’t the same with the ferments activity and ferments activity of the soils under different plants is distinguished.

The microorganisms quantity, their life products influence on soil biological activity and fertility directly or indirectly.

Some scientists (Krasilnikov, 1958; Mishustin, 1972) estimate a total quantity of microorganisms as a criterion of soil biological activity. The microorganisms quantity in soils depends directly on plant feeding, intensity of matter exchange, plants development phase and level (Zeynalova, 1998). The sort structure of soil microflora a quantity and quality is a main indicator parameter of the soil state change. Microflora develops actively because of occurrence of oxidizing process on soil surface, the microflora development weakens because of becoming stronger of reducing process velocity as an oxygen quantity decreases towards low layers, these two process which are opposite each-other depend on soil characters and depth and define aerob and anaerob microorganisms development (Voynova-Roykova, 1986).

A comparison between microorganisms and actinomycetes quantity is closed with humidity and temperature in soil in the season. An influence of the zone on soilforming process of soil-climate condition, microflora quantity and structure is different.

Obeying the vertical and horizontal law objectives for a quantity and structure of the microb association reflects in some researchers (Aliyev, 1978; Mishustin, 1972). It was determined that a total quantity of microorganisms, bacteria without spore and microscopic fungus increase, but sporforming bacteria and actinomycetes decrease in microflora structure while raising the height. The analyses show that the spreading sequence of microorganism groups for all the types of the zonal soils and over vertical zonality is so: bacteria > basils > actinomycetes > oligotrophs which dominate over the layers in the field plants > leaf-fall > soils horizons (Dobrovolskaya and et. al., 1996). The available objective laws are characteristic for all the zonal soils by paying attention to some aspects. The soil function and ecological state depend on activity of alive organisms living there in the natural and antropogen landscape (Smagin and et. al., 2006).

70% of bacteria, approximately 30% of actinomycetes form soil microflora and they are durable while humidity is insufficient, they are comparatively more in the dry soils, especially in summer (Krasilnikov, 1958; Mishustin, 1972). Because of participation of microflora in mineralizing process their quantity is much in the soil where plant remnants are much, they possess high ferment activity, and the ferments which they secrete take part in mineralization of humus, plant and animal residues together with humus formation in all the geographical zones. One of the characteristic peculiarities of soil microflora is to secrete antibiotic substances for perishing microbes procreating disease. Mineralization of weakly shattering organic substances is fulfilled by fungus in a low temperature and humidity in the actinomycetes, acid and good aeration soils (Zenova and et. al., 2004). Microorganisms spreading and composition depends not on soil type, but on ratio of the factors which are characteristic for the same soil (Zvyaginsev, 1987). A majority of actinomycetes by a quality and

quantity in a nature especially in the soil, their widely spreading is explained by their durability for soil aridity, little insistence for food source in the environment where they live (Voynova-Roykova, 1986). The fungus takes an active part in overturning of nitrogen combinations and they possess improvement of soil structure, aggregating ability. Many sorts of the fungus develop when pH is less than 4. The funguses are sensible for aeration, that's why they are mainly on the soil upper part. The fungus-macromisets-high bazidal fungus plays a decisive role in mineralization of large spreaded polymers as cellulose and lignin in the soils, especially, in the forests and shatter aromatic ring of lignin till the last crop (Kurakov, 2001).

O. E. Marfenina (2000) says according to the researchers that the fungus diversity can be reduced in pedosphere under condition of increasing antropogen influence, as a result the sort structure becomes simpler, biodiversity reduces the sorts which are not characteristic form, a quantity of potential dominants rises, representatives of the separate fungus change and etc. Some scientists show that the soils cultural level regulate biological especially microbiological process to considerable extent, change microflora quantity by a quality and a quantity (Mamedzade, 2004) and increase microorganisms quantity (Orudzheva, 2009; 2011; 2012) in agrocenos. A microbiological activity of spreaded soils in Azerbaijan has been studied by H. S. Gasimova (1985), S. A. Aliyev and et. al., (1979) and others. An application of sowing rotation with complex agromeliorative measures is necessary to establish degraded soils fertility exposed to antropogen tension (Dobrovolskiy, 2002). The sowing rotation plays an important role in expedient change of microflora in the soils under hereditary plants and in improvement of the plant feeding regime. The collection intensity of nitrate in soil reflects the microflora activity which fulfils mineralization and over turning of nitrogen substances (Belousov, 1973).

The microflora which use of nitrogen mineral form according to its structure and quantity and overturning it into organic combinations is enough in the soil. Denitrificating bacteria are a reason for loss of nitrogen in a gas form.

Increase of nitrification process activity and biological process intensity in the plant alternation distinguishing from each other according to biology is observed. Ammonification of nitrogen organic combinations-this is microbiological process. Ammoniac is absorbed by exchangeable ions or used by microorganisms and overturn into organic form again, that is it is immobilized. Ammonificating bacteria, some of actinomycetes, microscopic fungus and other microorganisms provide separation of assimilating ammoniac for plants and mineralization of organic substances in the soil (Voynova-Roykova, 1986). A quantity and sort of ammonificating bacteria influence on intensity of nitrogen organic combination mineralization. The albumen ammonification occurs very intensively. As a result of hydrolysis simple albumen get shattered into amino acids, complicated albumen get shattered into organic and inorganic combinations. Studying ammonification process in dynamics has been elucidated in some authors' works (Orudzheva, 2009; Jumshidova, 1987). According to T. V. Aristovskaya (1980) the albumen shattering is fulfilled by protheolithic exoferments being synthesized by microorganisms. Cellulose from organic combinations is met by chance more in the soil. Study of cellulose shattering intensity is one of the methods which make a notion about soil biological activity and it is a main diagnostic parameter of the biological activity (Zaxarov, 2006). An energy which is decomposed during cellulose shattering microorganisms activity in the soil. Nitrification ability from soil biochemical process, “respiration”, “application” method shows a general rationality of mobilizing process (Mishustin and et. al.,

1966). Much cellulose is entered the soil by plants and manure and they form organic substances structure by origin of carbon.

Cellulose shattering a occurs under aerob and anaerob condition and all the soil microorganisms in this process: bacteria, fungus, actinomycetes take part. They use from mineral form of nitrogen as food source. Bacteria, fungus, actinomycetes take part during aerob condition of cellulose shattering, bacteria participate during anaerob condition of cellulose shattering (Belousov, 1973). The cellulose shattering intensity depends on provision of soil environment, phosphorus, nitrogen and other elements. One of the main rings of carbon circulation is cellulose shattering in the soil. The soil cellulose shattering ability depends on microflora sort structure, quantity, humidity, temperature and quality and quantity of plant remnants. Organic combinations (remnants of leguminous plants) preserving nitrogen in its structure shatter very quickly, as a result nitrogen which is easily assimilated, necessary for cellulose shattering microorganisms activity by ammonifixating bacteria gathers (Voynova-Roykova, 1986).

Carbon gas decomposes during respiration of bacteria, fungus, lucerne, primitive, plant roots and overturning carbonates into biocarbonates in a little quantity. We can express an opinion about the soil biological activity according to carbon gas decomposed from soil (Abasov, 1980; Jumshidova, 1987; Babayev and et al. 2009; Orudzheva, 2009). The soil “respiration” intensity is estimated an integral indicator of biological activity for a long time (Kazeyev and et. al., 2003; Smagin, 2006), that's why it is necessary to use from this indicator in soils biodiagnostics (Kazeyev and et. al., 2003). The sources of carbon gas being decomposed from soil: 1) the plant roots respiration; 2) the microorganisms respiration shattering the plant roots respiration secretion; 3) microorganisms respiration (bazal respiration) fulfilling humus substances

shattering in the soil; 4) humus shattering (praiming-effect) at the expense of microorganisms increase (Sapronov and et. al., 2007). D.Greenwood (1970) notes that increase of CO<sub>2</sub> quantity till optimum level rises development of microorganisms and plants, the plant development stops while CO<sub>2</sub> density is 1-2%, if it is more than 2% it influences on microflora murderously.

As a result of biochemical reactions occurring in the soil carbon gas decomposes that its role is great in fulfillment of some process. Carbon gas rises phosphates solution, improves nutrient regime of soil. One of the main factors which define microorganisms development is being more of CO<sub>2</sub> quantity in soil air, carbon gas is very much on upper layers (Voynova-Roykova, 1986). While saying a total biological activity parameter we understand its “respiration”-decomposition of carbon gas from soil and absorption of oxygen by soil (Zvyaginsev, 1978). Intensity of CO<sub>2</sub> decomposition from soil depends on durability of agricultural plants in agrocenoz, soil environment in natural ecosystems, ecosystems and hydrothermal condition (Larionova, 2003). Lately a special idea is paid attention to carbon circulation and decomposition of CO<sub>2</sub> gas from soil in connection with it. It connects with it that CO<sub>2</sub> gas effects on greenhouse gas creation, efficiency to an important degree and enriches it, as a result change of CO<sub>2</sub> density in atmosphere can bring to global changing (Oberbauer and et. al., 1996). There is enough information about entering of CO<sub>2</sub> the soil by different surface residues in the references. Exudants of plant roots is carbon source which is easily assimilating for microorganisms, its activity in rizospher and quantity is much more to a considerable degree than a part that is free from plant roots (Paul and et. al., 1996). The different ferments participating in humus mineralization and synthesis are secreted by microorganisms. Increase of humin acids fraction in a structure of soil humus raises the soil ecological durability, an increase of aliphatic structural

combinations, acid fractions, especially, carboxyl groups reduces their chemical activity (Bakina and et. al., 2000). An index of humus state in soil is one of the main criteria of fertility and gathering of organic substances in soil depends on ratio of organic substances entering the soil and mineralizing (Vorobyeva, 2005). Organic matter determines soil fertility, the main physico-chemical and biological process is formed on its basis. Humus is a basis of life, secretion products of plant activity and soil ferments, both quantity and qualitative relations between humus quantity and soil ferments activity approve this notion. There is a special role of organic matters in the soil substantial structure, because humification and humus collection is connected with soil forming process. According to the contemporary ideas the organic substances existing on soil genetic layers are divided into two groups: specific and unspecific (Orlov, 1998). The inspecific substances aren't soil by origin, they are phyto-zoo-and microbcenothic naturally, enter the soil in dead biomass (organic residue) structure as a product of life activity of alive organisms. Soil humus or specific organic substances are soil-genetical by nature, they are only characteristic to the soil cover. Some authors show that overturning of cellulose, albumen, lignin and plant remnants into different substances of soil humus as specific soil process is determined by biochemical process (Orlov, 1998). A chemical structure of soil humus is very different, the organic substances in origin of plant and animal form its source. One of the main characters humus is its variation in a space. O. S. Bezuglova (2001) shows seasonal, vegetation and yearly changing of humus structure and its some characters depending on time frame and advices to measure the change of humus qualitative character with  $C_{h.a.} : C_{f.a.}$  and this comparison (ratio) can change sharply (2-4 times), a quantity of humin acid 50-100%, fulvoacids 50%. D.S. Orlov (1998) advices to replace a ratio of  $C_{h.a.} : C_{f.a.}$  by  $C_{h.a.} : C_{gen.}$  for humification estimating depending on depth. The humus layer is formed as a result of replacement of the plants with each

other continuously and is a main means in an optimum condition creation in a soil profile. During intensive use of soils their fertility regulation remains a main problem in soil science and agriculture, it is feeding these plants, ensuring with nutrient, forming definite water, air and heat regime for them and forming product with this. The soil fertility depends on humus quantity and quality. It raises soil absorption ability, plays an important role in structure formation and improves water-physical characters. V. A. Kovda (1973) shows that an establishment of soil fertility in intensive agriculture is a main principle, a solution of this problem mustn't limited by mobilizing the soil natural resources on practical side that should be based on returning of them into soil again and creating of the new one in spite of used materials and on provision of increasing ecosystem with additional energy and increase of photosynthesis product. Humus quantity and structure depends on mineralization degree together with plant remnants structure.

The contemporary soilforming process exposes to the evolution changes under an influence of agricultural plants and plant cover, depending on time. At this time a change occurring in the soils is more quickly than natural change. Some researchers' works consequences approve it on different climate-condition of the country (Dospexov, 1979; Kovda, 1973). Intensive use of soils is a reason for reduction of physico-chemical, biological indicators initially, fertility, and soils degradation. Degradation process happens from natural and antropogen effect. The soil degradation separates into 3 categories: 1. physical and chemical; 2. chemical and physico-chemical; 3. biological and biochemical (Bulgakov and et. al., 2005). Intersorts and innersort relation, population durability weakens in the soil ecosystem, as a result reduction of the biological diversity is formed. Intensive agriculture, incorrect use from soil results in reduction of genetic resources and biological diversity sort structure. A problem

of preservation of genetic resources of the biological diversity in Azerbaijan has been raised by J. A. Aliyev and his students and he made a speech on a subject of “Biological diversity is mankind’s resource” (J. Aliyev, 2001). The soil is a main and decisive factor in preservation and management of the biological diversity. One of the global problems of XXI century is soil and a solution of the problems connected with it. The soil resources of the world lose an ability of population’s need for food gradually. An academician H. A. Aliyev (H. Aliyev, 2002) informed us of an importance of soil problem solution in his “Excitement drum” monograph at first in Azerbaijan, the author called all to protect soil and based it on scientific side. The soils fertility loss occurs for different reasons, degradation is united under a general name (Babayev, 2000; Babayev and et. al., 2003; Dobrovolskiy, 2002).

The world different scientists study loss of soils fertility, degrading, degree and etc and show a main reason of its formation in connection with antropogen factors. The following changes occur in soil cover under a natural-antropogen influence: 1) improvement of all the soil characters and increase of soil fertility; 2) change of soil fertility in a different direction and change of soil fertility to an insignificant degree; 3) aggravations of all soil characters (Bulgakov, 2005). Degradation reasons of the soil resource in Albania, German, Hungary, Rumania, Georgia and other countries, antropogen effect is on the first plan (Kostadinov, 2000; Lacatusu, 2000). R.Kolly, K.Almir (2000) show that the soils degradation under private economical condition is less quicker than collective economic economical activity for last 10 years, as a result of the man’s economic activity a yearly soil loss is 20 t/h, restoration is 2-6 t/h. A main reason of the soil fertility reduction is explained by agricultural intensity in Yugoslavia (Steer, 2000).

M. P. Babayev (2000) was busy with the spreaded soils and a problem of their degradation, fertility reduction at first in Azerbaijan. The authors show that one of the reasons of soils degradation spreaded in Azerbaijan is a loss of organic substance (humus), weakening of biological activity (Babayev and et. al., 2003). In order to restore the soils fertility, physical-chemical and biological character of soils selection of predecessor plants correctly in agrocenoz, application of sowing rotation, fulfillment of agrotechnical rules depending on soil-ecological condition in time and etc. are important term. A correct organization of the relation between soil and components which form them is a main term for occurring of biochemical process under optimal condition. During sowing circulation application and tillage as a result of shattering of organic substances in under soil and surface plant remnants structure some works have been dedicated to study of soil fertility preservation (Orudzheva, 2009; Abasov, 1980).

The organic substances quantity entering the soil can be regulated by alternating the plants every year. The authors consider necessary to plant leguminous plants and to apply sowing rotation in regulation of soils fertility by biological method (Orudzheva, 2003; 2009; Ramazanova, 2005). Entering the plants (under soil and surface) which keep plant remnants after itself in crop rotation influences on increase of plant productivity positively later and this effect continue some years, therefore humification of organic substances occurs. An analysis of the contemporary references shows that the plant alternation, fertilizer application in soil changes a direction of chemical and biological process. Being planted one plant in the same place for a long time reduces humus quantity and microflora activity, aggravates feeding of plants with nitrogen and an ability of soil absorption (Kononova, 1963).

So, a biological activity of soil is a sensible diagnostic indicator of soil fertility and characterizes dynamically depending on soil-ecological condition.

From this point of view depending on different soil-climate condition an influence of an ecological factors under vegetable and fodder crops in a comparative from with constant tillage and in crop rotation under irrigative condition in the grey-brown, grey-meadow, alluvial meadow-forest and gleyey-yellow soils on microorganisms quantity and sort composition, ferments and biochemical process intensity has been studied in dynamic.