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Sources of Humus Formation in the Soil, the Importance of Microorganisms in the Formation of Humus

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Abstract: *Humus is a complex complex of nitrogen-retaining high-molecular substances with a complex chemical composition, usually dark in color and evenly embedded in the soil, and in a very solid state with a mineral part. The organic composition of the soil consists of the sum of specific substances that organic matter in the soil is formed from the rotting of living organisms, microorganisms, plant residues. It is formed from the rotting of organic matter, plant and animal remains in the soil. In the first place is the mass of plant products, roots and the rest-the remains of living animals. The remains of animals and microorganisms enrich the soil with protein and nitrogen in its composition.*

INTRODUCTION

The organic part of the soil is the main factor determining its quality, fertility. The physical and chemical properties of the soil, the level of productivity of agricultural crops, largely depend on the quantity and quality of the organic part of the soil, the chambered - chas. Therefore, the balance of organic matter in the soil, its reproduction in expanded form - should be in special care and close attention of agronomists. The organic part of the soil is made up of organic matter of different types and composition. VI organic matter consists of rotting residues of plants, animals and microorganisms to varying degrees, products of their metabolism, as well as the sum of the specific substance of the soil - humus. Humus is a complex complex of nitrogen-retaining high-molecular substances with a complex chemical composition, usually dark in color and evenly embedded in the soil, and in a very solid state with a mineral part. The organic composition of the soil consists of the sum of specific substances that organic matter in the soil is formed from the rotting of living organisms, microorganisms, plant residues. It is formed from the rotting of organic matter, plant and animal remains in the soil. In the first place is the mass of plant products, roots and the rest-the remains of living animals. The remains of animals and microorganisms enrich the soil with protein and nitrogen in its composition. The amount of plant phytomass is from 150 to 2500 g/m^2 in the tundra region , and plant roots are 3-4 times more than it. The biomass of microorganisms is 10-15

g/m^2 , the residue of invertebrates is 1-3, and the residue of terrestrial vertebrates is 0.01 g/m2. In forest regions, phytomassa is 25-40 thousand g/m^2 , and roots are 3-5 times less than above-ground phytomassa. And in desert regions, the phytomass of grass-plants is from 1200 to 25,000 g/m^2 , and the amount of Roots is 3-6 times more than phytomass on the Earth's surface. In the desert region, from microorgnisms, the amount of spore bacteria, actinomycetes increases, and lilies also increase.

In addition to these, in the soils of this region, earthworms are 12-16 g/m^2. In the desert regions, however, the phytomassa decreases sharply, and the ratio between the mass of the Earth's surface and the roots varies within 1:8 and 1:9. So different H.X.Tursunav. Soil science 69 the amount of phytomass in regions determines the amount of protein, carbohydrate, lipid and aromatic substances in the soil. There are several theoretical and practical concepts about the formation of humus in the soil. Russian scientist M.V.Lomonosov: ...” over time, the remains of animals and plants form humus as a result of rotting, " he wrote. I.G.Valerian humus is porous, dark in color, often becomes cloudy when it is sernamed, and dusty when it dries. So, explains that humus comes from rotting of plant residues, that is, from decay. Later P.A.Kostochev, S.P.Kravkov, A.G.Trusov explains the organic part of the soil as a product of the living conditions of various animals and microorganisms. L.S.Mayard isolated, under laboratory conditions, humus-like dark substances in a mixture of amino acids and carbohydrates. V.R.Williams concludes that the synthesis of humus formation in the higher body of organic substances, when they die, is a product of processes that occur alternately in decomposition by microorganisms. According to him, under the influence of arboreal plants and associated fungi, actinomycetes and anaerobic bacteria, water-soluble crenic acid (fulgvocylates) is synthesized. Under the influence of aerobic and anaerobic microorganisms living on and in connection with herbivorous plants, guminic acid (Brown gumins) forms guminic acid in the presence of aerobic microorganisms of the steppe herbivorous plant pharmacy. There are three different directions in the chemistry of the formation of humus substances in the composition of the soil. The first direction is the remains of plants khimizmi. I.V.Tyurin, 1937; S.Vaksman, 1937; M.M.Kononova, 1951,1964; L.N.Alexandrova, 1980; A.D.Fagin, 1981. The second is the mechanism of morphological change of the forest descent. In this, mainly the rate of Decay (R.E.Müller, 1897; Ye.Ramann, 1905; G.F.Marazov, 1912; N.P.Remezov, 1958; A.F.Sokolov, 1959; A.F.Chertov, V.S.Shumakov, 1941) studied. The third direction is the action of macro-and microorganisms in the rotting of plants (P.A.Kostichev, 1986; V.Ya.Chastukhin, 1949; T.G.Mirchnik, 1976; N.A.Chernova, 1977; B.R.Striganova, 1980) who studied in every possible way. A number of scientists who studied the formation of humus in the composition of the soil I.V.Tyurin, M.M.Kononova, S.S.Dragunov, V.V.Ponomaryova, L.N.Alexandrova, V.According to the composition of organic matter, Kubiena is divided into three groups: H.X.Tursunav. Soil science 70 1. The first substances in plant and animal residues that have not yet rotted (proteins, carbohydrates, lignins, fats, etc.). V.Coarse humus Moder on Kubiena. 2. Intermediate products that are turning into humus (amino acid-oxycislota, phenol, monosaccharide etc.) V.The formation of Moog humus according to Kubiena occurs under certain environmental conditions. Due to the variety of these conditions, the end products in the formation of humus are also not the same.

Usually, emphasizing the variety of environmental conditions, it is possible 110 to indicate the following factors of humus formation: the mass of plant residues. the chemical composition of the substances turning into humus, soil moisture and aeration regime, environmental reaction and redox conditions, the intensity of the activity of microorganisms, the granulometric composition of the soil and other characteristics of the mineral part. Even the monotonous conditions themselves can sometimes have the opposite effect on the humus formation process. For example. the calcium enrichment of the soil activates microf1ors under favorable conditions and accelerates the processes of transformation of plant residues, but at the same time the interaction of organic matter with calcium increases the resistance of themnil1g UA as a result can reduce the rate of humification. 3. Humus substances, being the main component of humus itself, make up 85-90% of all humus. The first and second group of organic matter, considered a non-specific part of humus, accounted for 10-5% of humus, C.Mule on Kubiena. The importance of bacteria is very great in the transformation of organic matter in the soil, that is, in its rotting. Under the influence of exoferments of bacteria,

protein, sugar, starch, organic acids, alcohol, aldehyde are broken down. By the nature of enzymes, the mahlum rapidly decomposes a type of substance. For example, cellulose is broken down by bacteria such as Cytauphaga, Clostridium, Celvibrio, cellulose and cellobiosis enzyme, starch Clostridium accectobotilicana, Bacillus subtillis, Bac.mesentericus breaks down the enzymes amylase and glucosidase. Actinomycetes are actively involved in the decomposition of organic matter. They are a source of carbohydrates, xylan, pectin substances, cellulose, keratin, chitin, fatty acids and break down the carbohydrate chain. Actinomycetes - containing a large number of types of microorganisms, are not as resistant as bacteria and other fungi, that is, they develop well only when the temperature is 5-10 ^{0}C and the humidity is 91.5-99 %, and are actively involved in the rotting of organic matter. Lilies quickly decompose plant and animal residues in the soil with the help of enzymes, but in terms of speed they occupy the next place after bacteria and microorganisms.

Aromatic organic compounds-lignin and tannins-are rapidly eroded by them in relation to microorganisms. Algae (autotrophs) living in the soil are actively involved in the formation of organic substances, their cell is a source of nutrients of Amoeba, infusoria, mites, nematodes.

Invertebrates in the soil, mites, earthworms, millennials, beetles, sandurs, on the other hand, mechanically mix organic substances and pass them through themselves, preparing raw materials for microorganisms. Vertebrates living in the soil make up 2 % of the total zoomassa, but their product actively participates in soil biological processes. H.X.Tursunav. Soil science 71 enzymes are actively involved in the decomposition of organic matter, the source of which is living beings living in the soil. They are made up of protein substances, with a molecular mass of even 10,000 divers, performing a catalytic function in biochemical processes. Plant and animal residues are made up of protein, carbohydrates, starch, cellulose, lipids and aromatic substances. All humus in the soil is divided into compounds, specific and nonspecific substances. 10-15% of organic matter is made up of nospetsific substances, which are composed of nitrogenous compounds, proteins and amino acids.

Proteins are components of living organisms and are polymers made up of amino acids. The protein contains carbon, hydrogen, a fragment from oxygen, nitrogen 15-19 %, boron and 0.3-2.4 % sulfur, phosphorus. In the soil, proteins break down, forming amino acids, glycine, alanine, serine, Cysteine, threonine, valine, methionine, carbocylota and amines. Carbohydrates are the source of life for microorganisms and invertebrates living in the soil. Carbohydrates are more than monosaccharides (glucose, fructose, mannose, galactose, arabinose, ribose, xylose), oligosaccharides 2-4 %, polysaccharides 11 %, they are monosaccharide polymers. Polysaccharides include pentosanes and hexosanes. Pentosans are made up of csilans and arabans, while hexosanes include glucose monomers, starch, isolichenin, cellulose, polyfructozan, polygalactane, polymannans.

Heteropolysaccharides include-sopolimer saccharides, that is, arabinosalactane, hemicellulose, galactomannan, glucomannan, arabinoxilanes. Lipids included groups of oils, ether, glycerin, steroids, isoprenoids, caratinoids. In addition to these, the products of aliphatic, cyclic hydrocarbons, their compounds formed with alcohol, alkyd and oxycislotes, Mumm, cutin, suberin, sparapoli are also included. Aromatic substances included aromatic acids, vanillin, procatechin, siren, coffee, ferula acids. Nospetsific organic substances are mineralized that form CO2, H2O, NH3, N2, and they can act on the soil cut and participate in the formation of humus. Study of humus content M.V.It dates back to the era of Lomonosov. S.P.Kravkov and A.G.Trusov comes up with the idea that light organic acids, which are quickly assimilated, form humus substances. L.S.Mayard (1912, 1917) synthesized dark solutions that resembled humus. V.R.Williams (1897, 1914, 1939), on the other hand, had argued that organic acids were formed by the upper class plants and animals, and that microorganisms erode them, forming humus substances. J.Fisher and G.Schroeder (1921,1922); V.Fuchs (1931,1936) anaerobic and aerobic bacteria live in the flora and fauna of crenic acid, fulgvo and H.X.Tursunav. Soil science has written that it synthesizes 72 augminic acids, the basis of humic acids is formed by lignin substances. Academician I.V.A group of scientists, led by Tyurin, found out that the flora and fauna, microorganisms, under the influence of negative abiotic factors, produce specific humus substances. Aromatic polydispers with heterogeneous nitrogen in the form of a humus-specific substance are high molecular compounds. Humic acid contains C-50-62 %, H-2.8-

6.6 %, O-31-40%, N-2-6%. The color of humic acids is scab, insoluble in water. Fulgvocislotes, on the other hand, are a whitish color, less carbon, with a density of 1.43-1.61 g/cm3, which remains after humic acid falls into the precipitate, with a content of C-41-46%, H-4-5%, N-3-4%. Fulgvocylates will be combined with oxides, cations and anions, phosphorus compounds, and secondary minerals in the soil. In the field of humus formation and determination of its chemical composition, M.M.Kononova, L.N.Alexandrov (1970), F.Dyushafor (1972), D.S.Orlov (1977), S.A.Aliyev (1980) conducted a lot of research. Humus improves soil fertility, porosity, granularity, moisture and air regime. Black soils with a lot of humus (10-15 %) are the most fertile. Humus soil is collected in the AV layer of the cut. Hence, the complex chemical composition of humus contains a complex of nitrogen-retaining high-molecular substances, dark in color and evenly embedded in the soil, and very firmly combined with the mineral part. 85 % of organic matter in the soil is humus, 10 % is plant residues, soil flora and fauna (lilies, algae, bacteria, actinomycetes, rainworms) make up 5 %. The amount of humus that accumulates in the soil will depend on a number of factors and conditions, will depend on the quantity and quality of biomass, chemical composition, environment, water-air, thermal regime and physical and mechanical properties. On black soils, the humus content is more than 10 %, and on sandy desert soils it does not exceed 0.5 %. The system of signs indicating the humus state of the soil L.A.Grishina and D.S.Recommended by Orlov. The state of humus, the amount and reserve of organic matter in the soil, the fact that its distribution along the genetic layer of the cut is enriched with nitrogen, the degree of humus formation, the types of humic acids and their individual symptoms were taken into account. The amount of humus in the soil varies, for example, in black soils it is 10 %, in podzol it is 1.5-2.0, in gray soils it is 2-3 %, and the thickness also varies from 0.5-1.5 meters. H.X.Tursunav. Soil science according to the amount of humus 73, the following types of soil are distinguished: without humus < 1 % very low humus – 1-2 low humus – 2-4 medium humus – 4-6 highest humus – 6-10 humus – 15-30 peat > 30 soil contains almost all the necessary elements for plants in the composition – C, O_2, N, Cf, Mg, S and Fe. When the content of humus in the soil is at an optimal level, the level of its donadolia, porosity, ability to keep moist and productivity increases. In the soil, the microbiological process is well absorbed by the redox reaction, the environment, the biofil elements that determine fertility, as well as the nitrogen that the plant will need. To increase the humus content in the soil, it is recommended to apply organic fertilizers, plant grass field crops.

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