

EVOLUTIONARY PROCESSES OF THE SOIL STRUCTURE IN THE PERENNIAL PLANTINGS

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Key words: spatial area, subsoils, water stability aggregate.

Abstract. The anthropogenous influence on the structure of the gardens' subsoils was investigated. Investigated soils have satisfactory structure, the factor of structure is 1. The contents of the water stability units > 0.25 mm decreases in arable horizon and in the condensed layer, is especial in the Chernozems of young terraces, where these parameters are reduced till 36-18 of %. These layers of soil have satisfactory structure in the lines, unsatisfactory in interlines and unsatisfactory on the traces of wheels of the farm machinery.

1. Introduction.

Among the physical soil properties the structure borrows the especially important place. To a soil structure are connected water, salt, air and thermal regimes of the soil. The physical methods of increase of soil fertility are carried out mainly through influence on their configuration and structure.

The mechanization of agriculture raises productivity of the work. However wrong and unlimited application of engineering, except for expected effect, the negative result can be achieved and indirect, collateral, and quite often. The special acuteness the problem of influence of the soil processing has got recently in connection with intensification of agricultural manufacture and occurrence on the fields of more and more heavy machines and tractors. The modern technologies provide repeated passes of farm machinery on the fields. [7]

The special problem creates the soil compacting in interlines of gardens and vineyards. Here the soil density exceeds accessible limits and negatively has an effect for development of plantings [5].

The Moldavian's soil and mainly the Chernozems are characterized by good expressed water stability structure, is especial subsoils horizons, where the water stability aggregates with a diameter $> 0,25$ mm make 75-80 % [3].

Last years the soil processing by heavy engineering (is especial the subsoils)) has finished up to degradation of initial structure of the Chernozems and other soil types, as for example of grey soil.

Researches of soil structure last years shows, that the arable and subarable horizon is contained the water stability aggregates > 0.25 mm, no more than 50 %.

Is especially appreciable the structure degradation in the subsoils under the perennial plantings).

2. Object and methods

For an estimation of influence of engineering on the subsoils structure in the intensive gardens were carried out the experimental researches in natural and laboratory conditions. The researches were spent in north and at the centre of Moldova on the Chernozems and the grey soils of a clay loam structure. The researched areas were used under the gardens. The experiences spent in the spatial area both on a vertical, and on a horizontal. In laboratory conditions determined the structure by a method of N. I. Savinov.

3. Results and their discussion

As a result of researches of subsoils, which represent the tehnogen profiles , it is possible to make a conclusion, that degradation of the structure takes place both on a vertical, and on horizons.

The contents of aggregates $> 0,25$ mm in arable layer of 10-15cm at dry sifting make 75 % with prevalence of mezoaggregates. On the depth of 15-25 cm the compacting horizon is formed, where the sum of mezoaggregates makes no more than 50 %. Till estimations of a coefficient of structure, the soil is characterized by good structure of arable horizon and unsatisfactory structure in compacting layer of 15-25cm, where (a coefficient of structure) C str. is < 1 . [2]

The especial estimation of soil structure is given by result of researching of water stability aggregates. According to researches of Kuznechov the Chernozems are characterized by stable configuration of arable horizon, when contain less than 40-45 % of water stability aggregates $> 0,25$ mm. In another a case, the soil easily is exposed to compacting, therefore the physical properties are worsened, is especial permeable and air-water regime and these soil easily are exposed to erosive processes.

The structure researched Chernozems by us of the young terraces of a Prut degraded under action of processing of gardens in comparison with the Chernozems of older terraces; it is explained by the large contents of a fraction of a dust in the granulometric composition.

The contents of the water stability aggregates by a diameter > 0.25 mm in the Chernozems of young terraces in the arable horizon make 23-34 %, and in the Chernozems of older terraces make 40-48 %. The soil in the interlines in comparison with the same soil, but which are under dead fallow, contain the water stability aggregates $> 0,25$ mm from 54 % up to 61 %. The soil degradation and the

soil compacting in the subsoils as a result processing of intensive gardens takes place since the first years of existence. In the soils of a three-year garden the reduction of water stability aggregates both in an arable layer, and on a depth of 20-30 cm is observed.

The agro systems created by the man, in which are saved the majority of boocenoz's connections conduct to change of natural processes, in the subsoils to change of a natural profile and genetic horizons, and also in change of physical properties and on horizons. As a result of subsoils research in the interlines intensive gardens, shows, that the quantity of macroaggregates suffers essential changes in the interlines on all soil types increasing on 4-10 % in the interlines and on 10-25 % on a trace of wheels of engineering in comparison with the soil from a line (Tab. 1).

Tab. 1 - The flocculated analysis of influence of the soil processing in gardens depending on the factors A (soil), B (depth), C (special variants) on macroaggregates

The factor	Degree of influence, %	F real	F theoretic	DL _{0,95}	The error, %
A	19,33	17,19	2,36	2,86	11,70
B	2,44	7,60	3,34	1,75	
C	49,98	155,55	3,34	1,75	

The grey soil contains 16-20% macroaggregates in a line, 20-25 % in interline and 34-40 % on a trace of wheels. The increase at 9 % of the macroaggregates contents in interlines and on 24% on a trace of wheels in comparison with the soil from a line conducts to formation in interlines of blocky structure.

The leached Chernozems is characterized by weak blocky structure in a line and in the interline and on a trace of wheels it characterized by average blocky structure [6].

The typical Chernozems of young terraces of a Prut is characterized by more blocky structure as a result of the soil processing in intensive gardens and especially on the depth of 15-25 cm in the interline and on a trace of wheels in comparison with the typical Chernozems of old terraces (Tab. 2).

The changes in the spatial area of a garden and in the contents of the mezoaggregates (tab.3) observe. If the soil contains in a line 70-80 % of mezoaggregates, in interline their quantity changes on 7-17 %, and on a trace of wheels on 20-30 %, depending on a soil type. In grey soils which are in a line, in horizon of 0-20 cm contains 78-80 % of mezoaggregates, in interline their quantity decreases on 10 %, and on a trace of wheels on 20-24 %.

Tab. 2 - The contents of the macroaggregates, %

The factor A (soil)	The factor B (the depth, cm)	The factor C (spatial area)		
		line	interline	a trace of wheels
The grey soil	0-15	16,00	25,10	40,40
	15-25	18,00	24,40	34,00
	25-35	20,60	20,40	33,70
The leached Chernozem	0-15	20,70	22,50	35,30
	15-25	19,70	25,30	32,70
	25-35	20,40	22,40	25,70
The typical Chernozem (young terraces)	0-15	26,30	33,50	39,20
	15-25	32,10	41,00	46,00
	25-35	20,20	25,00	32,70
The typical Chernozem (old terraces)	0-15	9,0	19,60	33,30
	15-25	12,50	20,30	37,10
	25-35	11,80	19,50	25,00

Tab. 3 - The contents of the mezoaggregates, %

The factor A (soil)	The factor B (the depth, cm)	The factor C (spatial area)		
		line	interline	a trace of wheels
The grey soil	0-15	79,10	69,00	55,10
	15-25	79,60	73,50	57,10
	25-35	78,10	76,50	62,30
The leached Chernozem	0-15	77,30	74,70	63,40
	15-25	79,60	74,10	66,30
	25-35	78,50	77,10	74,10
The typical Chernozem (young terraces)	0-15	70,50	57,70	54,20
	15-25	61,20	44,40	38,30
	25-35	75,90	69,20	60,60
The typical Chernozem (old terraces)	0-15	88,10	69,00	61,20
	15-25	81,90	73,80	58,70
	25-35	84,5	73,60	68,60

In leached Chernozems the contents of mezoaggregates in interline and on a trace of wheels in comparison with the soil from a line decrease accordingly on 3-5 % and 13-14 %.

In the typical Chernozems of the young terraces the greatest reduction quantity of mezoaggregates in interline and on a trace of wheels is observed, in comparison with the Chernozems of old terraces.

The reduction of the contents of mezoaggregates in interlines and on a trace of wheels occurs on all soil types investigated (tab. 4). The flocculated analysis demonstrates that the reduction of the mezoaggregates takes place at the basic level and in case of all factors: a type of soil (A), the depth (B) and the spatial factors (C). A degree of influence of the factors accordingly: 34.,17 %, 2,13 % and 36.02 %.

Tab. 4 - The flocculated analysis of influence of the soil processing in gardens depending on the factors A (soil), B (depth), C (special variants) on mezoaggregates

The factor	Degree of influence, %	F real	F theoretic	DL _{0,95}	The error, %
A	34,17	25,13	2,36	3,67	5,66
B	2,13	2,91	3,34	2,25	
C	36,02	92,69	3,34	2,25	

One of parameters of the characteristic of the soil structure is water stability of the aggregates. Results of research of the water stability of the aggregates with a diameter > 0.25 mm, show, that the structure of the arable layer suffers in special area of a garden essential changes as a result of soil using in the intensive gardens. These changes are essential to all soil types (tab. 5).

In grey soil, in a line, in a layer of 0-20 cm the structure is characterized as good, where the contents of the water stability aggregates > 0,25 mm make 62-64 %, in the interline and on a trace of wheels their quantity decreases accordingly on 12 % and 16 %. The structure soil's degradation is more appreciably observed in the Chernozems. The quantity of the water stability aggregates in the leached Chernozem characterize the soil as satisfactory in a line and unsatisfactory in interline and on a trace of wheels [6].

The typical Chernozems of young terraces in a line have satisfactory structure, in interline and on a trace of wheels unsatisfactory. It is explained by feature of the grain size composition, where the fraction of a dust prevails. By more good structure is characterized the typical Chernozem of old terraces (Tab. 5).

Tab. 5 - The contents of water stability aggregates with the diameter $>0,25$ mm (%)

The factor A (soil)	The factor B (the depth, cm)	The factor C (spatial area)		
		line	interline	a trace of wheels
The grey soil	0-15	64,20	52,30	48,90
	15-25	61,50	58,50	46,80
	25-35	75,50	66,20	60,80
The leached Chernozem	0-15	46,70	39,70	31,20
	15-25	49,30	43,40	39,00
	25-35	48,20	42,50	40,50
The typical Chernozem (young terraces)	0-15	40,20	29,50	23,30
	15-25	40,40	34,60	27,50
	25-35	40,50	34,90	30,30
The typical Chernozem (old terraces)	0-15	47,20	38,40	26,50
	15-25	45,00	36,50	24,50
	25-35	62,60	57,90	44,40

Tab. 6 - The flocculated analysis of influence of the soil processing in gardens depending on the factors A (soil), B (depth), C (special variants) on the water stability aggregates $> 0,25$ mm

The factor	Degree of influence, %	F real	F theoretic	DL _{0,95}	The error, %
A	54,85	239,17	2,36	1,78	4,10
B	2,60	39,62	3,34	1,09	
C	24,62	375,77	3,34	1,09	

Basically, it is possible to say, that the soil investigated under the contents of the water stability aggregates, are characterized by good structure in a line, satisfactory in interline and unsatisfactory on a trace of wheels. Accordingly the layer of 15-25 cm is characterized by reduction of the water stability aggregates on 5-9 % in interline and on 10-23 % on traces of wheels in comparison with the soil from a line. The flocculated analysis is demonstrates, that the influence of the soil processing in the intensive gardens approaches for all factors, is especial for A-54,85 [1] (tab. 6).

Conclusions

As a result of the comparative characteristic of the subsoils and the arable soil's structure possible to conclude, that, degradation the structure in the subsoils under perennial plantings is more intensive. In first, in the subsoils is appreciably increased blocky of the arable layer, where the quantity of the macroaggregates on 15-20 of % is more, and also the quantity of the mezoaggregates decreases on 10-15%.

The contents of the water stability aggregates $> 0,25$ accordingly in the subsoils on 10-15 % is less, than in the arable horizon of field cultures, it is explained to that in result of the subsoiling on a surface the layers of soil get from 40-50 cm, that is characterized by the smaller contents of humus and the water stability aggregates.

The soils investigated on the average are characterized by satisfactory structure. Essentially degraded the structure of Chernozems on a trace of wheels and in the generated condensed horizon of 15-55 cm, where the contents of the water stability aggregates is less than 40 %. The contents the agricultural valuable aggregates $> 0,25$ mm make in the Chernozems less than 40 %.

The contents in the Chernozems the agricultural valuable aggregates and the water stability aggregates $> 0,25$ mm are lower on 20-30 than % of an optimum level in the arable and the subarable layer. It specifies irreversible changes in a soil structural condition, caused to their compacting.

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