HUMUS ACCUMULATION IN TECHNOZEMS WITH DIFFERENT LITHOLOGICAL COMPOSITION IN SOUTH STEPPE OF UKRAINE

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Gaved the results of investigation of the processes of humus accumulation and transformation of plants phytomass in organic matter in the early stages of biological development of technozems formed on a potentially fertile rocks on reclaimed lands. Esteblished the dependence of the rate of accumulation of humus in various qualities models of technozems from saturation of crop rotation with perennial phytomelioration agrocenosis.

INTRODUCTION

It is known that humus is biological accumulator of solar energy and depositor of elements causes edaphic properties of soil and its fertility. Therefore, investigation of factors influencing the transformation of fresh organic matter and the rate of accumulation of humus, and the ability to manage these processes is an important theoretical issues of soil formation. Its become more actual during recultivation of man-disturbed lands at the stage of young soil of various qualities for lithogenic composition of potentially fertile rocks, which in career mode mining submitted to the surface and become parent material of modern soil formation.

The purpose of the research is to study processes of humus accumulation and transformation of phytomass into organic matter on the early stages of biological development of technozems, formed from potentially fertile rocks.

OBJECTIVES AND METHODS

The experiments were performed on a research center of land recultivation, which is located on the external heap of manganese quarry near the Ordzhonikidze city, Dnipropetrovsk region (southern steppes). In technozems, formed from loess-like loam (LS), mix of red-brown clay and loam (RC) and gray-green clay (GC), studied humus accumulation processes on the early stages of biological development of potentially fertile rocks. Detailed edaphic characteristic studied technozems reproduced in publications of M. Masyuk [1, 2].

In long-term field experiments during 1971 - 2012 on technozems by the same methods studied various options of crop rotation in time. Every year held records of phytomass entering the technozem as the main source of replenishment of organic matter. Options of experiments had a rotation of crops in time:

Filed № 1: alfalfa 4 years, spring barley 5 years, spring barley with legume grass mixtures 9 years, clean field, winter wheat, legume grass mixtures 20 years;

Field № 2: alfalfa 4 years, clean field, spring barley, spring barley, clean field, winter wheat, spring barley, clean field, winter wheat, spring barley, corn, spring barley, peas, spring barley, peas, spring barley, clean field, winter wheat, winter wheat, legume grass mixtures for 19 years.

Difference between options of the experiment is their richness of perennial legumes and legume- grass that have much larger melioration effect compared with annual agrocenoses, especially from cereals.

In experiments used standard methods in soil science.

RESULTS AND ANALYSIS

With the results of productive efficiency phytomass of agrocenoses 42 -year period of the development of technozems we can identify changes of humus content of technozems since their formation - the «zero - moment» of soil formation - 1971. These phytomass productivity of crops from the beginning of biological development technozems (for the period 1971-2009 years), are found in the works of M. Masuk and V. Zabaluev [2-4].

According to the data of table № 1, the total overall performance agrophytocenoses phytomass (aboveground and underground phytomass) for the period of their biological development depended from variant of crop rotation and the substrate from which technozem was formed.

Table 1. *Total long-term productivity and energy content in phytomass of agricultural crops from the beginning of biological development of technozems (1971-2012)*

Variant	total productivity, t/ha			Energy accumulated, GJ/ha		
	Above ground phytomass	Under ground phytomass	Total	Above ground phytomass	Under ground phytomass	Total
Technozem, formed from loess loam						
1	117,3	218,7	336,0	2052,8	3761,6	5814,4
2	112,7	166,1	278,8	1972,3	2856,9	4829,2
Technozem, formed from the mix of red-brown clay and loam						
1	109,2	238,7	347,9	1911,0	4105,6	6016,6
2	101,6	191,8	293,4	1778,0	3299,0	5077,0
Technozem, formed from the gray-green clay						
1	121,9	222,7	344,6	2133,3	3830,4	5963,7
2	111,5	175,6	287,1	1951,3	3020,3	4971,6

To study the process of humus accumulation first of all we are interesting of productivity of underground phytomass (root mass) as the main sources of fresh organic matter and energy of materials in technozems.

On the field, dominated by perennial agrocenosis, the amount of root mass was significantly bigger than on the field № 2 on all investigated models of technozems. The biggest amount of root phytomass during the period of observations recorded at technozems from a mixture of red- brown clay.

In Table № 2 summarizes the data transformation of phytomass for 42 -year period, depending of the lithological basics technozems and saturation of phytomelioration crops. Data from table № 2 indicate that edafotops entered a different number of energy material in the form of plant residues, which affected the performance of humus creation.

Thus, accumulation and transformation processes of organic matter in the rocks under agricultural use in the early stages occur relatively quickly, despite differences and heterogeneity of the material composition and some edaphic factors that limit the vegetation of crops.

CONCLUSION

With agricultural development of technozems basic process of soil formation is humus accumulation, the speed of which depends not only on the structure and properties of technozems and bioclimatic potential of the territory, but also on phytomelioration possibilities of crops.

Table 2. *Indicators of phytomass transformation in humus based on lithological basics of technozems and saturation with phytomelioration agrocenoses (field experiments, 1971-2012 years)*

Value	Technozem					
	LS			RC		GC
	Field					
	1	2	1	2	1	2
Total phytomass productivity by 42- year period, t/ha	336,0	278,8	347,9	293,4	344,6	287,1
Amount of phytomass that entered edafotop with root biomass and residues, t / ha	218,7	166,1	238,7	191,8	222,7	175,6
Received energy with phytomass, GJ/ha	3762	2857	4106	3299	3830	3020
Humus content in 0−20 sm layer, %						
• at the beginning of development	0,4	0,4	0,2	0,2	0,18	0,18
• after 42 years	1,38	1,12	0,97	1,21	1,22	1,35
Stock of humus						
• at the beginning of development	9,6	9,6	4,8	4,8	4,3	4,3
• after 42 years	33,1	26,9	23,3	29,0	29,3	32,4
Humus accumulated in layer 0−20 sm, t/ha						
• all period of agricultural development	23,5	17,3	18,5	24,2	25,0	28,1
• annual average	0,56	0,41	0,44	0,58	0,59	0,67

The quantity and quality of plant residues, which enter in technozems is the main energy material for and humus accumulation.

Acceleration of soil formation processes possible due to the saturation rotation with legumes and legume-cereal grasses.

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ГУМУСОНАКОПЛЕНИЕ В РАЗНОКАЧЕСТВЕННЫХ ПО ЛИТОГЕННОМУ СОСТАВУ ТЕХНОЗЕМАХ В УСЛОВИЯХ СТЕПИ УКРАИНЫ

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Приведены результаты исследования темпов гумусонакопления и трансформации фитомассы сельскохозяйственных растений в органическое вещество на первых этапах биологического освоения технозёмов, сформированных из потенциально плодородных горных пород на рекультивированных землях. Установлена зависимость темпов гумусонакопления в разнокачественных моделях технозёмов от насыщенности агросукцессий многолетними фитомелиоративными агроценозами. Ускорение темпов гумусонакопления возможно благодаря насыщению севооборотов фитомелиоративными бобовыми и бобово-злаковыми многолетними агроценозами.